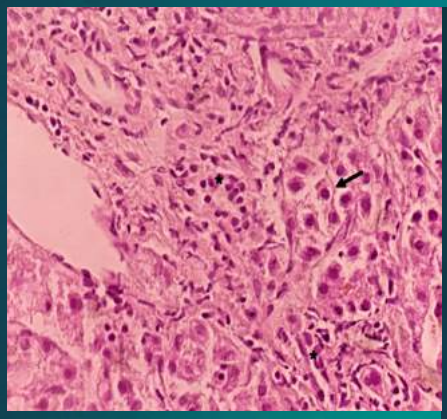
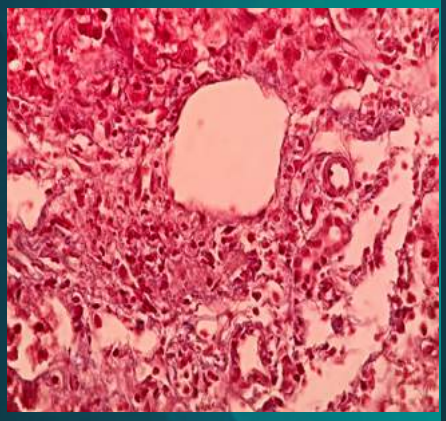
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Courtesy by the authors: Carlos Marín-López, Nilson José Morales-Córdoba, Félix Alejandro Bello-Martínez, María Cecilia Loredo-Mayorga.

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Editorial

Interval Cancer, a Challenge yet to Be Solved

David B. Páramo-Hernández.[1*]

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Defining interval cancer, also called missed or post-endoscopy cancer—for both gastric and colorectal cancers—presents a complex challenge. Consequently, the Interval Colorectal Cancer Expert Working Group from the World Endoscopy Organization's (WEO) Colorectal Cancer Screening Committee[1,2] defines it as a cancer diagnosed after a colorectal screening exam where no cancer was found, and before the next recommended screening. This term is broadly used to denote cancers of the gastrointestinal tract identified in the interval between an endoscopically reported normal study and the next scheduled follow-up examination. For gastric cancer, the interval cancer rate stands at 9.4% (95% confidence interval [CI]: 5.7-13.1%)[3], aiming for an ideal rate below 5% as per WEO standards; whereas, for colorectal cancer, the incidence rate of interval cancer is a matter of debate, ranging between 5.25% and 9.3%[4,5]. The importance of understanding interval cancer spans diagnostic, therapeutic, ethical, legal, and public health concerns, especially considering these represent the two most prevalent digestive neoplasms in our society.

Dr. Castaño and colleagues[6] offer a compelling analysis aimed at determining the rate of interval cancer in both gastric and colorectal cancers by comparing the two. They delve into the local tumor incidence rates, addressing the lack of data on this phenomenon in our context, with the goal of sparking interest in acquiring specific local data among the journal's readership.

The etiology of these neoplasms is multifactorial, with the highest risk stemming from overlooked or incompletely excised lesions. There is no consensus in the literature regarding whether interval colorectal cancers are inherently more aggressive due to molecular composition changes[7]. Colorectal cancer itself is recognized as a heterogeneous disease, with different molecular entities involved in oncogenesis, potentially contributing to the development of interval colorectal cancer. Evidence suggests the sessile serrated neoplasia pathway might accelerate carcinoma development post-screening colonoscopy. Nonetheless, the overall survival rates for interval colorectal cancers are comparable to those detected within the screening process[7]. Flat neoplastic lesions pose a significant challenge for both endoscopists and pathologists[7]. In our context, factors such as schedule overloads, preparation difficulties (refer to Aponte and colleagues)[8], endoscopist haste, and the lack of appropriate technology in various settings are among the numerous determinants of the quality in diagnostic and screening endoscopy[9,10].

Enhancements in the quality of endoscopic procedures, through endoscopist education, procedure quality surveillance systems, risk-stratified screening, and the integration of technologies such as chromoendoscopy and artificial intelligence, could significantly influence this situation[7].

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Original article

Stomach Cancer and Postendoscopy Colorectal Cancer: Parallel Lives

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Abstract

Background and objectives: The rates of (interval) stomach cancer (SC) or postendoscopy (PECRC) or postcolonoscopy (PCCRC) colorectal cancer (CRC) have been little studied in our setting. Data from overseas studies reported PECRC and PCCRC rates of 7–26%. We aim to determine and compare local PECRC and PCCRC rates and characteristics. **Patients and methods:** With data from three quaternary-care cancer centers, we ambispectively identified patients diagnosed with SC and CRC between 2012 and 2021, in whom a history of endoscopies or colonoscopies in the previous three years was investigated. Cancers diagnosed between 6 and 36 months after an endoscopic study reported as normal were defined as interval cancers. This study compares the clinical, endoscopic, and survival characteristics of both PECRC and PCCRC cohorts. **Results:** Of 828 patients diagnosed with SC, 66 had PECRC (rate: 7.3%), while in 919 patients with CRC, 68 had PCCRC (rate: 6.9%). There were no significant differences in age or sex, although males predominated (2:1) in the PECRC (0.09). The finding of premalignant lesions was similar in both groups (p = 0.260). The anatomical location was shown to be more proximal (right colon) in the PCCRC than in the PECRC (cardia/fundus) (p = 0.002). Gastric neoplasms were more poorly differentiated (58%) than colon neoplasms (26%) (p = 0.001). There were no differences in early cancers, but tumor status was more advanced in PECRC (p < 0.01). The Kaplan-Meier showed a worse survival for PCCRC than for detected CRC, with no differences in SC and PECRC, suggesting poor survival. **Conclusions:** The rate of interval cancers is 7.3% and 6.9%, and differences were found between PECRC and PCCRC, proximal locations of the lesions, degree of differentiation, tumor status, and poor survival for the PCCRC. Establishing measures to achieve the World Endoscopy Organization's goal of <5% is necessary.

Keywords

Stomach cancer, postendoscopy colorectal cancer, colorectal cancer, postcolonoscopy colorectal cancer, endoscopy, colonoscopy, survival.

INTRODUCTION

Gastric and colorectal cancers rank among the top six most prevalent and lethal cancers globally[(1)]. In Colombia, by 2020, gastric cancer (GC) emerged as the third most common cancer following breast and lung cancers and was the foremost cause of cancer mortality. Colorectal cancer (CRC) positioned fourth in both incidence and mortality for the same period[(2)].

The five-year relative survival rate for CRC stands at 65% overall, fluctuating from 72% to 91% in cases of cancer diag-

nosed with locoregional affliction, plummeting to 15% for those with advanced-stage disease[3]. In the United States, the median five-year survival rate for GC is recorded at 31%, and Europe reports a rate of 26%[4]. Notably, survival rates for localized disease have been documented to exceed 65%, highlighting the critical nature of early detection[5].

It is well-established that endoscopic examinations equipped with biopsy capabilities serve as potent tools for the identification of preneoplastic and neoplastic lesions across both upper and lower sections of the gastrointestinal tract[6,7]. Through polypectomy, the overall incidence of mortality due to CRC can be nearly reduced by 30% (colon cancer: 29%-37%, rectal cancer: 27%, respectively)[6].

Terms such as *post-endoscopy* or *post-colonoscopy cancer*, *missed*, or *interval cancer* are frequently employed to delineate cancers of the gastrointestinal tract diagnosed in the period between an endoscopically reported normal study and the next planned follow-up examination[8-10].

A multitude of studies have pursued the cause behind this phenomenon. Identifying post-endoscopy CRC and GC is crucial as they are acknowledged as indicators of the quality of endoscopy[11] and colonoscopy[12] procedures. It has been determined that enhancing the quality of colonoscopy can either decrease the prevalence of cancer or facilitate earlier detection of the disease in over 50% of instances[13]. In 2014, Singh and colleagues contributed a meta-analysis outlining a 3.7% prevalence of post-colonoscopy colorectal cancer (PCCRC)[14]. Despite this, the exploration into the quality implications of upper digestive endoscopy remains scant. Studies have reported prevalences ranging from 25.8% to a mere 0.2% for post-endoscopy gastric cancer (PEGC); yet, detailed knowledge regarding its characteristics, incidence, and causal factors remains sparse[15].

In drawing parallels between post-endoscopy colorectal and gastric cancers, this study invokes a method akin to that used by Plutarch[16] in his seminal biographical work, *Parallel Lives*. Composed between 96 and 117 A.D., Plutarch's narrative uniquely juxtaposes the lives of a Greek and a Roman figure, linked by a shared trait or dedication deemed defining by the author, ultimately comparing both individuals at the conclusion of their biographies. Similarly, our investigation seeks to parallel the narrative of post-endoscopy colorectal and gastric cancers by: (1) delineating the demographic, clinical, and endoscopic characteristics of two distinct patient cohorts, one diagnosed with PEGC and the other with PCCRC; (2) quantifying the incidence rates of PEGC and PCCRC; (3) juxtaposing the demographic, clinical, histological, and endoscopic findings across the studied groups, and (4) evaluating patient survival rates for PEGC and PCCRC, comparing these with the survival rates of other gastric and colorectal cancers identified without prior negative endoscopic evaluations for neoplasia.

PATIENTS AND METHODS

This research was conducted by gathering cases from the gastrointestinal oncology surgery departments of three quaternary care centers within the Medellín metropolitan area, Colombia, identifying instances of gastric and colorectal cancers that followed endoscopy and colonoscopy procedures between 2012 and 2021.

Data Collection and Management

Utilizing this dataset, a comparative analysis was performed between two patient cohorts managed ambispectively: one group with PEGC and another with PCCRC, covering the years 2012 to 2021. This analysis included patients diagnosed with gastric or colorectal cancer within a timeframe of six months to three years following an endoscopic procedure that did not initially detect neoplasia. The comparison focused on various dimensions including demographic (age, sex), clinical, and endoscopic characteristics, degree of differentiation, tumor stage (as determined by the tenth edition of the cTNM system of the American Joint Committee on Cancer), survival (calculated from the diagnosis of PEGC and PCCRC to the date of death), and potential reasons for the missed early detection (whether related to the quality of endoscopic or colonoscopic procedures or other factors).

Definitions

For patients with multiple endoscopies or colonoscopies, the analysis considered the most recent procedure. The interval defined for considering cancers as missed was set at 36 months following the last negative endoscopy or colonoscopy. The rate of missed cancers was determined by dividing the total number of missed cancers by the sum of missed cancers plus the total number of cancers diagnosed that met the inclusion criteria within the study period, in accordance with guidelines suggested by the World Endoscopy Organization (WEO).

The overall survival time was identified as the interval from the date of death, irrespective of cause, to the date of the histologically confirmed cancer diagnosis via endoscopy or colonoscopy, based on the reports from the procedures; essentially, this pertains to the second endoscopy or colonoscopy for cases of PEGC or PCCRC.

Inclusion and Exclusion Criteria

The principal criterion for inclusion in this study was the identification of patients who received a histopathological diagnosis of either gastric or colorectal adenocarcinoma

within the study's timeframe, with a requisite follow-up period of at least one year. We also included patients who had undergone previous surgeries, such as colectomies or gastrectomies, as well as those diagnosed with CRC or GC at an external facility before being referred to the participating study institutions for treatment. Patients were excluded if their gastric (six patients) or colorectal (four patients) cancers were diagnosed via imaging techniques, if they had a history of familial adenomatous polyposis syndrome, which invariably leads to CRC (three patients), or if they suffered from inflammatory bowel disease, including Crohn's disease (two patients) and ulcerative colitis (nine patients).

Statistical Analysis

For continuous variables, we calculated means, standard deviations, medians, and ranges. Categorical data were expressed as frequency counts and percentages. We computed 95% confidence intervals (CIs) for proportions using Wilson's method. The analysis employed parametric methods for normally distributed continuous data (t-tests) and non-parametric methods (Mann-Whitney U test) for data not normally distributed.

Chi-square and Fisher's exact tests were applied to categorical data. To reduce the risk of type I errors, only variables previously identified as risk factors for interval gastric cancer (IGC) or those with a plausible pathophysiological connection to IGC were included in our analysis.

We estimated one- and two-year survival probabilities for IGC and non-interval gastric adenocarcinoma using the Kaplan-Meier method. The Log-Rank test was utilized to compare differences in overall survival. All statistical analyses were two-tailed, with p-values below 0.05 deemed statistically significant. Statistical computations were performed using IBM SPSS software, version 24, at the sponsoring institution.

Ethical Considerations

The procedures were conducted in strict accordance with the ethical standards set by the responsible committee on human experimentation (both institutional and national) and aligned with the principles of the 1964 Declaration of Helsinki and its subsequent amendments. We ensured the protection of data confidentiality. It is important to note that this article does not contain any personal information that could lead to the identification of patients involved. This research compared data from two previously analyzed studies, which were obtained from a secondary source without any direct intervention on the patients, hence, informed consent was not required.

RESULTS

The study compared a total of 128 patients across two cohorts: 66 patients with PEGC, which translates to a rate of 7.3% of the patients evaluated (828 gastric cancer patients over a ten-year period) and 68 patients with PCCRC, representing a rate of 6.9% of the evaluated CRC patients (919 colorectal cancer patients over the same ten-year span) (**Figure 1**).

Demographic Characteristics

The median age in the group with PCCRC was 74 years, whereas it was 66 years for the group with PEGC. Those with cancer diagnosed after colonoscopy exhibited a median age that was eight years greater than that of the post-endoscopy cancer group (74 versus 66 years), which was a significant disparity as per the Student's t-test ($p = 0.0012$).

The sex distribution exhibited a predominance of males in the PEGC group (69% compared to 31%), while in the PCCRC group, the distribution by sex showed no marked differences (53% male versus 47% female). The male predominance historically seen in gastric cancer (2:1 ratio) persists. The characteristics of the two patient groups are detailed in **Table 1**.

Clinical Characteristics

Within the cohort of patients with PEGC, the impetus for endoscopy was more often due to alarm symptoms such as dysphagia, hematemesis, melena, vomiting, and constitutional syndrome in 54% of cases. Conversely, for the PCCRC group, the trigger for colonoscopy was largely the presence of alarming symptoms like rectal bleeding, anemia, abdominal pain, or changes in bowel habits, reported in 74% of cases, marking a significant difference ($p = 0.004$). Screening or early detection studies were conducted more commonly in the PEGC cohort (46%) compared to the PCCRC patients (26%).

Endoscopic Characteristics

The presence of concurrent premalignant lesions was noted to be more prominent in the PEGC group (48%) than in the PCCRC group (37%), yet this difference did not reach statistical significance ($p = 0.260$).

The median time between a negative esophagogastroduodenoscopy and the diagnosis of IGC was 14.4 months (range: 2-46 months). The most frequently encountered findings in the negative esophagogastroduodenoscopy were gastritis (73%), intestinal metaplasia (36%), gastric atrophy

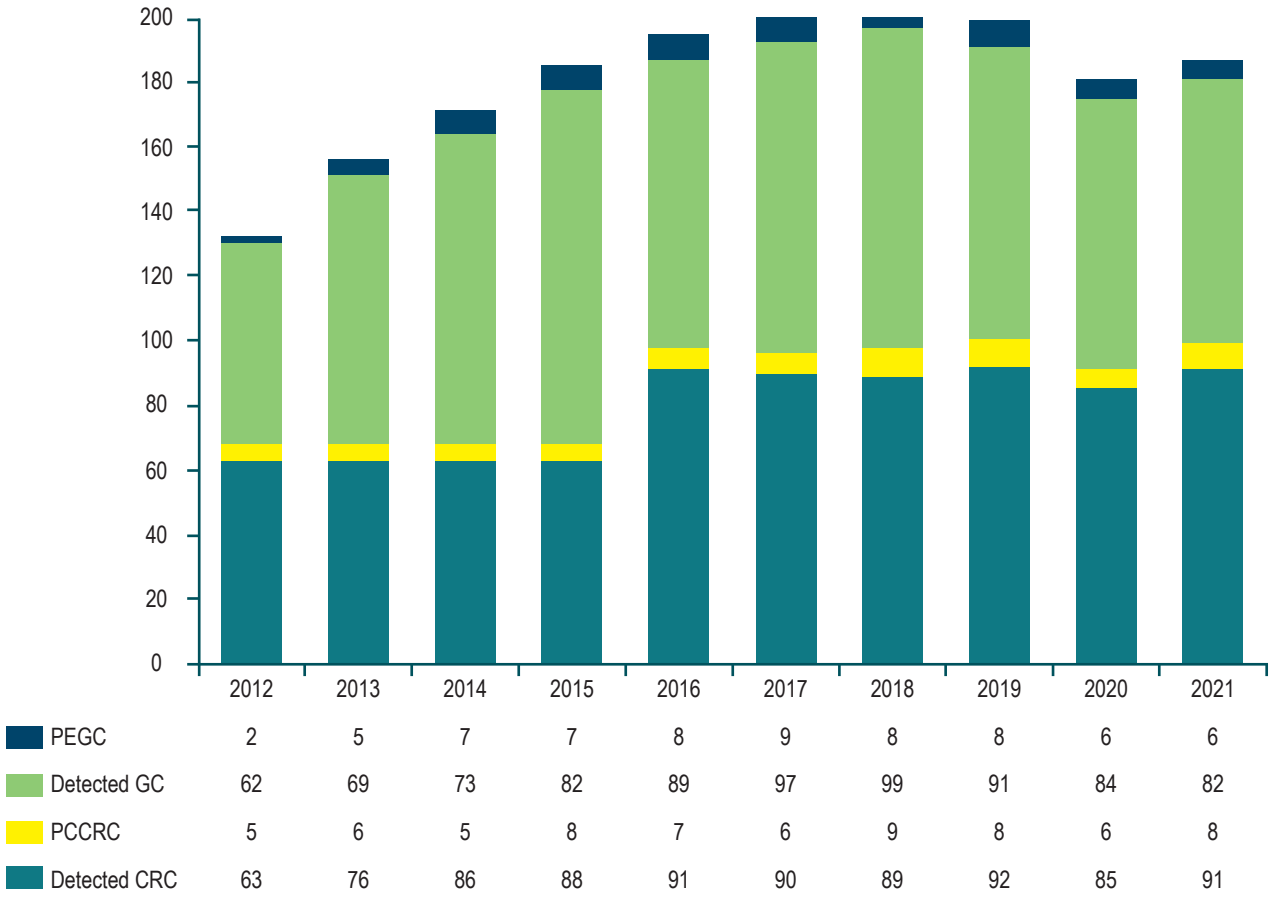


Figure 1. Number of GC/PEGC and CRC/PCCRC Cases Detected between 2012 and 2021. Author's own research.

(45%), and gastric ulcer (29%). Two percent had an esophagogastroduodenoscopy reported as normal. Meanwhile, the median time span from a negative colonoscopy to the diagnosis of PCCRC was 22.8 months, with diverticulosis being more prevalent in this group (41.2%) than in those with cancer identified on the initial colonoscopy.

Regarding the location of lesions missed during upper gastrointestinal evaluation, no significant differences were observed across the sites of the cardias/fundus, body, antrum, and pylorus (p = 0.925). However, a significant proximal involvement (right colon and transverse colon) was demonstrated in the PCCRC group (p = 0.006) as shown in **Figure 2**.

Histological Characteristics

In the cohort with PEGC, the histological differentiation most commonly observed was of the poorly differentiated variety (58%), whereas in the PCCRC group, this was seen less frequently (26%), a difference that proved to be statistically significant (p = 0.001). No significant differences were noted in the occurrence of early-stage GC or CRC (21% compared to 19%, p = 0.768).

Tumor Staging

It was observed in the PEGC group that 21% of patients were in early tumor stages (stages 0 and I) as opposed to 15% in the PCCRC cohort. A higher incidence of advanced tumor stages was found in the PEGC patients (36%) compared to those in the PCCRC cohort (4%) (p < 0.001).

Causal Analysis According to the WEO for PCCRC

In evaluating post-colonoscopy colorectal cancer, 62 of the 68 affected patients were assessed on this issue. It was discovered that 61.3% of the cases occurred as a consequence of inadequately performed colonoscopies (**Table 2**).

Table 1. Characteristics of Patients with PEGC and PCCRC

Characteristic		PEGC (n = 66) Rate: 7.3% (%)	PCCRC (n = 68) Rate: 6.9% (%)	*p-Value*
Post-endoscopy/Post-colonoscopy Cancer	Yes	66	68	0.591
	No	762	851	
Average Age (Years)		66 ± 16.6	74 ± 8.6	0.001
Age Group	< 55	13 (19)	9 (13)	0.344
	55-65	14 (21)	10 (15)	
	65-75	28 (43)	28 (41)	
	> 75	11 (17)	21 (31)	
Sex	Male	46 (69)	36 (53)	0.09
	Female	20 (31)	32 (47)	
Screening Study	Yes	30 (46)	18 (26)	0.004
	No	36 (54)	50 (74)	
Premalignant Lesions	Yes	32 (48)	25 (37)	0.260
	No	34 (52)	43 (63)	
Location		Cardias-Fundus: 9 (14) Body: 34 (52) Antrum: 17 (26) Pylorus: 6 (8)	Ascending Colon: 25 (37) Transverse: 14 (21) Descending Colon: 19 (28) Rectum: 10 (14)	0.002
Differentiation	Well	28 (42)	50 (74)	0.001
	Poor	38 (58)	18 (26)	
Early Cancer	Yes	14 (21)	10 (15)	0.768
	No	52 (79)	58 (85)	
Stage	0/I	14 (21)	10 (15)	< 0.01
	II	13 (19)	25 (37)	
	III	16 (24)	30 (44)	
	IV	23 (36)	3 (4)	

Author's own research.

Table 2. Causal Analysis of PCCRC According to the WEO

Characteristic	PCCRC Patients (%)
n	68
Missed lesion, with prior adequate colonoscopy	18 (29)
Missed lesion, with prior inadequate colonoscopy	38 (61.3)
Detected lesions not resected	0 (0)
Incomplete resection of previously identified lesion	6 (9.7)

Author's own research.

Survival Analysis

Kaplan-Meier survival curves for patients with PEGC and PCCRC are depicted in **Figure 3**. Notably, 72% of these patients had undergone a negative high gastrointestinal endoscopy less than two years prior to their GC diagnosis.

In terms of specific cancer survival rates for PCCRC, there was a 73.4% survival at one year (95% confidence interval [CI]: 72.2%-74.7%), 61% at three years (CI 95%: 56.3%-65.4%), 58% at five years (CI 95%: 54%-62%), and 55.2% at ten years (CI 95%: 51%-60%). These rates were lower compared to CRC detected during screening; 83.0% survi-

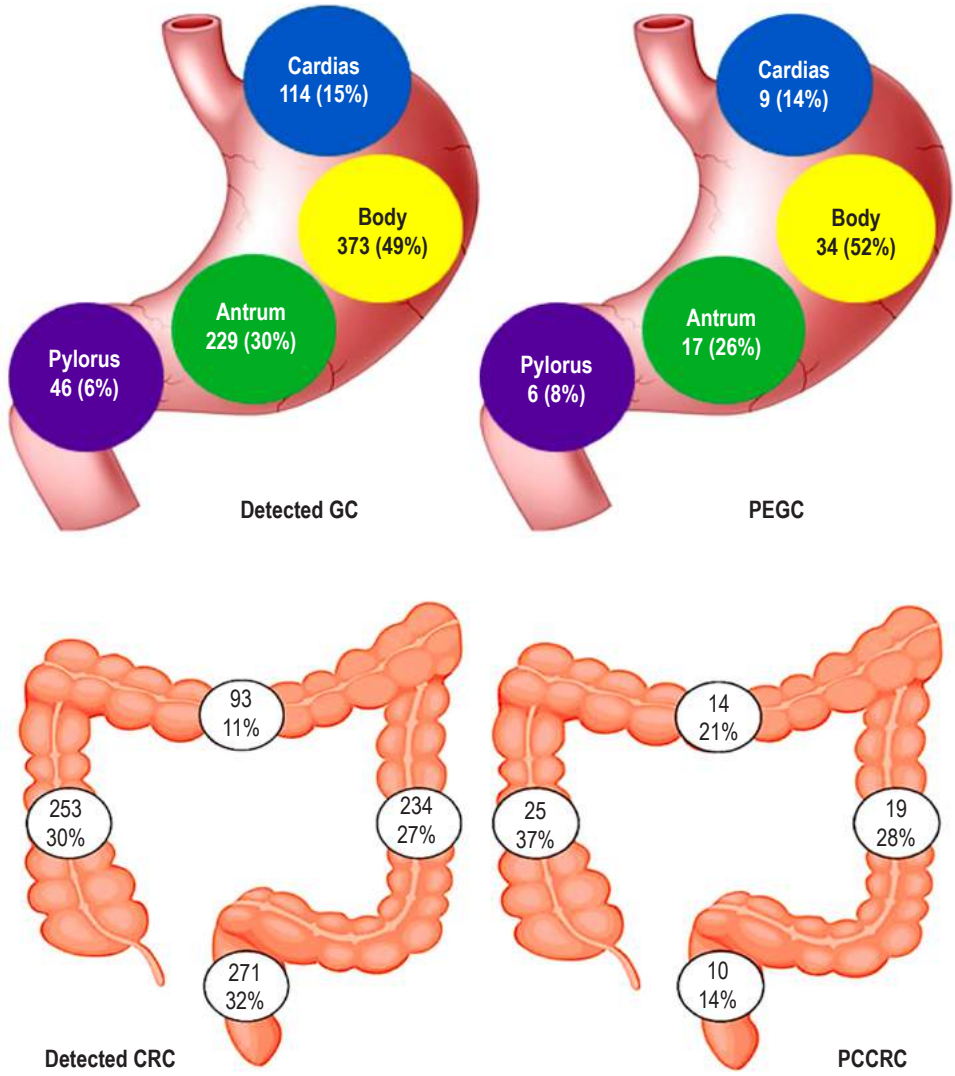


Figure 2. Anatomical Distribution of Detected GC and CRC and Missed Lesions (PEGC and PCCRC). Author's own research.

val at one year (CI 95%: 82.3%-85%), 71.5% at three years (CI 95%: 70.3%-72.5%), 67% at five years (CI 95%: 65.6%-67.6%), and 63.0% at ten years (CI 95%: 62.0%-65.3%). The survival for PEGC was assessed at one and two years and revealed no statistically significant differences when compared with detected GC, as shown in **Table 3**.

DISCUSSION

Upper endoscopy and colonoscopy play a crucial role in the diagnosis, prevention, and management of GC and CRC. However, the last decade has seen mounting evidence of a significant rate of false negatives or missed detections in both procedures, as population studies have suggested[17,18]. The risk of missing cancers, a concern for the past and looking ahead, is a prevailing thought among clinicians and patients alike[19]. Interestingly, rates of missed diagnoses during upper endoscopy have not been scrutinized to the same degree as colonoscopy, and it was only two decades ago that the first study addressing missed upper gastrointestinal cancers in Western populations emerged[20].

This study stands as the inaugural research within our nation to evaluate and contrast the missed or interval rates for GC and CRC following endoscopy and colonoscopy. It uses two patient cohorts from oncology centers with established diagnoses of GC and CRC for reference. The missed rate of 7.3% found for PEGC, as per WEO guidelines, falls within the range cited in international literature (4.6% to 14.3%) but exceeds the preferred threshold of less than 5%[21]. PCCRC rate in our research was found to be 6.9%, surpassing the rates in Korea (0.1%)[22], Turkey (1.8%)[23], and Portugal (3.8%)[24], yet aligning with figu-

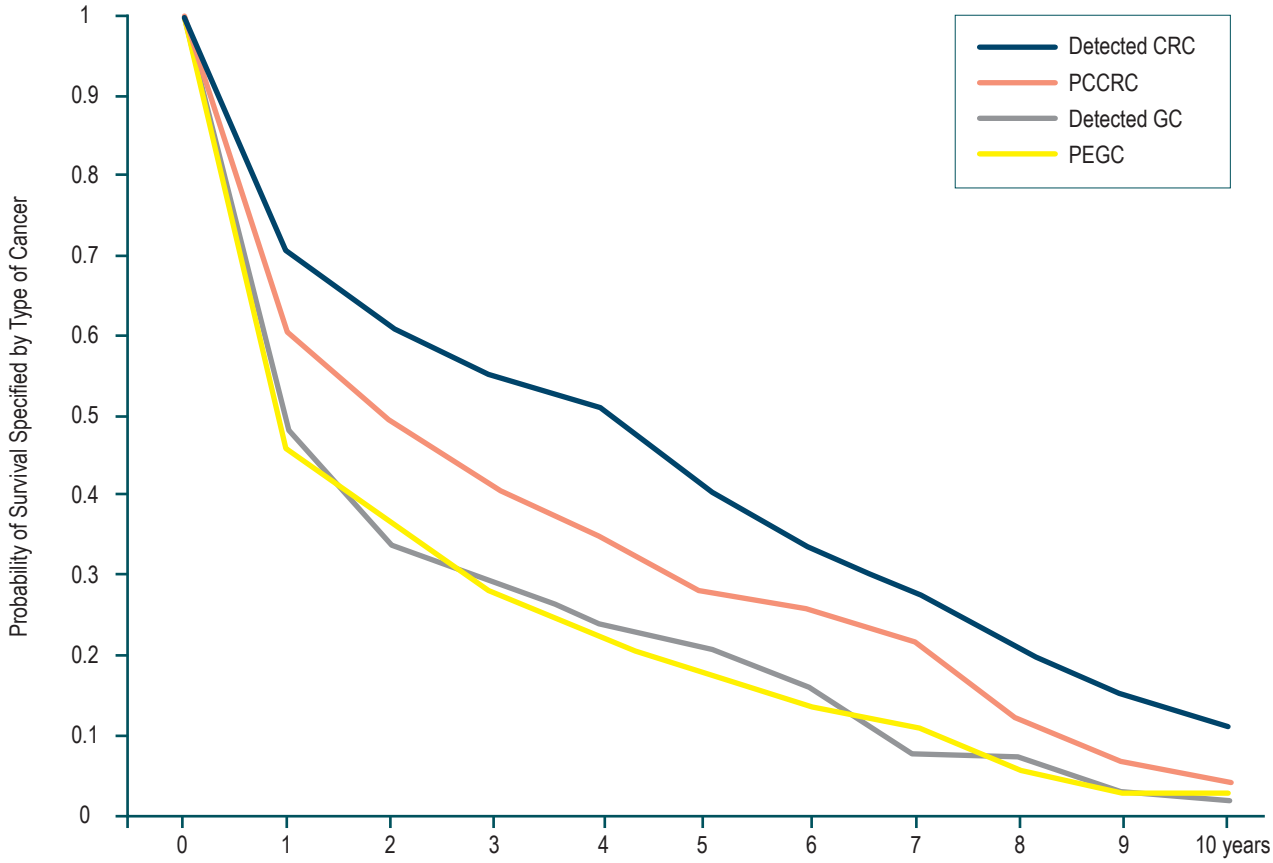


Figure 3. Survival Curve for Detected versus Interval Cancers. Author's own research.

Table 3. Comparative Survival between Unnoticed GC and Detected GC

	1-Year Survival (%)	2-Year Survival (%)	Median Survival (Months)
PEGC	45.7% (36.9%-61.3%)	37.2% (30.3%-37.6%)	12 (5.7-26)
Detected GC	48.4% (44.1%-53.4%)	34.4% (24.1%-47.7%)	13 (11.2-15.7)
Overall	49.8% (45.1%-53.7%)	36.7% (33.8%-38.2%)	12.8 (6.1-13.7)

Author's own research.

res from Sweden (7.9%)[25], Hong Kong (7.9%)[26], the United Kingdom (7.4%)[27], and Belgium (7.6%)[28], and remaining below those reported in Denmark (8.6%)[29], the United States (9.4%)[30], and Israel (12.8%)[31].

Notably, there is a lack of a standardized definition for post-endoscopy or post-colonoscopy GC or CRC, which results in significant discrepancies among researchers, especially concerning the time frame between the two endoscopic studies (ranging from three to fives years). Furthermore, there is no consensus on the calculation method, whether as a rate, index, or percentage[32]. The WEO released a consensus in 2018 on post-colonoscopy and post-imaging colorectal cancer[33] to standardize terminology, identification, analysis, and reporting of these cases. They recommend the term "post-colonoscopy colorectal cancer" for cancers identified following a colonoscopy that failed to diagnose cancer, further dividing these into interval cancers (when cancer is found before the recommended date for the next screening or surveillance exam) and non-interval cancers.

In our series, PEGC did not exhibit a preferential anatomical location, contrasting with findings of higher frequency in the post-surgical stomach[10]. Unlike PEGC, the right-sided location of lesions in PCCRC has been identified as a risk factor for post-colonoscopy cancer. Our study pinpointed a greater incidence of post-colonoscopy colon cancer in the right colon, consistent with previous studies[25,34-36]. This could be attributed to challenges such as incomplete procedures or poor bowel preparation since the right colon is more difficult to clean with oral agents, offers less clear landmarks, and is technically more demanding in reaching the proximal colon and maintaining appropriate positions for polypectomies. Additionally, a connection was observed between post-colonoscopy colorectal cancer and prior diverticulosis diagnoses, corroborating literature reports[25,34]. The presence of diverticular disease complicates colonoscopy due to increased patient discomfort, altered mucosa in the affected zones, and the hazard of mistaking neoplastic tissue for diverticular inflammation[37]. These insights should heighten colonoscopists' vigilance during procedures in high-risk individuals (those with inflammatory bowel disease or adenomatous polyposis syndromes) and in assessments of the right colon. Should there be any doubts about the thorough examination of an intestinal segment, or if a deep cecal intubation is not achieved, it is prudent to recommend repeating the study or opting for an alternative method to exclude unobserved neoplasms from the initial examination.

The discovery and comparison of rates for PEGC and PCCRC are intended to spotlight a concern that might otherwise fly under the radar for many endoscopists and endoscopy services. Awareness of post-endoscopy and post-colonoscopy cancer in daily practice is limited, largely because it is a relatively rare occurrence. Moreover, linking cancer to a prior endoscopy or colonoscopy is challenging, as these events can be separated by months or even years. Often, endoscopists or colonoscopists are unaware of a cancer that emerges several years after the index study. There might also be a degree of complacency, a belief that a cancer found after endoscopy or colonoscopy is a fast-growing tumor rather than an overlooked or incompletely resected lesion, or that missing lesions are an issue that affects other colleagues or are too rare to warrant concern. From a patient's standpoint, however, it can make a significant difference—it can mean the difference between having cancer or not, receiving treatment for an advanced-stage tumor, or facing a worse prognosis due to delayed diagnosis. Additionally, delayed diagnoses incur extra costs to the healthcare system.

It is widely acknowledged that most post-endoscopy or post-colonoscopy cancers are preventable (at least half of them)[38]. Research has indicated a more than tenfold variation in PCCRC rates among colonoscopists. Physicians with lower rates of colonoscopy performance, polyp detection, and polyp resection are more likely to encounter PCCRC[28].

This study contributes several key insights: firstly, that reducing PEGC and PCCRC rates could lower the incidence of GC and CRC and improve patient prognosis; secondly, it corroborates existing literature that high-quality endoscopy or colonoscopy will decrease PEGC and PCCRC rates[11,39]; and thirdly, it provides clinical evidence on the characteristics of these overlooked neoplasms. For instance, PCCRC is typically found in a proximal location, affects older patients, and impacts survival, whereas PEGC patients tend to be younger, have more undifferentiated tumors, and present in more advanced stages.

Technological advancements in endoscopy equipment, such as high-definition endoscopes, and techniques like narrow-band imaging (NBI) and chromoendoscopy, have gradually reduced the rate of overlooked gastrointestinal cancers[40]. An emerging element in this landscape is the supportive diagnostic role of artificial intelligence (AI). Recent incorporation of AI in colonoscopy has halved the risk of missing colorectal neoplasms (compared to standard colonoscopy), especially reducing the oversight of flat neoplasms under 10 mm in both the proximal and distal colon, and potentially enhancing early-stage neoplasm detection[41,42].

CONCLUSIONS

The rates of missed cancers following endoscopy or colonoscopy stand at 7.3% and 6.9%, respectively. Distinctions between PEGC and PCCRC include differences in the reasons for study referrals, with PCCRC presenting more symptoms, more proximal lesion locations, a greater degree of tumor undifferentiation, and more advanced tumor stages in PEGC, along with poorer survival outcomes for PCCRC. Upon acknowledging these rates, it is crucial to implement strategies by various associations to strive for the goal set by the WEO of maintaining these rates below 5%.

Conflict of Interest

The authors report no conflicts of interest.

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Original article

Information Needs of Patients with Cirrhosis of the Liver and Quality of Life

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Abstract

Introduction: Patients and their caregivers' knowledge about the disease is essential in the self-care process to prevent its progression and improve quality of life. Awareness of the information needs of these patients can help design educational strategies that will enhance clinical outcomes. **Objectives:** To identify the information needs of patients with cirrhosis of the liver and their relationship with quality of life. **Methods:** A cross-sectional, observational study. We designed a questionnaire considering the information collected in focus groups and previous publications to determine the priorities of patients and health personnel regarding the educational needs of patients. To establish the relationship between educational needs and quality of life, the SF36V2 survey was conducted. The perceived need for some support services and the actual use of some of them were identified to estimate their relationship with the patient's quality of life. **Results:** The five needs prioritized by patients were decompensations/complications, progression/prognosis, pharmacotherapy, liver cancer, and liver transplant. There was no strong relationship between information needs and quality of life. **Conclusions:** The information needs of patients with cirrhosis of the liver may vary depending on the etiology, the existence of comorbidities, and other sociodemographic variables such as sex and age. There are gaps between the information needs perceived by health personnel and the needs reported by patients.

Keywords

Cirrhosis of the liver, needs assessment, patient priority, health-related quality of life, health education.

INTRODUCTION

Liver Cirrhosis (LC) marks an advanced phase of liver fibrosis, distinguished by the alteration of hepatic structure and the emergence of regenerative nodules. It serves as the ultimate common path for the majority of liver diseases, thus manifesting as a multifaceted chronic condition that contributes to mortality rates globally of about five to ten individuals per 100,000 annually[(1)]. In its advanced stages, LC is identified through the onset of clinical complications primarily due to portal hypertension and liver failure[(2)]. Presently, it stands as a significant public health issue, propelled by rising alcohol consumption, obesity rates, and viral hepatitis prevalence[(3)]. Medical advancements through controlled and randomized clinical trials have spotlighted numerous strategies to enhance patient prognosis, evidencing, for instance, the advantages of prophylactic actions against variceal bleeding[(4)] and spontaneous bacterial peritonitis (SBP)[(5)]. Similarly, there is an extensive array of preventive recommendations grounded in evidence, including hepatitis A and B vaccinations, alongside early detection of hepatocellular carcinoma[(6)].

Individuals diagnosed with LC are advised to adhere to specific dietary guidelines, engage in a regimen of medications, undergo routine laboratory tests, and partake in frequent medical consultations. While health professionals are

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tasked with offering these recommendations, it fundamentally falls upon the patients to implement them, significantly impacting medication adherence, diet compliance, alcohol cessation, and medical follow-up. Consequently, successful cirrhosis management necessitates educating patients on the importance and methodology of these practices[7].

Global health policies have underscored the necessity of formulating patient-centric services, positioning the patient at the forefront of service design and delivery[8]. To achieve this, optimizing patient involvement in their care management is imperative; services should cater to their needs and preferences, empower their decision-making, and furnish them with the requisite information to make informed choices[9]. Herein, the concept of "information need" is introduced, defined as "the awareness of insufficient knowledge to fulfill a specific objective within a given context or situation at a particular moment"[10]. It is acknowledged that fulfilling these information needs is essential for health care providers to deliver adequate patient education[11].

Various research endeavors have explored the information needs associated with respiratory, metabolic, and cardiovascular conditions. However, investigations focusing on populations with chronic liver diseases such as cirrhosis are relatively scarce[12,13]. Within this context, studies have revealed that patients with cirrhosis encounter a myriad of physical and psychosocial challenges, frequently reporting unmet needs across five pivotal areas: informational/educational, practical, physical, healthcare, and psychological support. Specifically, in the informational/educational domain, there are noted deficiencies in patients' understanding of their illness, its progression, prognosis, the necessity for hepatocellular carcinoma screening, the linkage between cirrhosis and their experienced symptoms, alongside a notable lack of palliative care awareness and dissatisfaction with the communication skills of healthcare professionals[14]. Further analysis into the experiences, knowledge, and beliefs of individuals with chronic liver disease highlighted a significant information deficit regarding the etiology of their condition, available treatment options, symptomatology, and medical management, also underscoring substantial educational gaps[15].

Acknowledging that insufficient disease awareness may amplify anxiety and the emotional toll of the condition, thereby adversely affecting the quality of life of these individuals, and recognizing that grasping patients' concerns and needs is critical for crafting educational strategies aimed at enhancing clinical outcomes and healthcare models in line with patient expectations[16], this study sets out to pinpoint the primary information needs of patients with hepatic cirrhosis in our region and their impact on quality of life.

MATERIALS AND METHODS

Study Design and Population

This study employed an observational, analytical cross-sectional design to assess patients diagnosed with liver cirrhosis at the Gastropack medical center's outpatient hepatology service in Cartagena, 2021. Inclusion criteria encompassed individuals aged 18 and above with either a newly diagnosed or known case of liver cirrhosis, established through clinical, imaging, histological criteria, or elastography. Exclusions were made for pregnant individuals and those with severe cognitive impairments or hepatic encephalopathy.

To ascertain the information needs, focus groups comprising patients with a cirrhosis diagnosis (10 patients in each group) were formed. These groups were presented with four open-ended questions: What would you like to know about your liver condition? Which topics do you feel you are more informed about and why? Which topics do you feel less informed about and why? And what additional topics would you be interested in or require information on? This method aimed to further delineate the various subtopics under the principal information needs identified, allowing for the introduction of new subjects. A literature review was also conducted to identify potentially significant areas for patients.

The primary information needs unearthed during this initial phase included the causes of cirrhosis, signs and symptoms, decompensations/complications, disease progression/prognosis, pharmacological treatments, liver cancer, liver transplantation, nutrition, medical follow-ups, and lifestyle adjustments. Subsequently, through a telephone survey employing a questionnaire designed around the 10 identified needs, participants were asked to select and rank the top five needs on a scale of 1 to 5, where 1 represented the least important and 5 the most crucial.

To assess the congruence between patients' actual information needs and those perceived by healthcare professionals, the same questionnaire was administered to both groups with identical instructions. Furthermore, to gauge the patients' perceived need for additional support services, they were provided with a list including: alcoholism management treatment, palliative care, psychological counseling, spiritual counseling, disease education, financial aid, home care, physical therapy, and nutritional support. They were instructed to select the three services they deemed most critical for priority access. This questionnaire was similarly applied to the healthcare professionals to understand their perspective.

For the purpose of evaluating the real utilization of support services by cirrhotic patients, they were asked to

report their engagement with services such as psychology/psychiatry, nutrition, social work, and spiritual counseling over the three months preceding the interview. The participants' quality of life was assessed during the telephone interview utilizing the SF36 version 2 quality of life survey (SF36V2).

Statistical Analysis

The analysis of quantitative variables was conducted using measures of central tendency appropriate to the variables' distribution, employing the Shapiro-Wilk test for determination. Qualitative variables were described using absolute and relative frequencies. The chi-square test was utilized to identify sociodemographic, clinical, and historical factors associated with information needs. The relationship between information needs and quality of life in cirrhotic patients, as measured by the SF36V2 scale, was explored by comparing the mean SF36V2 scores between patients who identified this specific need as among their top five and those who did not. To examine the interplay between the utilization of support services, the perceived need for these services, and quality of life, SF36V2 scores were compared based on reported service use and perceived access need. The Mann-Whitney U test was employed for SF36V2 score comparisons. A p-value of less than 0.05 was considered indicative of statistical significance. The statistical analysis was conducted using Stata software version 16.0.

Ethical Considerations

This study received approval from the Gastropack medical center's ethics committee as a minimal risk study, conforming to the guidelines set forth in Resolution 8430 of 1993 by the Ministry of Health and Social Protection of Colombia.

RESULTS

The study included 107 patients with liver cirrhosis, with a median age of 63 years (interquartile range [IQR]: 54-73). Female participants constituted 53.3% (n=57) of the study population. The most prevalent educational attainment was completion of secondary school, reported by 34.6% (n=32) of participants. The majority, 60.8% (n=65), were married.

The comorbidity most commonly reported was overweight/obesity/dyslipidemia, followed by arterial hypertension (HTA) at 36.5% (n=39), and diabetes *mellitus* (DM) at 27.1% (n=29). Non-alcoholic steatohepatitis (NASH) emerged as the most frequent etiology of cirrhosis at 28.9% (n=31), with viral etiology following at 26.2% (n=28). A significant portion of patients, 38.3% (n=41), reported being diagnosed more than 36 months ago. Overweight or obesity was noted in 56.1% (n=60) of patients. A majority, 80.4% (n=86), were in a compensated phase (Child-Pugh A), and 19.6% (n=21) were in stage B. Detailed characteristics of the clinical and sociodemographic profile of the sample are provided in **Tables 1** and **2**.

The top five information priorities identified by patients include decompensations/complications (76.6%), disease progression/prognosis (71.0%), pharmacological treatment options (63.6%), liver cancer risk (53.3%), and the necessity for liver transplantation (42.9%) as detailed in **Table 3**.

Factors Associated with Information Needs

In exploring factors associated with information needs, it was found that concerns regarding pharmacological treatments were predominantly noted among patients aged 61 to 80 years (p = 0.044), females (p < 0.01), and those who are married (p = 0.02). Conversely, these needs were less pronounced among patients suffering from kidney disease (p = 0.008) and those with alcohol-induced cirrhosis (p = 0.001). Information needs centered around liver cancer and the prospect of liver transplantation appeared more frequently among males (p = 0.013 and p = 0.011, respectively), patients with a viral or NASH etiology (p = 0.025 and p = 0.019, respectively), and were notably less common among individuals with obesity or overweight (p < 0.001). The desire for information on liver transplantation was especially prevalent among those with autoimmune conditions (p = 0.046) and a higher BMI (p = 0.022). Meanwhile, the demand for insights into disease progression/prognosis was particularly high among those with a viral etiology (p = 0.046), as outlined in **Tables 1** and **2**.

Relationship Between Information Needs, Support Services, and Quality of Life

The relationship between information needs, support services, and quality of life reveals a significant link between the SF36V2's health status change domain and the quest for knowledge on disease progression and prognosis. Patients emphasizing this informational need scored higher compared to their counterparts who did not view it as crucial (p = 0.035), as illustrated in **Table 4**.

A total of 48.6% (n = 52) of the participants reported using a support service in the three months prior to the survey. The service most frequently utilized was psychology, reported by 59.8% (n = 64), followed by nutritional counseling at 53.3% (n = 57). Utilization of psychiatry/psychology services was linked to a decline in quality of life across various SF36V2 subscales, with lower scores noted

Table 1. Sociodemographic Variables and Information Needs in Patients with Liver Cirrhosis

Variable	Total n = 107	Decompensations/ Complications		p	Progression/ Prognosis		p	Pharmacological Treatment		p	Liver Cancer		p	Liver Transplant		p
		Yes n = 82	No n = 25		Yes n = 76	No n = 31		Yes n = 68	No n = 39		Yes n = 57	No n = 50		Yes n = 46	No n = 61	
Age, Median (IQR)	63 (54-73)	64 (53-73)	63 (55-76)	0.724	64 (54-73)	62 (51-76)	0.589	63 (52.5-77)	64 (54-71)	0.685	64 (54-73)	63 (55-73)	0.973	62 (51-70)	64 (55-76)	0.071
Age Groups				0.628			0.628			0.044*			0.870			0.262
18-40 Years	10 (9.4)	9 (10.9)	1 (4.0)		9 (10.9)	1 (4.0)		7 (10.3)	3 (7.7)		5 (8.8)	5 (10.0)		6 (13.0)	4 (6.6)	
41-60 Years	27 (25.2)	19 (23.2)	8 (32.0)		19 (23.2)	8)32.0)		20 (29.4)	7 (17.9)		15 (26.3)	12 (24.0)		12 (26.1)	15 (24.6)	
61-80 Years	59 (55.1)	46 (56.1)	13 (52.0)		46 (56.1)	13 (52.0)		31 (45.6)	28 (71.8)		30 (52.6)	29 (58.0)		26 (56.5)	33 (54.1)	
> 80 Years	11 (10.3)	8 (9.8)	3 (12.0)		8 (9.8)	3 (12.0)		10 (10.7)	1 (2.6)		7 (12.3)	4 (8.0)		2 (4.4)	9 (14.8)	
Sex				0.219			0.055			< 0.001*			0.013*			**0.011***
Male	50 (46.7)	41 (50.0)	9 (36.0)		40 (52.6)	10 (32.3)		23 (33.8)	27 (69.2)		33 (57.9)	7 (34.0)		28 (60.9)	22 (36.1)	
Female	57 (53.3)	41 (50.0)	16 (64.0)		26 (47.4)	21 (67.7)		45 (66.2)	12 (30.8)		24 (42.1)	33 (66.0)		18 (39.1)	39 (63.9)	
Education				0.778			0.319			0.310			0.794			0.364
Illiterate	3 (2.8)	3 (3.7)	0 (0.0)		3 (3.9)	0 (0.0)		2 (2.9)	1 (2.6)		2 (3.5)	1 (2.0)		1 (2.2)	2 (3.3)	
Incomplete Primary School	28 (26.2)	20 (24.4)	8 (32.0)		23 (30.3)	5 (16.1)		22 (32.4)	6 (15.4)		15 (26.3)	13 (26.0)		9 (19.6)	19 (31.2)	
Complete Primary School	7 (6.5)	6 (7.3)	1 (4.0)		4 (5.3)	3 (9.7)		3 (4.4)	4 (10.3)		5 (8.8)	2 (4.0)		5 (10.9)	2 (3.3)	
Incomplete Secondary School	37 (34.6)	29 (35.4)	8 (32.0)		26 (36.2)	11 (35.5)		21 (30.9)	16 (41.0)		20 (35.1)	17 (34.0)		18 (39.1)	19 (31.2)	
Completed Secondary School	32 (39.9)	24 (29.3)	8 (32.0)		20 (26.3)	12 (38.7)		20 (29.4)	12 (30.8)		15 (26.3)	17 (34.0)		13 (28.3)	19 (31.2)	
Higher Education	0 (0.0)	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	

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Table 1. Sociodemographic Variables and Information Needs in Patients with Liver Cirrhosis (*continued*)

Variable	Total n = 107	Decompensations/ Complications		*p*	Progression/ Prognosis		*p*	Pharmacological Treatment		*p*	Liver Cancer		*p*	Liver Transplant		*p*
		Yes n = 82	No n = 25		Yes n = 76	No n = 31		Yes n = 68	No n = 39		Yes n = 57	No n = 50		Yes n = 46	No n = 61	
Marital Status				0.284			0.548			0.002*			0.683			0.068
Single	16 (14.9)	11 (13.4)	5 (20.0)		11 (14.5)	5 (16.1)		13 (19.1)	3 (7.7)		10 (17.5)	6 (12.0)		7 (15.2)	9 (14.8)	
Married	65 (60.8)	52 (63.4)	13 (52.0)		45 (59.2)	20 (64.5)		35 (51.5)	30 (76.9)		32 (56.1)	33 (66.0)		30 (65.2)	35 (57.4)	
Common Law Marriage	6 (5.6)	6 (7.3)	0 (0.0)		6 (7.9)	0 (0.0)		2 (2.9)	4 (10.3)		4 (7.0)	2 (4.0)		5 (10.9)	1 (1.6)	
Widowed	19 (17.7)	12 (14.6)	7 (28.0)		13 (17.1)	6 (19.4)		18 (26.5)	1 (2.6)		10 (17.5)	9 (10.0)		4 (8.7)	15 (24.6)	
Separated	1 (0.9)	1 (1.2)	0 (0.0)		1 (1.3)	0 (0.0)		0 (0.0)	1 (2.6)		1 (1.8)	0 (0.0)		0 (0.0)	1 (1.6)	
Residence				0.369			0.508			0.280			0.181			0.840
Rural	2 (1.9)	1 (1.2)	1 (4.0)		1 (1.3)	1 (3.2)		2 (2.9)	0 (0.0)		2 (3.5)	0 (0.0)		1 (2.2)	1 (2.2)	
Urban	105 (98.1)	81 (98.8)	24 (96.0)		75 (98.7)	30 (96.7)		66 (97.1)	39 (100.0)		55 (96.5)	50 (100.0)		60 (98.4)	45 (97.8)	
Social Stratum				0.343			0.302			0.707			0.263			
2	23 (21.5)	16 (19.5)	7 (28.0)		18 (23.7)	5 (16.1)		14 (20.6)	14 (20.6)		7 (14.0)	16 (28.1)		13 (28.3)	10 (16.4)	
3	32 (29.9)	25 (30.5)	7 (28.0)		25 (32.9)	7 (22.6)		23 (33.8)	23 (33.8)		16 (32.0)	16 (28.1)		13 (28.3)	19 (31.6)	
4	33 (30.8)	26 (31.7)	7 (28.0)		21 (27.6)	12 (38.7)		14 (35.9)	19 (27.9)		15 (30.0)	18 (31.6)		13 (28.3)	20 (32.8)	
5	18 (16.8)	15 (18.3)	3 (12.0)		12 (15.8)	6 (19.4)		7 (17.9)	11 (16.2)		11 (22.0)	7 (12.3)		7 (15.2)	11 (18.0)	
6	1 (0.9)	0 (0.0)	1 (4.0)		0 (0.0)	1 (3.2)		0 (0.0)	1 (1.5)		1 (2.0)	0 (0.0)		0 (0.0)	1 (1.6)	
Social Security				0.366			0.167			0.499			0.077			0.139
Subsidized	23 (21.5)	16 (19.5)	7 (28.0)		19 (25.0)	4 (12.9)		16 (23.5)	7 (17.9)		16 (28.1)	7 (14.0)		13 (28.3)	10 (16.4)	
Contribution-Based	84 (78.5)	66 (89.5)	18 (72.0)		57 (75.0)	27 (87.1)		52 (76.5)	32 (82.1)		41 (71.9)	43 (86.0)		33 (71.7)	51 (83.6)	

*p < 0,005. IQR: Interquartile Range. Author's own research.

Table 2. Clinical Variables, Medical History, and Information Needs of Patients with Liver Cirrhosis

Variable	Total n = 107	Decompensations/ Complications		*p*	Progression/ Prognosis		*p*	Pharmacological Treatment		*p*	Liver Cancer		*p*	Liver Transplant		*p*
		Yes n = 82	No n = 25		Yes n = 76	No n = 31		Yes n = 68	No n = 39		Yes n = 57	No n = 50		Yes n = 46	No n = 61	
Comorbidities																
Arterial Hypertension	39 (36.5)	28 (71.8)	11 (28.1)	0.370	28 (71.8)	11 (28.2)	0.895	25 (64.1)	14 (35.9)	0.929	19 (48.7)	20 (51.3)	0.475	13 (33.3)	26 (66.7)	0.126
Heart Failure	3 (2.8)	2 (66.7)	1 (33.3)	0.679	3 (100.0)	0 (0.0)	0.262	3 (100.0)	0 (0.0)	0.183	1 (33.3)	2 (66.7)	0.483	0 (0.0)	3 (100.0)	0.127
Kidney Disease	11 (10.3)	8 (72.7)	3 (27.3)	0.746	7 (63.6)	4 (36.4)	0.568	3 (27.3)	8 (72.7)	**0.008***	8 (72.7)	3 (27.3)	0.172	8 (72.7)	3 (27.3)	0.172
Diabetes *mellitus*	29 (27.1)	21 (72.4)	8 (27.6)	0.529	19 (65.5)	10 (34.5)	0.444	21 (72.4)	8 (27.6)	0.245	14 (48.3)	15 (51.7)	0.528	8 (27.6)	21 (72.4)	**0.050***
Neoplasms	9 (8.4)	7 (77.8)	2 (22.2)	0.933	8 (88.9)	1 (11.1)	0.217	6 (66.7)	3 (33.3)	0.839	4 (44.4)	5 (55.6)	0.579	6 (66.7)	3 (33.3)	0.541
HIV	3 (2.8)	2 (66.7)	1 (33.3)	0.679	3 (100.0)	0 (0.0)	0.262	3 (100.0)	0 (0.0)	0.183	2 (66.7)	1 (33.3)	0.637	2 (66.7)	1 (33.3)	0.732
Thyroid Disease	6 (5.6)	4 (66.7)	2 (33.3)	0.553	4 (66.7)	2 (33.3)	0.808	5 (83.3)	1 (16.7)	0.300	3 (50.0)	3 (50.0)	0.869	3 (50.0)	3 (50.0)	0.721
Other Conditions	46 (42.9)	38 (82.6)	8 (17.4)	0.205	34 (73.9)	12 (26.1)	0.568	29 (63.0)	17 (36.9)	0.924	26 (56.5)	20 (43.5)	0.558	21 (45.7)	25 (54.4)	0.629
Etiology of Cirrhosis																
Viral	28 (26.2)	24 (85.7)	4 (14.3)	0.186	24 (85.7)	4 (14.3)	**0.046***	19 (67.9)	9 (32.1)	0.582	20 (71.4)	8 (28.6)	**0.025***	11 (39.3)	17 (60.7)	0.645
Alcohol-Related	6 (5.6)	0 (0.0)	6 (100.0)	0.164	4 (66.7)	2 (33.3)	0.808	0 (0.0)	6 (100.0)	**0.001***	4 (66.7)	2 (33.3)	0.498	2 (66.7)	4 (66.7)	0.228
NASH	31 (28.9)	20 (64.5)	11 (35.5)	0.058	18 (58.1)	13 (41.9)	0.059	22 (71.0)	9 (29.0)	0.309	11 (35.5)	20 (64.5)	**0.019***	9 (29.0)	22 (71.0)	0.063
HAIs	15 (14.0)	13 (86.7)	2 (13.3)	0.322	10 (66.7)	5 (33.3)	0.688	8 (53.3)	7 (46.7)	0.375	9 (60.0)	6 (40.0)	0.573	10 (66.7)	5 (33.3)	**0.046***
Cryptogenic	22 (20.6)	15 (68.2)	7 (31.8)	0.293	15 (68.2)	7 (31.8)	0.741	15 (68.2)	7 (31.8)	0.613	10 (45.5)	12 (54.6)	0.410	9 (40.9)	13 (59.1)	0.825
Other Etiology	7 (6.5)	6 (85.7)	1 (14.3)	0.557	6 (85.7)	1 (14.3)	0.376	5 (71.4)	2 (28.6)	0.654	5 (71.4)	2 (28.6)	0.319	4 (57.1)	3 (42.9)	0.434
Time of Diagnosis				0.351			0.312			0.663			0.662			0.567
< 12 Months	21 (19.6)	17 (20.7)	4 (16.0)		15 (19.7)	6 (19.4)		11 (16.2)	10 (25.6)		13 (22.8)	8 (16.0)		7 (15.2)	14 (22.9)	
12-24 Months	25 (23.4)	16 (19.5)	9 (36.0)		20 (26.3)	5 (16.1)		16 (25.5)	9 (23.1)		12 (21.1)	13 (26.0)		11 (23.9)	13 (22.9)	
25-36 Months	20 (18.7)	17 (20.7)	3 (12.0)		11 (14.5)	9 (29.0)		14 (20.6)	6 (15.4)		9 (15.8)	11 (22.0)		11 (23.9)	9 (14.8)	
> 36 Months	41 (38.3)	32 (39.0)	9 (36.0)		30 (39.5)	11 (35.5)		27 (39.7)	14 (35.9)		23 (40.4)	18 (36.0)		17 (36.9)	24 (39.3)	
BMI, Median (IQR)	25.7 (23.1-29.9)	25.5 (23.0-29.8)	26.7 (25.6-29.9)	0.232	25.4 (23.1-28.9)	26.7 (23.6-30.8)	0.257	26.7 (23.2-29.8)	25.5 (23.1-30.1)	0.636	24.1 (22.5-26.6)	27.9 (24.3-30.9)	**< 0.001***	24.6 (22.7-27.1)	26.7 (24.1-30.7)	**0.022***

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Table 2. Clinical Variables, Medical History, and Information Needs of Patients with Liver Cirrhosis (*continued*)

Variable	Total n = 107	Decompensations/ Complications		*p*	Progression/ Prognosis		*p*	Pharmacological Treatment		*p*	Liver Cancer		*p*	Liver Transplant		*p*
		Yes n = 82	No n = 25		Yes n = 76	No n = 31		Yes n = 68	No n = 39		Yes n = 57	No n = 50		Yes n = 46	No n = 61	
BMI				0.331			0.495						< 0.001*			
Low Weight	0 (0.0)	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
Normal Weight	47 (43.9)	39 (47.6)	8 (32.0)		36 (47.4)	11 (35.5)		30 (44.1)	17 (43.6)		34 (59.7)	13 (26.0)		25 (54.4)	22 (36.1)	
Overweight	32 (29.9)	22 (26.8)	10 (40.0)		22 (28.9)	10 (32.3)		21 (30.9)	11 (28.2)		16 (28.1)	16 (32.0)		14 (30.4)	18 (29.5)	
Obesity	28 (26.2)	21 (25.6)	7 (28.0)		18 (23.7)	10 (32.3)		17 (25.0)	11 (28.2)		7 (12.3)	21 (42.0)		7 (15.2)	21 (34.4)	
Child-Pugh				0.529			0.964			0.741			0.563			0.332
A	86 (80.4)	61 (70.9)	25 (29.1)		61 (70.9)	25 (19.1)		54 (79.4)	32 (82.1)		47 (82.5)	39 (78.0)		35 (76.1)	51 (83.6)	
B	21 (19.6)	19 (76.0)	67 (81.7)		15 (71.4)	6 (28.6)		14 (20.6)	7 (17.9)		10 (17.5)	11 (22.0)		11 (23.9)	10 (16.4)	
C	0 (0.0)	6 (24.0)	15 (18.3)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
Decompensations				0.201			0.590			0.925			0.398			0.987
0	79 (73.8)	63 (76.8)	16 (64.0)		55 (72.4)	24 (77.4)		50 (73.5)	29 (74.3)		44 (77.2)	35 (70.0)		34 (73.9)	45 (73.8)	
Between 1 and 3	28 (26.2)	19 (23.2)	9 (36.0)		21 (27.6)	7 (22.6)		18 (26.5)	10 (25.6)		13 (22.8)	15 (30.0)		16 (26.2)	12 (26.1)	
Ascites	20 (18.7)	15 (75.0)	5 (25.0)	0.848	14 (70.0)	6 (30.0)	0.911	13 (65.0)	7 (35.0)	0.881	11 (55.0)	9 (45.0)	0.864	8 (40.0)	12 (60.0)	0.764
Hepatic Encephalopathy	4 (3.7)	2 (50.0)	2 (50.0)	0.199	4 (100.0)	0 (0.0)	0.193	2 (50.0)	2 (50.0)	0.566	3 (75.0)	1 (25.0)	0.375	2 (50.0)	2 (50.0)	0.773
Variceal Bleeding	9 (8.4)	5 (55.6)	4 (44.4)	0.118	8 (88.9)	1 (11.1)	0.217	7 (77.8)	2 (22.2)	0.354	3 (33.3)	6 (66.7)	0.210	3 (33.3)	6 (66.7)	0.541
Hospitalizations	53 (49.5)	43 (81.1)	10 (18.9)	0.201	11 (20.8)	42 (79.3)	0.063	32 (60.4)	21 (39.6)	0.499	27 (50.9)	26 (49.1)	0.633	26 (49.1)	27 (50.9)	0.209

BMI: Body Mass Index; IQR: Interquartile Range; HIV: Human Immunodeficiency Virus. Author's own research.

Table 3. Quality of Life and Information Needs in Patients with Liver Cirrhosis

Variable	Total n = 107	Decompensations/Complications		p	Progression/ Prognosis		p	Pharmacological Treatment		p	Liver Cancer		p	Liver Transplant		p
Quality of Life, Median (IQR)		Yes n = 82	No n = 25		Yes n = 76	No n = 31		Yes n = 68	No n = 39		Yes n = 57	No n = 50		Yes n = 46	No n = 61	
Physical Role	50 (25-100)	50 (25-100)	75 (25-100)	0.456	50 (25-100)	75 (25-100)	0.815	50 (25-100)	75 (25-100)	0.564	50 (25-100)	50 (25-100)	0.776	50 (0-100)	50 (25-100)	0.311
Emotional Role	66 (33-100)	66 (33-100)	66 (33-100)	0.818	83 (33-100)	66 (33-100)	0.713	66 (33-100)	100 (33-100)	0.233	100 (33-100)	66 (33-100)	0.240	66 (33-100)	66 (33-100)	0.792
Energy/ Fatigue	65 (45-85)	65 (45-85)	70 (55-80)	0.879	62.5 (45-85)	70 (50-85)	0.515	57.5 (45-85)	70 (55-85)	0.198	70 (45 -85)	60 (45-85)	0.821	65 (45-85)	65 (45-85)	0.625
Emotional Well-Being	76 (56-88)	68 (52-88)	76 (60-84)	0.559	68 (52-84)	76 (56 -88)	0.350	66 (52-88)	80 (60-84)	0.533	76 (52-84)	70 (56-88)	0.880	76 (52-84)	72 (56-88)	0.517
Social Function	75 (50-87)	62 (50-87)	75 (50-87)	0.717	68.5 (50-87)	75 (50 -87)	0.407	62 (50-87)	75 (50-87)	0.486	75 (50-87)	75 (50-87)	0.619	75 (50-87)	62 (50-87)	0.771
Pain	77 (67-90)	77 (57-100)	77 (67-77)	0.579	77 (55-95)	77 (67-77)	0.678	77 (55-95)	77 (67-90)	0.516	77 (67-90)	77 (67-90)	0.972	77 (57-90)	77 (67-90)	0.796
General Health	50 (30-80)	42.5 (30-80)	60 (30-75)	0.891	45 (30-77.5)	65 (35-80)	0.359	45 (30-75)	60 (30-80)	0.547	45 (30-75)	51.5 (35-80)	0.775	42.5 (30-75)	55 (35-80)	0.374
Change in Health Status	50 (25-75)	50 (25-75)	50 (25-75)	0.386	50 (25-75)	50 (25-62.5)	0.035*	50 (25-75)	60 (30-80)	0.367	50 (25-75)	50 (25-75)	0.833	50 (25-75)	50 (25-75)	0.803

*p < 0,005. IQR: Interquartile Range. Author's own research.

for emotional well-being ($p = 0.002$), social function ($p = 0.031$), pain ($p = 0.005$), general health ($p = 0.005$), and changes in health status ($p = 0.009$) among this group.

An analysis of the association between perceived need for certain support services revealed a correlation between the lack of perceived need for palliative care access and higher scores across physical function, physical role, emotional role, energy/fatigue, emotional well-being, social function, pain, general health, and changes in health status ($p < 0.001$ for all variables). Conversely, patients who deemed access to educational services a priority scored higher in physical function and physical role ($p = 0.041$ and $p = 0.003$, respectively) compared to those who did not prioritize it.

Patients who prioritized access to physical therapy services reported higher physical function ($p = 0.047$), whereas those who emphasized access to nutrition services achieved higher scores in physical function ($p = 0.019$), physical role ($p = 0.008$), energy/fatigue ($p = 0.014$), emotional well-being ($p = 0.005$), social function ($p = 0.003$), pain ($p = 0.026$), general health ($p = 0.006$), and changes in health status ($p = 0.033$).

Information Needs as Perceived by Healthcare Personnel

Among the healthcare personnel surveyed, 28.0% (n = 14) were internists; 24.0% (n = 12), general practitioners; 14.0%, hepatologists (n = 7); with gastroenterologists, surgeons, or staff from other specialties making up 20% of the sample (n = 10), and the remaining 20% were nurses, nutritionists, and other paramedical professionals. The service area most commonly associated with their work was hospitalization, at 86.0% (n = 43), followed by outpatient services, at 62.0% (n = 31).

The healthcare professionals prioritized information needs around the indications and side effects of pharmacological treatments (74.0%), decompensations/complications (72.0%), causes and symptoms of cirrhosis (58.0% for both), and lifestyle information (52.0%) (**Table 3**). Support services identified as priorities by healthcare professionals included nutrition (64.0%), assistance for patients with alcohol addiction (52.0%), psychology (52.0%), and home care (38.0%).

Table 4. Utilization of Services, Access to Support Services, and Quality of Life as Evaluated by the SF-36 Scale among Patients with Liver Cirrhosis

Variable		Total n = 107 Me (IQR)	Physical Function		Physical Role		Emotional Role		Energy/Fatigue	
			p	Me (IQR)	*p*	Me (IQR)	*p*	Me (IQR)	*p*	Me (IQR)
Support Services	Yes	52 (48.6)	80 (60-92.5)	0.804	62.5 (25-100)	0.559	66 (16.5-100)	0.116	60 (45-80)	0.096
	No	55 (51.4)	75 (50-95)		50 (25-100)		100 (33-100)		70 (50-85)	
Psychology/Psychiatry	Yes	17 (15.9)	65 (55 -90)	0.548	25 (0-100)	0.136	33 (0-66)	**0.009***	45 (45-60)	**0.002***
	No	90 (15.9)	80 (60-95)		75 (25-100)		83 (33-100)		70 (50-85)	
Nutrition	Yes	41 (38.3)	80 (60-90)	0.867	75 (25-100)	0.624	66 (33-100)	0.505	65 (45-80)	0.292
	No	66 (61.7)	80 (55-95)		50 (25-100)		66 (33-100)		62.5 (50-85)	
Social Work	Yes	2 (1.9)	80 (65-95)	0.659	50 (0-100)	0.763	100 (100- 100)	0.156	65 (45-85)	0.935
	No	105 (98.1)	80 (55-95)		50 (25-100)		66 (33-100)		65 (45-85)	
Espiritual Counseling	Yes	0 (0.0)	-	-	-	-	-	-	-	-
	No	107 (100.0)	80 (55 -95)		50 (25 -100)		66 (33 -100)		65 (45-85)	
Other	Yes	1 (0.9)	95	-	100	-	100	-	85	-
	No	106 (99.1)	80 (55-95)		50 (25-100)		66 (33-100)		65 (45-85)	
Access to Support Services										
Access to Alcohol Support Services	Yes	10 (9.4)	60 (45-95)	0.267	62.5 (25-100)	0.775	66 (33-100)	0.519	52.5 (40-80)	0.196
	No	97 (90.7)	80 (60-95)		50 (25-100)		66 (33-100)		65 (45-85)	
Access to Palliative Care	Yes	15 (14.0)	55 (45-60)	**< 0.001***	25 (0-25)	**< 0.001***	33 (0-33)	**< 0.001***	45 (40-55)	**< 0.001***
	No	92 (14.0)	90 (60-95)		75 (25-100)		100 (33-100)		70 (50-85)	
Access to Psychological Counseling	Yes	64 (59.8)	80 (55-95)	0.788	50 (25-100)	0.732	66 (16.5-100)	0.298	60 (45-85)	0.335
	No	43 (40.2)	75 (60-95)		50 (25-100)		66 (33-100)		70 (50-85)	
Access to Spiritual Counseling	Yes	26 (24.3)	72.5 (50-95)	0.736	50 (25 (100)	0.769	66 (33-100)	0.880	57.5 (45-85)	0.910
	No	81 (75.7)	80 (60-95)		50 (25-100)		66 (33-100)		65 (45-85)	
Access to Educational Support Services	Yes	59 (55.1)	90 (65-95)	**0.041***	75 (25-100)	**0.003***	66 (33-100)	0.317	70 (50-85)	0.191
	No	48 (44.9)	65 (50-95)		50 (12.5-100)		66 (33-100)		55 (45-85)	
Access to Financial Support Services	Yes	28 (26.2)	72.5 (50-95)	0.568	50 (0-100)	0.256	100 (33-100)	0.503	65 (45-85)	0.867
	No	79 (26.2)	80 (60-95)		75 (25-100)		66 (33-100)		65 (45-85)	
Access to Home Care Services	Yes	37 (34.6)	70 (55-95)	0.347	50 (0-100)	0.240	100 (33-100)	0.718	55 (45-85)	0.496
	No	70 (34.6)	80 (60-95)		75 (25-100)		66 (33-100)		67.5 (45-85)	
Access to Physical Therapy	Yes	24 (22.4)	90 (62.5-95)	0.159	100 (50-100)	0.282	83 (33-100)	0.403	75 (55-85)	0.211
	No	83 (77.6)	75 (55-95)		50 (25-100)		66 (33-100)		60 (45-85)	
Access to Nutritional Services	Yes	57 (53.3)	85 (60-95)	**0.019***	100 (50-100)	**0.008***	66 (33-100)	0.169	70 (55-85)	**0.014***
	No	50 (46.7)	67.5 (50-95)		50 (0-100)		66 (0-100)		52.5 (45-80)	

Table 4. Utilization of Services, Access to Support Services, and Quality of Life as Evaluated by the SF-36 Scale among Patients with Liver Cirrhosis (*continued*)

Variable		Total n = 107 Me (IQR)	Emotional Well-Being		Social Function		Pain		General Health		Change in Health Status	
			p	Me (IQR)	*p*	Me (IQR)	*p*	Me (IQR)	*p*	Me (IQR)	*p*	Me (IQR)
Support Services	Yes	52 (48.6)	64 (52-87)	0.083	62 (50-86)	0.314	77 (61-82)	0.514	45 (30-75)	0.277	50 (25-50)	0.316
	No	55 (51.4)	75 (50-87)		75 (50-87)		77 (67-100)		55 (35-80)		50 (25-75)	
Psychology/ Psychiatry	Yes	17 (15.9)	52 (44-64)	**0.002***	62 (50-62)	**0.031***	77 (45-77)	**0.005***	30 (25-45)	**0.005***	25 (25- 50)	**0.009***
	No	90 (15.9)	76 (60-88)		75 (50-87)		77 (67-100)		65 (35-80)		50 (25-75)	
Nutrition	Yes	41 (38.3)	72 (52-88)	0.699	75 (50-75)	0.699	77 (67-77)	0.701	60 (30-75)	0.774	50 (25-50)	0.372
	No	66 (61.7)	76 (60-88)		75 (50-88)		77 (57-87)		47.5 (30-80)		50 (25-75)	
Social Work	Yes	2 (1.9)	70 (52-88)	0.945	68.5 (50-87)	0.972	72 (67-77)	0.679	55 (30-80)	0.963	50 (25-75)	0.991
	No	105 (98.1)	76 (56-88)		75 (50-87)		77 (67-90)		50 (30-75)		50 (25-75)	
Espiritual Counseling	Yes	0 (0.0)	-	-	-	-	-	-	-	-	-	-
	No	107 (100.0)	76 (56-88)		75 (50-87)		77 (67-90)		50 (30-80)		50 (25-75)	
Other	Yes	1 (0.9)	88	-	100	-	100	-	75	-	75	-
	No	106 (99.1)	74 (56-88)		75 (50-87)		77 (67-90)		47.5 (30-80)		50 (25-75)	
Access to Support Services												
Access to Alcohol Support Services	Yes	10 (9.4)	68 (44-80)	0.227	56 (37-75)	0.142	72 (67-77)	0.340	35 (30-80)	0.352	25 (25-75)	0.271
	No	97 (90.7)	76 (56-88)		75 (50-87)		77 (67-90)		55 (30-75)		50 (25-75)	
Access to Palliative Care	Yes	15 (14.0)	56 (44-64)	**< 0.001***	50 (37-62)	**< 0.001**	55 (45-77)	**< 0.001***	30 (25-35)	**< 0.001***	25 (25-50)	**< 0.001***
	No	92 (14.0)	76 (60-88)		75 (50-87)		77 (67-100)		65 (35-80)		50 (25-75)	
Access to Psychological Counseling	Yes	64 (59.8)	66 (52-84)	0.166	62 (50-81)	0.221	77 (67-90)	0.894	45 (30-77.5)	0.725	50 (25-62.5)	0.4135
	No	43 (40.2)	76 (56-88)		75 (50-87)		77 (57-100)		60 (30-80)		50 (25-75)	
Access to Spiritual Counseling	Yes	26 (24.3)	70 (56-88)	0.488	62 (50-87)	0.570	77 (55-87)	0.443	35 (30-80)	0.721	50 (25-75)	0.128
	No	81 (75.7)	76 (56-84)		75 (50-87)		77 (67-100)		53 (30-75)		50 (25-75)	
Access to Educational Support Services	Yes	59 (55.1)	76 (60-88)	0.303	75 (50-87)	0.135	77 (67-100)	**0.008***	65 (35-80)	0.122	50 (25-75)	0.195
	No	48 (44.9)	64)52-86)		62 (50-87)		72 (50-82)		35 (30-75)		50 (25-75)	
Access to Financial Support Services	Yes	28 (26.2)	72 (52-84)	0.678	75 (50-75)	0.597	72 (61-77)	0.251	42.5 (30-75)	0.358	37.5 (25-75)	0.216
	No	79 (26.2)	76 (56-88)		75 (50-87)		77 (57-100)		53 (30-80)		50 (25-75)	
Access to Home Care Services	Yes	37 (34.6)	64 (52-88)	0.235	62 (50-87)	0.722	77 (55-100)	0.541	40 (30-80)	0.580	50 (25-75)	0.550
	No	70 (34.6)	76 (60-88)		75 (50-87)		77 (67-90)		57.5 (30-75)		50 (25-75)	
Access to Physical Therapy	Yes	24 (22.4)	84 (60-88)	0.095	81 (56-100)	**0.047***	77 (51-100)	0.568	62.5 (37.5-80)	0.154	50 (35-75)	0.726
	No	83 (77.6)	68 (52-84)		62 (50-87)		77 (67-90)		40 (30-75)		50 (25-75)	
Access to Nutritional Support Services	Yes	57 (53.3)	76 (60-88)	**0.005***	75 (62-100)	**0.003***	77 (67-100)	**0.026***	35 (30-75)	**0.006***	50 (25-75)	**0.033***
	No	50 (46.7)	64 (46-84)		62 (50-75)		77 (55-77)		35 (30-75)		50 (25-50)	

*p < 0,005. IQR: Interquartile Range. Author's own research.

Focus Groups

During focus group discussions, participants voiced concerns about various complications that could occur as their disease progressed, how to prevent disease progression, and the different stages of cirrhosis. Regarding pharmacological treatments, they expressed a need for information on whether a specific treatment for cirrhosis exists and had questions about medications they should avoid or that might exacerbate their condition. They were keen to understand at which stage they would need to consider a liver transplant and the procedure to access such a treatment. Furthermore, while many participants acknowledged receiving adequate information on nutritional recommendations, they felt these guidelines were not sufficiently clear and suggested the integration of a nutrition professional into their routine medical follow-up. The etiology of their disease remained unclear to some participants, who expressed a desire for more detailed information. Among the additional topics of interest, information needs relating to COVID-19/cirrhosis emerged, specifically concerning the relevance and adverse effects of vaccination for the virus and the risk of complications should they contract the infection.

DISCUSSION

The demographic composition of this study aligns with previous research conducted in Colombia on patients with cirrhosis[17-20], providing a consistent epidemiological backdrop. Among the cirrhosis patients studied, the foremost informational need revolved around the decompensations and complications associated with the disease. This was followed by concerns over disease progression and prognosis, details on specific pharmacological treatments and their side effects, the risk of liver cancer, and the necessity for liver transplantation. These findings mirror those of an Australian cohort[21], where a significant emphasis was placed on understanding liver cancer and disease prognosis.

Patients with a viral cause for their LC expressed a heightened demand for information pertaining to liver cancer and the progression/prognosis of their condition. This contrasts with findings from Chen and colleagues, whose research focused on evaluating educational needs, who noted a predominant interest in the side effects of antiviral treatments among patients with chronic viral hepatitis[22]. The divergence could be attributed to the limited number of patients undergoing antiviral treatment within our cohort, suggesting that information on this subject might bear lesser significance for them.

A notable observation was that patients with chronic kidney disease (CKD) as a comorbidity demonstrated a diminished interest in pharmacological treatment information. This could be explained by the early stage of liver disease and infrequent decompensations in this patient subgroup, making pharmacological interventions less pertinent compared to the management of renal conditions. Additionally, among patients with an alcoholic etiology, there was an apparent disinterest in treatment-related information, highlighting a potential area of concern for ensuring compliance and effective management of LC. Demographically, patients over 60, males, and those who were married reported a greater need for information on pharmacological treatments. All of the above underscores the importance of tailoring educational initiatives on LC to accommodate varying information needs based on cirrhosis etiology, comorbidities, and age.

Furthermore, our study uncovered an association between the desire for information on the disease's progression and prognosis and an improved quality of life, particularly in the domain of health status changes as measured by the SF36V2. This finding diverges from prior studies which identified a negative correlation between the need for educational and support services and quality of life metrics[23-25]. This discrepancy may reflect a proactive interest among patients predominantly in the compensated stage of cirrhosis in averting further complications.

In our study, we were able to ascertain the utilization of health support services, which constitute integral components for managing patients with LC comprehensively. Among these, the most frequently accessed service was that of psychology/psychiatry, closely followed by nutrition, aligning with findings from prior research[14,21]. Moreover, our investigation demonstrates a correlation between the utilization of psychiatry services in the preceding three months and a diminished quality of life, particularly evident in emotional well-being, social function, pain, general health, and changes in health status.

An additional contribution of our study lies in evaluating patients' needs regarding access to these support services and their impact on quality of life, a dimension heretofore unexplored in extant literature. Notably, participants prioritizing access to educational, nutritional, or physical therapy services exhibited elevated quality of life scores. This observation may suggest a heightened commitment to self-care and an increased awareness of their role in mitigating disease progression.

This study additionally appraised the viewpoint of healthcare professionals regarding the information needs of patients with LC. For these professionals, the most commonly identified information need pertained to pharmacological treatment, which was followed by decompensations/complications, the causes and symptoms of cirrhosis, and advice on lifestyle. These discrepancies may lead to

gaps between the patients' actual information needs and what is provided during healthcare interactions, potentially resulting in a lack of disease comprehension, poor adherence to treatment, and neglect of medical recommendations (see **Table 5** and **Figure 1**).

In addition to other methods, our study utilized focus groups, a qualitative technique that facilitates a deeper understanding of the experiences and beliefs of participants[26]. Researchers such as Burnham and colleagues in 2014 previously applied focus groups to patients with chronic liver disease and elicited discussions encompassing lifestyle, the lack of knowledge about chronic liver disease, adverse attitudes/emotions, stigma, healthcare access issues and high costs, and substance abuse. Participants in their study identified a knowledge gap as a critical element in their perception of disease prevention, risks, causes, and management[15]. Our investigation, through this methodology, garnered more nuanced insight into the specific subtopics of information needs and also brought to light a newly identified need for information concerning COVID-19 infection in conjunction with cirrhosis.

Table 5. Information Needs in Patients with Liver Cirrhosis and Healthcare Professionals

Importance of Information Variables	Patients n (%)	Healthcare Professionals n (%)
Decompensations/complications	82 (76.6)*	36 (72.0)*
Progression/prognosis	76 (71.0)*	27 (54.0)
Pharmacological treatment	68 (63.6)*	37 (74.0)*
Liver cancer	57 (53.3)*	14 (28.0)
Liver transplantation	46 (42.9)*	6 (12.0)
Nutrition	43 (40.2)	28 (56.0)
Medical follow-up	42 (39.3)	13 (26.0)
Causes of cirrhosis	38 (35.5)	29 (58.0)*
Symptoms of cirrhosis	37 (34.6)	29 (58.0)*
Lifestyle	28 (26.2)	26 (52.0)*

*Five variables classified as of the highest importance by both patients and healthcare professionals. Author's own research.

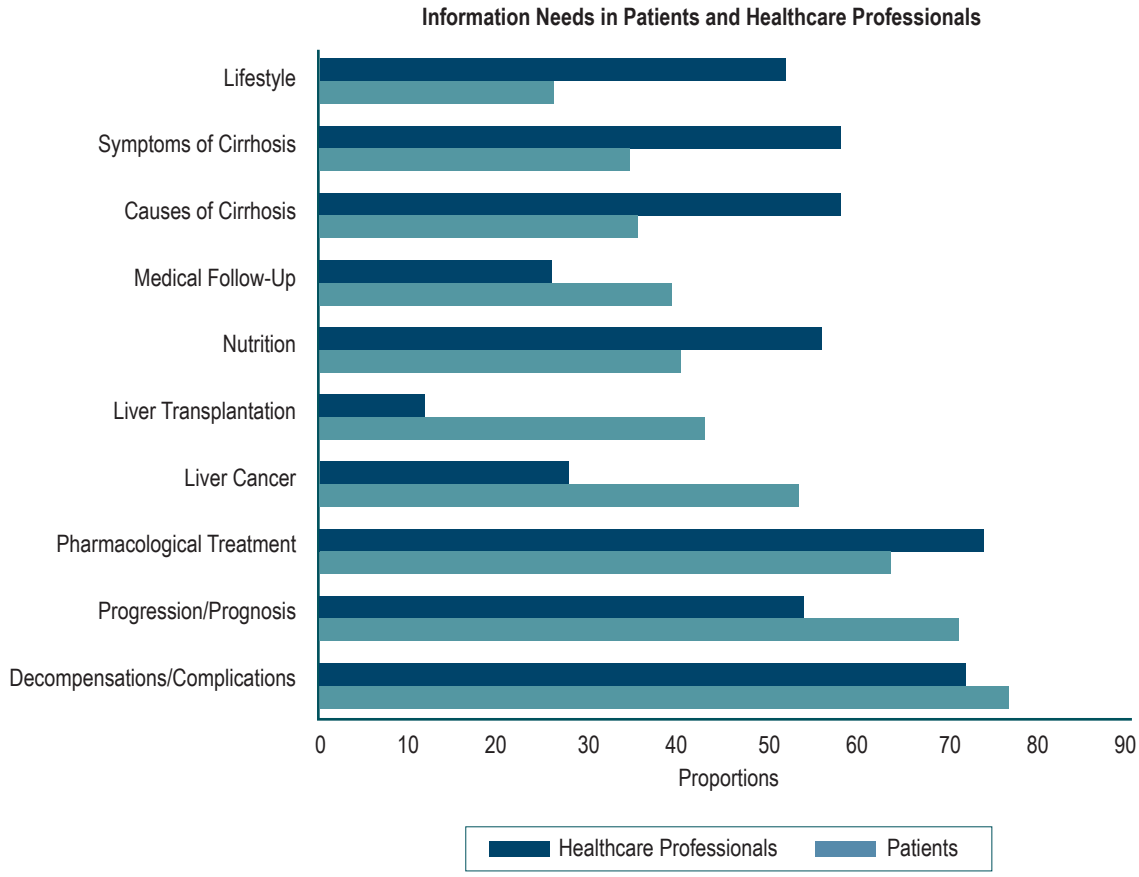


Figure 1. Comparison of Information Needs in Patients with Liver Cirrhosis and Healthcare Professionals. Author's own research.

CONCLUSIONS

The primary information needs discerned among patients with LC pertain to decompensations/complications, progression and prognosis of the condition, pharmacological treatment, liver cancer, and the requirements for liver transplantation. These information requirements are subject to variation based on the disease's etiology, comorbidities present, and demographic factors like sex and age.

A correlation was observed between the need for information about disease progression and prognosis, a lack of need for palliative care, prioritization of access to educational and nutritional services, and enhanced quality of life. In contrast, utilizing psychiatry/psychology services was associated with a reduction in quality of life across multiple dimensions of the SF36V2.

The detail afforded by focus group interviews augmented our understanding of the information needs identified. Discussions frequently returned to topics such as potential complications, preventative strategies for halting disease progression, nutritional therapy, and specifics regarding the appropriate juncture and procedural considerations for liver transplantation.

The study also highlighted discrepancies between the information needs as perceived by healthcare professionals and those articulated by patients, potentially leading to a diminished grasp of the disease and adherence to treatment regimens.

Conflict of Interest

None.

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Original article

Early-onset Colorectal Cancer: A Study in a Colombian Population

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Abstract

Introduction: Colorectal cancer (CRC) is the third most common cancer in terms of incidence and the second cause of death secondary to cancer. Early-onset CRC accounts for about 10% of cases and carries a higher mortality than that seen in older patients. We analyze the association between age and the clinical, endoscopic, and histopathological characteristics of CRC at the time of diagnosis in a Latin American population. **Methods:** A cross-sectional study was conducted using the database of the Gastroenterology Service of Clínica Foscal and Clínica Foscal Internacional in Bucaramanga, Colombia. **Results:** Between July 2016 and June 2021, 521 cases of *de novo* adenocarcinoma-type CRC were diagnosed, of which 77 patients (14.7%) were under 50. In patients with early-onset CRC, the prevalence of CRC was higher in women. Family history of CRC was more common in patients younger than 50 years. Hereditary syndromes, particularly familial adenomatous polyposis and hereditary non-polyposis CRC, were also more frequent in the youth. Histopathologically, mucinous adenocarcinoma and signet ring cell adenocarcinoma were more common in young patients. **Conclusions:** The study showed an approach to the characteristics of early-onset CRC in a Latin American population. Increasing the prevention, control, and early detection of CRC in young people is necessary to improve diagnosis and treatment.

Keywords

Colorectal neoplasms, colon neoplasms, early onset, Colombia.

INTRODUCTION

Colorectal cancer (CRC) ranks as the third most prevalent cancer globally, accounting for approximately 1,931,590 new cases annually, and emerges as the second leading cause of cancer-related mortality, claiming 935,173 lives each year[(1)]. The incidence and mortality rates exhibit significant disparities across different nations. High-income countries report markedly high CRC-associated death rates; conversely, developing countries are witnessing a rise in both incidence and mortality rates linked to CRC[(2)]. According to the 2020 GLOBOCAN (Global Cancer Statistics) report, Colombia is experiencing an age-standardized incidence rate of 13.7 cases per 100,000 individuals, coupled with an age-standardized mortality rate of 6.3 cases per 100,000 individuals[(3)].

CRC, particularly the adenocarcinoma type, arises from the aberrant proliferation of glandular epithelial cells. These occurrences may be categorized as sporadic, hereditary, or

colitis-associated[2]. A blend of hereditary and environmental elements drives carcinogenesis, with microsatellite instability, chromosomal instability, and the CpG island methylator phenotype standing out as the most significant oncological genetic factors[4]. A comprehensive risk-modeling meta-analysis highlighted the association between inflammatory bowel disease, a history of CRC in first-degree relatives, and a substantially increased risk of CRC development. Furthermore, factors like obesity, consumption of red meat, smoking, reduced physical activity, and low intake of vegetables and fruits were linked to a moderately elevated risk[5].

Early-onset colorectal cancer (EOCRC) is identified in patients younger than 50 years[6]. Recent decades have observed a simultaneous global rise in EOCRC incidence alongside a decline in late-onset CRC cases and mortality, thereby lowering the average age at diagnosis from 72 in the early 2000s to 66 years presently[7]. This epidemiological trend has drawn significant attention from the scientific community, with a near 30% spike in the global incidence of EOCRC over the past 20 years, now constituting around 10% of all CRC cases[6,8].

Consequently, this study aims to explore the relationship between age and the clinical, endoscopic, and histopathological features of CRC at diagnosis within a Latin American population.

MATERIALS AND METHODS

Patient Selection

This study was a retrospective, descriptive cross-sectional analysis, utilizing the database from the Department of Gastroenterology at Clínica Foscal and Clínica Foscal Internacional, located in Bucaramanga, Colombia. Between July 1, 2016, and June 30, 2021, a total of 10,708 colonoscopies were performed for various medical indications, encompassing both inpatient and outpatient scenarios. Conducted in accordance with the Declaration of Helsinki's ethical standards, the study received approval from the institutional ethics committees.

Participants included in the study were individuals aged 18 and above with no prior diagnosis of CRC, who underwent colonoscopy based on recommendations from the emergency service, the hospital medical team, or through outpatient service. Exclusion criteria ruled out individuals previously diagnosed with CRC, those with CRC but with non-adenocarcinoma histology, individuals infected with the human immunodeficiency virus (HIV), recipients of solid organ or hematopoietic precursor transplants, and those under active treatment with immunosuppressive medications. The sample size calculation was influenced by the study conducted by Álvarez and colleagues[9], considering a significance level (alpha) of 0.05 and a statistical power of 80%. With a 33.4% prevalence in the exposed group and 48.6% in the unexposed group, alongside an exposed to unexposed ratio of 5 to 1, the calculation yielded a minimum sample size of 89 exposed and 446 non-exposed participants, totaling 534 individuals.

Data for the study were extracted from the electronic health records of both institutions. Variables of interest included sociodemographic details (age, sex), risk factors for CRC development (family history of CRC, inflammatory bowel disease, obesity, diabetes *mellitus*, tobacco and alcohol use, and hereditary syndromes linked to CRC). Diagnoses of hereditary non-polyposis colorectal cancer were established using the Amsterdam II criteria. In contrast, diagnoses of familial adenomatous polyposis were confirmed through the identification of either 100 or more adenomatous polyps in the colon and rectum or fewer than 100 polyps with a confirmed family history of familial adenomatous polyposis[10,11]. The study also considered clinical symptoms reported by patients during the colonoscopy, endoscopic macroscopic findings such as the anatomical lesion location and observed endoscopic patterns (e.g., protruding lesions, ulceration, annular stenosing), tumor staging according to the Eighth Edition of the American Joint Committee on Cancer's Staging Manual[12], and histopathological characteristics of the lesion, including histological subtype and tumor differentiation grade.

Statistical Analysis

A descriptive univariate analysis was performed for clinical, endoscopic, and histopathological variables. Quantitative variables were presented using central tendency and dispersion measures (median and interquartile range [IQR]), due to their non-normal distribution. Qualitative variables were characterized by absolute and relative frequencies. Furthermore, a bivariate analysis was undertaken, wherein each database variable was stratified and subjected to the appropriate statistical tests (χ^2 test or Fisher's exact test).

Age was employed as a dichotomous independent variable (categorized from 50 years of age) to calculate the prevalence ratio (PR) of CRC among patients younger than 50 years for each clinical, endoscopic, and histopathological feature, accompanied by its respective confidence interval. A significance level of $\alpha = 0.05$ was applied across all comparative analyses. The entire analytical process was executed using Stata 14 statistical software.

RESULTS

During the period from July 1, 2016, to June 30, 2021, a total of 538 *de novo* cases of CRC were identified. Seventeen

cases were excluded due to a non-adenocarcinoma histology (comprising 10 neuroendocrine carcinomas, 6 lymphomas, and 1 sarcoma), leaving 521 cases eligible for inclusion in the study. The median age at the time of diagnosis was established at 66 years, with an interquartile range (IQR) spanning from 57 to 76 years. Of these patients, 77 (14.7%) were younger than 50 years, while 444 (85.2%) were 50 years or older. Sex analysis revealed a slight female predominance in CRC diagnoses (55.28% compared to 44.72%), with similar proportions observed among both below and above 50-year-old patient groups. Statistically significant findings indicated a higher prevalence of family history of CRC and associated genetic syndromes in patients under 50 years old diagnosed *de novo* with CRC. Likewise, the incidence of clinical histories such as obesity, diabetes *mellitus*, and smoking was statistically more prevalent in the older patient cohort. The most commonly reported symptoms at the time of colonoscopy included gastrointestinal bleeding (69.29%), abdominal pain (59.5%), weight loss (57.01%), anemia (55.09%), and constipation (34.17%). Detailed patient clinical characteristics are further delineated in **Table 1**.

In the performance of colonoscopy, the anatomic sites where a higher incidence of tumor lesions was noted in the general population included the rectum (n = 166,

Table 1. Clinical Characteristics and Their Association with Colorectal Cancer Prevalence in Patients Under 50 Years of Age

Characteristics	Total n = 521 (100%)	< 50 Years n = 77 (14.7%)	≥ 50 Years n = 444 (85.2%)	p-Value	Prevalence Ratio (95% CI)	p-Value
Sex						
Female	288 (55.28)	44 (57.14)	244 (54.95)	0.409	Reference	
Male	233 (44.72)	33 (42.86)	200 (45.05)		0.92 (0.61-1.40)	0.722
Background						
Family History of CRC	46 (8.83)	22 (28.57)	24 (5.41)	**< 0.001**	4.13 (2.79-6.10)	**< 0.001**
Familial Adenomatous Polyposis	6 (1.15)	3 (3.90)	3 (0.68)	**< 0.001**	3.64 (1.58-8.34)	0.002
Non-Polyposis Hereditary CRC	5 (0.96)	4 (5.19)	1 (0.23)		5.82 (3.57-9.50)	**< 0.001**
Crohn's Disease	1 (0.19)	-	1 (0.23)	0.770	-	-
Ulcerative Colitis	2 (0.38)	-	2 (0.45)			
Obesity	201 (38.58)	13 (16.88)	188 (42.34)	**< 0.001**	0.32 (0.18-0.57)	**< 0.001**
Diabetes *mellitus*	98 (18.81)	4 (5.19)	94 (21.17)	**< 0.001**	0.23 (0.08-0.63)	**0.004**
Smoking	130 (24.95)	11 (14.29)	119 (26.80)	**0.01**	0.50 (0.27-0.91)	**0.026**
Alcoholism	68 (13.05)	12 (15.58)	56 (12.61)	0.290	1.22 (0.70-2.15)	0.469
Signs and Symptoms						
Constipation	178 (34.17)	35 (45.45)	143 (32.21)	**0.044**	1.48 (0.96-2.26)	0.071
Diarrhea	72 (13.82)	6 (7.79)	66 (14.86)		0.62 (0.27-1.43)	0.268
Abdominal Pain	310 (59.50)	51 (66.23)	259 (58.33)	0.119	1.33 (0.86-2.07)	0.197
Rectal Pain	108 (20.73)	22 (28.57)	86 (19.37)	**0.049**	1.52 (0.97-2.39)	0.062
Gastrointestinal Bleeding	361 (69.29)	54 (70.13)	307 (69.14)	0.498	1.04 (0.66-1.63)	0.863
Anemia	287 (55.09)	47 (61.04)	240 (54.05)	0.155	1.27 (0.83-1.95)	0.258
Narrow Stools	80 (15.06)	17 (22.08)	63 (14.19)	0.059	1.56 (0.96-2.53)	0.070
Weight Loss	297 (57.01)	43 (55.84)	254 (57.21)	0.459	0.95 (0.62-1.44)	0.823
Palpable Abdominal Mass	49 (9.40)	10 (12.99)	39 (8.78)	0.168	1.43 (0.79-2.60)	0.232
Intestinal Obstruction	48 (9.21)	6 (7.79)	42 (9.46)	0.415	0.83 (0.38-1.81)	0.645
Ascites	17 (3.26)	1 (1.30)	16 (3.60)	0.256	0.60 (0.15-2.30)	0.335

CRC: colorectal cancer; CI: confidence interval. Author's own research

31.86%), the sigmoid colon (n = 108, 20.73%), and the ascending colon (n = 103, 19.77%). This study observed a predominance of exophytic tumor lesions (n = 362, 69.48%) as compared to constricting annular lesions (n = 159, 30.52%). Tumor staging was conducted according to the Eighth Edition of the American Joint Committee on Cancer's Staging Manual, with a majority of patients classified as stage III (n = 177, 33.97%), followed by stages IV (n = 163, 31.29%) and II (n = 128, 24.57%). No statistical difference was found regarding tumor location, endoscopic pattern of the lesion, or tumor staging between patients under and over the age of 50.

The study population was limited to patients diagnosed with adenocarcinoma-type CRC. The conventional adenocarcinoma subtype was the most prevalent in both age groups, being significantly more common in the group aged over 50 (84.91% vs. 51.95%, $p < 0.001$). The younger group more frequently exhibited histological subtypes such as mucinous adenocarcinoma (27.27% vs. 13.29%; $p < 0.001$) and signet ring cell adenocarcinoma (20.78% vs. 1.8%; $p < 0.001$). Additionally, moderately differentiated adenocarcinomas were more predominant among patients aged 50 or older (69.98% vs. 64.94%), followed by well-differentiated adenocarcinomas (23.93% vs. 18.18%). In contrast, poorly differentiated adenocarcinomas were more commonly reported in patients younger than 50 years (16.88% vs. 6.09%; $p = 0.004$). Complementary information detailing endoscopic, neoplastic, and histological features is outlined in **Table 2**.

Table 2. Endoscopic, Neoplastic, and Histological Features in Conjunction with the Prevalence Ratio for Colorectal Cancer in Patients up to 50 Years of Age

Characteristics	Total n = 521 (100%)	< 50 Years n = 77 (14.7%)	≥ 50 Years n = 444 (85.2%)	p-Value	Prevalence Ratio (95% CI)	p-Value
Endoscopic Localization						
Cecum	46 (8.83)	3 (3.90)	43 (9.68)	0.396	Reference	
Ascending Colon	103 (19.77)	14 (18.18)	89 (20.05)		2.08 (0.62-6.90)	0.229
Transverse Colon	32 (6.14)	5 (6.49)	27 (6.08)		2.39 (0.61-9.31)	0.207
Descending Colon	27 (5.18)	5 (6.49)	22 (4.95)		2.83 (0.73-10.9)	0.13
Sigmoid	108 (20.73)	22 (28.57)	86 (19.37)		3.12 (0.98-9.92)	0.053
Rectum	166 (31.86)	24 (31.17)	142 (31.98)		2.21 (0.69-7.03)	0.177
Rectosigmoid Junction	39 (7.49)	4 (5.19)	35 (7.88)		1.57 (0.37-6.60)	0.536
Endoscopic Pattern of the Lesion						
Exophytic	362 (69.48)	54 (70.13)	308 (69.37)	0.505	Reference	
Annular Stenosing	159 (30.52)	23 (29.87)	136 (30.63)		0.96 (0.61-1.52)	0.894
Tumor Stage (according to the Eighth Edition of the American Joint Committee on Cancer's Staging Manual)						
0	5 (0.96)	-	5 (1.13)	0.209	-	-
I	48 (9.21)	3 (3.9)	45 (10.14)		0.39 (0.12-1.23)	0.111
II	128 (24.57)	16 (20.78)	112 (25.23)		0.78 (0.43-1.39)	0.409
III	177 (33.97)	32 (41.56)	145 (32.66)		1.13 (0.70-1.81)	0.603
IV	163 (31.29)	26 (33.77)	137 (30.86)		Reference	
Histological Subtype of Adenocarcinomas						
Conventional	417 (80.04)	40 (51.95)	377 (84.91)	**< 0.001**	0.36 (0.22-0.58)	**< 0.001**
Mucinous	80 (15.36)	21 (27.27)	59 (13.29)		Reference	
Signet Ring Cells	24 (4.61)	16 (20.78)	8 (1.80)		2.53 (1.59-4.03)	**< 0.001**
Histological Differentiation						
Well Differentiated	120 (23.08)	14 (18.18)	106 (23.93)	**0.004**	Reference	
Moderately Differentiated	360 (69.23)	50 (64.94)	310 (69.98)		1.19 (0.68-2.07)	0.538
Poorly Differentiated	40 (7.69)	13 (16.88)	27 (6.09)		2.78 (1.43-5.41)	**0.003**

Author's own research.

DISCUSSION

The issue of EOCRC is of increasing public health significance. Despite overall declines in both incidence and mortality of CRC due to enhanced screening efforts, there has been a marked rise in both metrics among individuals under 50 globally[13,14]. Specifically, EOCRC has seen an annual increase of 1%-2% since the 1990s, with an even sharper 3.8% annual rise among those aged 20 to 29 since 1987[15]. Our investigation found that 14.7% (n = 77) of the *de novo* CRC cases were patients under 50, with a higher incidence among females (n = 44, 57.14%). Previous estimates in Colombia place EOCRC between 17% and 26% of all CRC cases[16,17], while a Chilean study by Álvarez and colleagues[9] found that 17% (n = 72) of CRC patients were under 50, with females accounting for 54.2% (n = 39) of these cases. These figures suggest that EOCRC prevalence in South America exceeds that reported in developed countries. Projections for the United States indicate that by 2030, 10.9% of colon cancers and 22.9% of rectal cancers will be diagnosed in individuals under 50 — a significant increase from 4.8% and 9.5%, respectively, in 2010[18]. Notably, the prevalence of EOCRC differs between sexes, with a higher occurrence in females in South America, contrasting global trends where EOCRC is more commonly seen in males[15,19].

CRC diagnosed before the age of 50 is strongly linked to family history of the disease or related hereditary syndromes[20]. Our data showed that EOCRC patients had almost a fourfold increase in likelihood of having a familial CRC history compared to those with late-onset CRC. Gausman and colleagues[21] included 269 EOCRC patients, 2802 with late-onset CRC, and 1122 controls, highlighting that EOCRC patients were eight times more likely to report a family history of CRC than controls, and nearly triple that of patients over 50. Our findings also pointed to a statistically significant greater incidence of hereditary syndromes linked to CRC in younger patients. It is pertinent to note that while hereditary syndromes' prevalence is notably higher in EOCRC patients than in healthy controls, the link to family history of CRC in the absence of identified hereditary syndromes remains unclear[21,22].

While this study did not perform molecular analyses on EOCRC patients, it is crucial to acknowledge the existence of various molecular classification methods. These are based on cellular events such as chromosomal instability (CIN), microsatellite instability (MSI) status, CpG island methylator phenotype (CIMP), and mutations in genes like *BRAF*, *TP53*, *CDKN1A*, *CDKN1B*, and *KRAS*[23].

Additionally, the prevalence of comorbid conditions was significantly higher in CRC patients over 50 compared to those with EOCRC, with notable differences in obesity (42.34% vs. 16.88%), smoking (26.80% vs. 14.29%), and diabetes *mellitus* (21.17% vs. 5.19%). Although a retrospective case-control study suggested certain dietary components are linked to EOCRC, obesity and diabetes were not identified as factors. However, Liu and colleagues[24] reported an association between obesity and increased EOCRC risk in women, underlining the necessity for prospective studies to delve deeper into this association.

The most commonly reported symptoms during colonoscopy for CRC patients included gastrointestinal bleeding, abdominal pain, weight loss, anemia, and constipation. Our research did not reveal statistical differences when comparing patients above 50 with younger patients. Nonetheless, certain symptoms and signs such as constipation (45.45% vs. 32.21%), abdominal pain (66.23% vs. 58.33%), rectal pain (28.57% vs. 19.57%), anemia (61.04% vs. 54.05%), stool narrowing (22.08% vs. 14.19%), and palpable abdominal mass (12.99% vs. 8.78%) were more frequently reported in EOCRC patients. There is a vital need to enhance awareness about EOCRC, as young CRC patients often lack knowledge about the disease, attributing their symptoms to benign conditions[25]. Health professionals are also more inclined to postpone diagnostic testing, such as fecal occult blood tests or colonoscopies, in younger individuals[26].

Evidence suggests distinct pathophysiology and tumor behavior in EOCRC compared with CRC in patients over 50[27]. EOCRC often shows a preference for the distal colon, especially the sigmoid colon and rectum[9,20]. In the study conducted by Holowatyj and colleagues[28], cases of EOCRC were stratified into distinct subgroups according to age ranges (15-19, 20-24, 25-29, 30-34, and 35-39 years). The findings elucidated a predominance of left-sided tumors within the 15-19 age cohort, accompanied by a gradual and consistent decline in the prevalence of right-sided tumors among patients aged 20-39 years. Our findings concur with the previous literature, indicating the rectum (31.17%) and sigmoid colon (28.57%) as prevalent sites in younger patients; however, there was no statistical difference when EOCRC cases were compared with patients older than 50. Additionally, no differences were seen in the prevalence ratio when comparing tumor staging by diagnosis age, although it has been suggested that malignancies in young adults may present different biology, are often diagnosed at more advanced stages, and have a poorer prognosis[29-31].

In individuals under 50 diagnosed with CRC, there was a notably higher incidence of mucinous adenocarcinoma (27.27%) and signet ring cell adenocarcinoma (20.78%) ($p < 0.001$), and these were more likely to be poorly differentiated (16%) compared to their older counterparts (6.09%) ($p < 0.01$). These histopathological patterns align with prior studies indicating that EOCRC tends to show more adverse

histological features, including perineural venous invasion, signet ring cell histology, and positive surgical margins[27,28,32].

The study faced limitations in its conduct and analysis. The array of variables, particularly comorbidities, was limited. Due to its cross-sectional design, the study cannot provide conclusions with substantial statistical weight regarding factor associations. Also, confirmatory diagnostic molecular analyses were not performed for genetic syndromes associated with CRC, suggesting the need for further longitudinal studies with larger sample sizes and stronger levels of evidence and degrees of recommendation.

CONCLUSIONS

This investigation offers an insight into the characteristics of EOCRC within a Latin American cohort, uncovering data on sociodemographic, clinical, endoscopic, and histological variables. Given the increasing prevalence of EOCRC, a shift in the management of this cancer type is imperative. Heightened awareness and the introduction of prevention, control, and early detection strategies are crucial areas to be addressed in the upcoming years worldwide.

Conflict of Interest

The authors have no conflicts of interest to declare in relation to the research, authorship, or publication of this article.

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Original article

Diagnostic Performance of FibroScan in a Liver Disease Center in Bogotá from 2019 to 2022

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Abstract

Introduction: The medical record and liver biochemical profile are essential in diagnosing liver diseases. Liver biopsy is the reference parameter for diagnosis, activity evaluation, fibrosis status, or therapeutic response, but it is invasive and carries risks. For fibrosis staging, easily accessible non-invasive tests without resorting to biopsy have been developed. The FIB-4 and APRI indexes are helpful but do not determine the degree of fibrosis in the early and intermediate stages. Fibrosis can be evaluated using elastography, a sensitive technique to differentiate patients without fibrosis from those with advanced fibrosis. **Objective:** To describe the diagnostic performance of FibroScan in detecting fibrosis compared to the APRI and FIB-4 indexes versus the biopsy in a care center for patients with liver diseases in Bogotá. **Methods:** A retrospective, cross-sectional cohort study compared the APRI, FIB-4, and Fibroscan with biopsy; diagnostic accuracy measures and an area under the curve (AUROC) analysis were described. **Results:** The biopsy was positive for fibrosis in 40%. The AUROC was 0.90 (confidence interval [CI]: 0.83–0.97) for FibroScan, 0.52 (CI: 0.35–0.68) for APRI, and 0.52 (CI: 0.37–0.68) for FIB-4. **Conclusions:** FibroScan helps diagnose and monitor chronic liver disease and should be combined with other tests and the clinical picture. FibroScan was better at detecting advanced stages when discriminating against patients with liver fibrosis than the APRI and FIB-4 indexes.

Keywords

Elastography, FibroScan, APRI, FIB-4, ROC curves, liver fibrosis.

INTRODUCTION

Worldwide, chronic liver diseases such as metabolic dysfunction-associated steatotic liver disease (MASLD), viral hepatitis, alcohol-related liver disease, and autoimmune liver disorders are significant causes of morbidity and mortality. Early identification of hepatic fibrosis at any stage can lead to treatments that significantly improve outcomes.

Hepatic fibrosis, a common structural alteration in many chronic liver diseases, is a key prognostic factor. Its extent correlates with the risk of developing cirrhosis, which ranks as one of the top twenty global causes of death. The mortality rate one year after diagnosis can range from 1% to 57%[(1)].

The most common causes of chronic liver disease include metabolic hepatic steatosis, alcohol consumption, and viral hepatitis. Progressive liver injury may lead to severe complications such as hepatocellular carcinoma, cholangiocarcinoma, coagulopathy, hepatorenal and hepatopulmonary syndromes, and pulmonary portal hypertension. Risk factors encompass obesity, bariatric surgery, transfusion of blood products, use of intravenous drugs, risky sexual behaviors, congenital heart diseases, and a family history of autoimmune or liver diseases[(2)].

Patients with liver damage at risk of developing cirrhosis may remain asymptomatic for years, only to present suddenly with complications such as ascites, anasarca, vari-

ceal bleeding, jaundice, and encephalopathy. This highlights the importance of early-stage identification through paraclinical tests in the diagnostic efforts for fibrosis[2].

The clinical history, liver biochemistry profile, and ultrasound are fundamental in the diagnostic process of liver diseases. For staging fibrosis, which is crucial in decision-making for treatment and follow-up, non-invasive, easily accessible tests have been developed to avoid biopsy[2].

Although liver biopsy remains the gold standard for diagnosis, assessing activity, fibrosis status, or therapeutic response, it is an invasive procedure with complication risks. It is reserved for patients when the diagnosis is uncertain and understanding the etiology could influence treatment decisions and prognosis. Biopsy has limitations ranging from technical difficulties to potential complications such as pain, infections, and bleeding[3]. Furthermore, the biopsy sample represents only a small portion of the liver and may not accurately reflect the extent of fibrosis due to its irregular distribution. Additionally, biopsy does not assess the dynamic process of fibrogenesis, where disease and treatment evolution may lead to regression or progression. These limitations have spurred the development of non-invasive serological and imaging methods for evaluating hepatic fibrosis[4].

Multivariate tools such as the APRI Platelet Ratio Index and the FIB-4 Index for Liver Fibrosis are based on transaminase measurements and platelet count. However, FIB-4 and APRI index calculations, while useful in general practice, are not sufficient for determining the degree of fibrosis in early and intermediate stages. Consequently, guidelines recommend non-invasive tests like transient elastography, magnetic resonance elastography, or acoustic radiation force impulse imaging, among others[5].

Hepatic fibrosis increases tissue stiffness and decreases elasticity, which can be assessed through liver elastography. Currently, it is the preferred non-invasive imaging technique for evaluating fibrosis, measuring liver stiffness as a quantitative biomarker of fibrosis magnitude in patients with chronic liver disease. It is even sufficient for suspecting liver disease in asymptomatic individuals[6].

No diagnostic test is perfect, and a test might have high sensitivity but low specificity, or vice versa[7]. Therefore, these tests should be evaluated alongside clinical findings. Although studies have identified the diagnostic performance of these tests[8], and some exist in Colombia, it is crucial to continue providing information about these tests over time to observe their behavior. The aim of this study was to describe the diagnostic performance of elastography in detecting hepatic fibrosis compared to biopsy in patients enrolled in a liver disease care center in Bogotá.

METHODS

This study was designed as a retrospective cohort and cross-sectional investigation. It entailed the review of 3,066 patient records who were treated for various liver diseases between 2019 and 2022 at two private care centers in Bogotá. The diseases covered included hepatitis C, metabolic hepatic steatosis, alcohol-induced liver disease, and autoimmune hepatitis.

The inclusion criteria specified that participants should be patients over 18 years old who received care in private consultation at two gastroenterology centers, Gastromedicall and Unidad de Gastroenterología Integral in Bogotá, Colombia. These patients were diagnosed with conditions such as metabolic hepatic steatosis, autoimmune hepatitis, alcohol-induced liver disease, primary biliary cholangitis, sclerosing cholangitis, hepatitis B, non-cirrhotic portal hypertension, and congestive hepatopathy, all confirmed by liver biopsy results. Additionally, these patients must have undergone a FibroScan within six months before or after their biopsy date, with the report available.

The study excluded patients with incomplete APRI, FIB-4, biopsy, or FibroScan data. Specifically, five patients were excluded due to missing descriptions of fibrosis stage in their biopsy results.

Ultimately, 65 patients were included in the final analysis. The study recorded all necessary clinical and paraclinical variables required for the construction of indices, such as age, transaminase levels, and platelet count, treating sex as an independent variable. Data was systematically input into an MS Excel spreadsheet and analyzed using Stata 17.0 statistical software. Qualitative variables were summarized using frequencies and percentages, while quantitative variables were described using mean and standard deviation. The bivariate analysis employed parametric (Student's t-test) or non-parametric (Wilcoxon rank-sum test) tests based on the normality of the distribution of quantitative variables, and the χ^2 test for qualitative variables, with a p-value of < 0.05 considered statistically significant.

Further, APRI and FIB-4 indices were developed and their results compared with FibroScan outcomes against the biopsy-confirmed diagnosis of hepatic fibrosis. The study delineated the diagnostic accuracy measures, including sensitivity, specificity, and positive and negative likelihood ratios of the APRI, FIB-4, and FibroScan indices. Additionally, an area under the receiver operating characteristic curve (AUROC) analysis was performed, with a 95% confidence interval (CI). The study did not seek approval from an institutional ethics committee due

to the private nature of the consultation centers involved. However, it adhered to the ethical guidelines outlined in the Declaration of Helsinki and the 1993 Resolution 8430 for human research, ensuring data confidentiality and protection through an anonymized MS Excel spreadsheet.

RESULTS

Of the 70 patients initially considered eligible, five were excluded due to the absence of fibrosis state reporting in their biopsy results, leading to a final cohort of 65 patients for analysis. Among these, 26 patients (40%) showed a biopsy positive for any degree of fibrosis. For the FibroScan evaluation, a threshold of 7 kPa was established, with readings greater than or equal to this value considered positive, and those below it deemed negative. Of the patients with biopsy-confirmed fibrosis, 16 (61.54%) had positive FibroScan results, while 10 (38.36%) were negative.

In total, 39 patients exhibited no fibrosis upon biopsy examination. Among this group, four (10.26%) had positive FibroScan findings, and 35 (89.74%) had negative outcomes. This resulted in four false positives (10.26%) and 10 false negatives (38.36%) when comparing FibroScan results to biopsy findings, as depicted in the participant flow diagram (**Figure 1**).

In terms of demographic characteristics, males constituted 24.62% of the study population, with an average age of 53.53 years, ranging from a minimum of 23 to a maximum of 77 years. In regards to fibrosis status, biopsy results classified eight patients as having advanced fibrosis stages F3 and F4, accounting for 12.8% of the cases. The remaining general characteristics are presented in **Table 1**.

Table 1. Basic Demographic and Clinical Characteristics of Participants

General Characteristics of Patients with Liver Biopsy and FibroScan	
Total Population	**n (%)**
Male	16 (24.62)
Female	49 (75.38)
	Mean (SD)
Age (years)	53.53 (12.11)
Platelets (10^3/u/L)	259.276.92 (94.151.39)
AST (U/L)	44.32 (38.57)
ALT (U/L)	52.56 (53.45)
FIB-4	1.59 (1.43)
APRI	0.61 (0.73)
Elastography (kPa)	6.60 (3.80)

ALT: Alanine Aminotransferase; APRI: AST to Platelet Ratio Index; AST: Aspartate Aminotransferase; FIB-4: Index for Liver Fibrosis. Author's own research.

Table 2 displays the characteristics adjusted for biopsy-confirmed fibrosis and the statistical outcomes for patients categorized by the presence or absence of fibrosis along

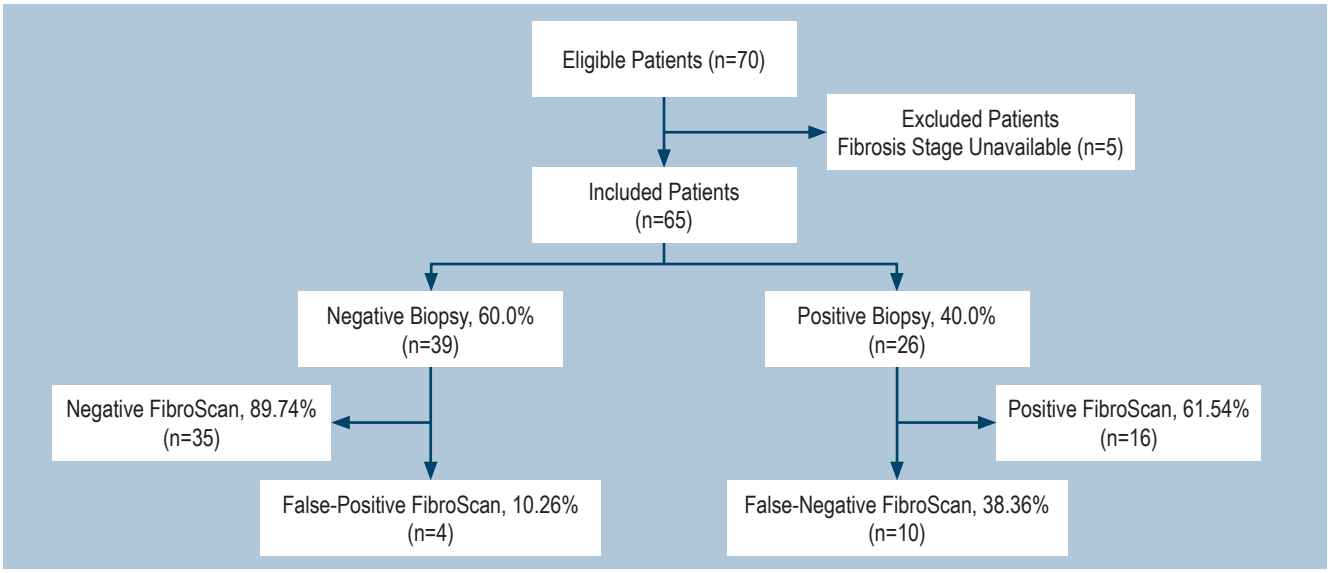


Figure 1. Participant Flow Diagram. Author's own research.

Table 2. Comparison According to the Biopsy Report Indicating Any Degree of Fibrosis*

Characteristic	No Fibrosis χ^2/Rank sum	With Fibrosis χ^2/Rank sum	p-Value
Male	10 (62.50)	6 (37.50)	0.781
Age (%)	52.74 (52.74)	56.42 (56.42)	0.271
Platelets (10^3/u/L)	258.121	267.578	0.715
AST (U/L)	1.222	923	0.383
ALT (U/L)	1.369.5	775.5	0.269
FIB-4	1.215.5	929.5	0.338
APRI	1.285.5	859.5	0.984
Elastography (kPa)	874.5	1.270.5	< 0.001

*Statistics were reported. ALT: Alanine Aminotransferase; APRI: AST to Platelet Ratio Index; AST: Aspartate Aminotransferase; FIB-4: Index for Liver Fibrosis. Author's own research.

with their p-values. For qualitative variables with a normal distribution, the difference was assessed using the mean difference, while for those with a non-normal distribution, the median rank test statistic was reported. The sole variable that exhibited a statistically significant difference between the two groups was the elastography measure. Upon performing a Spearman's correlation test, it was found that there was neither a positive nor a negative correlation between the elastography values and the APRI and FIB-4 indices.

Table 3 encapsulates the diagnostic precision metrics for various elastography cutoff points ranging from >7 to 13.1 kPa, which are the thresholds recommended in literature for differentiating fibrosis. The highest diagnostic yield was noted at the cutoff point of ≥7 kPa, which accurately classified 78.46% of patients and demonstrated a positive likelihood ratio of 6.00.

Figure 2 illustrates the comparative analysis between ROC curves for elastography and the FIB-4 and APRI indices correlated with biopsy outcomes. It is clearly shown that elastography outperforms with an AUC of 0.57 for the FIB-4 index and 0.50 for the APRI index.

Table 3. Sensitivity, Specificity, Positive Likelihood Ratio (LR+), Negative Likelihood Ratio (LR-), and Percent Correctly Classified According to Elastography Cutoff Points

Cutoff Point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
≥ 7	61.54%	89.74%	78.46%	6.00	0.42
≥ 7.4	57.69%	89.74%	76.92%	5.62	0.47
≥ 7.5	53.85%	89.74%	75.38%	5.25	0.51
≥ 7.7	42.31%	94.87%	73.85%	8.25	0.60
≥ 7.9	38.46%	94.87%	72.31%	7.50	0.64
≥ 8.5	30.77%	94.87%	69.23%	6.00	0.72
≥ 8.8	26.92%	94.87%	67.69%	5.25	0.77
≥ 10	26.08%	94.87%	66.15%	4.50	0.81
≥ 10.6	19.23%	94.87%	64.62%	3.75	0.85
≥ 11.5	19.23%	97.44%	66.15%	7.50	0.82
≥ 12	19.23%	100.00%	67.69%	-	0.80
≥ 12.2	15.38%	100.00%	66.15%	-	0.84
≥ 13.1	11.54%	100.00%	64.62%	-	0.88

LR: Likelihood Ratio. Author's own research.

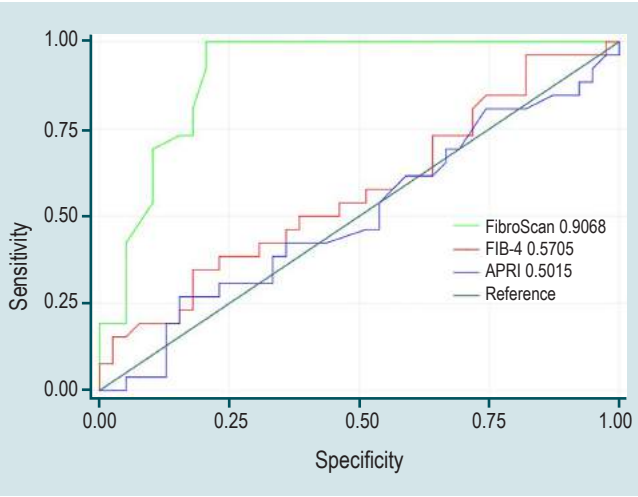


Figure 2. Comparison of ROC Curves for Elastography and FIB-4 and APRI Indices Relative to Biopsy. Author's own research.

Table 4 collates the areas under the curve of the AUROC tests for the tested parameters along with their respective confidence intervals. Elastography emerges as the most effective measure.

Table 4. Area Under the Curve for Elastography and the FIB-4 and APRI Indices

Test	ROC Area	CI (95%)
Elastography (kPa)	0.90	0.83-0.97
FIB-4	0.57	0.42-0.71
APRI	0.50	0.35-0.64

APRI: AST to Platelet Ratio Index; FIB-4: Index for Liver Fibrosis; CI: Confidence Interval. Author's own research.

DISCUSSION

Our study assessed the diagnostic accuracy of FibroScan for detecting fibrosis by comparing its AUROC curve with biopsy diagnosis, revealing an AUROC of 0.90%. This result is considered excellent. Furthermore, the study reviewed the performance of the APRI and FIB-4 indices, which yielded AUROCs of 0.50% and 0.57%, respectively, indicative of moderate performance, thereby establishing elastography as a superior diagnostic tool.

Key performance metrics of a diagnostic test include sensitivity, or the proportion of truly diseased individuals as per the reference test who are correctly identified by the test under scrutiny; specificity, or the proportion of truly non-diseased individuals who are correctly identified by the test; positive predictive value, which is the proportion of individuals with a positive test result who are truly diseased; and negative predictive value, which is the proportion of individuals with a negative test result who are truly disease-free. These metrics should be interpreted against the backdrop of the disease's prevalence, and when combined, they yield positive or negative likelihood ratios (LR). These LRs describe the probability of a test result occurring in diseased individuals compared to healthy ones[9].

As of now, there are no studies reporting the prevalence of liver disease in Colombia. The recent literature on liver disease and the application of elastography stems from descriptive accounts from clinical settings[10], which limit the interpretation of predictive values, hence these are not reported in our study.

A ROC curve, which is constructed to synthesize the sensitivity and specificity of a test, facilitates the graphical comparison across various cutoff points. It plots sensitivity against 1 - specificity across a range of values. The axis values range from 0 to 1, equating to 0%-100%. Tests with high diagnostic efficacy are characterized by a curve that approaches the top-left corner of the ROC plot. An increase in sensitivity, resulting from lowering the cutoff point, leads to a decrease in specificity. Conversely, tests with poor diagnostic efficacy are closer to the bottom-left or top-right corners of the curve[9].

Our findings indicated an AUROC of 0.90 for FibroScan, denoting excellent performance and aligning with results by Mozés and colleagues, who reported an AUROC of 0.85[4]. These outcomes are also supported by findings in Colombia from Prieto and colleagues in 2021, which involved 654 subjects at a referral center for liver disease. They underwent both elastography (SuperSonic) and biopsy, and the studies concluded that elastography is a useful tool for fibrosis assessment[9,10].

The study revealed that the APRI and FIB-4 tests had modest performances. This contrasts with Zhong's meta-analysis, which assessed APRI's efficacy in diagnosing significant fibrosis, severe fibrosis, and cirrhosis, with AUROCs of 0.77, 0.80, and 0.83, respectively[11]. However, it is worth noting that these results pertained to patients with hepatitis C-related fibrosis, a data set not present in our current research.

With respect to FIB-4, commonly used for patients with hepatitis C virus and HIV, a 2022 meta-analysis of 37 primary studies by Mozés and colleagues in 2022 reported AUROC performances of 0.76 for predicting advanced fibrosis[4]. However, it must be highlighted that only eight of our study's participants had advanced fibrosis, potentially accounting for the indices' observed performance.

The meta-analyses cited earlier[4,11] advocate for the sequential integration of biomarkers derived from bio-

chemical profiles and elastography scores, especially with adjusted cutoffs for advanced fibrosis and cirrhosis. This recommendation takes into account the variable efficacy of such tests; hence, these indices must be interpreted with clinical circumspection within the broader clinical narrative when monitoring patients with hepatic fibrosis.

Correlation analyses failed to demonstrate any significant positive or negative correlation. However, given the reported efficacy in the literature, the employment of APRI and FIB-4 indices could enhance diagnostic acumen in scenarios where FibroScan is unavailable, particularly in regions with a high prevalence of liver pathology and associated risk factors.

Among the suite of non-invasive ultrasound-based imaging modalities, vibration-controlled transient elastography (VCTE) is globally recognized as the most thoroughly researched and validated. Esteemed organizations such as the American Gastroenterological Association (AGA), the European Association for the Study of Liver Diseases (EASL), and the Latin American Association for the Study of the Liver (ALEH) endorse its use for hepatitis B and C patients. Its diagnostic prowess in identifying cirrhosis and advanced hepatic fibrosis is well-documented, boasting a negative predictive value exceeding 90% in excluding cirrhosis[3].

This technique hinges on the generation of a shear wave, with the speed of its hepatic traversal directly correlating with tissue rigidity—a faster wave signifies greater liver stiffness and thus, more advanced fibrosis. The VCTE (FibroScan, Echosens, Paris, France) induces a 50 Hz shear wave via a vibratory piston at the intercostal space, penetrating the liver 25 to 65 mm beneath the skin with the adult M probe or 25 to 75 mm with the XL probe. Kilopascals (kPa) serve as the unit of measurement, with a dynamic range from 2.5 to 75 kPa[12].

For the test, patients lie supine with the right arm retracted behind the head to expose the intercostal space at the convergence of the mid-axillary line and a line extending from the xiphoid cartilage, or alternatively, at the first intercostal space below the upper margin of hepatic dullness. A physician, nurse, or a trained technician, with at least 100 supervised studies under their belt, can conduct the procedure. The study ensured adherence to all test quality criteria at the performing center.

Despite previous reports suggesting higher performance for APRI and FIB-4 scores, our study underscores FibroScan's sustained excellence. Nevertheless, such findings warrant considered interpretation due to inherent study limitations, namely its retrospective nature, a relatively small cohort of 65 patients, and instances of incomplete fibrosis grading in biopsy reports. However, a notable strength of this work is the implementation of FibroScan at a highly experienced center, thus enriching the data from other larger-scale Colombian studies and providing a foundation for further research with enhanced statistical robustness for more substantial analyses.

CONCLUSIONS

FibroScan has proven to be a valuable instrument for the longitudinal assessment of liver disease, facilitating non-invasive fibrosis evaluation. It should, however, not be the solitary diagnostic modality but rather a component of a multifaceted diagnostic strategy that includes additional tests and clinical patient assessment. The FIB-4 and APRI tests yielded less robust performances than anticipated. This might be attributed to the limited patient sample size and the fact that the majority of patients were not at an advanced stage of fibrosis. Elastography demonstrated superior discrimination of hepatic fibrosis and seems to excel in detecting advanced stages of the condition. There is a call for prospective diagnostic studies with larger cohorts to increase statistical robustness.

Conflict of Interest

The authors report no conflicts of interest.

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Original article

Usefulness of Preoperative Anorectal Manometry for Ostomy Closure: A Cross-sectional Study

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Abstract

Introduction: For several reasons, a patient may be taken to a colostomy for closure as soon as possible. However, their treatment may vary, and predicting adequate continence after colostomy closure can be difficult. The objective is to characterize preoperative manometry because, in Colombia, few cases describe its usefulness. **Methods:** A descriptive cross-sectional study of adult patients treated in two gastroenterology centers in Colombia between 2018 and 2020. **Results:** Of 316 patients, 13 were indicated manometry before colostomy closure, predominantly women (69%), with an average age of 51.69 years (standard deviation: 24.18). When evaluating the basal pressures of the anal sphincter, we noted 68% hypotonia, 16% hypertonia, and 16% normal pressures. The voluntary contraction test was abnormal in 25%, and a pattern of dyssynergic defecation was observed in 30%, all with type III patterns. The inhibitory rectoanal reflex was present in 92%, with an abnormal balloon expulsion test in 100% of patients. More than 70% of patients persisted with the colostomy *in situ* after the first year of construction and 30% beyond 36 months. **Conclusions:** The present study posits questions about the cost-effectiveness of anorectal manometry before colostomy closure, which requires corroboration by studies with more patients and more robust methodological designs.

Keywords

Anorectal manometry, colostomy, fecal incontinence, rectal diseases, ostomy.

INTRODUCTION

The indication for a colostomy is varied, yet consistently aims for the prompt closure of the stoma. The perianal region comprises the internal anal sphincter, voluntary striated muscle, external anal sphincter, and the puborectalis part of the levator ani muscle, all of which regulate fecal passage, which are involved in regulating the passage of stool. Furthermore, this region is innervated by the pudendal and inferior rectal nerves, which control sensitivity and muscular activity, and contains connective tissues such as adipose and vascular structures essential for anorectal functionality. Anomalies in these tissues can manifest in symptoms identified through anorectal manometry, including difficult defecation, fecal incontinence, and anorectal discomfort[(1)].

Research indicates that anorectal manometry may forecast the surgical outcomes for anal sphincter repair in fecal incontinence cases, thus influencing colostomy decisions[(2)]. Another publication revealed anorectal manometry's efficacy in evaluating post-surgical continence following colorectal cancer operations, potentially guiding colostomy

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considerations[3]. Nonetheless, the variability in preoperative care for these patients poses a challenge in predicting post-stoma removal fecal continence. Ostomy, a surgical intervention that may be temporary or permanent, serves to facilitate elimination (fecal or urinary), nutrition (via food and fluid supply), or oxygenation (through respiratory function maintenance).

The need for colostomy construction often stems from colon obstruction, predominantly caused by either malignant or benign conditions such as obstructive diverticular disease, inflammatory bowel diseases, post-radiation or ischemic colon stenosis. In cases where colon perforation arises from such pathologies, the presence of localized or generalized peritonitis discourages immediate resections and anastomoses. Here, a colostomy, coupled with segment resection, is advised. Colon injury also frequently necessitates colostomy[4]. Minor, uncontaminated wounds in stable patients might be immediately sutured if addressed within six hours; however, severe trauma, extensive lacerations, devascularized areas, prolonged shock, and concurrent organ damage warrant a colostomy.

Fecal continence does not solely hinge on manometric pressures; patients can exhibit complete continence or experience incontinence despite presenting with low pressure readings. The assurance of anal continence is attributed to the operational synergy of the internal and external anal sphincters, alongside the levator ani muscle, particularly its puborectalis component. A pre-colostomy closure review of these structures' functionality could enhance the management and outcomes for patients, highlighting the recommendation for anorectal manometry. This diagnostic technique is pivotal for assessing defecation-related issues, such as constipation, fecal incontinence, and functional anorectal pain. Furthermore, it yields invaluable insights during both the preoperative and postoperative phases of surgeries, as well as in evaluating pelvic floor function. Conducting a comprehensive evaluation of the perianal zone's structure and functionality is crucial for patients exhibiting these symptoms.

Given the significant variability in normal values and the intricate nature of anorectal functions, no singular diagnostic test can encapsulate all the requisite information for an accurate diagnosis and informed treatment decision-making. Anorectal manometry (ARM), through the simultaneous documentation of intraluminal pressure alterations at various levels, facilitates the investigation of anorectal motor activities. This includes both resting states and the simulation of diverse physiological scenarios such as the rectoanal inhibitory reflex, retention efforts, defecation maneuvers, and the Valsalva maneuver. ARM's capability extends to assessing rectal sensitivity in conjunction with the barostat[5], establishing its utility in clinical practice for diagnosing defecation disorders in patients resistant to conventional constipation treatments, evaluating fecal incontinence cases, implementing biofeedback therapy for constipation or fecal incontinence, assessing painful anorectal syndromes, and conducting both preoperative and postoperative evaluations of ileorectal anastomoses. The inclusion of the balloon expulsion test, necessitating equipment capable of rectal balloon distention, further identifies potential candidates for colostomy reversal, particularly those with normal rectal and anal sphincter functions. In such instances, manometry serves as a critical tool in surgical planning, facilitating the selection of appropriate surgical techniques and identifying patients who may benefit from anal sphincter reconstruction[6].

The advent of high-resolution and high-definition anorectal manometry has marked a significant advancement in clinical practice in recent years[7]. These sophisticated techniques, through the employment of proximal circumferential sensors, offer an expanded array of measurement points, enabling a more distinct visualization of rectal and anal pressure fluctuations. The high-resolution and high-definition approach provides a continuous pressure recording capability, offering a more detailed spatiotemporal visualization, unaffected by movements of the pelvic floor.

In light of the absence of Colombian data on the utility of pre-surgical anorectal manometry, this article aims to delineate the manometric findings in patients scheduled for colostomy closure. A cross-sectional study was thus undertaken in two gastroenterology centers within Colombia.

METHODS AND PATIENT POPULATION

Study Design

We conducted a descriptive, observational, cross-sectional study, engaging a cohort of 316 patients who underwent anorectal manometry between 2018 and 2020. Within this cohort, 13 patients were identified as requiring manometry prior to their scheduled colostomy closures across two gastroenterology centers in Colombia.

Data Collection

Data for this study were gathered over a span of two years, from 2018 to 2020, at two Colombian gastroenterology centers participating in the research. Patient medical records and the outcomes of anorectal manometry tests constituted the core data sources. This compilation included sociodemographic and clinical details such as sex and age.

Technical Characteristics

The ManoScan system, provided by Given Imaging, facilitated the ARM procedures. Utilizing a solid-state high-resolution catheter from Medtronic B. V., featuring 10 circumferentially arranged sensors at intervals of 0.6 cm, we employed a disposable ManoShield catheter equipped with an integrated 400 mL rectal balloon. Two of these catheters were inserted within the balloon, situated 3.5 cm above the most proximal of the 10 anal sensors. Placement of the catheter was achieved through the anus in a left lateral position, adhering to a rigorously standardized test protocol. This protocol included assessments for maximum anal compression pressure over three attempts, a 30-second holding capacity across two attempts, defecation efforts (also over two attempts), the rectoanal inhibitory reflex (RAIR), sensation threshold evaluations, and cough reflex tests.

The anorectal manometry explorations examined the following parameters[8]:

- Anorectal resting pressure, recorded over a 20-second duration and extended to at least one minute if slow-wave patterns were detected.
- Maximum voluntary contraction pressure, assessed through three 20-30 second maneuvers separated by 30-second rest intervals.
- Cough maneuver to assess extrinsic nerve integrity, conducted both with and without 50 mL of air in the balloon.
- Defecation maneuver tested through three attempts, both with and without 50 mL of air in the balloon, and 30-second rest intervals.
- Anorectal inhibitory reflex and rectal sensitivity, assessed concurrently during gradual rectal balloon distension by increments of 10-20 mL.

Following data acquisition, baseline anorectal manometry readings concerning pressures were analyzed. These encompassed anorectal pressures in resting state, during contraction, and throughout simulated evacuations in the left lateral decubitus position, in addition to RAIR assessments. Metrics such as rectal pressure, rectal pressure increment, anal pressure, anal relaxation, and the rectoanal gradient were evaluated during simulated evacuations. Thresholds for rectal sensation, including first sensation, urge, and discomfort, were also determined. A visual evaluation was conducted to confirm that the increase in anal pressure accurately reflected the contraction's topography. The balloon expulsion test involved inflating a balloon to 50 mL and observing whether it was expelled within a minute. The protocol and criteria for interpretation remained uniform across all participating institutions.

Statistical Analysis

Data compilation was undertaken using MS Excel 2019. Efforts to address missing data involved revisiting the information sources, leading to analyses solely based on complete datasets. Data processing was conducted using the SPSS software, version 26.0, tailored for social sciences. Quantitative variables were described using median, standard deviation, and the range of minimum and maximum values, while qualitative variables were analyzed based on absolute and relative frequencies.

Ethical Considerations

The study was designed with strict adherence to the ethical guidelines set forth in the 2013 Declaration of Helsinki, Fortaleza, Brazil, and the Colombian National Ministry of Health's Resolution 8430 of 1993. It was classified as a risk-free research project, ensuring the confidentiality and protection of all gathered information. The nature of the study negated the need for informed consent. Importantly, no patient records contained sensitive identity information. Ethical approval was granted by the research ethics committees of each participating institution.

RESULTS

In a cohort of 316 patients, 13 individuals were identified for manometry prior to their colostomy closure. Predominantly female (69%), the average age within this subgroup was 51.69 years with a standard deviation of 24.18 years. Among them, 8 out of 13 had a history of rectal trauma with associated pelvic injuries, while 5 out of 13 had a previous diagnosis of low rectal cancer. Regarding the type of colostomy, a descending colostomy was performed in 8 out of 13 cases, a sigmoid colostomy in 3 out of 13 cases, and a transanal total mesorectal excision (TaTME) had been carried out in 2 out of 13 cases. Since these patients underwent preoperative evaluations outside the institution, comprehensive medical histories prior to surgery were unavailable (**Table 1**).

Table 1. Demographic Characteristics of Patients Undergoing Anorectal Manometry (n = 316)

Number of Patients (n = 316)	Women (n = 218)	Men (n = 98)
Age, median (standard deviation), years	51.69 (24.18)	

Source: Author's own research.

Upon assessing the baseline pressures of the anal sphincter (**Figure 1**), it was revealed that 68% exhibited hypotonia, 16% displayed hypertonia, and 16% demonstrated normal pressures. Voluntary contraction testing yielded abnormal results in 25% of cases, while a pattern of defecation dysfunctions was observed in 30%, all presenting with type III patterns[9]. RAIR was present in 92% of cases, with abnormal balloon expulsion test results observed in 100% of patients. More than 70% of patients retained their colostomy beyond the first year of its creation, with 30% continuing beyond 36 months. The findings from manometry enabled colostomy closure in 62% of patients exhibiting acceptable continence for both liquids and solids.

The Wexner score serves as a validated scale ranging from 0 to 20 points, utilized for assessing the severity of fecal incontinence (FI), with 0 representing asymptomatic and 20 indicating complete incontinence[10]. A threshold of 9 was established to delineate severity, where a Wexner score below 9 denotes mild FI, while a score equal to or above 9 suggests moderate to severe FI[8,11].

Upon computing the incontinence index using the Wexner scale (**Figure 2**), it was found that 60% of individuals exhibited mild incontinence (0-8 points), while 40% presented with moderate incontinence (9-16 points). Remarkably, none of the patients falling into the moderate incontinence category had undergone biofeedback therapy up to the conclusion of data collection. Upon subgroup analysis, among patients under 40 years old (predominantly female), the decision to perform a diverting colostomy stemmed from rectal trauma with associated pelvic injuries. Within this subgroup, manometric assessments revealed a more pronounced decline in pressures, contraction tests, sensory thresholds, dysynergic patterns, and altered balloon expulsion tests compared to patients in an older age bracket, whose ostomies were predominantly indicated for malignant diseases.

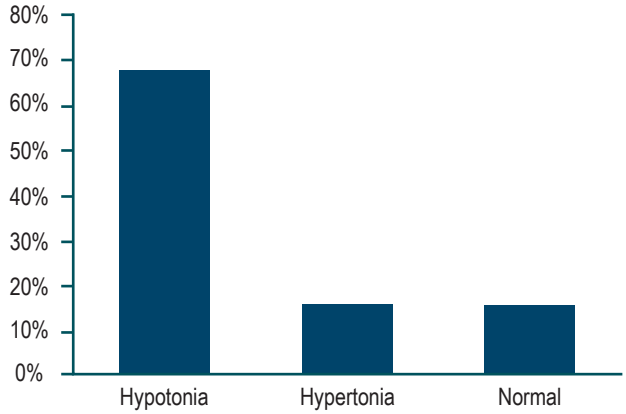


Figure 1. Baseline Anal Sphincter Pressures in Pre-Colostomy Closure Anorectal Manometry Author's own research.

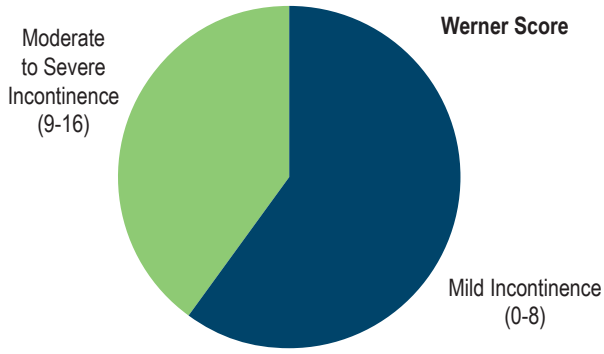


Figure 2. Wexner Continence Score at the Time of Pre-Colostomy Closure Anorectal Manometry Author's own research.

DISCUSSION

Manometry stands as the premier approach for assessing continence in those with suspected anorectal alterations. The value of manometric testing lies in its capacity to reduce incontinence risk and inform the correct treatment pathway[8,11,12]. However, there is an absence of consistent data regarding the efficacy of this examination for patients who are scheduled to undergo colostomies followed by subsequent stoma closure[12].

Utilized for appraising pelvic floor disorders affecting the anal and rectal regions, the diagnostic robustness of manometry must be interpreted with caution, as patient and healthy control results may exhibit considerable variability. Normative values can fluctuate across different medical teams since many laboratories set their own reference standards. Variations in resting pressure readings are also attributable to differing methodological approaches. For example, values of 72 mm Hg in men and 65 mm Hg in women have been reported with stationary techniques and microtransducers. Contrarily, other comparable methodologies have yielded readings ranging from 49 ± 3 to 58 ± 3 in women, and from 49 ± 3 to 66 ± 6 in men[8,11,13].

The presence of RAIR is imperative to observe during anorectal manometry. This reflex, crucially modulated by the myenteric plexus of the autonomic nervous system and triggered by the release of nitric oxide and vasoactive intestinal peptide, is a key diagnostic marker for Hirschsprung's disease within manometric evaluations. Its absence, or incomplete manifestation, may also be encountered in patients who have undergone post-circular myotomy and low anterior rectal resection[14].

Diverse studies indicate that preoperative maximum compression pressure emerged as an independent predic-

tor for stoma non-reversibility in multivariate analyses. However, preoperative maximum resting pressure and Wexner scores did not share this association[15].

It is imperative to recognize that continence impairment in colostomy patients can stem from both the disuse and desensitization of the anal sphincter. Disuse reflects the reduced engagement of the sphincter muscle, while desensitization results from a dysfunctional sphincter due to a disrupted normal defecation reflex. It is widely held that both these factors—disuse and desensitization—can detrimentally affect continence in colostomy individuals. Hence, deployment of anal sphincter rehabilitation techniques is advocated to bolster sphincter function and mitigate fecal incontinence symptoms in colostomy patients[16].

Biofeedback, during the temporary stoma period, did not yield symptom improvement. Nevertheless, it was instrumental in preserving sphincter sensitivity and integrity, as well as in curbing the incontinence of liquid stools[17]. Conversely, the timing of post-colostomy manometry could sway test results. Anorectal function following colostomy is predominantly gauged through manometry, a methodical approach to quantifying the muscular and sensory integrity of the rectum and anal sphincter. Yet, the timing of these measurements can influence the outcomes.

The consensus advises a waiting period of six to eight weeks post-colostomy surgery prior to conducting anorectal manometry. This interval is crucial for scar tissue development and patient adaptation to their modified anatomical and physiological states. Premature manometric evaluations can lead to compromised accuracy due to ongoing inflammation and the body's ongoing adjustment to post-surgical changes[18].

In our cohort, a significant presence of hypotonia at 62%, and a 100% incidence of abnormal balloon expulsion tests were observed, likely a consequence of disuse deconditioning. This finding is in accordance with similar observations noted in the literature. Furthermore, these outcomes suggest that patients have preserved adequate proprioception and voluntary muscular activity. This is evidenced by the fact that 75% of patients had a normal voluntary contraction test and 70% did not exhibit dysynergic patterns, indicating that they maintain effective rectal evacuation capabilities. Sensory-wise, a positive RAIR was present in 92% of the cohort, and a normal sensory threshold was observed in the same percentage of patients, suggesting intact myenteric innervation. A point of concern, however, is that over 70% of these patients, regardless of the initial reason for their colostomy, retained it *in situ* after one year, and 30% still had it beyond three years. Additionally, colostomy closure was performed in only 62% of patients despite reporting adequate continence for liquids and solids, and interestingly, none had received biofeedback therapy, prompting a reevaluation of the cost-effectiveness of anorectal manometry prior to colostomy closure, especially considering the substantial proportion of patients who did not undergo closure nor receive management for documented manometric changes.

The study does possess limitations, chiefly its retrospective design based on a review of outpatient medical records, which might compromise the data's integrity. The small sample size subjects the exposure information to potential measurement inaccuracies. Another limitation is the study's capacity to establish causal links between the variables examined.

CONCLUSIONS

Reflecting on the outcomes of this cohort study, one is prompted to question the cost-effectiveness of anorectal manometry prior to colostomy closure given the substantial proportion of patients who continued with an *in situ* colostomy, and the apparent disconnect between pre-closure manometric data (hypotonia: 68%) and the reported post-closure continence rate of 62%.

Ethical Approval and Participant Consent

Ethical approval was granted by the research ethics committees of each participating institution.

Consent for Publication

Designed with adherence to the Declaration of Helsinki of 2013, Fortaleza, Brazil, and Colombian National Ministry of Health's Resolution 8430 of 1993, the study was deemed risk-free, ensuring the confidentiality of collected data and thereby obviating the need for informed consent.

Data and Material Availability

All data and materials supporting the findings are contained within the manuscript, with no omissions.

Conflict of Interest

The authors declare no conflicts of interest.

Funding Sources

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Author Contributions

All authors actively participated in every research phase, from literature review and data collection to manuscript drafting, and approved the final manuscript.

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Original article

Improving Colonoscopy Preparation Using Information and Communication Technologies (ICT), Randomized Clinical Trial

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Abstract

Objective: Colonoscopy is a handy tool in preventing and diagnosing colorectal cancer. Its optimal performance requires adequate preparation for good visualization of the mucosa. In our endoscopy unit, we use the Boston scale to evaluate the quality of bowel preparation. The present work intends to assess whether or not an additional intervention with an educational video on the Internet could improve the result of preparation using the Boston scale for colonoscopy to enhance the visualization and detection of adenomas. **Methods:** A double-masked, randomized clinical trial. One group of patients received printed instructions on colonoscopy preparation, and another group received the same preparation plus the form contained a link and instructions to access and view a colonoscopy video posted on YouTube. **Results:** A highly significant difference was observed between the means of the Boston preparation score for the group that watched the video versus the group that did not (8.16 vs. 6.75; $p < 0.0001$). A significant difference was also found in the Boston score by segments of the colon: right (2.6 vs. 1.9; $p < 0.001$), transverse (2.7 vs. 2.3; $p < 0.0001$), and left (2.8 vs. 2.5; $p < 0.0001$). Concerning the adenoma detection rate, it was higher in the group that watched the video (28%) than in the group that did not (21%); however, the difference was not significant ($p = 0.33$). **Conclusion:** Watching an educational video significantly improves the quality of colonoscopy preparation through the Boston scale and the detection of adenomas; however, this difference was not significant, possibly due to a lack of a larger sample.

Keywords

Colonoscopy, colonoscopy preparation methods, Boston scale, pedagogical video.

INTRODUCTION

Achieving an optimal colonoscopy necessitates adhering to quality criteria, among which proper preparation stands paramount. A variety of preparation methods incorporating different pharmacological products, dietary plans, and timings have been explored. In the realm of educational strategies, modalities such as videos, clips, or apps have emerged as cost-effective and user-friendly tools for disseminating health-related knowledge.

Conventionally, colonoscopy preparation instructions are printed and handed to patients during their medical consultations, with instances where these guidelines are delivered by nursing or secretarial staff. Although straightforward, this approach has been associated with a 10% to 30% incidence of inadequately prepared patients.

This study aims to assess whether supplementing printed colonoscopy preparation instructions with an educational video can enhance preparation quality as gauged by the Boston scale and, consequently, improve the detection of colon adenomas. Such research is pioneering within the Colombian context.

Colonoscopy stands as the cornerstone for colon cancer prevention and diagnosis[1]. Its efficacy, efficiency, and effectiveness pivot on thorough preparation, making the patient's comprehension of preparation instructions crucial. Conversely, inadequate preparation can lead to increased time consumption, the need for repeat colonoscopies, missed lesion detection, and heightened complication risks[2], thereby escalating healthcare costs and burdening the health system's economy[3-5]. Factors contributing to insufficient preparation, as identified in literature, include the patient's low socioeconomic status, limited education, chronic constipation, antidepressant use, male gender, afternoon colonoscopy appointments, and improper preparation consumption[6]. Often, such inadequacies are attributed to the patient's poor understanding of the preparation process and suboptimal guidance from healthcare personnel.

Pedagogical videos, a facet of audiovisual education, fall under the broader umbrella of e-health. Unlike traditional educational strategies such as illustrations and text, videos offer a unidirectional approach that potentially enhances understanding by combining visual imagery with narration. These can be disseminated via computers, smartphones, or hosted on widely accessible internet platforms like YouTube, offering patients easy access[7-9].

While the use of these devices as a tool for improving colonoscopy preparation is on the rise, the body of literature on their utility remains relatively sparse. Research has shown that educational videos can enhance the understanding of the colonoscopy preparation process, thereby improving its quality[10,11]. Furthermore, other studies have indicated a reduction in the necessity for repeat colonoscopies due to inadequate preparation, as well as a notable increase in patient satisfaction[12]. However, a more recent investigation focusing on an educational video about dietary restrictions did not observe any improvement in preparation quality when compared to a control group receiving standard education[13]. These findings suggest that educational or instructional videos are cost-effective, risk-free, repeatable, intuitive, and understandable for patients. Nonetheless, a conclusive verdict has yet to be reached. Challenges such as difficulties in accessing internet videos have been noted, and it has been proposed that younger patients may engage more frequently and easily with video content than older patients, who might find access and availability more challenging compared to printed materials. Another study employing the Boston scale across four groups demonstrated that participants receiving both written and visual instructions achieved significantly better outcomes than those who were provided with only one form of instruction[14].

In conclusion, while evidence supports the notion that educational videos can enhance the quality of colonoscopy preparation, further research is warranted to solidify this claim, allowing for the acquisition of more objective knowledge and the formulation of clearer recommendations.

To this end, a 9-minute educational video was crafted to elucidate the nature of colonoscopy, including its indications, utility, benefits, and risks, with a particular emphasis on the preparation process as delineated by clear instructions tailored to the timing of the procedure. This video was made available on the universal platform YouTube, accessible via the following link: https://www.youtube.com/watch?v=P-9-0WwRgqo.

MATERIALS AND METHODS

Participants were enlisted from two gastroenterology specialty clinics renowned for conducting outpatient consultations and scheduling patients for colonoscopies, which are carried out in the digestive endoscopy units of the clinics on an outpatient basis. The sample size and selection criteria were determined using EPIDAT 4.2, focusing on patients older than 18 years, with an indication for colonoscopy, who had not undergone the procedure in the past five years. Exclusion criteria included patients with prior surgeries affecting the colon or those contraindicated for conventional colonoscopy preparation.

The sample size was calculated to ensure a 95% confidence interval (CI) and a 90% power, resulting in a minimum required population of 22 patients per group.

Instrument Measures

The Boston score[15], a numerical scale ranging from 0 to 9, assesses the quality of intestinal preparation following the endoscopist's cleaning maneuvers. It is defined as follows:

- 0: The colon segment is unprepared, with its mucosa obscured by solid feces that cannot be cleansed.
- 1: Partial visibility of the mucosa in the colon segment is achieved, though other areas remain poorly visible due to the presence of residual fecal staining or opaque liquid.
- 2: Minimal residual staining, with small fecal fragments or opaque liquid present, yet the mucosa of the colon segment is predominantly visible.
- 3: The entire mucosa of the colon segment is clearly visible, free from any residual staining, fecal fragments, or opaque liquid[15].

Each region of the colon is assigned a segment score from 0 to 3, with these segment scores aggregating to a total score ranging from 0 to 9. Thus, a score of 9 represents an impeccably clean colon, while a score of 0 indicates a colon that is inadequately prepared[15].

Procedure

Randomization and Masking

The study took place from December 2018 to March 2019. Eligible patients, after meeting the inclusion criteria, were briefed on the research details. Upon agreement, they signed an informed consent form. Subsequently, they were directed to the clinic's administrative assistant to schedule their colonoscopy appointment. The assistant then provided a sealed envelope, which was marked with either an even or odd number following a pre-established randomization table, containing their assigned preparation instructions.

For the even-numbered group, the sealed envelope included printed instructions alongside the URLs for instructional videos, accompanied by detailed guidance on how to access these resources via computers or smartphones through Google or YouTube. Conversely, the control group received a sealed envelope containing only the printed instructions, remaining unaware of any video's existence.

Colon Preparation

The study employed a commercial *low-volume* preparation consisting of two commercial bottles of sodium sulfate, magnesium sulfate, and potassium sulfate; each containing 176 mL of the solution. All participants received identical quantities and printed instructions tailored to their scheduled procedure time. Following best practice recommendations, participants were advised to commence an exclusive clear liquid diet 24 hours prior to their procedure. Morning appointments required the consumption of the first bottle between 9 and 10 AM the day preceding the procedure, and the second bottle between 9 and 11 PM that evening. Following each bottle, patients were instructed to drink an additional two 250 mL glasses of water. Emphasis was placed on liquid fasting (as solid food intake was prohibited 24 hours before the exam) starting 6 hours before the examination, in line with the anesthesiology team's recommendations for sedation[16].

For afternoon appointments, a clear liquid diet was prescribed starting 24 hours prior, with the first bottle to be taken between 8 PM and 10 PM the night before, and the second bottle between 6 AM and 7 AM on the day of the examination. A 6-hour liquid fast was also mandated before the procedure.

Colonoscopy

On their scheduled date, patients arrived at the designated endoscopy unit with their received preparation and signed the informed consent for the colonoscopy. An anesthesiologist administered sedation to all patients. The colonoscopy findings and the Boston score for preparation were documented in the colonoscopy's final report.

Intervention

The implemented intervention was the viewing of an instructional video, conceptualized and produced by the study's principal researcher. The video outlined the essentials of colonoscopy, including its benefits, indications, risks, and detailed dietary and preparation instructions. Running for nine minutes, the video was made available on YouTube for easy access. Released several months prior to the study, it was part of initial pilot tests to assess viewing accessibility. Despite mentioning both high and low volume preparations, specific instructions were provided for the consumption of the study's chosen solution containing sodium sulfate, magnesium sulfate, and potassium sulfate.

The video can be accessed at the following URL: https://www.youtube.com/watch?v=P-9-0WwRgqo.

Outcomes

The primary aim of this study was to evaluate the quality of colonoscopy preparation using the Boston score. A secondary aim focused on the adenoma detection rate within the colon. The methodology encompassed several steps:

- The initial patient consultation took place at the principal author's gastroenterology clinic.
- Eligibility was determined by satisfying the inclusion criteria and excluding any patients based on the exclusion criteria identified through clinical history review.
- Patients were briefed on the study's objectives and procedures verbally.
- Upon agreement, participants signed an informed consent form.
- Essential data such as weight, age, sex, and the indication for the colonoscopy were recorded in an MS Excel database.
- Participants were then directed to the administrative office to receive their scheduled appointment and a sealed envelope containing their assigned preparation instructions. This envelope was allocated based on randomization to either receive written instructions complemented by video directions or written instructions alone.

- The colonoscopy was performed on the assigned date under sedation, managed by an anesthesiologist, followed by a report detailing any polyps found for further histopathological analysis.
- A follow-up consultation was conducted to ascertain if the participant had viewed the video, with the administrative office confirming the randomization details, envelope allocation, colonoscopy report, and histopathological findings.

Statistical Analysis

The statistical analysis and figures were performed using EPIDAT 4.2 software. A goodness-of-fit test, specifically the Shapiro-Francia test, was employed to assess distribution type and homoscedasticity, evaluating equality of variances through Levene's test. Further inferential analysis compared the mean Boston scores between two independent populations, utilizing the Student's t-test due to the presence of homoscedasticity and a normal distribution pattern.

An additional inferential analysis compared independent proportions, focusing on the presence of adenomatous polyps between the groups.

RESULTS

The study included 142 patients, divided into 73 in the video group and 69 in the control group, comprising 92 females (64.8%) and 50 males (35.2%). Age ranged from a minimum of 30 years to a maximum of 84 years.

Overall, patients achieved a mean Boston score of 7.5 (standard deviation [SD]: 1.32), with a median score of 7.5. The video group exhibited an average Boston score of 8.16 (SD: 1.6), while the non-video group had an average of -6.75 (SD: -1.2). When analyzed using EPIDAT 4.2 software, an inference-based comparison with the means of two independent populations yielded a highly significant difference of (p -0.0001; t: 4.6) (**Figure 1**).

The average comparison computation was conducted for Boston scores within each segment separately, resulting in the following outcomes: right colon (2.6 versus 1.9; $p < 0.001$), transverse colon (2.7 versus 2.3; $p < 0.0001$), and left colon (2.8 versus 2.5; $p < 0.0001$). A notably significant difference was observed across each segment individually.

Regarding polyp detection analysis based on video visualization, the findings were as follows: the adenomatous polyp detection rate for the overall group stood at 26% (36/106) (**Figure 2**).

Within the video-watching cohort, adenomatous polyps were identified in 28% (21/73), while in the non-video-watching group, they were detected in 21% (15/69) of cases (**Figure 3**). An inference analysis of population proportions, conducted using EPIDAT 4.2, revealed no statistically significant difference, with a p-value of 0.33.

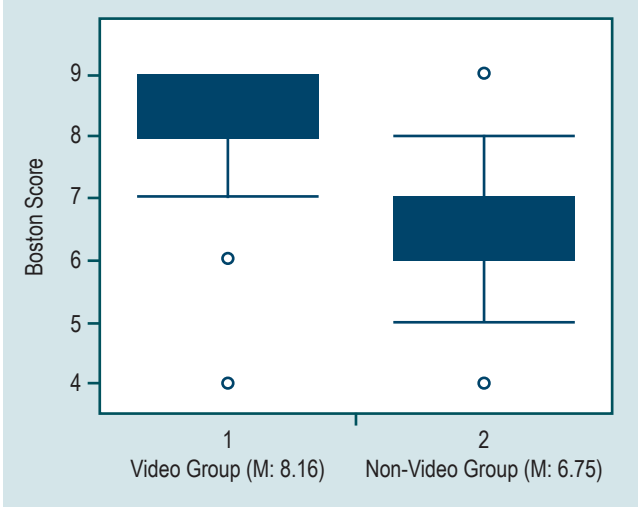


Figure 1. Superior Quality of Colonoscopy Preparation in the Video Group Compared to the Non-Video Group ($p < 0.00001$). Author's own research.

DISCUSSION

The recent years have witnessed a remarkable surge in the advancement of information and communication technologies, a trend that has seen broad adoption across general education, academia, and learning. In medicine, these technological tools are increasingly employed to achieve similar educational outcomes. The critical role of adequate colonoscopy preparation for the early detection of lesions is well established; thus, the impetus for this study was to ascertain whether supplementing printed instructions with an educational video could enhance the quality of colonoscopy preparation.

This study identified a highly significant increase in the mean Boston score for the group of patients who had access to the video. These results are notable as they underscore the efficacy of electronic resources in improving comprehension of colonoscopy preparation, likely owing to several factors:

- Enhanced understanding of the importance and benefits of colonoscopy provided by the video content;
- Increased time dedicated to patient consultation, which is often brief, allowing for the clarification of any uncertainties regarding the colonoscopy and its preparation process;
- The ability to replay the video, which may bolster information retention;
- The incorporation of auditory learning to complement visual information.

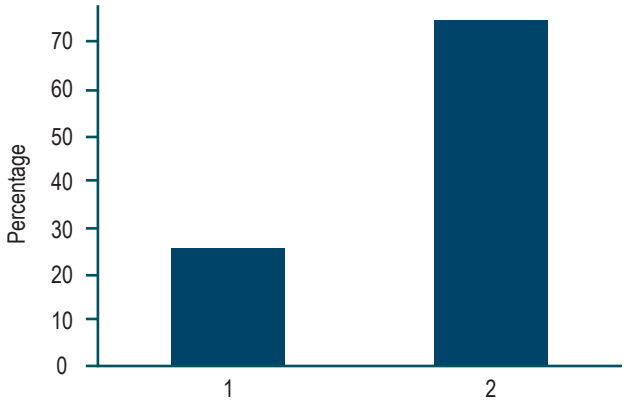


Figure 2. Adenoma Detection Tate, Totaling 26%. Author's own research.

The study's secondary aim examined potential disparities in adenoma detection rates; however, no differences were observed. This outcome may indicate an actual absence of variance or it might suggest the need for a larger sample size for more definitive results. One possible limitation of the study is that the patient population was predominantly from the upper-middle to high socioeconomic stratum, likely with better access to internet technologies, which could imply that the findings may not be universally applicable. Nonetheless, literature suggests that technological health tools can improve preparation quality across all socioeconomic levels.

A review of the scientific literature identified several existing articles on the subject, prompting a comparison of this study with prior findings across four distinct aspects. The first pertains to the use of objective scales for assessing intestinal preparation quality, crucial for accurate evaluation of the colonic mucosa and for ensuring neoplastic lesions or their precursors are not overlooked. Moreover, optimal preparation minimizes procedural time and reduces the likelihood of necessitating a repeat colonoscopy due to inadequate initial preparation. Various professional societies, including the American Society for Gastrointestinal Endoscopy (ASGE), endorse the inclusion of preparation quality in the procedural report as a quality metric. Previously, subjective descriptors such as "good", "fair", and "poor" were used, which did not distinguish between different colonic segments. Consequently, this study utilized the Boston preparation scale, which methodically assesses the three colon segments (ascending, transverse, and descending) as elucidated earlier[15].

Concerning the second aspect, regarding the choice of medication for preparation, literature reveals various strategies and pharmacological agents utilized. While the current study does not aim to compare their effectiveness, it is essential to highlight prevailing recommendations based on diverse high-quality studies. These recommendations advocate for the adoption of split-dose regimens, regardless of the specific medication employed, administered as closely as feasible to the time of colonoscopy to facilitate safe sedation[17,18].

Regarding the third aspect, concerning the use of educational, technological tools, several have been employed and evaluated. These educational strategies aim to enhance the quality of colon preparation and fall into three categories[9,11,12,14,19-22]:

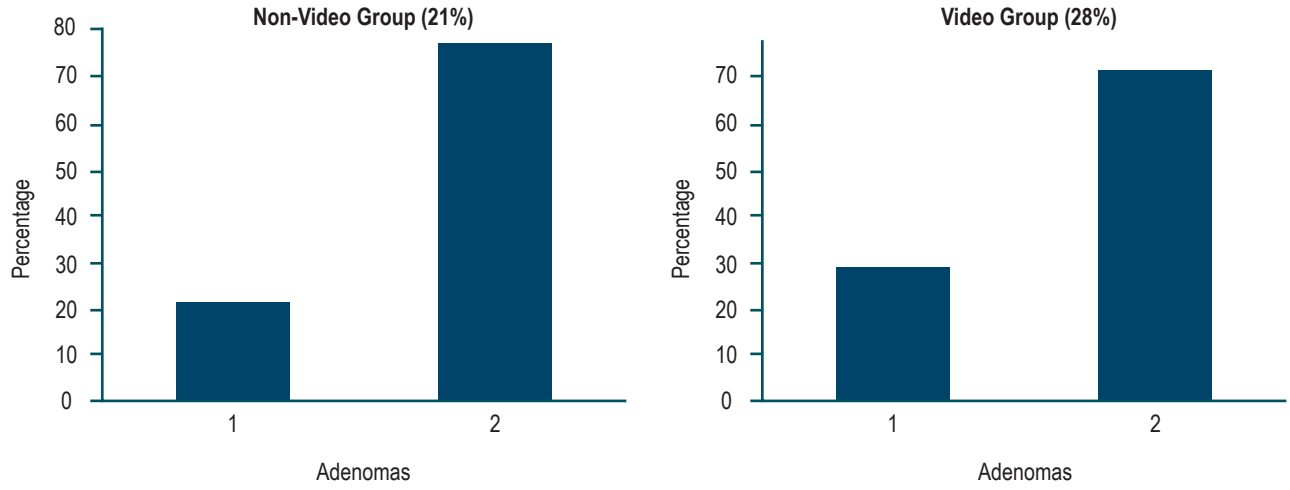


Figure 3. Percentage Comparison for Adenoma Detection. Author's own research.

- The first includes instructive leaflets, visual aids featuring animations, and educational videos that simplify the preparation process[23].
- The second involves sending reminder text messages to patients' phones to prompt preparation steps.
- The third incorporates smartphone applications that aim to present preparation instructions in an easily digestible format.

For our investigation, we selected the first approach, deploying an educational video crafted by the lead researcher. This video addressed the most frequent inquiries patients present during medical consultations: the nature of a colonoscopy, its significance, the associated benefits, potential risks, and recommendations for optimal preparation.

The four aspect we must also examine is the parametric measures or designs employed across various studies in the literature, comparing our methodology with others regarding the aforementioned aspects.

A 2016 study featured in BMC Gastroenterol[20] posed the question of whether an educational tool could enhance patient preparation for colonoscopy. Conducting a prospective randomized trial, it provided patients with periodic preparation instructions at a pre-colonoscopy visit. One group received additional educational intervention through a video the day before their procedure, while a control group did not. The video group demonstrated superior preparation. This study's conclusion resonates with our own findings, asserting that educational videos are instrumental in facilitating proper colonoscopy preparation. However, it also notes differences such as using polyethylene glycol for preparation and utilizing the Ottawa score for outcome measurement.

Another expansive study published in the American Journal of Medicine[12] in 2016 made an educational video publicly accessible online from 2010 to 2014. The study ensured patient engagement with the video through a unique code linked to their medical records. It included 2530 participants, with 1251 viewing the video and 1279 who did not. A multivariate analysis indicated a higher rate of adequate bowel preparation in the video group: 92% (84-96) versus 87% (76-93) ($p < 0.01$). The likelihood of requiring a repeat colonoscopy within three years was also less for video viewers: 3.3% compared to 6.6% who did not watch the video ($p < 0.001$). Though a cross-sectional descriptive study with a significant sample size, it intimates that providing educational videos for colonoscopy preparation not only augments the quality of preparation but might also decrease the frequency of repeat procedures over time.

An additional study from August 2018 in Medical Science Monitor[24] detailed a prospective, randomized, controlled trial among outpatient colonoscopy patients. Randomly allocated into two groups (1:1 proportionally), one engaged with a preparatory video, while the control group did not. The research aimed to evaluate intestinal preparation quality using the Ottawa score and identify risk factors for inadequate preparation. Results indicated that the video group achieved better bowel preparation for colonoscopy (Ottawa < 6) than the control group ($p < 0.001$), with enhanced cleanliness in each colon segment. Identified risk factors for poor preparation included male gender, diabetes *mellitus*, and non-viewing of educational videos. Mirroring our study, this research underscores the importance of incorporating a technological tool such as an audiovisual video for preparation, differing from our approach in the application of the Ottawa preparation score.

Another study, published in Gastrointestinal Endoscopy in 2018[25], conducted a prospective, blinded, randomized controlled trial comparing various preparations, including polyethylene glycol with ascorbic acid and low-volume options such as sodium picosulfate with magnesium citrate. Participants were divided into two cohorts: one undergoing a smartphone reeducation strategy, comprising 139 individuals, and a control group with 144 individuals. The primary endpoint was assessed using the Boston Bowel Preparation Score (BBPS). Out of 283 subjects analyzed according to the protocol, the mean BBPS was higher in the smartphone reeducation group at 7.53 compared to 6.29, indicating that an alternative educational strategy to that used in our research can also be more user-friendly with the aid of a smartphone.

These investigations endorse the notion that leveraging technological education in colonoscopy preparation not only improves the quality of the preparation but also the colonoscopy's efficiency, which is in line with our study's outcomes. Nonetheless, there is a need for additional research to expand upon these findings, such as enlarging the sample size and undertaking multicenter studies that consider various population strata.

CONCLUSION

In summary, incorporating an educational video into conventional printed instructions markedly enhances the quality of colonoscopy preparation as measured by the Boston score, warranting its adoption as a routine technological strategy. Although an improvement in adenoma detection in the colon was observed with the addition of the video, this increase was not statistically significant, potentially due to an insufficient sample size. Thus, it is recommended that future research include larger, multicenter studies.

Conflict of Interest

Article guarantor.

Funding Sources

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Potential Competing Interests

The authors have stated that there are no conflicts of interest or competing interests.

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Review article

Researching and Publishing. 1. How to Formulate a Research Question

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Abstract

Introduction: The research question is the genesis of knowledge; it represents the need to answer something unknown or at least suspected about reality. This article aims to show the fundamental elements of a research question for its adequate formulation. **Methods:** A literature review was conducted in search of articles that presented the most valuable and practical steps for formulating a research question. Emphasis was placed on essential words such as *feasible*, *interesting*, *novel*, *ethical*, and *relevant*, summarized in the acronym FINER. **Results:** To adequately structure the question, the following aspects were included: population, patients or problem; intervention or indicator being studied; comparison group; outcome of interest; and time frame of the study, summarized in the acronym PICOT. **Conclusions:** Research questions can be phrased to address essential elements of the study, including the population to be studied, the expected outcomes, and the time it will take to achieve them.

Keywords

Question, research, knowledge.

INTRODUCTION

The progression of humanity's discovery history, its significant advancements, and the comprehension of the universe have predominantly been driven by our intrinsic curiosity about the world. This curiosity has led to formulating questions and systematically gathering information to address these inquiries. This approach has led to monumental discoveries, such as the control of fire and the answers Newton or Copernicus provided to the uncertainties they observed in the world around them. Although questioning is a fundamental aspect of the research process, the specifics of conducting this effectively are not always common knowledge. Therefore, this article aims to encapsulate all necessary information regarding the formulation of a research question for a project.

RESEARCH QUESTION

An illustrative and straightforward example of a research question might be the kind contemplated by children in their early school years: Why do tree leaves fall? Or, why does the sun set only to rise again in the morning? Reflecting on such queries reveals numerous research questions that children, through their curiosity, begin to answer.

The process begins when we pose questions about reality, seek relevant information to answer these questions, reassess reality in light of the information gathered, and formulate new questions. This cycle succinctly encapsulates the scientific method.

Crafting a well-posed research question emerges from the uncertainties encountered in daily clinical practice, where a researcher or physician seeks to resolve these through

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observation and measurement in their patients. Another wellspring of research questions can be the observations made previously by the researcher themselves or the findings published in other studies. Thus, the medical literature becomes a rich source of questions, and conferences provide a venue for the introduction of new technologies or advancements in a particular field. In the majority of studies, the question is framed to accentuate various study aspects, including the problem it seeks to address, the target population, and the variables under investigation.

Research questions typically become more defined over the course of the study. Consequently, these questions are dynamic, allowing researchers the flexibility to modify or refine their research question as they review related literature and develop a conceptual framework for their study. Maintaining a creative and observant approach yields productive descriptive studies, which become excellent sources of research questions. Moreover, imagination, creativity, and the perseverance to revisit an unresolved question multiple times are crucial[1].

The primary purpose of formulating a research question is to narrow down a broad area of interest to a specific field of study. Research questions, along with hypotheses, establish a framework that guides the investigative process. These questions also define the study's scope, setting its boundaries and ensuring coherence. Importantly, the research question *influences* the remainder of the study significantly, affecting aspects such as the design, sample size, data collection methods, and the analytical approach.

In this section, we outline the optimal approach for constructing a robust research question, evaluated within the context of achieving an exemplary study design that is feasible, interesting, novel, ethical, and relevant. These criteria are encapsulated in the FINER acronym.

1. Feasible: A research question is feasible if:
    - An adequate number of patients can be accessed; otherwise, the question cannot be satisfactorily answered.
    - Adequate technical expertise is available to gather information, conduct measurements, and assess outcomes.
    - The research can be conducted within reasonable time and financial constraints.
    - The research is practical to carry out, has a focused scope, and does not attempt to measure everything simultaneously; in simple terms, tackle one question at a time.
2. Interesting: The question should captivate attention and spark curiosity upon being posed.
3. Novel: The question should aim to confirm, refute, or expand upon previous findings, necessitating a comprehensive review of existing literature to avoid duplicating efforts. However, exploring whether the same results can be obtained in a different population might be justified.
4. Ethical: The research must adhere to the ethical standards of the institution, aligning with guidelines such as those outlined in the Declaration of Helsinki.
5. Relevant: The question should contribute to scientific knowledge, influence public health policies, enhance clinical practice, and lay the groundwork for future research[2].

For a study design to be considered well-constructed, the research question must be well-organized and encompass all necessary aspects. This involves clearly defining the population from which the question arises, the intervention to be applied, the comparison method, and the desired outcomes. This leads to the formulation of the PICO acronym: Population, Intervention, Comparison, and Outcomes.

Employing the PICOT framework enables the construction of research questions that address critical study elements, including the study population, expected outcomes, and the timeframe for achieving these outcomes. The components of this framework are:

- P: Population, patients, or problem being addressed
- I: Intervention or indicator under investigation
- C: Comparison group against which the intervention is evaluated
- O: Outcome of interest
- T: Timeframe for the study

This framework is widely used in clinical research and evidence-based studies, facilitating a systematic approach to study design.

Crafting a cogent descriptive or analytical research question is foundational to determining the study's design. The considerations highlighted by the FINER and PICO acronyms are instrumental in this process but are further refined by specific objectives or goals. For instance, if observations systematically indicate that patients aged 30 to 60 years who had COVID-19 in 2020 are experiencing gastric emptying disorders, the application of the stated principles could be as follows:

- Population (P): Male or female patients with COVID-19 who required hospitalization, aged between 30 and 60 years during 2020.
- Intervention (I): COVID-19 infection.

- Comparison (C): Hospitalized patients during the same period with a diagnosis of gastric emptying without COVID-19 infection.
- Outcome (O): Gastric emptying disorder[3].

This approach not only determines the study's design, sample size, and statistical analysis method but also bridges the gap from the enchanting realm of questioning reality to the systematic observation and nurturing of creativity and curiosity. This fosters the development of original research based on the observation of real-world events and entities.

CONCLUSIONS

We propose several essential elements for formulating a well-structured research question. Such a question should be designed with consideration for feasibility, interest, novelty, ethics, and relevance, as summarized by the FINER acronym. Moreover, proper structuring of the question involves incorporating dimensions such as the population, patients or problem, intervention or indicator being studied, comparison group, outcome of interest, and study timeframe, collectively abbreviated as PICOT.

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Review article

Current Approach to Training and Assessing New Generations of Endoscopists

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Abstract

Esophagogastroduodenoscopy (EGD) is a diagnostic and therapeutic study for various upper gastrointestinal tract diseases. It is a fundamental part of the education and training fellows receive in gastroenterology programs, focusing on developing skills to perform it safely, effectively, and efficiently and master the technique. Historically, value has been attached to the number of procedures required to acquire skills; there is a discrepancy in the recommendations by scientific societies regarding the "ideal" number to meet the minimum requirements and learn the necessary skills. However, each student has different innate and developed abilities that make this process asymmetric.

Adopting a combined training approach (observation, clinical practice, and simulation) is the best method to learn diagnostic EGD. We are facing a generation with forms of learning different from those traditionally implemented, which implies an ongoing process of training and updating for endoscopists dedicated to teaching.

Keywords

Student Health Services, Esophagogastroduodenoscopy, Teaching, Learning, Clinical Competence.

INTRODUCTION

Esophagogastroduodenoscopy (EGD) serves as a pivotal diagnostic and therapeutic tool for various upper gastrointestinal tract disorders. It plays an essential role in the educational foundation and training of gastroenterology fellows, emphasizing the cultivation of skills necessary for its safe, effective, and efficient execution with thorough technical proficiency[1,2].

This involves nurturing both cognitive and psychomotor abilities, alongside temporal-spatial correlation skills, which are applied to three-dimensional spaces for examination or intervention[3]. Currently, a standardized methodology for EGD training is absent, leading to significant variability across adopted educational frameworks[1,2,4].

The conventional training model is built around two core principles: the first advocates for observing procedures performed by experts, engaging in supervised practice, and subsequently gaining experience, encapsulated by the "see, do, and teach" mantra[2,4]. Although this approach has merits, it has also introduced challenges in learning customization and the depth of knowledge acquired[3]. The second principle focuses on the volume of EGD procedures as a metric for procedural proficiency, yet this is subject to debate among scientific societies over the optimal procedure count, highlighting that such metrics serve merely

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as benchmarks rather than guarantees of comprehensive learning[1,2,4]. This method of instruction should not be perceived as deficient; rather, both principles are seen as mutually enriching.

It is advocated that the EGD training regimen should be meticulously structured and evaluated at each stage to ensure superior quality and safety, urging a collective effort towards the establishment of a standardized protocol[1]. In response, there is a movement towards integrating alternative educational strategies, such as skill-based pedagogy. This approach leverages didactic and cognitive resources combined with practical instruction[3], aiming to foster competencies, namely a foundational level of knowledge, skill, and experience derived from training, alongside the essential ability to perform interventions with confidence and effectiveness[3]. This methodology promotes individualized learning trajectories, acknowledging the variability in learning styles and speeds among students[5].

A proposed strategy to enhance training frameworks and align them with the expectations of new generations of gastroenterologists includes the adoption of innovative approaches inspired by educational theory, incorporating online learning, digital technologies, and social networking tools[2,6]. This leads to the recommendation of conducting a review that delves into the core aspects of learning, offering an integrated approach to maximize the efficacy of the EGD training process.

TRADITIONAL APPROACHES TO ESOPHAGOGASTRODUODENOSCOPY EDUCATION

The educational methods for instructing fellows in the performance of EGD exhibit a considerable range of variability[4]. Historically, endoscopy education has taken place within the clinical setting, primarily relying on a mimicry-based learning system. This approach posits that hands-on patient experience is paramount, as it allows for direct engagement with procedures in the "real world"[1,2]. However, this traditional model is inherently flawed due to its lack of standardization, potentially leading to poor decision-making and the formation of inappropriate practices[1]. Additional limitations include extended duration of procedures, dependency on a patient population willing to undergo procedures by students, and an increased risk to patient safety[1]. These concerns underscore the significance of incorporating observation phases into the EGD training, preceding any hands-on patient experiences.

Within this traditional framework, the transfer of knowledge occurs as educators relay their expertise. Yet, it is critical to acknowledge that not all endoscopists are equipped with teaching skills, and extensive experience does not automatically equate to effective instructional capabilities[2]. To address these gaps, a variety of methodologies have been proposed to enhance the learning process. Among these is an active learning approach, emphasizing competency-based education—a model that shifts focus from the educator to the learner, aligning with adult learning principles[7]. This strategy advocates for a move from mimicry-based to competency-focused learning, tailored to the individual's intrinsic attributes, prior knowledge and experience, exposure to varying pathologies, and access to resources[3].

TRAINING OBJECTIVES IN ENDOSCOPIC PROCEDURES

The core objectives of endoscopic procedure training encompass both the acquisition of theoretical knowledge and the honing of technical skills. Despite being a generally safe practice, the inherent risk of complications necessitates the ability to perform procedures with high quality and minimal patient risk[1]. These objectives constitute fundamental pillars for training programs in digestive endoscopy, as the proficient and secure execution of EGD, coupled with an adept mastery of the technique, stands as a central goal for fellows in gastroenterology during their training trajectory[2].

Historically, the objective assessment of skill acquisition in endoscopic procedural training has been delineated by a prescribed minimum quantity of procedures, theoretically culminating in technical mastery[1,2,4]. However, inherent and cultivated skill disparities amongst students engender an asymmetrical progression in this process[3]. The attainment of requisite competencies upon the culmination of the training process is defined by the American Society for Gastrointestinal Endoscopy (ASGE) as the "minimal level of skills, knowledge, or expertise derived from training and experience that is necessary to execute a procedure safely and competently"[4].

While these mandated minimal standards in procedural volume are pertinent, they emanate from expert consensus or the deliberations of prominent scientific societies and should merely serve as guidelines, given that they do not ensure competence acquisition, which can vary contingent upon the assessed skill (both technical and cognitive)[2,8]. Thus, this parameter ought to be construed as a surrogate for competency attainment, coalescing with milestone evaluations, endoscopic findings interpretation, and their integration into holistic patient care[2,8].

Traditionally, the requisites for conducting endoscopic procedures have been dichotomized into two fundamental skill domains: technical and cognitive, crucial for furnishing quality care. Nonetheless, these are deemed inadequate, prompting the emergence of integrative skills, deemed indispensable and recognized for their role in mitigating

the risk of adverse events, as deficiencies in behavior and communication may yield a greater propensity for errors when juxtaposed against technical knowledge deficits[9].

A lucid comprehension of the minimal competencies requisite for executing high-quality endoscopic procedures is imperative for delineating an evaluative framework. It necessitates conceptualization within the purview of three cardinal competency domains: technical, cognitive, and integrative, with the primary domains expounded upon in **Figure 1**[9].

THE ROLE OF SIMULATION IN EGD EDUCATIONAL AND LEARNING PROCESSES

In the realm of medical education, simulation-based learning caters specifically to adult education, utilizing audiovisual aids, such as multimedia and clinical case resolution, along with technological tools[4].

The introduction of simulation models before patient engagement, coupled with the systematic approach to EGD instruction and learning in clinical phases, serves a supplementary function. This approach contributes to mitigating the risks or unwarranted discomfort that patients might otherwise endure[10]; it also allows fellows to concentrate on mastering technical skills, expedite the learning trajectory, and assimilate various requisite skills for procedural execution, encompassing technical, cognitive, methodological, and communicative abilities[2]. Furthermore, simulation aids in the assessment of integrative competencies like communication and teamwork[9], and it provides a structured platform for the diversification of clinical scenarios[11].

The advantages of simulation-based training for EGD are most pronounced when employed early in the training sequence. However, these benefits diminish after the completion of about 50 EGD procedures[12]. An array of simulators exists, including mechanical models featuring obstacles and tasks of differing complexities, live animals, *ex vivo* organs from animal cadavers, and virtual simulators[13]. These simulators have been effective in enhancing skill acquisition for colonoscopies and the execution of hemostatic procedures, though the consistency of these outcomes across various studies remains debatable. Furthermore, the definitive impact on clinical practice, patient safety, and the health care cost-benefit analysis is yet to be fully established[1]. Notwithstanding this limitation, initiating any potentially risky learning process with simulation is considered prudent[1].

The ASGE, in 2012, underscored the importance of embracing simulation, stressing two pivotal considerations: first, simulation has the potential to reduce by 25% the number of cases that trainee gastroenterologists must undertake to achieve essential EGD competencies; second, performance metrics derived from simulation activities can exhibit a correlation with actual minimum competency standards (kappa of 0.7 or higher)[14]. Despite the clear benefits, the efficacy of simulation-based education is not universally acknowledged. Its utility diminishes, for instance, when conducted in the absence of feedback from

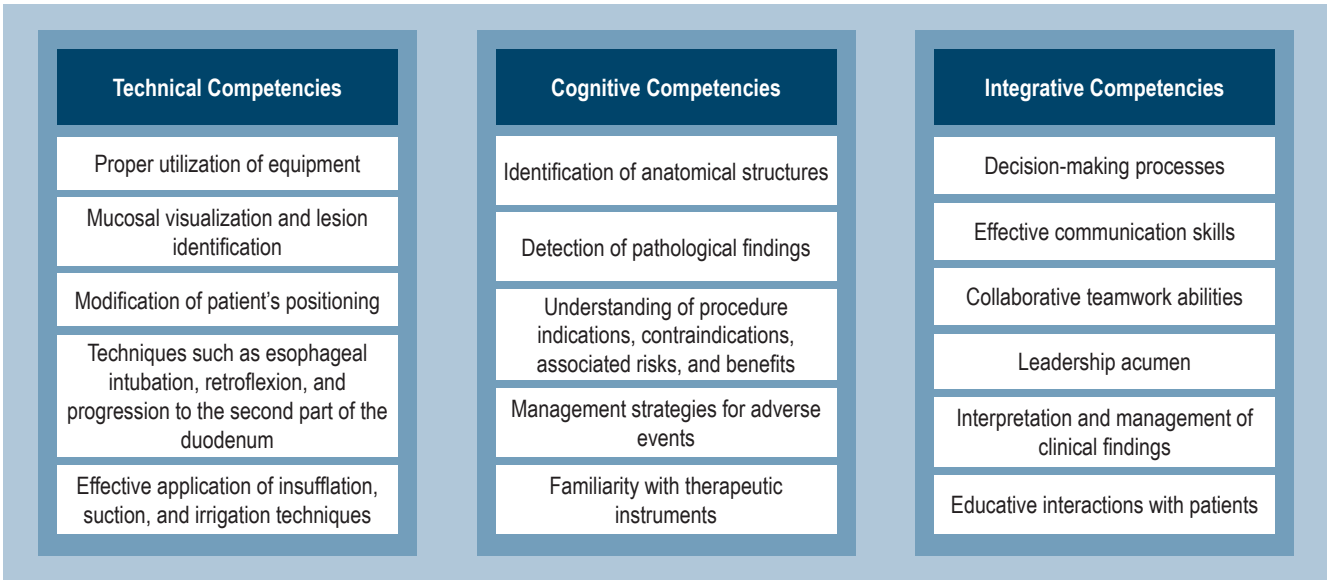


Figure 1. Core Competency Domains. Adapted from: Walsh CM. Best Pract Res Clin Gastroenterol. 2016;30(3):357-374[9].

instructors, signifying that its integration into training programs must be deliberate, reflective[10], and evidence-based to optimize the learning benefits while justifying the related expenses[10].

As detailed in the review by Khan and colleagues[10], simulation-based education centers on four principal practices, delineated in **Figure 2**. In conclusion, incorporating a blended training model that includes observation, clinical practice, and simulation represents the optimal strategy for learning the intricacies of performing an EGD[2].

RECOMMENDATIONS FROM INTERNATIONAL SCIENTIFIC SOCIETIES

Building upon the aforementioned premise concerning the significance of both the quantity of endoscopic procedures conducted and the acquisition of competencies, there exists variability in the recommendations provided by various scientific societies in gastroenterology and digestive endoscopy regarding the "optimal" quantity of procedures necessary to fulfill minimum requirements and attain requisite skills[1,2]. **Table 1** delineates the extant guidelines.

Table 1. Required Number of EGD Procedures for Skills Acquisition as Recommended by Various Scientific Societies

Organization	Number of EGDs
American Society for Gastrointestinal Endoscopy	130
British Society of Gastroenterology	300
European Union of Medical Specialists	300
Korean Society of Gastrointestinal Endoscopy	1000
Gastroenterological Society of Australia	200

Adapted from: Kim JS, et al. Clin Endosc. 2017;50(4):318-321[2].

HOW TO EVALUATE PERFORMANCE?

The role of evaluation transcends merely cataloging what has been learned; it should also act as a catalyst for transformation, serving as a critical source of feedback for educators, programs, and students alike. This evaluative process aims to gauge the effectiveness of educational initiatives,

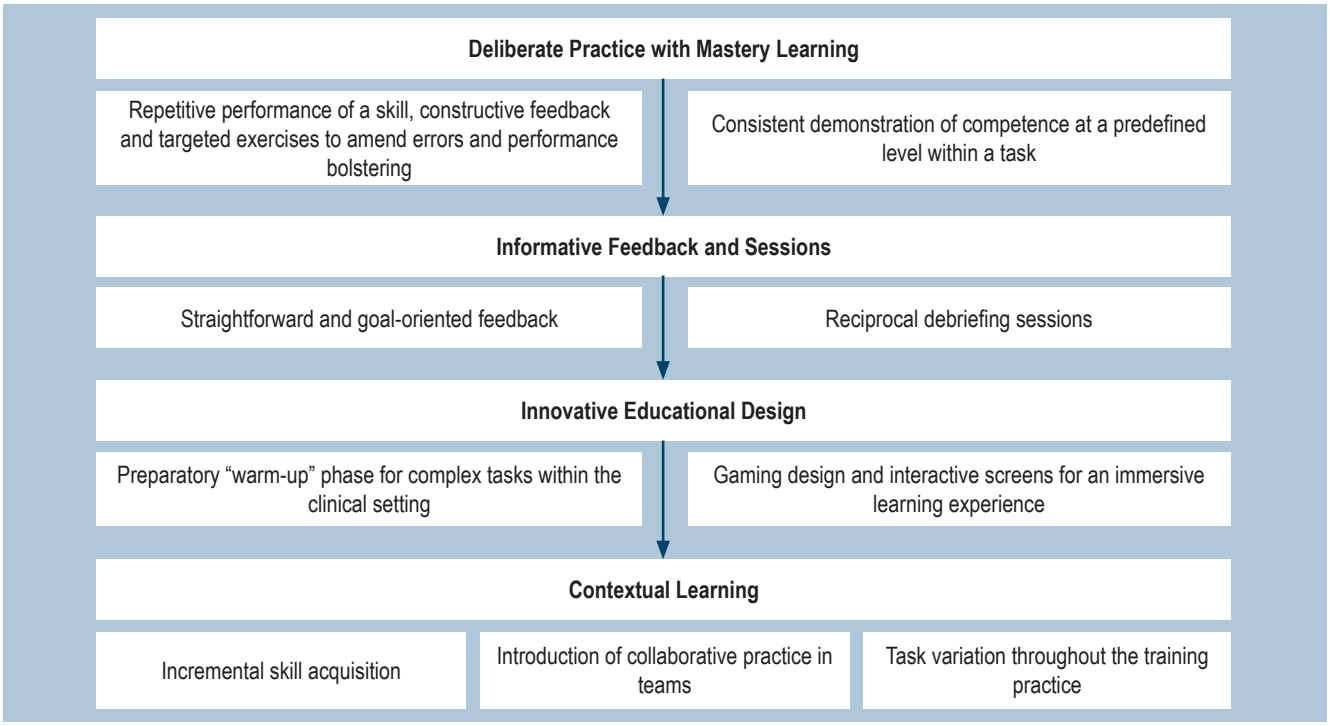


Figure 2. Simulation-Based Education. Adapted from: Khan R, et al. World J Gastrointest Endosc. 2019;11(3):209-218[10].

pinpointing strengths and identifying weaknesses among all involved parties, thus paving the way for dynamic, progressive, and systematic enhancements that align with established learning objectives[3].

Furthermore, evaluation constitutes a key component of the instructional process across various disciplines. To execute this, a diversity of models or strategic approaches may be employed. When these are applied in a complementary manner to an individual student, they afford a more nuanced appreciation of their skillset and highlight areas ripe for improvement[15]. Integral to this assortment is Miller's model, which delineates a structure for appraising competency-based education, presuming predictive capability for performance across four dimensions: "knows", "knows how", "shows how," and "does"[15]. However, while offering a comprehensive framework for evaluation, it does not account for the interplay between performance and competence, prompting the introduction of the Cambridge model, which contemplates the impacts of systemic and individual influences[15].

FUTURE PERSPECTIVES

- The competency-based approach stands out as a valuable tool for assessing milestones, along with technical and cognitive proficiencies.
- Incorporation of simulation-based instruction is recommended within the training curriculum for fellows specializing in gastroenterology and digestive endoscopy.

CONCLUSIONS

Competence assessment must be an integral element of the training regime for gastroenterology fellows, not limited to considering the quantitative metrics of procedures performed. While these figures hold significance, they should not be the sole determinant of competence.

The pedagogy of EGD should be inherently motivating rather than punitive for fellows, offering educators a dynamic platform to disseminate their expertise in an engaging and interactive fashion.

Acknowledging that each student assimilates skills (technical, cognitive, and integrative) at their own pace, personalized guidance and constructive feedback become indispensable.

We stand before a generation characterized by learning styles distinct from traditional norms, necessitating continual professional development and instructional renewal for endoscopists who teach. Embracing a multifaceted training strategy that blends observation, clinical practice, and simulation emerges as the optimal pathway for mastering both diagnostic and therapeutic EGD, potentially hastening the progression of learning trajectories.

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Case report

Lower Gastrointestinal Bleeding Due to Rectal Dieulafoy's Lesion: A Case Report

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Abstract

Dieulafoy's lesion is a 1–3 mm vascular lesion in the submucosa and represents 1–2% of total GI bleeding; 80% are located in the stomach and 15% in the duodenum, while its finding in the rest of the GI tract is <5%. This work presents the case of a 79-year-old male patient who went into hypovolemic shock due to GI bleeding secondary to a rectal Dieulafoy's lesion with endoscopic and subsequent surgical management.

Keywords

Dieulafoy's lesion, hemoclip, lower gastrointestinal bleeding.

INTRODUCTION

First identified in 1989 by Paul Dieulafoy within a cohort of patients experiencing gastrointestinal bleeding in the absence of ulcerations, lower gastrointestinal bleeding caused by rectal Dieulafoy's lesion is characterized as a winding or aberrant artery of small diameter located in the submucosa[(1)]. This condition is an infrequent cause of gastrointestinal bleeding, predominantly occurring in the lesser curvature owing to the dense vascular supply and significant diameter of the arteries in that region[(2)]. Its occurrence in the lower segments of the gastrointestinal tract is rare. Diagnosis necessitates the fulfillment of the following criteria:

1. Active arterial micropulsatile flow or jetting from a mucosal defect smaller than three millimeter or through intact mucosa;
2. The observation of a blood vessel, with or without recent bleeding signs, protruding through a minor mucosal defect or intact mucosa;
3. The presence of a freshly adherent clot over a minimal mucosal defect or on mucosa that appears normal[(3)].

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This condition is associated with significant morbidity and mortality due to blood loss, ranging from 8% to 10%[4], making timely diagnosis and intervention crucial. Given its rarity, the risk factors and therapeutic approaches for this disease are not well-defined. Nevertheless, several descriptive studies[5,6] have outlined potential risk factors (**Table 1**). This paper aims to report a patient case featuring an uncommon presentation of Dieulafoy's lesion, notably due to its location in the lower gastrointestinal tract.

Table 1. Risk Factors Associated with Dieulafoy's Lesion

Male
Prior NSAID use
Chronic kidney disease
Major burns
Median age at presentation: 52 years
Type 2 diabetes
Systemic arterial hypertension
Chronic alcohol consumption

NSAID: Non-Steroidal Anti-Inflammatory Drug. Author's own research.

CASE PRESENTATION

The subject of this case is a 79-year-old male, a diabetic and hypertensive individual with a history of renal cancer treated via nephrectomy, who presented with a week-long episode of diarrhea followed by bright red transrectal bleeding 48 hours before admission. Upon arrival at the emergency department, laboratory findings revealed severe normocytic normochromic anemia with a hemoglobin level of 6.1 g/dL, prompting the transfusion of four units of red blood cells and his subsequent admission to internal medicine for a priority colonoscopy. This decision was informed by signs of hypovolemic shock secondary to 2.5 liters of bright red stool, necessitating an urgent bowel preparation with polyethylene glycol administered over 3 hours at a total volume of 3 liters, achieving a bowel preparation described as Boston 7. The colonoscopy withdrawal time was recorded at 17 minutes.

Endoscopic examination revealed blood remnants primarily in the left colon and non-significant findings of descending diverticular disease, not accounting for the substantial decrease in hemoglobin. Rectal retroflexion 1 cm from the dentate line exposed a pulsatile vessel of 2 mm diameter in otherwise normal mucosa, with minimal adjacent fibrin and an adherent clot at its tip (**Figure 1**).

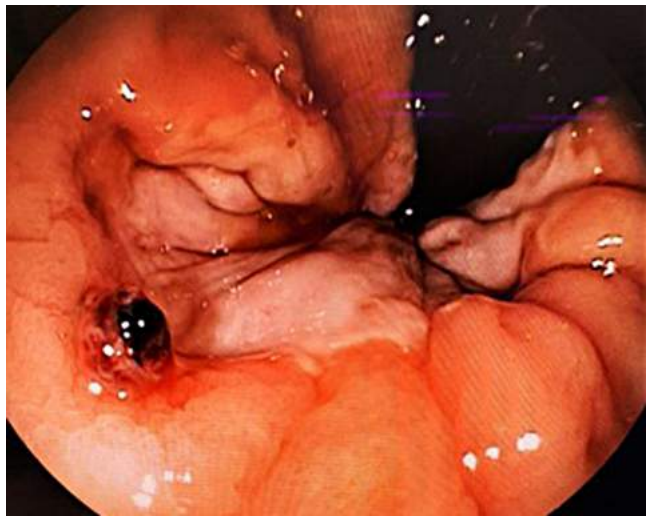


Figure 1. Pulsatile Bleeding Vessel Observed at the Anal Margin. Source: Author's File.

An endoscopic intervention employing a hemoclip was selected; however, the lesion's location prevented achieving an adequate angle for perpendicular mucosal placement, leading to the clip being applied with pressure at its base. The lesion's diameter, suboptimal hemoclip positioning, and proximity to the anal canal necessitated a consultation with the coloproctology service for assessing definitive treatment. A spontaneous active bleeding event occurred 72 hours later, warranting surgical intervention. The procedure entailed a rectoscopy followed by the cross transfixation suture ligation of the vessel and two Lembert stitches over the previous area, aimed at minimizing friction against the aberrant vessel to lower future bleeding risks.

CONCLUSION

Surgical intervention for Dieulafoy's lesion is typically reserved for scenarios where endoscopic methods, such as adrenaline injections, hemoclips, argon plasma coagulation[7-9], embolization treatment failures, or instances of massive hemorrhage with hypovolemic shock, prove ineffective. Options include wide wedge resection, complete segmental resection, or the suture ligature of the lesion with transfixation of stitches[10,11]. In this particular case, the lesion's suboptimal position and anatomical location limited the effectiveness of endoscopic treatment. While some literature suggests angiography as an alternative when endoscopic approaches fail or are not viable[12], surgical management was deemed definitive in this instance, leading to a successful outcome without subsequent rebleeding. Despite its rarity, this lesion's presence in such a unique location underscores the importance of considering it among the differential diagnoses for patients presenting with obscure gastrointestinal bleeding.

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Case report

Dupilumab in Eosinophilic Esophagitis Refractory to Conventional Management in Pediatrics: Report of Two Cases

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Abstract

Introduction: This publication aims to show the clinical, endoscopic, and histological responses of two pediatric patients who received dupilumab as a management strategy for eosinophilic esophagitis. Dupilumab is a monoclonal antibody that inhibits the alpha chain of the interleukin (IL)-4 and IL-13 receptors involved in the T_h2 inflammatory response. The potential therapeutic role of this biological drug has been demonstrated in pediatric clinical trials in other allergic pathologies, such as atopic dermatitis and asthma, with an adequate safety and effectiveness profile. **Clinical cases:** Two children with a personal history of atopy, allergic rhinitis, asthma, atopic dermatitis, and food allergy began with gastrointestinal symptoms that confirmed the diagnosis of eosinophilic esophagitis. Despite the different management strategies, adequate control of the disease was not achieved, and it is considered that they benefited from management with dupilumab due to the disease evolution and the coexistence of uncontrolled atopic dermatitis. **Conclusions:** In recent years, various management strategies in pediatrics have been published, particularly high-dose proton pump inhibitors, topical corticosteroids, and elimination diets. However, despite these strategies, at least one-third of patients may fail to achieve remission with initial treatment, making this entity a therapeutic challenge for the gastroenterologist and pediatric allergist. Our patients received the dose recommended for their weight and age and approved for asthma and atopic dermatitis, resulting in clinical and histological remission. The improvement in gastrointestinal symptoms was accompanied by better control of asthma, rhinitis, and dermatitis. None of the patients had adverse effects of the medication.

Keywords

Eosinophilic esophagitis, dupilumab, anti-interleukin-4 receptor alpha monoclonal antibody, pediatrics, allergy.

INTRODUCTION

Eosinophilic esophagitis is a chronic inflammatory condition immunologically mediated, distinguished by esophageal dysfunction symptoms, local endoscopic inflammatory alterations, and an eosinophilic infiltrate confined to the esophagus. Its diagnosis encompasses clinical, endoscopic, and histological findings. Symptoms typically emerge during school age but can manifest at any age[1,2]. Early diagnosis and prompt treatment are critical for improving the prognosis by halting disease progression and preventing secondary complications arising from esophageal dysfunction and tissue remodeling. Recent years have seen various pediatric management strategies published, notably including high-dose proton pump inhibitors, topical corticosteroids, and exclusion diets. Despite these approaches, a significant frac-

tion of patients, at least one-third, may not achieve remission with initial treatment, presenting a therapeutic challenge to gastroenterologists and pediatric allergists[3,4].

The disruption of the esophageal barrier plays a pivotal role in eosinophilic esophagitis pathophysiology, facilitating the penetration of food allergens. This initiates an immune response that is not mediated by immunoglobulin E (IgE), further amplified by the production of thymic stromal lymphopoietin (TSLP), which activates lymphocytes to produce a type 2 inflammatory response (T_h2). As a result, pro-inflammatory cytokines are generated, promoting eosinophil recruitment to the esophageal epithelium and their degranulation, leading to inflammation and fibrosis[2,5].

Diagnosing eosinophilic esophagitis necessitates clinical, endoscopic, and histological criteria. The onset of symptoms typically occurs in school-aged children, with incidence peaking during adolescence and early adulthood. Clinical manifestations vary based on the age of onset and may include dysphagia, upper abdominal pain, and food impaction[3,6]. Upper gastrointestinal endoscopy (UGIE) allows for the evaluation of the esophageal appearance and biopsy collection to confirm eosinophilic infiltration of the mucosa. Histological examination commonly reveals acanthosis, basal cell hyperplasia, and eosinophilic inflammatory infiltrate, with a requirement of more than 15 eosinophils per high power field (HPF), thus recommending at least six biopsies across the esophagus's thirds. Chronic inflammation can lead to fibrostenosis, characterized by concentric ring lesions and esophageal stenosis[7].

The type 2 inflammatory response involves the secretion of interleukins (IL) 4, IL-13, and IL-5, leading to an increased eosinophilic infiltrate in the tissue, which contributes to tissue remodeling. This inflammatory pattern is common to atopic dermatitis, asthma, allergic rhinitis, and eosinophilic esophagitis. IL-4 encourages a shift towards T_h2 lineage and prompts B lymphocytes to produce IgE. Both IL-4 and IL-13 enhance cellular migration to inflammation sites, whereas IL-13 also increases mucus production and smooth muscle contractility, thereby facilitating mast cell proliferation, antigen recognition, degranulation, and enhancing the inflammatory response[5,8].

Dupilumab is a humanized monoclonal antibody that serves as a dual inhibitor of the alpha chain of the IL-4 and IL-13 receptors, having a significant impact on the T_h2 inflammatory cascade[9,10]. A clinical trial conducted on adolescents and adults with eosinophilic esophagitis has shown the efficacy and safety of dupilumab. The trial involved administering a loading dose of 600 mg, followed by 300 mg administered subcutaneously (SC) weekly, which resulted in improvements in clinical, endoscopic, and histological parameters over 12 weeks of treatment compared to a placebo[11]. For pediatric patients younger than 12 years, substantial studies on the safety and efficacy of dupilumab in treating eosinophilic esophagitis are yet to be conducted, but it is viewed as a promising therapy based on its pathophysiological rationale[8,12].

CLINICAL CASE 1

We present the case of a 9-year-old female with a history of allergic rhinitis, asthma, atopic dermatitis, and IgE-mediated food allergy. At the age of 6, due to a failure to thrive, a UGIE was performed, revealing a normal-looking esophagus (EREFS 0), with esophageal biopsies confirming the diagnosis of eosinophilic esophagitis. This led to the initiation of a dietary restriction eliminating milk; however, the patient lost follow-up due to the SARS-CoV-2 pandemic. At 8 years old, she presented again with symptoms of impaction and chest pain. A repeat UGIE showed EREFS 5, characterized by exudates, edema, furrows, and a crepe-paper appearance of the mucosa (**Table 1**). The esophageal biopsies indicated 30 eosinophils per HPF, acanthosis, and basal hyperplasia. Consequently, treatment was augmented with proton pump inhibitors (PPIs) at a dosage of 2 mg/kg/day and swallowed fluticasone at 250 µg every 12 hours, yet no improvement was observed. Due to the clinical severity and lack of response, specific IgE testing for food allergens was conducted, revealing sensitization to multiple allergens: casein, lactoalbumin, lactoglobulin, wheat, soy, pineapple, peanuts, and oats. A dietary restriction for foods with positive IgE was initiated, but the response was irregular, and the patient and her mother faced challenges in adhering to the dietary exclusion, particularly during school hours.

Table 1. Case 1: Evolution of EREFS Scores and Histopathological Findings

	Age	6 Years	8 Years	10 Years
UGIE	EREFS	0	5	1
Histology	Acanthosis	Not reported	Present	Present
	Basal Hyperplasia	Not reported	Present	Present
	No. of Eosinophils x HPF	18	30	13

Dupilumab therapy

HPF: High Power Field. Author's own research.

Despite the patient's nutritional supplementation with an elemental formula (Neocate®), she was found to have low weight, short stature, and bone densitometry indicative of osteopenia (T-score -2 SD). Managing her asthma, rhinitis,

and dermatitis proved challenging, with clear evidence of dust mite sensitization. Given these difficulties, treatment was initiated with dupilumab 300 mg subcutaneously (SC) every four weeks. Remarkably, after two months of therapy, the patient experienced complete resolution of her gastrointestinal symptoms.

Six months into the biological therapy regimen, a follow-up UGIE revealed only mild furrowing (EREFS 1). Histological analysis of the proximal, middle, and distal thirds of the esophagus showed fewer than 15 eosinophils per HPF, (**Table 1**). Furthermore, after six months on dupilumab, reevaluation of specific IgE levels to foods demonstrated a reduction of over 50% for casein, peanuts, and wheat. This positive outcome prompted the cautious reintroduction of these foods into the patient's diet (**Table 2**). The patient currently reports complete gastrointestinal symptom resolution and has achieved excellent control over her allergic comorbidities, leading to a phased reintroduction of previously restricted foods.

CLINICAL CASE 2

This case involves an 8-year-old male patient with a background of asthma, allergic rhinitis, and IgE-mediated food allergy. At 8 years, due to failure to thrive and extensive dietary restrictions, a UGIE and biopsy identified more than 20 eosinophils per HPF, alongside exudates, rings, and furrows (EREFS 4) (**Figure 1A**). Elevated specific IgE levels were documented for casein, serum albumins, egg (both yolk and white), fish, sesame, avocado, orange, strawberry, soy, and wheat. Subsequently, a diet restricting milk, egg, and fish was initiated, along with swallowed fluticasone at a dosage of 250 µg every 12 hours and PPI at a dose of 2 mg/kg/day, albeit without clinical improvement. Subsequent UGIE revealed an eosinophil count exceeding 50 per field.

The patient exhibited clinical symptoms indicative of a mixed food allergy, manifesting as hives, vomiting, and diarrhea following accidental poisoning, alongside persistent abdominal pain and food impaction. Consequently, the parents opted for homeschooling, avoided dining in restaurants, and eschewed attendance at social gatherings, leading to isolation and depressive symptoms in the patient. Given the ongoing nature of these symptoms, coupled with malnutrition and stunted growth, treatment was commenced with dupilumab 300 mg administered subcutaneously every four weeks. Remarkably, a full resolution of symptoms was observed within two months of initiating treatment. A follow-up UGIE conducted six months after the start of dupilumab therapy revealed an EREFS score of 0 (**Figure 1B**), with biopsy results indicating a maximum eosinophil count of 15 per HPF throughout the esophagus (**Table 3**).

Following six months of dupilumab treatment, reassessment of specific IgE levels to various foods indicated a reduction of over 50% in most foods. Notably, however, IgE levels for casein exhibited an increase, necessitating the continued dietary restriction against milk (**Table 2**). Encouragingly, the patient successfully reintroduced avo-

Table 2. Specific IgE Levels to Foods Before and Six Months After Starting Dupilumab

Allergen (IgE kUI/L)	Patient 1 (Beginning of Treatment)	Patient 1 (6 Months into Treatment)	Patient 2 (Beginning of Treatment)	Patient 2 (6 Months into Treatment)
Casein	7.82	1.6	8.92	10.4
Alpha-lactalbumin	2.55	1.75	33.3	17.4
Beta-lactoglobulin	0.78	0.54	34.8	20.9
Egg yolk	-	-	40.7	24.3
Egg white	-	-	60.3	34.9
Peanut	4.72	0.2	4.06	2.25
Wheat	3.6	0.1	1.52	0.8
Avocado	-	-	2.17	0.74
Orange	-	-	5.17	2.41
Soy	-	-	1.87	0.86

IgE: Immunoglobulin E. Author's own research.

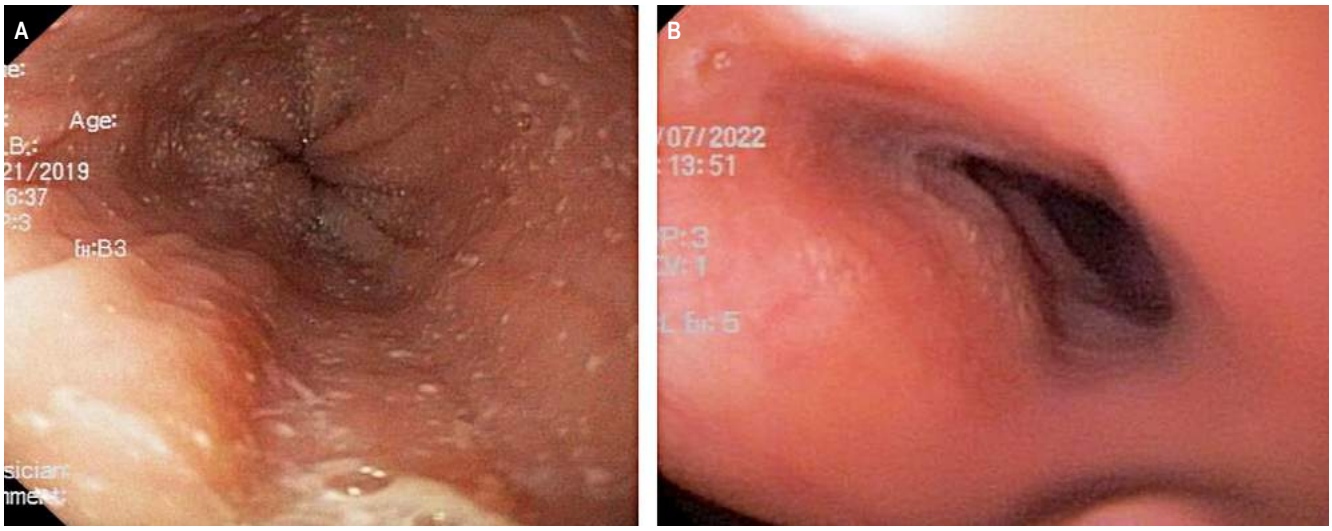


Figure 1. Case 2. **A.** Esophagogastroduodenoscopy showing an EREFS 4 esophagus, marked by the presence of exudates, rings, and furrows. **B.** Esophagogastroduodenoscopy showing an EREFS 0 esophagus, marked by the absence of exudates, rings, or furrows. Source: Author's File.

cado, orange, peanut, and soy into his diet and was able to resume in-person education, with a concurrent resolution of depressive symptoms.

Table 3. Case 2: Evolution of EREFS Scores and Histopathological Findings

	Age	6 Years + 9 Months	7 Years	8 Years	8 Years + 9 Months
UGIE	EREFS	4	5	4	0
Histology	Acanthosis	Present	Present	Present	Absent
	Basal Hyperplasia	Present	Present	Present	Absent
	No. of Eosinophils x HPF	> 20	100	50	< 15
				↑	
				Dupilumab therapy	

HPF: High Power Field. Author's own research.

DISCUSSION

In this report, we detail the experiences of two patients with a confirmed atopic march, suffering from eosinophilic esophagitis that was unresponsive to dietary interventions, swallowed steroids, and PPIs. These patients exhibited significant clinical improvement following the administration of dupilumab 300 mg subcutaneously (SC) every four weeks, a dosage guideline adapted from treatments for asthma and atopic dermatitis. It is noted that around 60% of individuals with eosinophilic esophagitis find relief through conventional treatments including PPIs, swallowed corticosteroids, dietary restrictions, and esophageal dilations. Yet, there exists a subset of patients who continue to experience eosinophilic inflammation of the esophagus despite comprehensive management efforts[3,7].

The advancing comprehension of immunological pathways implicated in allergic diseases has facilitated the emergence of monoclonal medications targeted at the T_h2 inflammatory pathway. Dupilumab has been approved for use in severe atopic dermatitis, asthma, and chronic rhinosinusitis with nasal polyps[12]. In a significant development, the Food and Drug Administration (FDA) in May 2022 approved dupilumab for individuals aged 12 years and older with eosinophilic esophagitis. Its application has been associated with improvements in dysphagia, reductions in eosinophil counts, enhancements in the EREFS endoscopic scale, and improved esophageal distensibility in comparison to placebo. Although the recommended dosage for adolescents and adults is established as a 600 mg SC loading dose followed by 300 mg SC weekly[13], the optimal dose for children under 12 remains undetermined. Presently, British consensus guidelines in gastroenterology, hepatology, and pediatric nutrition advocate for the consideration of dupilumab in treating eosinophilic esophagitis, especially in cases where initial treatments fail. Positive

effects of dupilumab have also been documented in other eosinophilic gastrointestinal disorders[6,8,12].

Our cases received doses recommended for their weight and age, aligned with guidelines for asthma and atopic dermatitis, due to the absence of studies specifically addressing eosinophilic esophagitis in children under 12 years at the time treatment commenced. Remarkably, clinical remission was observed prior to the administration of the third dupilumab dose, with subsequent histological remission confirmed via control endoscopy after six months of therapy. The patients also showed improved management of their asthma, rhinitis, and dermatitis and were able to commence immunotherapy for aeroallergen sensitivities as part of their comprehensive allergy treatment plan. Pain at the injection site was the sole adverse effect reported.

Spekhorst and colleagues (2022) described a cohort of 125 individuals with atopic dermatitis and food allergies who exhibited decreased specific IgE levels to foods after receiving dupilumab for atopic dermatitis[14]. Similarly, Rial and colleagues observed that patients with atopic dermatitis and IgE-mediated allergies to corn and nuts did not report symptoms following accidental ingestion after being treated with dupilumab[15]. In our patients, a decrease of over 50% in specific IgE levels to a majority of the restricted foods was recorded, enabling the cautious reintroduction of these foods with suitable clinical tolerance. These observations suggest that dupilumab may facilitate tolerance induction and mitigate the severity of allergic reactions to food by persistently inhibiting T_h2 activity. Notably, in patient 2, an increase in casein levels was observed, hinting at the potential of dupilumab to uncover true food allergies.

Determining the optimal dupilumab management strategy for eosinophilic esophagitis in pediatric patients remains an area of active investigation. This includes clarifying whether induction doses are necessary, identifying the appropriate therapeutic dose, establishing treatment duration, and assessing the drug's long-term efficacy in maintaining disease remission.

CONCLUSIONS

Eosinophilic esophagitis has been identified as a recently characterized condition for which there is not yet a universally effective treatment. Various therapeutic approaches exist, each yielding varying degrees of clinical, endoscopic, and histological success.

It is crucial to educate the medical team on the importance of timely diagnosis and intervention to prevent disease progression and avert complications, thereby ensuring an improved quality of life for affected patients.

Treating these patients, who often present with multiple comorbidities rooted in similar pathophysiological mechanisms, necessitates a coordinated approach within specialized centers experienced in managing such complex cases with multidisciplinary teams. Dupilumab stands out as a safe and efficacious therapeutic option that merits consideration for patients with severe or extensive T_h2 inflammation and those unresponsive to traditional clinical management strategies for eosinophilic esophagitis.

Ethical Considerations

Publication is authorized by the patient's guardian via the signing of an informed consent form, specifically designed for this purpose by the institution. The case report has received the approval of the institutional ethics committee of Fundación Hospital Pediátrico La Misericordia, ensuring the anonymity and confidentiality of the patient's personal data throughout all phases of research execution and publication.

Conflict of Interest

NVT and LMCJ have been compensated for delivering academic lectures by Sanofi.

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Case report

Gallbladder Adenomyomatosis in Pediatrics: A Case Report

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Abstract

Objective: Gallbladder adenomyomatosis (ADM) is a rare disease in pediatrics, characterized by epithelial proliferation and muscle hypertrophy, associated with the formation of fistulous tracts, classically called *Rokitansky-Aschoff sinuses*. It is an anatomical and clinical entity that is difficult to diagnose. Ultrasound is the primary diagnostic tool, but ADM is confirmed by its characteristic histological findings. **Clinical case:** A 15-year-old adolescent with a previous diagnosis of congenital scoliosis and hemivertebra at T11-12 with secondary spinal cord compression and butterfly vertebrae at T5-L3 was admitted for surgical management of this entity. In the immediate postoperative period, band-like abdominal pain and elevated pancreatic enzymes were present, considering the initial diagnosis of acute pancreatitis. Imaging studies revealed a thickened gallbladder with increased size and findings compatible with gallbladder ADM. The patient showed improvement in symptoms after undergoing laparoscopic cholecystectomy. The diagnosis of gallbladder ADM was later confirmed by histology. **Conclusion:** Gallbladder ADM is extremely rare in children; little is known about its pathogenesis and pathology. It is diagnosed mainly by ultrasound, which identifies hypertrophy of the muscular layer and the formation of fistulous tracts, known as *Rokitansky-Aschoff sinuses*.

Keywords

Gallbladder, cholecystitis, pancreatitis, laparoscopy, pediatrics.

INTRODUCTION

Gallbladder adenomyomatosis in the pediatric population represents a seldom-encountered condition. It is benign and acquired, with its etiology remaining elusive[(1)]. The condition is primarily characterized by either localized or diffuse epithelial proliferation, leading to mucosal invagination through an enlarged muscular layer. This process creates intramural diverticula or sinuous paths[(2)], known as Rokitansky-Aschoff sinuses[(1)]. Despite its identification, much about adenomyomatosis, including its pathogenesis, associated risk factors, and surgical indications—particularly within a pediatric context—remains poorly understood[(2)]. In adults, it is detected in as many as 5% of cholecystectomy cases, yet the pediatric literature documents it far less frequently[(3)].

CASE PRESENTATION

We report the case of a 15-year-old female patient, weighing 42.5 kg with a height of 141 cm, resulting in a body mass index (BMI) of 21.4 kg/m^2. She was admitted with a pri-

mary diagnosis of congenital scoliosis, specifically a hemivertebra at T11-12 level causing secondary spinal compression, and butterfly vertebrae spanning T5 to L3. The patient underwent a two-stage surgical procedure for the resection of the T11-12 hemivertebra and spinal instrumentation from T5 to L3. Following the second surgical intervention, she experienced nausea, abdominal pain and distension, and diarrheal bowel movements without the presence of mucus or blood, accompanied by reduced intestinal sounds.

An abdominal ultrasound revealed focal thickening of the gallbladder walls, perivesicular fluid, ascites, and focal thickening of the pancreatic tail measuring up to 22 mm in diameter (**Figure 1**). Laboratory tests showed elevated levels of aspartate aminotransferase (AST) at 235 U/L, alanine aminotransferase (ALT) at 93 U/L, serum amylase at 104 U/L, γ-glutamyl transpeptidase (GGT) at 96 U/L, lipase at 813.4 U/L, and C-reactive protein (CRP) at 84.5 mg/dL, prompting the initiation of treatment for acute pancreatitis.

Despite treatment, the patient's condition did not improve, with continued severe abdominal pain and clinical deterioration. A contrast-enhanced abdominal CT scan was performed, identifying changes consistent with gallbladder adenomyomatosis, accompanied by perivesicular fluid and intestinal ileus (**Figure 2**). Given the worsening of her gallbladder's condition, surgical intervention was deemed necessary. A laparoscopic examination revealed a gallbladder with thickened walls containing purulent material, identified as pyocholecyst, which was adhered to the duodenum.

Histopathological examination of the gallbladder wall disclosed extensive mucosal necrosis, severe transmural polymorphonuclear inflammatory infiltrates, Rokitansky-Aschoff sinuses, and muscular hypertrophy, with necrotic material found within the lumen. The patient experienced no postoperative complications, demonstrated significant improvement, and was subsequently discharged from the institution.

DISCUSSION

Gallbladder adenomyomatosis, known by various names historically, is currently the accepted term for this condition, first identified by Jutras and colleagues in 1960[3]. This disease represents an anatomoclinical challenge[4], with its precise diagnosis proving to be exceptionally difficult. It is a relatively rare gallbladder pathology in children, associated with cholecystitis and cholelithiasis[3,5]. To date, adenomyomatosis remains a markedly uncommon ailment, with unknown pathogenesis and unclear surgical indications, especially within the pediatric demographic. In the adult population, it is detected in 5% of cholecystectomy specimens[3,6]. As of 2020, merely ten cases have been documented in children[3].

Adenomyomatosis is characterized by epithelial proliferation alongside muscular layer hypertrophy, leading to the creation of fistulous tracts known as *Rokitansky-Aschoff sinuses*[3,6]. The adenomyomas formed are benign leiomyomatous growths, distinguished by proliferation of the superficial epithelium and its invagination deep into the muscular layer[4]. The condition exhibits a predilection for females over males, with a ratio of 3:1, aligning with the demographic details of our adolescent patient[1,7].

The disease can induce changes in the metaplastic epithelium (including intestinal and pyloric metaplasia), inflammation, and fibrosis. While these alterations are

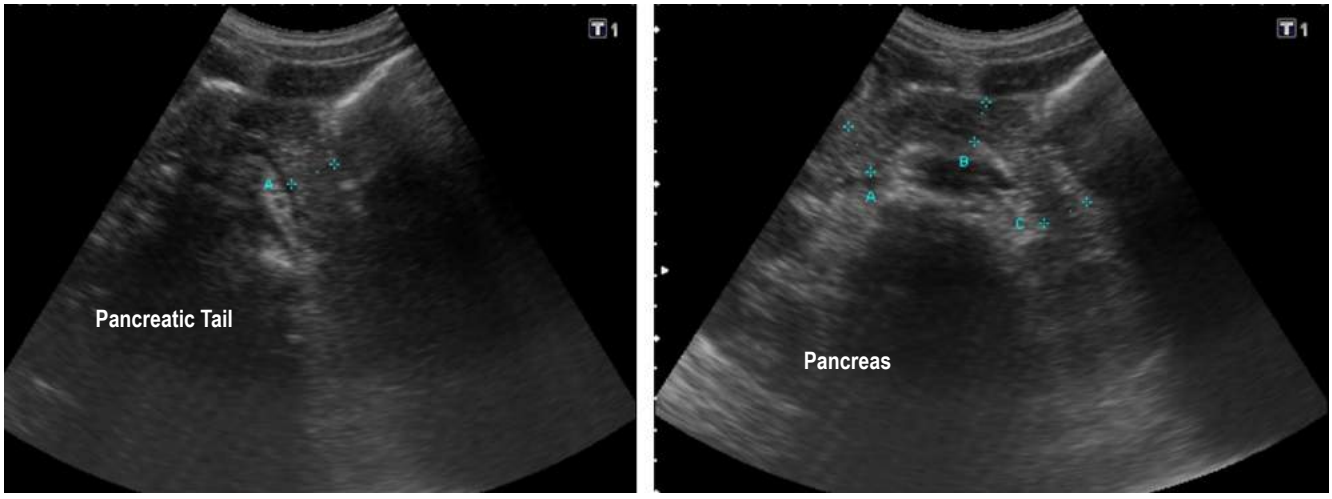


Figure 1. Total Abdominal Ultrasound. The image reveals a localized thickening of the walls in the body and neck regions, accompanied by perivesicular fluid accumulation. The pancreas exhibits a focal thickening of the sac, measuring up to 22 mm in diameter. Source: Patient's medical records.

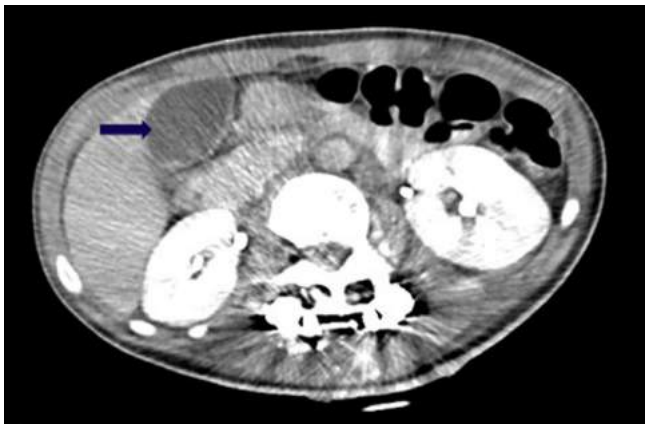


Figure 2. Contrast-Enhanced Computed Tomography (CT) Scan of the Abdomen. The arrow denotes the continued presence of findings indicative of gallbladder adenomyomatosis, accompanied by a mild increase in the anteroposterior diameter of the pancreatic tail and preserved peripancreatic fat with perivesicular augmentation. Source: Patient's medical records.

not deemed potentially premalignant, the development of dysplasia, *in situ*, or invasive carcinoma within adenomyomatosis epithelium can occur, potentially progressing to carcinoma. This progression is thought to be more closely associated with lithiasis, chronic inflammation, and metaplastic changes rather than with adenomyomatosis itself, highlighting the recognized link between lithiasis and gallbladder cancer[8].

Adenomyomatosis can manifest in the gallbladder through four principal patterns: localized, segmental, annular, and diffuse[5], all of which spare the serosa[1]. The most common is the localized pattern, typically presenting as focal thickening most often affecting the gallbladder fundus region[5]. This pattern may also feature an umbilicated nodule in the fundus, referred to as an *adenomioma*[9]. Conversely, diffuse adenomyomatosis typically affects the gallbladder body, characterized by a total circumferential thickening of the wall, resembling an "hourglass". In our case, ultrasound imaging revealed concentric wall thickening up to 5 mm towards the gallbladder neck.

Clinically, adenomyomatosis symptoms, when present, often mimic those of cholelithiasis, such as colic pain, or result from main bile duct obstruction; in some instances, the presentation may resemble acute pancreatitis[4]. Our patient experienced a significant elevation in lipase (1408 U/L) and amylase (307 U/L) levels, with subsequent improvement following cholecystectomy. Generally, the pediatric population predominantly presents with acute, nonspecific, and recurrent abdominal pain, occasionally accompanied by vomiting and fever[3]. These symptoms, specifically acute, nonspecific abdominal pain and nausea, were observed in our patient.

In numerous instances, the diagnosis of gallbladder adenomyomatosis is incidentally made through an ultrasound or abdominal computed tomography (CT) scan, originally intended to explore other medical conditions[3]. The hallmark findings typically include either focal or diffuse thickening of the gallbladder wall, the presence of small intramural diverticula that may encapsulate bile within small, multiple, and anechoic cystic spaces, and intramural echogenic foci when containing cholesterol collections or biliary sludge. These foci may or may not be associated with acoustic shadowing, or exhibit reverberation or twinkling artifacts on color Doppler ultrasound[1]. In the case we present, imaging revealed focal thickening of the gallbladder wall and the pancreas tail, associated with perivesicular fluid as notable findings.

Moreover, magnetic resonance imaging (MRI) studies highlight that Rokitansky-Aschoff sinuses manifest as a "pearl necklace" sign—multiple round spaces with hyperintense signals in T2-weighted sequences, demonstrating a 92% specificity for gallbladder adenomyomatosis[10]. Typically, ultrasound and MRI provide sufficient diagnostic clarity for most patients; however, a definitive diagnosis necessitates histopathological examination of the specimen. This analysis commonly details the gallbladder segmented into various parts by septa made of columnar epithelium, connective tissue, and smooth muscle fibers[11]. It further notes mucosal invagination extending through the subepithelial fibromuscular tissue, the presence of Rokitansky-Aschoff sinuses, and occasionally, associated smooth muscle hyperplasia. The detection of smooth muscle tissue underpins the congenital nature of this condition. Inside the Rokitansky-Aschoff sinuses, one might find thick bile, mucus, and calculi, inducing inflammatory, fibrotic, and metaplastic changes (including intestinal and pyloric gland metaplasia)[1]. On ultrasound, these may appear as echo-poor intramural cystic structures; containing sludge, they turn echogenic, potentially generating distal acoustic shadowing or ring-down ("comet tail") artifacts[2,12]. While these findings are not inherently abnormal, they are typically linked with adenomyomatosis and cholecystitis[1].

Surgical intervention is not deemed necessary for asymptomatic patients. However, symptomatic individuals may warrant a cholecystectomy, preferably performed laparoscopically[11]. Despite the absence of reported cases of carcinoma in pediatric patients with gallbladder adenomyomatosis in the current literature, cholecystectomy remains a viable option for those exhibiting symptoms, though the optimal timing for such a procedure remains unclear[3].

Gallbladder adenomyomatosis is notably rare, especially in the pediatric population. Its diagnosis fundamentally

relies on the identification of Rokitansky-Aschoff sinuses, with ultrasound serving as the diagnostic tool of choice[13]. The advancement of imaging techniques, combined with physician expertise, has led to an increase in the detection of this condition, suggesting that reports and diagnoses of adenomyomatosis may continue to rise. Although the pathogenesis of adenomyomatosis remains incompletely understood, it is associated with gallstones and chronic inflammatory diseases[4].

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Case report

Delayed Esophageal Perforation after Anterior Cervical Spine Fixation: Case Report and Literature Review

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Abstract

The anterior approach to cervical spine surgery can cause esophageal injuries; however, it is an infrequent complication with a 0.02–0.25% prevalence. It usually appears in two high-risk areas: Killian's dehiscence and the thyrohyoid membrane. Delayed esophageal perforations typically occur due to chronic friction and usually have a benign course. Most cases of late migration occur in the first 18 months of the surgical procedure, and the clinical manifestation varies between asymptomatic patients in the case of delayed perforations and patients with dysphagia, subcutaneous emphysema, and sepsis in the case of acute perforations.

Keywords

Esophageal perforation, spine, cervical.

INTRODUCTION

The anterior approach for cervical spine surgery has been in practice since the 1950s, serving various purposes such as spine stabilization in cases of spinal tumors, trauma, and osteomyelitis. The proximity of the cervical spine to the esophagus, coupled with the requirement to mobilize the esophagus, increases the risk of esophageal injury during these surgical interventions. Nevertheless, such complications are exceedingly rare, with prevalence rates reported between 0.02% and 0.25%[1,2].

CASE PRESENTATION

We report the case of a 60-year-old male with no significant comorbid conditions. The patient had a history of cervical trauma from a road traffic accident 12 years prior, which necessitated a C4-C5-C6 corpectomy and anterior cervical fixation using prosthetic material. Subsequently, the patient developed cervical myelopathy and symptomatic spinal stenosis. He sought medical advice for persistent dysphagia, weight loss, and dysphonia over six months. Neurosurgical evaluation led to the performance of a cervi-

cal spine radiograph, which revealed anterior displacement of the C7 fixation screw (**Figure 1**).



Figure 1. Lateral cervical spine radiography. Arthrodesis plate with proximal fixation at C3 and distal fixation at C7 (arrow), along with an intermediate and a displaced distal screw. Source: Author's File.

An esophagogastroduodenoscopy was conducted, revealing a piece of osteosynthesis material (screw) lodged in the upper third of the esophagus at the cricopharyngeal level. This foreign object was successfully removed using a foreign body forceps (**Figures 2** and **3**). The patient's clinical progression was favorable, marked by the resolution of dysphagia, and no additional procedures or interventions were required.

DISCUSSION

Acute esophageal perforations associated with the anterior surgical approach to the cervical spine predominantly occur in two anatomically distinct zones of heightened risk, where excessive manipulation or retraction often plays a contributory role[3,4]. The initial risk zone is identified as Killian's triangle, which is delineated by the juncture of the lower boundary of the pharyngeal constrictor muscle and the cricopharyngeal muscle; typically located at the level of C5-C6 or slightly more caudally. This area is notably vulnerable because the posterior mucosa of the esophagus lacks muscular protection, leaving only the slender buccopharyngeal fascia to separate the esophagus from the retrosternal space[5]. The second heightened risk area is situated laterally at the level of the thyrohyoid membrane[1].

Despite the rarity of esophageal perforation following cervical spine surgical procedures, with a notably low incidence, it represents a complication with significant morbidity and mortality implications, even when identi-

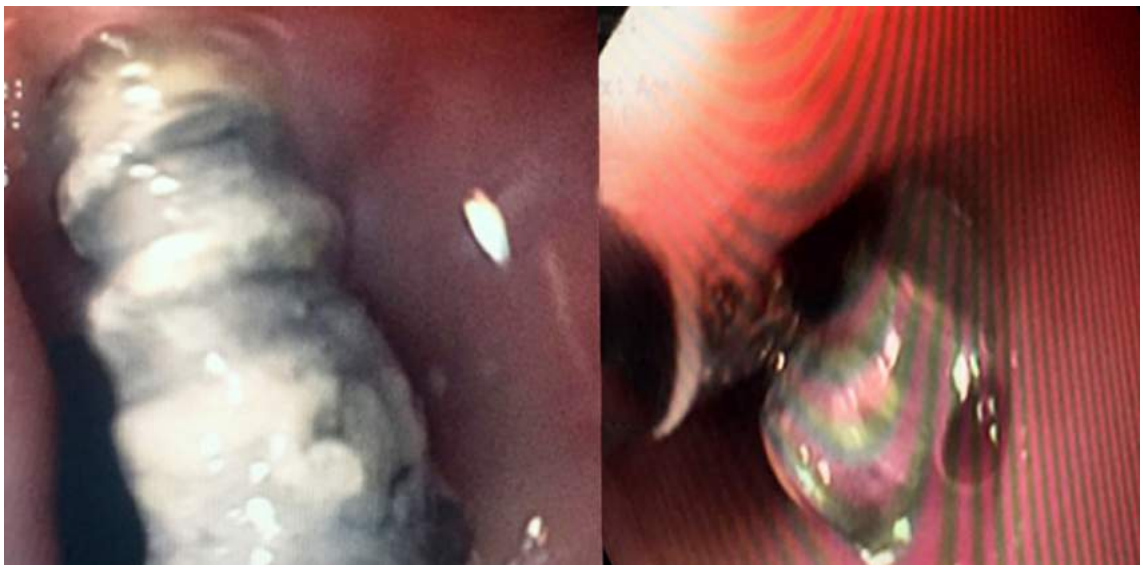


Figure 2. Endoscopic findings illustrating a foreign body (screw) in the proximal third of the esophagus at the level of the cricopharyngeus. Source: Author's File.

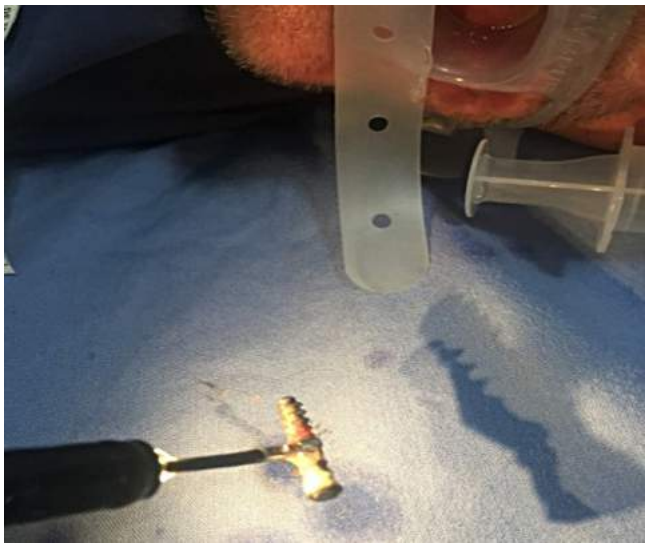


Figure 3. Extracted screw using foreign body forceps. Source: Author's File.

fied intraoperatively; mortality rates reported stand at 20%, escalating further with delayed diagnosis and treatment[2]. Late esophageal perforations generally result from chronic friction leading to subsequent ischemia and necrosis[2]; the migration of screws tends to follow a benign trajectory, potentially even remaining asymptomatic due to their small diameter. This gradual process allows for the spontaneous repair of the induced defect[6]. It is not uncommon for screws to be uneventfully expelled through the gastrointestinal tract[7]. The majority of late migration cases are reported within the first 18 months following surgery[8,9]; yet, there have been instances noted several years postoperation[6]. Clinical manifestations range from asymptomatic presentations in delayed perforations to symptoms of dysphagia, subcutaneous emphysema, and sepsis in acute cases[10].

The therapeutic arsenal for managing transmural esophageal defects via endoscopy includes the use of clips, esophageal stents, and negative pressure systems[11]. Esophageal stents, in particular, are favored for their established efficacy and safety, boasting success rates exceeding 80%[12]; their application in cervical perforations, however, is limited due to discomfort caused by the proximal end of the device protruding into the pharynx, often resulting in intolerance by the patient.

Negative pressure therapy emerges as a relatively novel approach that encourages granulation tissue formation, facilitating the obliteration of the cavity and the defect's closure[13,14]. This method can be implemented as either a standalone treatment or in conjunction with radiological or surgical interventions[15]. Retrospective studies have highlighted its high success rate (89.4%)[11] and the minimal complications associated with its application[16]. Similar to esophageal stents, the effectiveness of negative pressure therapy in proximal perforations may be limited by challenges in creating an airtight seal and maintaining a contained negative pressure environment. Consequently, the chosen treatment strategy should be tailored to the perforation's clinical presentation and anatomical location, ranging from conservative or endoscopic management to surgical intervention for debridement and primary defect closure[1,17].

CONCLUSIONS

Esophageal perforation stands as a potential albeit rare complication of the anterior cervical spine approach. In cases with a surgical history that align with the clinical presentation, late perforation should be considered a possibility.

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Case report

Endoscopic Ultrasound-guided Hepaticogastrostomy, Experience in Colombia: Case Series

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Abstract

The primary tool for malignant biliary obstruction is decompression of the bile duct, using endoscopic retrograde cholangiopancreatography (ERCP) with stenting, which is satisfactory in many cases; still, the actual challenge arises when it is impossible to cannulate the ampulla of Vater due to neoplastic involvement at that level. Although percutaneous transhepatic biliary drainage (PTBD) is an option, it has high morbidity, which directly impacts the patient's quality of life by having an external device added to a malignant pathology. With the arrival of endoscopic ultrasound (EUS), new methods have been reported, such as EUS-guided hepaticogastrostomy (EUS-HGS), which is performed through a natural orifice (NOTES) and positively impacts the outcome of these patients. Below is an example of our experience with the first three cases in Colombia.

Keywords

Hepatogastrostomy, endoscopy, biliary obstruction, Colombia.

INTRODUCTION

The primary method for managing both malignant and benign biliary obstructions is through the decompression of the bile duct via endoscopic retrograde cholangiopancreatography (ERCP) with stent placement. This approach is successful in a significant majority of cases, demonstrating a failure rate of only 5%-7%[(1)]. However, challenges arise when cannulation of the ampulla of Vater is rendered impossible due to anatomical alterations, such as those caused by neoplastic involvement. In recent years, endoscopic ultrasound-guided biliary drainage (EUS-BD) has emerged as a viable alternative to the traditional percutaneous or surgical approaches[(2)].

Endoscopic ultrasound-guided hepaticogastrostomy (EUS-HGS) has been acknowledged as a secondary strategy for biliary drainage in instances where endoscopic retrograde cholangiopancreatography is unsuccessful or when duodenal cannulation is not feasible. It boasts a clinical success rate of up to 93% and reports a 30-day post-procedure morbidity rate of 18%, with the most frequent complication being the recurrent occlusion of the biliary stent. The mortality rate associated with this procedure stands at 5%[(3)].

The option of percutaneous transhepatic biliary drainage (PTBD) is now considered a tertiary choice, given its potential morbidity rate of up to 33%. The adverse events associated with this method can include catheter dislodgement, recurrent infections, acute cholangitis, bleeding, bile leaks, pneumothorax, and aesthetic concerns due to the requirement for external drainage, all of which can significantly detract from the quality of life of the patients[4,5]. In our review of meta-analyses and systematic reviews, despite their inherent heterogeneity, a consistent conclusion is drawn across the board: EUS-BD is linked with a higher rate of clinical success, fewer post-procedure adverse events, and a reduced need for reinterventions when compared to PTBD[1,6]. This paper presents three case studies that highlight our experiences with performing hepaticogastrostomy in Colombia.

CASE 1

We report the case of a 75-year-old female patient who experienced a fall from standing height and was subsequently admitted to the emergency department. There, she was diagnosed with a right hip fracture. Incidentally, radiological studies revealed a neoplasm located in the head of the pancreas. During her clinical review, she reported a significant weight loss of 10 kg over the past two months and exhibited symptoms including jaundice, acholia, and dark urine approximately one week prior to admission. Her medical history was notable for basal cell carcinoma, an anxiety-depressive disorder diagnosed 13 years ago, atrial fibrillation identified thee years ago, and treated melanoma. A biliopancreatic endoscopic ultrasound was conducted, revealing a neoplasm in the head of the pancreas measuring 22 x 24 mm with irregular borders, heterogeneous hypoechoic appearance, and no vascular involvement. However, the lesion compromised the distal third of the bile duct, 2 mm from the duct of Wirsung, accompanied by a bile duct dilation of 17 mm. A fine needle biopsy of the mass indicated cells with epithelial atypia suggestive of adenocarcinoma, characterized by variability in nuclear size, irregular contours, hyperchromatism, clumped chromatin, and loss of polarity.

Upon her admission, the patient presented with generalized jaundice, corroborated by laboratory findings including leukocyte count of 7200, neutrophils at 5200, lymphocytes at 1300, hemoglobin at 9.8, total bilirubin at 12.8, direct bilirubin at 7.8, aspartate aminotransferase (AST) at 89, alanine aminotransferase (ALT) at 77, and alkaline phosphatase at 473. Further diagnostic work-up with magnetic resonance imaging and tomography of the chest and abdomen corroborated the endoscopic ultrasound (UES) findings and identified multiple hepatic lesions suggestive of a metastatic pattern. Given the elevated bilirubin levels, an ERCP was attempted but failed due to a laterally displaced and deformed ampulla of Vater, which precluded bile duct access, and a duodenal wall with a neoplastic infiltrative appearance at the level of the second portion. The patient was informed about the necessity of percutaneous transhepatic biliary drainage and the placement of an external drainage guide. However, she adamantly refused this approach, expressing concerns that it would exacerbate her anxiety and depression. Consequently, a hepaticogastrostomy was proposed as an alternative, which the patient understood and accepted. The procedure was successfully performed, and notable improvements were observed, with bilirubin levels reducing to 5 mg/dL at 48 hours and further decreasing to 2 mg/dL by 72 hours post-procedure. The patient was subsequently discharged, reporting no pain, weakness, fever, or discomfort during her immediate and subsequent postoperative recovery.

CASE 2

A 56-year-old female patient with a medical history of type 2 diabetes, hypertension, hypothyroidism, and gastroparesis presented with a three-year history of abdominal pain. The pain, predominantly located in the epigastrium, radiated to the dorsal region in a band-like pattern. The most recent episode was characterized by high intensity, accompanied by dark urine and generalized itching. Initial evaluation at another institution, through magnetic resonance cholangiopancreatography, revealed a lesion in the head of the pancreas causing biliary obstruction and pancreatic duct dilation. A plastic stent was placed for biliary drainage, after which the patient was referred to our center for hepatobiliary surgery evaluation.

Upon her admission, a biliopancreatic endoscopic ultrasound was conducted with biopsy sampling. Pathology confirmed the presence of adenocarcinoma, leading to the initiation of neoadjuvant chemotherapy and radiotherapy. One month following treatment initiation, the patient was admitted via emergency services due to a resurgence of right hypochondrial abdominal pain that radiated to the lumbar region, marked by increased intensity, dark urine, pale stools, and hand itching. A subsequent magnetic resonance cholangiopancreatography demonstrated a posterior solid-component pancreatic lesion, which resulted in amputation of the bile and main pancreatic ducts and significant dilation of the intra- and extrahepatic biliary pathways, likely due to stent dysfunction. Laboratory analyses revealed elevated liver enzymes and bilirubin levels (AST: 47, ALT: 328, alkaline phosphatase: 414, total bilirubin: 4.87, direct bilirubin: 3.6). A follow-up ERCP allowed for the removal of the initial plastic stent and place-

ment of a self-expanding metal stent, leading to improved laboratory results the subsequent day. An abdominal MRI indicated a 30% reduction in lesion size compared to prior imaging, prompting patient discharge.

The patient presented again one month later with symptoms indicative of biliary obstruction and episodes of fever. During this visit, ERCP revealed biliary stent migration, necessitating the placement of a new self-expanding metal biliary stent. Post-procedure, the patient showed favorable progress and was discharged. Seven months later, a planned right hepatic lesion ablation was successfully executed by an interventional radiologist. The patient was scheduled for a follow-up ERCP two months later for stent exchange. However, this ERCP was unsuccessful due to an inability to navigate the duodenum to the second portion because of stenosis. The patient was advised a soft diet and subsequently discharged.

Shortly thereafter, the patient was admitted with a new onset of biliary and intestinal obstruction. Surgical evaluation led to the decision to perform a gastrojejunostomy, which was executed a week later. Post-operatively, the patient demonstrated clinical improvement and a reduction in liver enzymes, warranting discharge. However, two months later, the patient returned with biliary obstruction. An attempt at endoscopic biliary diversion was thwarted by ascitic fluid, which hindered proper visualization. Following a paracentesis, the procedure was rescheduled, and a successful hepaticogastrostomy was performed three days later, leading to symptom relief, a decrease in liver enzymes, and patient discharge.

Over the subsequent month, the patient made several visits to the emergency department due to pain, abdominal distension from ascites, and fever episodes related to febrile neutropenia, but without evidence of biliary obstruction. Unfortunately, the patient succumbed to the natural progression of her tumor four months later.

CASE 3

A 73-year-old female patient presented with a one-week history of pain that originated in the left flank. Initially moderate in intensity, the pain progressively intensified and later radiated to the epigastrium and dorsally in a band-like fashion. The patient also reported dark urine and subjective weight loss over the past six months, with no episodes of nausea, vomiting, pale stools, fever, or other symptoms. A diagnosis of obstructive biliary syndrome was established following the identification of a mass in the head of the pancreas via abdominal angiotomography. This mass was consistent with neoplastic characteristics, displaying necrotic points and causing dilation of the biliary tract with involvement of the portal vein and superior mesenteric artery. Management commenced with piperacillin-tazobactam and analgesia, resulting in the patient's stable discharge.

The patient's medical history was notable for type 2 diabetes *mellitus* not requiring insulin, hypothyroidism, hypertension, and recurrent urinary tract infections secondary to urolithiasis. She had also experienced multiple episodes of acute pancreatitis, the most recent of which occurred six years prior and was managed with ERCP and pancreatic stent placement. A pancreatic pseudocyst had developed as a complication of pancreatitis. Additionally, she had undergone a laparoscopic cholecystectomy 30 years previously.

Upon this admission, the patient was hemodynamically stable and anicteric, exhibiting no signs of peritoneal irritation. Laboratory findings included leukocytes at 10,200, with 84% (8,600) neutrophils and 6.4% (600) lymphocytes, 6.4% (10.2) hemoglobin, hematocrit at 30%, platelets at 343,000, erythrocyte sedimentation rate at 122, sodium at 135.49, potassium at 3.13, creatinine at 0.50, AST at 76, ALT at 44, total bilirubin at 8.8, direct bilirubin at 5.11, indirect bilirubin at 3.69, alkaline phosphatase at 1193, and lipase at 7.4. Further investigation through total abdominal ultrasound revealed a large mass with neoplastic appearance affecting the head of the pancreas, causing local compressive effects with secondary dilation of the intra- and extrahepatic biliary tract, warranting further characterization by contrast-enhanced magnetic resonance imaging.

Subsequent ERCP and biliopancreatic ultrasound identified an impassable duodenal stenosis, obstructing progression to the second portion of the duodenum, with the duodenal mucosa presenting an infiltrative neoplastic appearance. Despite the failed ERCP due to duodenal obstruction, the patient's general condition improved during her hospital stay, with total bilirubin levels decreasing to 2.08 and alkaline phosphatase to 464. A successful hepaticogastrostomy guided by biliopancreatic ultrasonography was then performed.

Post-procedure, the patient's hepatic profile continued to improve, with total bilirubin reaching 2, direct bilirubin at 0.94, and alkaline phosphatase at 298. She tolerated oral intake, experienced normal bowel transit, and reported no abdominal pain, facilitating her discharge.

Pathology results later revealed a fibrohistiocytic reaction, active chronic inflammation, and epithelial fragments without evidence of high-grade dysplasia or malignancy. A subsequent multidisciplinary meeting concluded the patient was suffering from chronic pancreatitis, for which she was provided medical management. Follow-up visits over the next eight months showed the patient continued to make good clinical progress.

DISCUSSION

In the cases we presented (**Table 1**), each patient was female with an average age of 68 years. The pathologies involved tumors in the head of the pancreas, with associated bile duct involvement. One patient had chronic pancreatitis with a tumor that simulated an adenocarcinoma. In every case, stents were employed preemptively until cannulation of the ampulla of Vater could be accomplished. Notably, no complications occurred, and survival and follow-up were consistent across all cases for up to three months. Remarkably, the patient with chronic pancreatitis has not experienced any complications to date, suggesting good long-term stent maintenance—a promising indicator for future studies on stent durability.

It is evident that the utilization of EUS-HGS primarily occurs among palliative care patients, deemed ineligible for prospective treatments and characterized by a limited life expectancy. In such cases, the preference for employing this technique is justified by its demonstrated enhancement of quality of life and its capacity to mitigate complications arising from percutaneous drainage[6]. Each of our patients underwent a comprehensive explanation of the procedure and were provided the option between PTBD and EUS-HGS. Without exception, they conveyed the psychological burden associated with bearing an external catheter, underscoring the significance of their perspective within the clinical realm of such patients, crucial for alleviating the psychological strain accompanying terminal cancer. In light of this consideration, we advocate for regarding patient opinion as a decisive factor favoring the adoption of this technique over alternatives. Moreover, we posit that, given current trends, all minimally invasive procedures and natural orifice techniques should supersede their conventional counterparts.

In all cases, we employed a GIOBOR stent, deemed optimal for the procedure due to its design features. Notably, it boasts a 70% covered section, effectively preventing bile leakage between the left hepatic duct and the stomach, while also exhibiting a flexible configuration adaptable to the curved trajectory from the stomach to the left hepatic duct, accommodating certain degrees of movement. Furthermore, its 30% uncovered section serves to avert obstruction of lateral branches in the left hepatic duct and migration into the stomach. Additionally, the stent incorporates an anti-migration widened end, strategically positioned beyond the stomach wall to forestall migration towards the left intrahepatic duct. These attributes are illustrated in **Figures 1**, **2**, and **3**[7].

Table 1. Patients with Tumors Located in the Head of the Pancreas with Bile Duct Involvement

Age	Sex	Type of Pathology	Location	Type of Stenosis	Prior Stent	Complications	Survival at Three Months
75	Female	Adenocarcinoma	Head of the pancreas	Distal bile duct	Yes	No	Yes
73	Female	Solid pseudotumor in chronic pancreatitis	Head and uncinate process of the pancreas	Distal bile duct	Yes	No	Yes
56	Female	Adenocarcinoma	Head of the pancreas	Middle third of the bile duct and main pancreatic duct	Yes	No	Yes

Author's own research.

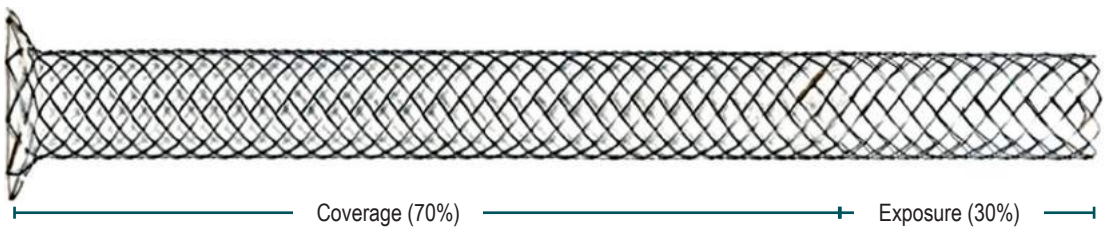


Figure 1. Distribution of the percentage of coverage and exposure. Source: TaeWoong Medical. [Internet]. Niti-S & ComVi Biliary Stent. User's Manual.

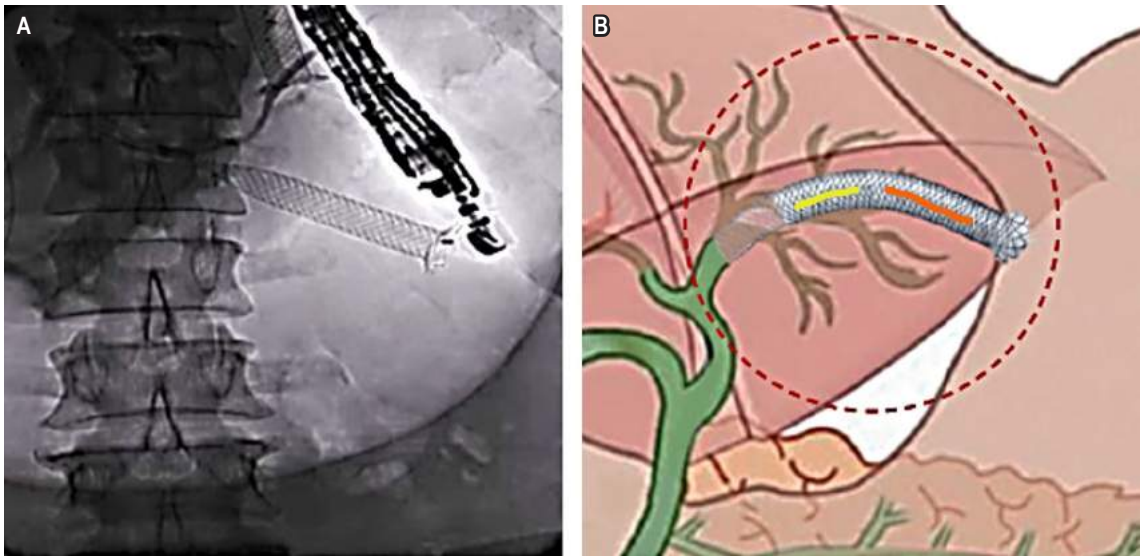


Figure 2. A. Fluoroscopic view showing the location of the hepaticogastrostomy stent. **B.** Illustration of the stent placement highlighting the angulation and adaptation of the GIOBOR stent. Source: Author's File.

CONCLUSION

EUS-HGS is asserted as the technique of choice subsequent to an unsuccessful ERCP and when anatomical alterations or cannulation challenges present. This approach is associated with lower complication rates and mortality in comparison to similar procedures. It benefits from the availability of a specialized stent designed for the specific anatomy addressed, and its placement is deemed to be at a reduced risk of tumor overgrowth relative to bile duct-level placement. Its apparent compatibility with gastrointestinal physiology is evidenced by the absence of complications or need for stent replacement across our series, extending up to eight months. The GIOBOR stent, given its described attributes, is advocated as the preferred option for this intervention.

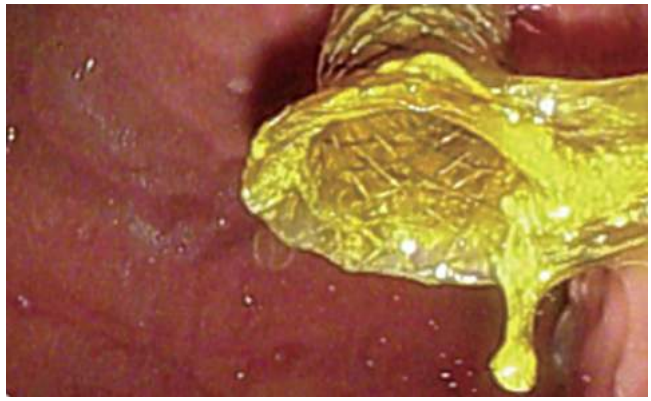


Figure 3. Endoscopic visualization of an intragastric catheter segment featuring an anti-migration widened end. Source: Author's File.

Conflict of Interest

The authors have disclosed that there are no financial conflicts of interest or any known personal relationships that might be perceived as influencing the reported findings.

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Case report

Self-dilatation: An Alternative for Managing Refractory Esophageal Strictures

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Abstract

We present the case of a patient with post-caustic stenoses who required surgical management and whose anastomosis was narrowed, requiring dilations using Savary, strictureplasty, and injection therapy without success. Given the recurrence, we decided to train him to do self-dilatation, which was successful since the patient could resume his daily activities. In addition to the photos, the case report provides a video explaining step-by-step the methods used in managing the patient.

Keywords

Caustics, stenosis, dilations, self-dilatations.

INTRODUCTION

Benign esophageal strictures resulting from the aftermath of radiotherapy, surgical interventions, caustic ingestion, or endoscopic mucosal resection are predominantly treated through endoscopic dilation procedures[1]. Despite this, between 30% and 40% of patients experience recurrence even after undergoing thorough dilation processes[1,2]. Refractory esophageal stricture (RBES) is characterized as a condition in which it is impossible to maintain luminal patency following five dilation attempts[1,3]. Managing RBES poses a significant therapeutic challenge. Available treatment strategies include repeated endoscopic dilations, injections of corticosteroids or mitomycin C, incisional therapy, or the placement of a temporary stent; however, these treatments have a limited efficacy over the long term and significantly burden both the patient and the healthcare system[3]. One study highlighted that the period free from dysphagia in patients with RBES treated with endoscopic dilations lasted for three months, and 2.4 months for those who underwent esophageal stent placement[4].

CLINICAL CASE

A 32-year-old patient experienced an accidental ingestion of caustic substances, leading to chemical pneumonitis and a complete obstruction of the esophagus. Following a two-week admission to the intensive care unit (ICU), the patient recovered from the acute episode and was discharged with an endoscopic gastrostomy. One month later,

the patient was referred for dilation treatments. During the initial dilation endoscopy, a complete obstruction of the esophageal lumen was observed. Attempts to recanalize the esophagus through both digestive endoscopy and retrograde endoscopy via the gastrostomy were unsuccessful (**Figure 1**). Consequently, the patient underwent esophagectomy with esophago-pharyngeal anastomosis and the creation of a neoesophagus. Due to the high location of the stricture, the neoesophagus was anastomosed parallel to the oropharynx. Subsequently, the anastomosis developed a post-surgical stricture, necessitating radial incisions of the anastomosis (**Figure 2**).



Figure 1. Retrograde view of the complete esophageal stricture. Author's File.



Figure 2. Stricture at the esophago-pharyngeal anastomosis. Author's File.

The patient revisited one month later presenting with strictures, prompting the initiation of a dilation regimen using Savary dilators (**Figure 3**). Regrettably, the patient experienced recurrent strictures every 10 to 15 days. Attempts at management with corticosteroid injections in all four quadrants proved unsuccessful, as did the application of mitomycin C instilled at the site of the stricture. Consequently, the decision was made to transition to a self-dilation protocol as the final option, given the patient's requirement for sedation every 8 to 10 days for dilation via endoscopy. Initially, the patient underwent training under endoscopic supervision (**Figure 4**), and upon becoming proficient, commenced interdiary self-dilations using a Savary dilator number 14 (**Figure 5**), achieving successful outcomes that have persisted to the present, completing approximately three years.

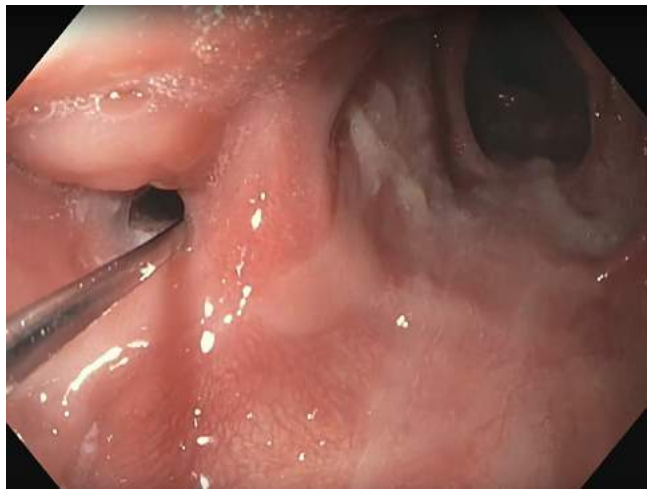


Figure 3. Endoscopic Dilations. Author's File.



Figure 4. Self-Dilation Training. Author's File.



Figure 5. Successful Self-Dilation. Author's File.

DISCUSSION

The practice of esophageal self-dilation, wherein the patient learns to routinely introduce a dilator (e.g., Maloney dilator) through the mouth, has been documented since the 1970s[3]. Several studies, predominantly retrospective in nature, have underscored the efficacy of this therapeutic approach in the management of RBES, demonstrating a decrease in the necessity for endoscopic dilations from an average of 21.7 annually to merely one[5]. A specific study involving 52 RBES patients at Clínica Mayo recorded a significant reduction in the frequency of endoscopic dilations from 9.5 (range 5-30) per year to 0 (range 0-3) annually, pre and post initiation of esophageal self-dilations, respectively ($p < 0.0001$). This intervention not only improved dysphagia symptoms but also increased the likelihood of discontinuing enteral nutrition tubes[3].

Our report showcases a successful instance of self-dilations in managing RBES. Illustrated in **Figures 1-5** and a step-by-step video on YouTube (https://youtu.be/94KkDmKgMsQ), all techniques utilized for addressing the complex stenosis, culminating in the self-dilations, are meticulously delineated. Specifically, a Savary dilator size 14 was employed. The intention is for these procedures to be disseminated within the medical community, thereby benefiting similarly selected patients.

CONCLUSION

Despite long-standing recognition in medical literature, research on self-dilation remains limited, primarily encompassing small, retrospective studies[5]. It can be concluded that self-dilation presents a viable therapeutic option for patients with RBES, characterized by high effectiveness and minimal adverse effects. Successful outcomes are contingent upon careful patient selection for this therapy.

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Case report

Endoscopic Management of Sharp Force Injury in the Esophagus: Case Report

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Abstract

Introduction: Esophageal trauma is a challenge because it may go unnoticed. These injuries are associated with high morbidity and mortality due to the increased risk of local or systemic infections that progress to sepsis and, finally, death. **Objective:** To describe a case of endoscopic management of a sharp force injury in the esophagus, which was corrected with hemostatic clips. **Case description:** A 28-year-old male patient with no significant history was referred due to a penetrating injury caused by a sharp weapon in region I of the neck at the sternal fork level. He had imaging findings suggestive of pneumomediastinum, so we opted for an endoscopic intervention with the initial plan of placing a fully covered esophageal prosthesis. However, given the location of the lesion and other risk factors, endoscopic management with hemostatic clips was performed, the evolution of which was satisfactory, and the patient was discharged without any complications. **Conclusions:** Esophageal perforation due to trauma continues to be a clinical situation that requires a high index of suspicion, so all tools for early diagnosis must be exhausted. Systemic complications such as mediastinitis must be avoided, given the high morbidity and mortality with which it is associated. Besides, each patient must be individualized according to their hemodynamic stability to determine the most appropriate intervention and reduce hospital stay. Endoscopy is an excellent alternative.

Keywords

Esophagus, trauma, gastrointestinal endoscopies, clips.

INTRODUCTION

Located anterior to the spinal column within the posterior and superior mediastinum, the esophagus's positioning renders injuries from trauma an uncommon occurrence. Literature suggests an incidence rate of approximately 10%[(1)]. The severity of these injuries is largely contingent upon the nature of the trauma and the involvement of adjacent critical structures such as major blood vessels, the airway, and the heart, with mortality rates ranging from 12% to 50% among patients presenting with any form of fistula. These percentages can rise in instances of undiagnosed conditions[(1,2)].

Diagnosing esophageal trauma presents a significant challenge due to the potential for injuries to remain unnoticed. When esophageal injuries lead to contamination of neighboring structures, they are associated with high rates of morbidity and mortality due to the risk of local or systemic infections, including mediastinitis. This condition can progress to sepsis, shock, and ultimately, death. Additionally, complications such as the development of abscesses, tracheoesophageal, or esophagocutaneous fis-

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tulas necessitate complex surgical interventions at advanced stages[3].

For any suspected case of esophageal injury, initiating antibiotic therapy and withholding oral intake are recommended to mitigate the high risk of mediastinitis. Surgical intervention serves as the primary management approach, supplemented by diagnostic imaging aids in patients without hemodynamic instability[4].

Esophageal trauma is deemed a surgical emergency. However, management strategies have primarily been outlined through a limited number of retrospective studies and expert recommendations, including options such as exploratory surgery and endoscopy[5]. This context sets the stage for presenting a case study focused on the successful endoscopic management of a sharp force injury to the thoracic esophagus.

CASE PRESENTATION

We report on a 28-year-old male, employed in informal work, with no notable medical history, who was transferred to our emergency department from a lower complexity hospital. The patient presented with a sharp force injury to the face and neck, which had occurred two hours prior and resulted in significant bleeding.

Upon initial assessment at the originating center, the patient received primary care that included wound irrigation and suturing, fluid therapy, broad-spectrum antibiotics comprising clindamycin 600 mg and gentamicin 240 mg intravenously, and a single dose of tetanus toxoid administered intramuscularly.

Upon admission to our secondary care facility, the patient's vital signs were within normal ranges: blood pressure (BP) at 120/70 mm Hg, heart rate (HR) at 60 beats per minute (bpm), partial oxygen saturation ($SpO_{2)}$ at 95%, and no signs of respiratory distress. The patient exhibited generalized pallor, weighed 75 kg, had a height of 173 cm, and a body mass index (BMI) of 25.1 kg/m^2. Physical examination revealed a sutured wound approximately 1 cm in length in region I of the neck at the sternal notch level, covered with a dressing without active bleeding, and a wound on the left temporal region with a dressing, showing signs of old bleeding, mild edema, and periorbital bruising. No subcutaneous emphysema was palpable, and no other significant findings were noted on examination.

An upper gastrointestinal endoscopy (UGIE) performed at a secondary institution revealed linear mirror-image wounds of 1 and 2 cm in length, located 25 cm from the dental arch, with an extrinsic perilesional hematoma. There was no clear evidence of a break in continuity, and the Z line and diaphragmatic pinch were observed at the same level without erosions. The preliminary diagnosis was a wound in the upper third of the esophagus with no complications (**Figure 1**), and the patient was advised against oral intake.



Figure 1. Linear mirror-image wounds of 1 and 2 cm in length. Courtesy of Dr. Edgardo Sánchez Gamboa.

The initial chest radiography was inconclusive, leading to further imaging with a contrast-enhanced neck CT scan. This imaging revealed the presence of air in the perivertebral, carotid, and retropharyngeal spaces, extending into the thoracic and posterior cervical regions (**Figure 2**). A contrast-enhanced chest CT scan confirmed a diagnosis of pneumomediastinum, indicated by a hypodense image consistent with air tracing from the neck through the visceral and prevertebral spaces and involving the mediastinum (**Figure 3**). A multidisciplinary team decided upon a repeat UGIE to attempt the placement of a fully covered self-expandable metal stent to avert the development of mediastinitis.



Figure 2. Neck CT scan with contrast, showing the presence of air in the perivertebral space with adjacent edema. Courtesy of Dr. Edgardo Sánchez Gamboa.

During the follow-up esophagoscopy, linear mirror-image wounds with well-defined edges, measuring 1 and 2 cm in length at 25 cm from the dental arch, were identified and approximated with two endoscopic clips each (**Figure 4**). A nasogastric feeding tube was placed under endoscopic guidance. The placement of a fully covered esophageal stent was

deemed inadvisable due to its proximity to the cricopharyngeal muscle and the associated high risk of stent migration.



Figure 3. Chest CT scan with contrast, illustrating pneumomediastinum as evidenced by a hypodense air image in the visceral and prevertebral space. Courtesy of Dr. Edgardo Sánchez Gamboa.

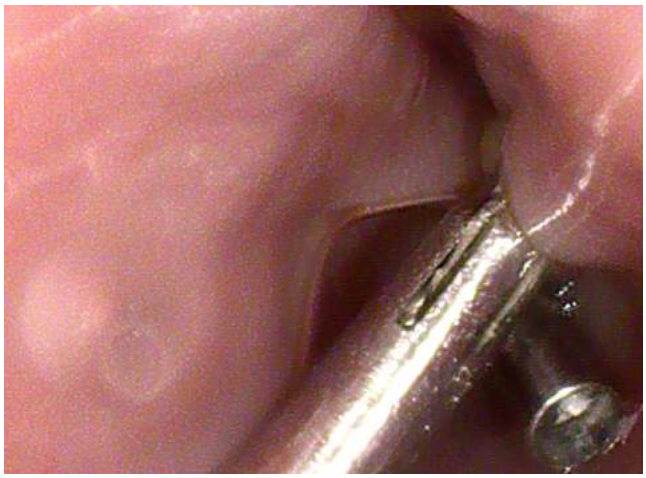


Figure 4. Linear mirror-image wounds approximated with double endoscopic clips. Courtesy of Dr. Edgardo Sánchez Gamboa.

On the seventh day following surgery, an esophagram was conducted to guide postoperative management strategies. This imaging study showed a satisfactory passage of contrast material through the esophagus into the stomach, without any indication of a tracheoesophageal fistula (**Figure 5**). Given the patient's swallowing difficulties, another UGIE was advised.

During the third UGIE, a healing wound was observed in the proximal esophagus. The patient subsequently recovered without any complications or difficulties swallowing, leading to his discharge from the hospital.

DISCUSSION

Esophageal trauma is acknowledged as a clinical condition linked to significant mortality. Hence, the essence of its management lies in the prompt identification and

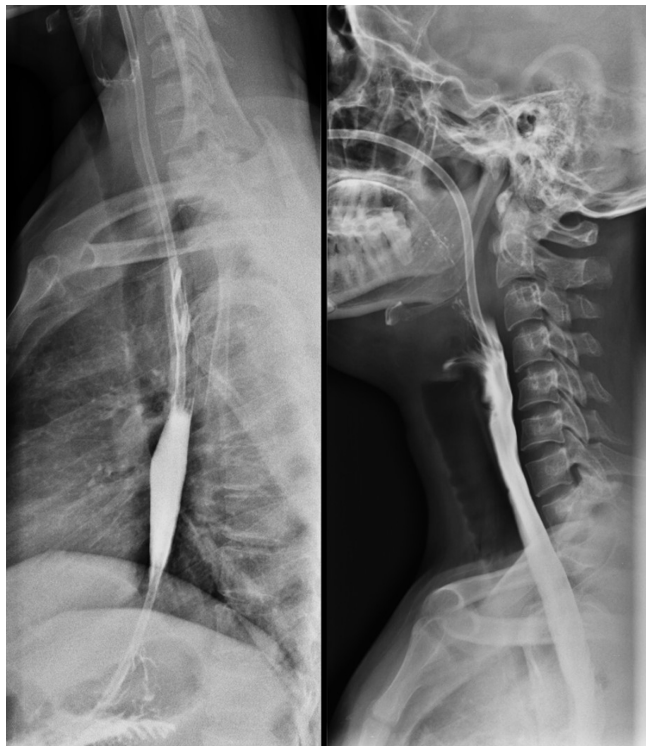


Figure 5. Esophagram demonstrating appropriate flow of contrast medium through the esophagus. Courtesy of Dr. Edgardo Sánchez Gamboa.

early intervention[6]. Surgical exploration is warranted for patients exhibiting hemodynamic instability, whereas stable patients might start with diagnostic imaging, such as plain chest radiography. This method is particularly useful for detecting free air within the mediastinum[7]. In our case, however, the initial chest radiograph did not provide conclusive results, prompting further assessment through UGIE, known for its 100% sensitivity in excluding injuries[8]. During the procedure, only a linear mirror-image wound was observed. There was no evident disruption of continuity, nor suspicion of mediastinal air, suggesting that withholding oral intake could be the most appropriate approach. Subsequent diagnostic evaluations, including contrast-enhanced CT scans of the chest and neck, confirmed the presence of pneumomediastinum. CT imaging has been documented as a valuable tool for identifying esophageal trauma and its associated local complications[9], as the case we present.

Management strategies vary from conservative approaches, such as the cessation of oral intake, administration of broad-spectrum antibiotics, and radiological monitoring, to surgical interventions like esophagectomy. Situated between these conservative and surgical extremes is minimally invasive management via endoscopic

techniques, reserved for patients without local or systemic complications who are stable from a hemodynamic standpoint[10]. In this case report, the patient maintained hemodynamic stability without any signs of an inflammatory response or clinical decline. Thus, the possibility of an endoscopic approach involving the placement of a fully covered esophageal stent was contemplated as a therapeutic option. However, this strategy was ultimately not pursued due to concerns over bronchoaspiration and intolerance of the device, largely because of its proximity to the cricopharyngeal muscle and a high risk of stent migration—a complication observed in up to 34% of patients with fully covered stents[11].

Given the patient's clinical stability, the specific locations of the two esophageal wounds, their linear nature with well-defined edges, and to circumvent additional complications, the decision was made to apply endoscopic clips to approximate the traumatic wounds. This method has rarely been delineated in the context of esophageal perforation treatment. Case reports have documented the use of over-the-scope clips (OTSC) and hemostatic clips, achieving up to a 100% effectiveness in restoring continuity in instances of esophageal perforation among patients undergoing peroral endoscopic myotomy (POEM)[12]. In contrast to our investigation, where conventional hemostatic clips were employed for esophageal perforation closure, there is scant literature, even though recent years have seen the introduction of less invasive techniques for gastroesophageal tract repairs. This topic remains contentious due to the lack of standardization in clip usage, with the preference still leaning towards the insertion of fully covered stents as the initial treatment choice[13].

It is pertinent to mention that the European Society of Gastrointestinal Endoscopy supports the deployment of clips for sealing perforations of up to 2 cm[14]. Our study aligns with the criteria for such intervention, deemed an appropriate approach in patients exhibiting hemodynamic stability. Furthermore, there is a noted case of successful esophageal fistula correction using endoscopic clips in a patient suffering from esophageal trauma due to a foreign body. Follow-up examination revealed total resolution of the leakage[15], reinforcing the potential of endoscopic clips as a viable emergency alternative for managing traumatic esophageal perforations.

CONCLUSION

Digestive endoscopy offers a minimally invasive therapeutic avenue, which results in decreased hospitalization duration, reduction in work-related leaves, lowered risk of systemic complications such as mediastinitis, and diminished pain from more invasive surgical techniques. At present, various strategies exist for the treatment of esophageal trauma, dependent on the patient's hemodynamic condition, and the wound's location, shape, and size, necessitating personalized treatment plans for each patient.

Conflict of Interest

The authors affirm that they have no conflicts of interest.

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Author Contributions

The research project was planned and developed by LGA, JSPB, ESG; LGA and JSPB were responsible for the design and data gathering; LGA, JSPB, ESG analyzed the clinical case; manuscript preparation for the dissemination of new knowledge to the scientific community was undertaken by LGA, JSPB, ESG; the final manuscript was reviewed and approved by LGA, JSPB, ESG.

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Case report

Seronegative Autoimmune Hepatitis: Case Report

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Abstract

Autoimmune hepatitis (AIH) is an immune-mediated inflammatory disease that requires the integration of histological abnormalities, characteristic laboratory findings, autoantibody positivity, and exclusion of other liver diseases for diagnosis. The case of a 28-year-old female patient with a week-long history of generalized jaundice associated with diffuse and intermittent abdominal pain is presented. Liver tests revealed hepatocellular injury (R factor = 17.6) with severe transaminitis (aspartate aminotransferase [AST]: 1.502 IU/L, alanine aminotransferase [ALT]: 2.029 IU/L) and conjugated hyperbilirubinemia (total serum bilirubin: 10.9 mg/dL, direct bilirubin: 8.50 mg/dL). Serological tests for hepatotropic viruses were negative, as were autoantibodies for autoimmune hepatitis. Percutaneous liver biopsy revealed findings compatible with autoimmune hepatitis. The revised 1999 International Autoimmune Hepatitis Group (IAIHG) score was calculated pretreatment, resulting in a score of 16, thus diagnosing it as definitive severe AIH. The patient was treated with oral steroids, obtaining clinical and biochemical improvement, so she was discharged after seven days of hospitalization without incidents. Maintaining a high index of suspicion for AIH, despite the initial negativity of autoantibodies, and complementing the diagnostic approach with percutaneous liver biopsy allow the timely diagnosis and treatment of this group of patients, thus preventing progression to advanced cirrhosis and its complications.

Keywords

Seronegative autoimmune hepatitis, liver biopsy, autoantibodies, transaminitis, hepatocellular injury.

INTRODUCTION

Autoimmune hepatitis (AIH) is characterized as an immune-mediated inflammatory disorder lacking distinctive diagnostic markers. Its diagnosis necessitates histological anomalies, specific laboratory findings, autoantibody positivity, and the exclusion of alternative hepatic conditions such as viral hepatitis, hereditary diseases, metabolic and cholestatic disorders, among others[1,2]. The diagnostic challenge in AIH stems from its broad spectrum of clinical presentations, the absence of pathognomonic features, and variability in the treatment outcomes[3].

CASE PRESENTATION

This report details the case of a 28-year-old female patient with no personal pathological history, medication or hepatotoxin use, alcohol consumption, other toxic habits, or a family history of autoimmune diseases. She presented with a week-long progression of cutaneous jaundice, mucosal and scleral icterus, associated with diffuse and intermittent abdominal pain. Persistent jaundice and the onset of generalized itching prompted her emergency department visit. Upon admission, she exhibited normal vital signs, and the physical examination revealed generalized jaundice

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and abdominal pain upon deep palpation in the upper right quadrant, with the remainder of the physical examination showing no abnormalities.

Initial laboratory tests did not reveal any abnormalities beyond those described in **Table 1**. The R factor was calculated (Formula: patient's ALT/upper normal limit of ALT ÷ patient's alkaline phosphatase/upper normal limit of alkaline phosphatase) to assess the predominant alteration pattern in liver tests, yielding a result of 17.6, indicative of hepatocellular injury (R factor > 5 denotes hepatocellular injury, < 2 cholestatic injury, and 2-5 a mixed pattern)[4]. General urine examination (GUE) reported positive urobilinogen, while inflammatory markers such as procalcitonin and C-reactive protein (CRP) were found to be negative.

An abdominal ultrasound was conducted, yielding the following results: the liver exhibited normal shape and size, with no discernible abnormalities in the gallbladder or bile ducts. In the color Doppler assessment, intrahepatic vessels demonstrated unremarkable perfusion. Subsequent testing for hepatotropic viruses, including anti-HAV IgM, HbsAg, ELISA Anti-HCV, anti-HBc IgM, and anti-HEV IgM, returned negative results. Similarly, a panel testing for non-hepatotropic viruses, comprising herpes virus, varicella-zoster virus, cytomegalovirus, and Epstein-Barr virus, also showed negative findings for both IgG and IgM. Additionally, a fourth-generation rapid test for HIV was non-reactive. Autoantibody screening for autoimmune hepatitis encompassed ANA, SMA, anti-LKM1, anti-LC1, and anti-SLA antibodies, all of which were negative. Quantification of IgG levels revealed a value of 4316.1 mg/dL, surpassing the reference range of 600-1600 mg/dL.

Following these investigations, a percutaneous liver biopsy was undertaken, yielding histological features consistent with AIH (**Figure 1**). These included a lymphoplasmacytic infiltrate in the portal and periportal regions, indicative of interface activity, as well as lobular and hepatic necrosis, pericentral necrosis, and the absence of ductal lesions. Masson's trichrome staining failed to reveal collagen deposition. Utilizing the revised International Autoimmune Hepatitis Group (IAIHG) scoring system from 1999[5], a pre-treatment score of 16 points was calculated, affirming the diagnosis of definitive AIH.

Treatment was commenced following the clinical guidelines of the American Association for the Study of Liver Diseases (AASLD)[6]. Prednisone was administered at a dosage of 60 mg/day, and the patient responded favorably, exhibiting clinical and biochemical improvement. This was evidenced by the normalization of the international normalized ratio (INR) and a decrease in transaminase levels by day three of corticosteroid therapy. After seven days of hospitalization, the patient was discharged, and azathioprine at a dose of 50 mg was introduced at week two

Table 1. Liver Tests Before and After Initiation of Corticosteroid Therapy

Laboratories	Initial	At the Beginning of Therapy	Day Three of Therapy	Day Seven of Therapy	Week Four of Therapy	Week Twelve of Therapy
TSB (mg/dL)	10.90	15.70	9.80	2.90	0.50	0.7
DB (mg/dL)	8.50	11.80	8.10	2.50	0.40	0.4
IB (mg/dL)	2.40	3.9	1.70	0.40	0.10	0.3
AST (UI/L)	**1.502.0**	**997**	**275**	191	25	27
ALT (UI/L)	**2.029.0**	**1840.0**	**681**	73.1	50	30
ALP (IU/L)	115	138	135	183.0	115	112
INR	**1.6**	1.68	1.17	1.09	1.0	1.1
GGT (U/L)	276					
Albumin (g/dL)	4.0			3.3	NR	
Globulins (g/dL)	5.1			4.1	NR	
IgG (mg/dL)	**4316.1**					1091.5

ALT: Alanine Aminotransferase; AST: Aspartate Aminotransferase; DB: Direct Bilirubin; IB: Indirect Bilirubin; TSB: Total Serum Bilirubin; ALP: Alkaline Phosphatase; GGT: γ-Glutamyl Transferase; IgG: Immunoglobulin G; INR: International Normalized Ratio; NR: Not Reported. Author's own research.

of treatment. At the three-month follow-up, the patient remained asymptomatic and demonstrated biochemical remission, with liver tests and IgG values within normal ranges (**Table 1**).

DISCUSSION

HAI manifests worldwide, transcending ethnic and age boundaries with a bimodal distribution pattern: one peak occurs between ages 10 and 18, and another surfaces between the fourth and sixth decades of life. The condition predominantly affects females, with a 3:1 female-to-male ratio. Global incidence rates are estimated to range from 0.67 to three cases per 100,000 person-years[2,6,7]. According to a recent Colombian retrospective cohort study, 80% of patients were female with a median age of 49 years[8].

The precise pathophysiological mechanisms leading to hepatic autoimmunity are yet to be fully understood.

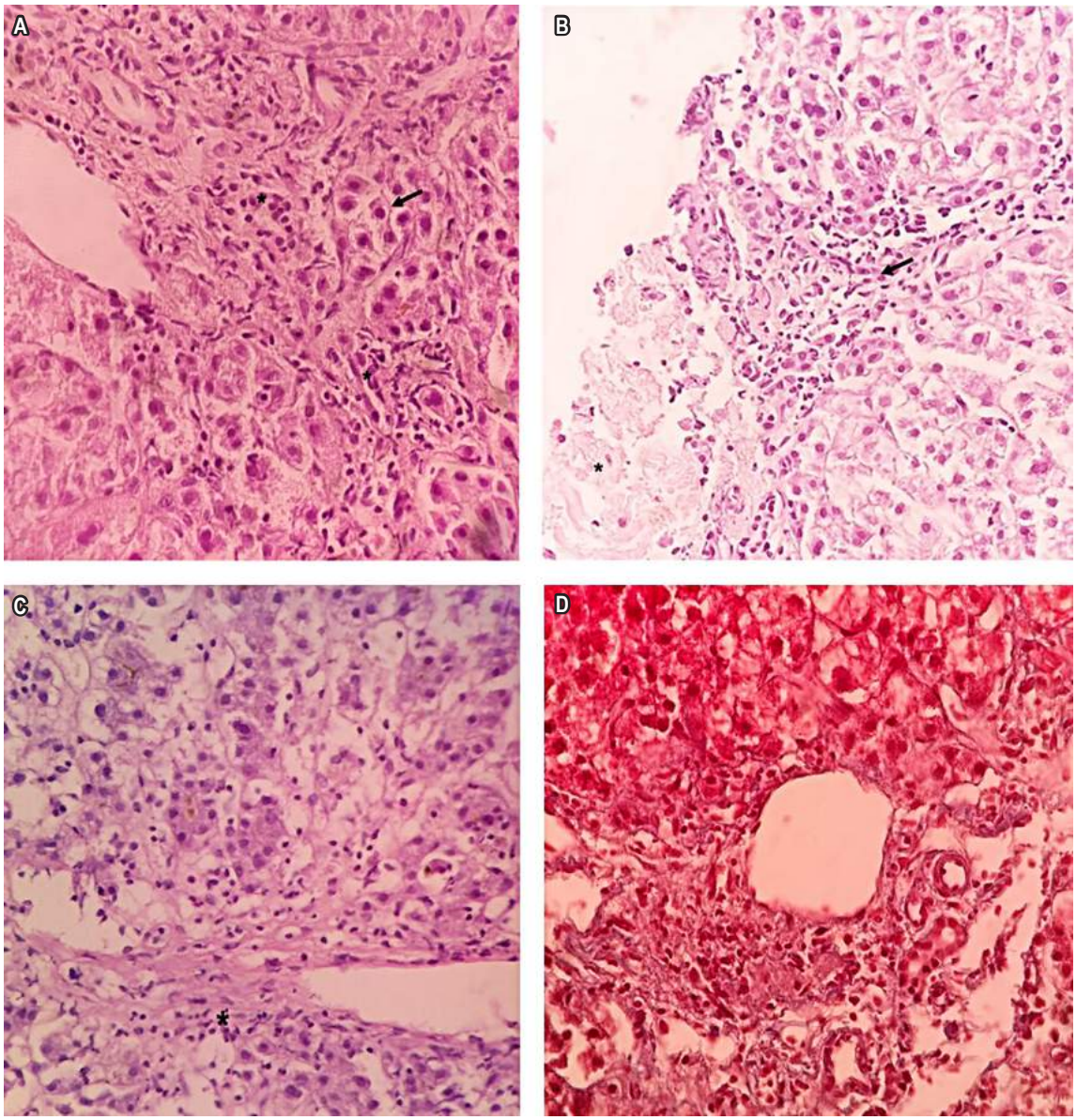


Figure 1. A. *: Interface activity. Arrows: Hepatocytes with a regenerative appearance (hematoxylin and eosin [H/E] stain: 20x magnification). **B.** *: Moderate necroinflammation (grade 2) at the lobule level. Arrow: Lymphoplasmacytic inflammatory infiltrate (H/E stain: 20x magnification). **C.** *: Inflammation and necrosis surrounding a central vein. Centrolobular interface necrosis (grade 1). **D.** Masson's trichrome staining at 20x magnification. No collagen deposition, stage 0. Activity at grade I. **D.** Basal membranes of the biliary ducts preserved.

Current hypotheses suggest a multifactorial etiology, encompassing genetic and epigenetic factors, aberrant autoregulatory immune mechanisms, and environmental precipitants[7,9]. The breakdown of self-tolerance to hepatic autoantigens triggers an immune reaction. Regulatory T cells (Tregs) fail to suppress the autoimmune response to these antigens when confronted with environmental factors, such as viral infections or xenobiotics. Antigen-presenting cells (APCs) then present autoantigenic peptides to naive Th $CD4^+$ cells through α/β T cell receptors (TCRs). Specific cytokine secretions prompt B cells to produce autoantibodies, lead to the development of regulatory B cells (Bregs), activate macrophages, and instigate pathogenic cytotoxicity via T_h17 $CD4^+$ cells. The resulting infiltration of inflammatory effector cells leads to periportal and lobular cytotoxicity, necroinflammatory hepatocyte destruction, and the activation of periportal stellate cells. These cells amplify the local immune response and drive the progression of portal fibrosis, which, without immunosuppressive treatment, can progress to cirrhosis[6,7].

The absence of defining characteristics complicates the diagnosis of HAI, relegating it to one of exclusion. The clinical manifestation spectrum is broad and varies by race, from asymptomatic liver disease to severe hepatitis presentations[6,7]. Acute onset (< 30 days) occurs in about 25%-75% of patients, with 3%-6% developing acute liver failure[2]. The majority will have chronic, nonspecific symptoms like fatigue, malaise, and arthralgia before presentation. The physical exam may be unremarkable or occasionally reveal hepatomegaly, painful splenomegaly, and, in advanced cirrhosis, clinical signs of chronic liver pathology, such as palmar erythema, spider angiomas, and gynecomastia[2,6,7].

Autoantibodies serve a diagnostic purpose during acute HAI episodes[3]. ANAs are present in 80%, SMAs in 63% and anti-LKM1 in 3% of cases[6]. Isolated serological findings of ANA, SMA, or anti-LKM1 occur in 49% of patients, while 51% possess multiple antibodies. ANAs are either undetectable or present in low titers in 30%-40% of patients[10]. Serum IgG levels are found to be normal in 25%-39% of the cases[3,6,7].

Circulating autoantibodies are absent in approximately 10% of patients with autoimmune hepatitis[11-13]. The prevalence of seronegativity is subject to regional variation and study design: for instance, in a cohort of 167 Chinese patients, 10.2% were seronegative[10]; in a study of 278 patients in Medellín, the seronegativity rate was 8.6%[14]; whereas a European study on 126 patients with cryptogenic hepatitis found that 34% were classified as seronegative AIH based on the IAIHG diagnostic score[15]. Seronegativity may arise from the inability of current assays to detect antigen-antibody complexes, the presence of antibodies not yet identifiable by commercially available tests, or fluctuations in antibody levels[13]. Seronegative AIH patients tend to present more frequently with severe disease compared to their seropositive counterparts (50% vs 20.3%), possibly due to immune dysfunction secondary to liver failure; however, the response to treatment generally parallels that of seropositive AIH[16].

In AIH, liver biopsy remains an essential and obligatory procedure for confirming diagnosis, assessing the severity and the level of inflammatory activity, and ruling out other liver diseases. Interface hepatitis stands out as a distinguishing feature in AIH. According to the 2008 simplified IAIHG criteria, the presence of interface hepatitis alone aligns with an AIH diagnosis, and this is often accompanied by a plasma cell infiltration in 66% of cases, emperipolesis in 65%, and lobular hepatitis in 47%[6,17,18].

To aid and standardize AIH diagnosis, various diagnostic scoring systems have been proposed. The original IAIHG scale, introduced in 1993[19] and revised in 1999[5], was supplemented by a simplified scoring system published in 2008[20]. The 1993 scale was deemed too intricate, incorporating clinical, biochemical, histological, and genetic parameters, and evaluating the response to treatment[19]. The 1999 revision, although still complex, struggled to effectively distinguish between AIH and cholestatic syndromes[21].

The 2008 simplified score offers a pragmatic, clinic-friendly alternative that relies on just four parameters: autoantibodies, hypergammaglobulinemia, histology, and exclusion of viral hepatitis[20]. The simplified and revised scores have comparable diagnostic accuracies in patients exhibiting classical AIH features; nonetheless, the simplified score may not suit cases with atypical features or seronegativity, for which the more comprehensive 1999 revised score is advised [22,23]. The latter is also suggested to be more effective for diagnosing acute onset AIH with severe presentation[3].

CONCLUSIONS

AIH is a relatively rare clinical entity posing a significant diagnostic challenge. It necessitates the assimilation of congruent clinical, paraclinical, and histopathological evidence. Diagnostic scales like the IAIHG's revised or simplified versions contribute to the standardization of the diagnostic process. Effective management with corticosteroids and immunosuppressive agents facilitates remission of hepatic inflammation and hepatic fibrosis regression, thereby averting progression to advanced cirrhosis and its attendant complications.

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Conflict of Interest

The authors report no conflicts of interest in relation to this article.

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Case report

Todani Type I Common Bile Duct Cyst in an Adult Patient: Clinical Case and Literature Review

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Abstract

Bile duct cysts are characterized by intrahepatic or extrahepatic bile duct dilation. It is a rare congenital pathology, diagnosed mainly in children. The clinical manifestation in adults is usually nonspecific but essential due to their increased risk of developing carcinoma. We present the case of a 37-year-old female patient who consulted for pain in the epigastrium radiating to the right hypochondrium, associated with emesis and choluria. The hepatobiliary ultrasound was normal, but due to the risk of choledocholithiasis, a magnetic resonance cholangiopancreatography was performed, revealing a cystic dilation of the proximal common bile duct of approximately 2 cm, classified as Todani type I. Bile duct cysts have been associated with several complications, and cholangiocarcinoma is the most important. The probability of malignancy is higher in adults and Todani type I cysts.

Keywords

Common bile duct cyst, common bile duct, abdominal pain, Roux-en-Y anastomosis, case reports.

INTRODUCTION

Choledochal cysts, also known as bile duct cysts, are congenital abnormalities characterized by the dilation of the intrahepatic or extrahepatic biliary ducts. They account for 1% of hepatic anomalies with estimated incidences ranging from 1 in 100,000 to 1 in 150,000 in Western populations and as frequent as 1 in 1,000 in certain Asian populations[1,2], with a female predominance[3]. Although typically identified in childhood, accounting for approximately 25% of cases[4], the incidence in adults is on the rise[5,6].

The underlying cause of persistent choledochal cysts is unclear, but the most widely accepted hypothesis is that proposed by Babbit in 1969[7]. This theory posits an anomalous junction of the pancreatic duct and the bile duct, which merge 1.5-4 cm distal to the sphincter of Oddi, forming a "common channel" that permits the reflux of pancreatic secretions into the biliary duct, a condition known as "pancreatobiliary reflux". The resulting activation of pancreatic enzymes leads to inflammation and thickening of the bile duct walls, prompting dilation. This is supported by reports of elevated amylase in the bile in patients with this conditions compared to those without it[8,9]. Babbit's theory accounts for 50%-80% of cases since not every patient with this long common channel develops a cyst; likewise, not every patient with a choledochal cyst has such

a channel[10]. Alternative theories propose the absence of ganglion cells, dysfunction of the sphincter of Oddi, and a weakened bile duct wall[11,12].

In 1959, Alonso-Lej[13] categorized choledochal cysts; subsequently, Todani and colleagues[14] revised this classification, which is now widely adopted. Five types of choledochal cysts are delineated based on location and morphology (**Table 1**)[15]. Clinical presentation varies according to age groups.

Prenatal ultrasound diagnoses have been made at an average gestational age of 20 weeks[16,17]. The classical triad of pain, right hypochondrial mass, and jaundice is primarily observed in children[18]. However, studies suggest that this triad's prevalence is relatively low[18-20]. In adults, symptom presentation is typically vague and nonspecific, with abdominal pain being the most frequently reported symptom[1,20]. When more specific symptoms do occur, they tend to be associated with complications such as cholangitis and pancreatitis[1,8,21]. Laboratory parameters are not diagnostic, though findings may include hyperamylasemia, raised levels of direct and total bilirubin, aminotransferases, and alkaline phosphatase[22,23].

Table 1. Todani's Classification of Choledochal Cysts and Their Frequency.

Type	Description	Frequency
 IA IB IC	Isolated dilation of the extrahepatic bile duct - **IA:** Cystic - **IB:** Saccular - **IC:** Fusiform	80%-90%
 II	Diverticulum	2%
 III	Choledochocele affecting the intraduodenal portion of the bile duct	4%-5%
 IVA IVB	Dilation of intra- and extrahepatic ducts - **IVA:** Intra- and extrahepatic cysts - **IVB:** Multiple extrahepatic cysts	10%
 IV	Saccular dilation limited to the intrahepatic biliary tree (Caroli's disease)	Rare

Author's own research.

Diagnosis of a bile duct cyst relies on identifying biliary dilation once other causes have been excluded, such as neoplasia or stones[24]. Ultrasound often serves as the initial imaging modality, proving highly effective in detecting cystic structures with a sensitivity rate between 71%-97%, particularly in pediatric cases[2,11,23,25]. Computed tomography is instrumental in illustrating the cyst's continuity with the biliary tree, as well as assessing its relations and potential malignancy[26]. Endoscopic retrograde cholangiopancreatography (ERCP) has largely been superseded by magnetic resonance cholangiopancreatography (MRCP), which remains useful in diagnosing choledochoceles[8,27,28]. MRCP is lauded for its precise delineation of anatomical pathology, including abnormal pancreatobiliary junctions, and for detecting ductal stones and tumors, rendering it the gold standard without the associated risks of ERCP[29,30].

CASE PRESENTATION

We present the case of a 37-year-old female with a surgical history inclusive of hysterectomy and three prior hospitalizations for epigastric pain, which ultrasound assessments had interpreted as acid peptic disease. The patient sought consultation for epigastric pain radiating to the dorsolumbar region described as a burning sensation, rated 8/10 in intensity, accompanied by multiple episodes of food and bilious vomiting, oral intake intolerance, and choluria. Physical examination did not reveal signs indicative of an acute abdomen. Laboratory tests indicated positive C-reactive protein (CRP), with elevated total bilirubin at 3.16 mg/dL, direct bilirubin at 2.90 mg/dL, alkaline phosphatase at 175 U/L, alanine aminotransferase (ALT) at 300.7 U/L, aspartate aminotransferase (AST) at 248.2 U/L, and urinalysis displaying bilirubin at 1 mg/dL with no additional anomalies.

Subsequent abdominal ultrasound reported a gallbladder containing small calculi, with normal-caliber intra- and extrahepatic bile ducts and a common bile duct measuring 4.5 mm. Owing to the risk of choledocholithiasis, an MRCP was performed, which depicted a normal-sized gallbladder devoid of calculi, cystic dilation of the proximal common bile duct approximately 2 cm below the hepatic duct bifurcation extending to the ampulla of Vater, absence of stones in the common bile duct, and non-dilated intrahepatic bile duct (**Figure 1**).

The patient was diagnosed with a choledochal cyst and underwent cyst resection followed by bilio-digestive bypass via Roux-en-Y hepaticojejunostomy (**Figure 2**).

The surgical exploration revealed a distended gallbladder, a 3 mm cystic duct, and a choledochal cyst measuring 5 x 4 cm with a proximal neck situated 5 mm from the bifurcation of the hepatic ducts and a distal retro-duodenal neck with thickened walls adherent to the portal vein (**Figure 3**). Two pathological samples were taken: one from the choledochal cyst and one from the gallbladder (**Figure 4**).

RESULTS

The surgical procedure was carried out without any adverse events, and the patient's postoperative recovery was free of complications. At a follow-up visit fifteen days post-surgery, the patient presented a pathology report which confirmed acute cholecystitis and a benign choledochal cyst.

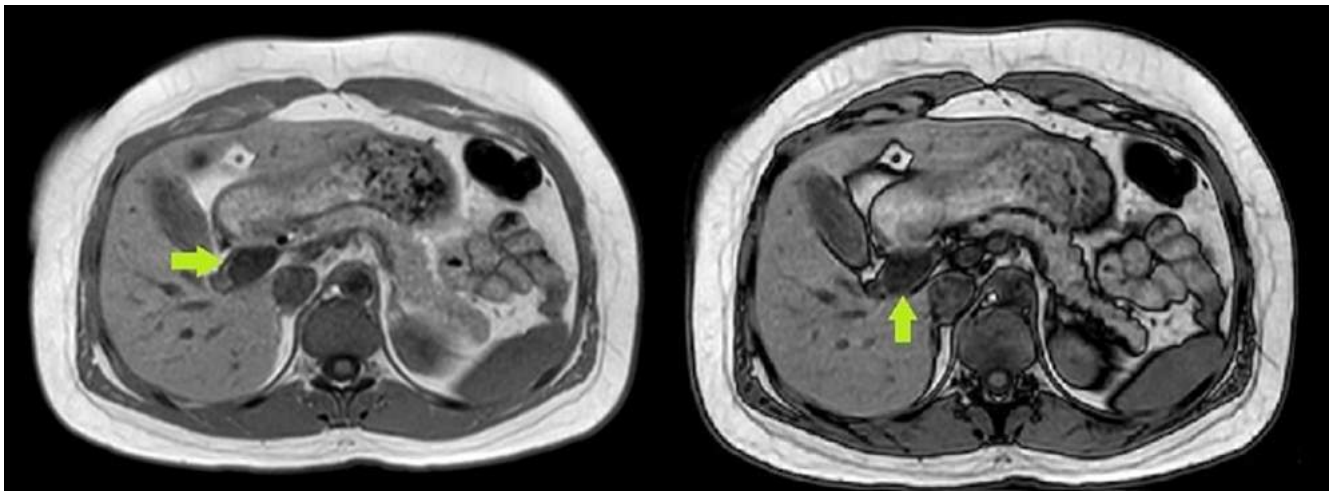


Figure 1. Magnetic resonance cholangiopancreatography (coronal section) with a green arrow pointing to the choledochal cyst. Author's own research.



Figure 2. Roux-en-Y hepaticojejunostomy. Author's own research.

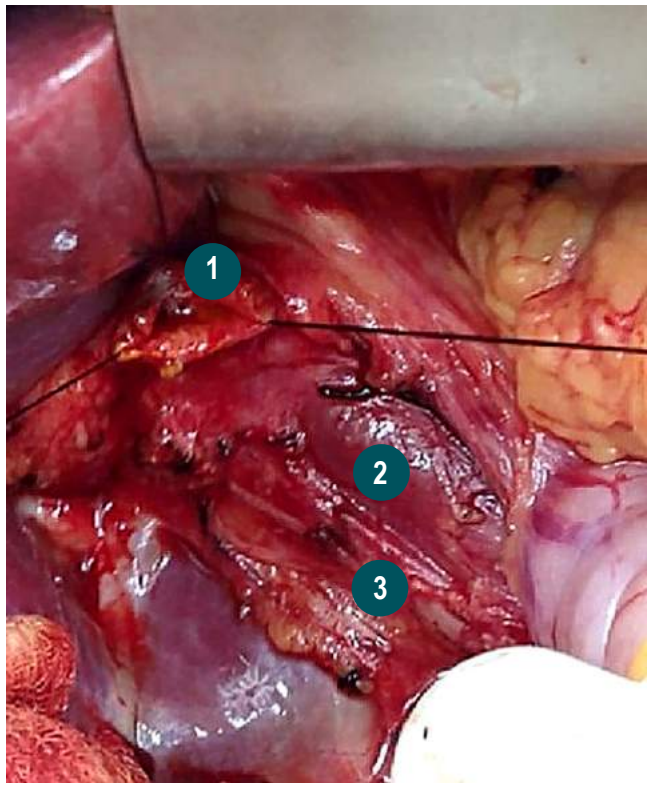


Figure 3. Anatomical structures. **1.** Confluence of the hepatic ducts. **2.** Portal vein. **3.** Right hepatic artery originating from the superior mesenteric artery. Author's own research.



Figure 4. Pathological specimen of the choledochal cyst. Author's own research.

DISCUSSION

The diagnosis of choledochal cysts in the adult population is becoming increasingly frequent[1,19,24,30]. In the case under discussion, the definitive diagnosis was established via MRCP after the initial ultrasound yielded inconclusive results. The clinical symptoms and laboratory findings were indicative of cholestasis, prompting the decision to proceed with more definitive imaging. While ultrasound remains the most accessible and cost-effective imaging technique, its variable sensitivity ranging from 71% to 97% can miss choledochal cysts, unlike MRCP, which boasts a detection rate of 96% to 100%[29]. Prompt diagnosis and intervention are paramount given the elevated risk of complications associated with choledochal cysts in adults, which include obstructive jaundice, symptomatic choledocholithiasis, pancreatitis, secondary biliary cirrhosis, and notably, cholangiocarcinoma[1,31,32]. The malignancy risk is reported to be approximately 10%-30%[6,29,30], and it escalates with age—from 0.7% in the first decade to over 10% beyond the second decade, with more than half of the patients older than 60 years with choledochal cysts showing malignancy[1,22]. The cyst type is another risk

factor, with type I presenting the highest incidence at 68%, followed by type IV at 21%[6,14,33].

Consequently, the management of choledochal cysts consists of complete surgical excision[6,34]. Resection of the cyst along with Roux-en-Y hepaticojejunostomy is the procedure of choice for type I and IV cysts[29,30], and partial hepatectomy may be necessary for type IVA. Type II cysts warrant excision and possibly biliary-enteric repair[2,29,35]. Treatment for type III cysts may involve sphincteroplasty, sphincterotomy[36], or the insertion of a drainage tube into the duodenum[11]. For Todani type V, options include segmental liver resection, liver transplantation, or close patient monitoring to preempt complications[29,37,38].

The emergence of minimally invasive surgery has established laparoscopic surgery as a safe and valid alternative. When compared to open surgery, the laparoscopic approach reduces the need for transfusions and shortens the recovery period, despite a typically longer operative duration[39,40].

CONCLUSIONS

Diagnosing biliary cysts is a significant challenge due to the nonspecific nature of the symptoms and signs associated with the condition. Ultrasound is an effective and cost-effective first-line imaging modality for diagnosing biliary cysts; however, as evidenced in the presented case, a negative ultrasound does not eliminate the possibility of disease. Hence, MRCP is crucial for definitive diagnosis, serving as the gold standard in the detection of choledochal cysts and in ruling out lithiasis and neoplasia. Cyst resection remains the preferred treatment approach due to the significant risk of malignant transformation associated with these cysts.

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Case report

Biliary Obstructive Syndrome as an Atypical Manifestation of Weil's Disease: A Case Series

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Abstract

Leptospirosis is a systemic zoonotic infection transmitted through the skin, mucous membranes, or ingestion of water contaminated with pathogenic spirochetes of the genus *Leptospira* in infected mammals and rodents. It appears with nonspecific symptoms of acute onset associated with abdominal pain, subconjunctival hemorrhage, and jaundice, which usually has complete resolution in the majority of patients. However, in a lower percentage, it can progress, causing severe systemic complications, with a high risk of mortality mainly due to acute kidney failure, liver dysfunction associated with jaundice, and hemorrhages, called *Weil syndrome* or *icterohemorrhagic fever*.

We present a series of cases of patients with biliary obstruction as the primary manifestation of severe leptospirosis.

Keywords

Weil's disease, leptospirosis, choledocholithiasis.

INTRODUCTION

The infection by leptospira in humans is transmitted through direct contact with mucous membranes and, to a lesser extent, through the skin, as well as indirectly by the consumption of water contaminated by pathogenic spirochetes. These spirochetes originate from infected mammals and rodents, predominantly dogs, cattle, and rodents, placing individuals living in poverty and those with a high risk of occupational exposure, such as farmers, agricultural workers, and ranchers, including those involved in sewer cleaning, at increased risk.(1)

The nonspecific nature of its symptoms complicates and delays diagnosis, often presenting with flu-like symptoms, neurological changes, and conjunctival hyperemia. This condition usually resolves in 90% of patients. However, in a minority of cases, it can lead to serious complications, such as acute nephropathy, hepatic dysfunction, and hemorrhages, known collectively as Weil's disease, which is associated with a high mortality rate.

This article presents a series of three patients who exhibited obstructive biliary syndrome as the primary manifestation of Weil's disease.

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CASE REPORTS

Case 1

A 42-year-old female patient with a history of alcoholic cirrhosis, working as a street vendor near sewer drains, presented with an eight-day history of polyarticular pain, jaundice, and neurological alterations including paraparesis and severe headaches, accompanied by tachycardia and upper hemiabdominal pain with palpable hepatosplenomegaly, but no signs of peritoneal irritation.

Initial laboratory tests revealed hemoglobin at 9 g/dL, leukocytes at 12,430, neutrophils at 90.8%, platelets at 21,000 µL, creatinine at 1.2 mg/dL, ALT at 90 U/L, AST at 74 U/L, and significant hyperbilirubinemia with a total bilirubin of 29 mg/dL, primarily due to direct bilirubin at 18 mg/dL. An abdominal ultrasound suggested cholelithiasis and choledocholithiasis without cholecystitis, leading to an endoscopic retrograde cholangiopancreatography (ERCP) with removal of a stone from the distal bile duct. After symptomatic improvement, the patient was discharged.

Fourteen days later, the patient returned with myalgias, encephalopathy, and jaundice. A follow-up abdominal ultrasound showed slight dilation of the intra- and extrahepatic bile ducts, highly suggestive of choledocholithiasis necessitating ERCP, which the patient declined.

Given the patient's occupational exposure and clinical presentation of recurrent obstructive biliary syndrome, an infectious disease consultation was sought. Leptospirosis was suspected, prompting the request for leptospira immunoglobulin M (IgM), which tested positive. However, during her hospital stay, she developed acute kidney injury with creatinine at 3.01 mg/dL and blood urea nitrogen (BUN) at 74.2 m/dL, alongside abdominal pain and hemorrhaging. An upper gastrointestinal endoscopy revealed acute gastropathy. Due to her hemodynamic instability, an emergency exploratory laparotomy was performed, revealing 4000 mL of citrine fluid in the cavity and a cirrhotic liver with multiple nodules, with no other pathological surgical findings. Despite these interventions, the patient's hemodynamic instability persisted, leading to her death in the immediate postoperative period.

Case 2

This case involves a 39-year-old male patient, a migrant with a prior diagnosis of cholelithiasis, who is employed as a grocer. He sought medical attention due to a week-long history of abdominal pain, which was accompanied by diarrheal stools, episodes of vomiting, and intermittent fever spikes.

At the time of admission, the patient was found to be hemodynamically unstable and exhibited jaundice. There was noted pain upon palpation in the right hypochondrial region, though no signs of peritoneal irritation were evident. Laboratory results at admission highlighted leukocytosis with a white blood cell count of 15,200, neutrophils constituting 89%, a platelet count of 25,000 µL, acute kidney injury evidenced by a creatinine level of 2.5 mg/dL and a BUN level of 60.8 m/dL. Liver function tests revealed an ALT of 84 U/L, AST of 70 U/L, and hyperbilirubinemia with a total bilirubin of 25 mg/dL, of which direct bilirubin comprised 10 mg/dL. An abdominal ultrasound suggested the presence of cholelithiasis and acute cholecystitis, with a moderate suspicion of choledocholithiasis. The patient subsequently developed septic shock attributed to a biliary origin, necessitating initiation of vasopressor support, fluid resuscitation, and antibiotic therapy in the intensive care unit (ICU). Renal replacement therapy was also planned.

Given the suspicion of cholangitis, an ERCP was performed. The procedure identified a bile duct dilation of 7 mm without internal calculi, but abundant biliary sludge and no filling defects were observed. Following an improvement in the infectious condition, the decision was made to proceed with a laparoscopic cholecystectomy, considering the possibility of intraoperative cholangiography or exploration of the bile duct due to the suspicion of a residual bile duct stone. Attempts to cannulate the cystic duct with a Nelaton catheter were unsuccessful, leading to a conversion to laparotomy. A fundocystic cholecystectomy was performed, and the cystic duct was successfully cannulated without the extraction of pus.

Despite these interventions, the patient continued to exhibit leukocytosis and mixed hyperbilirubinemia. This led to a reevaluation of potential underlying causes. The patient disclosed consumption of food prior to symptom onset, which he described as having a "rat-like smell", prompting the request for leptospira antibodies testing, which returned positive. The infectious diseases team recommended an antibiotic regimen of ceftriaxone 2 g/day for seven days. The patient showed a favorable response, culminating in the resolution of hyperbilirubinemia. Following the completion of antibiotic therapy, the patient was discharged from the hospital.

Case 3

A 41-year-old male with no significant medical history, employed in agriculture, presented with symptoms persisting for five days, including polyarticular pain, vomiting, headache, and abdominal discomfort.

At the time of hospital admission, the patient was found to be hemodynamically stable. Examination revealed localized abdominal tenderness in the upper right quadrant, but no signs indicative of peritoneal irritation were obser-

ved. Laboratory analysis showed hemoglobin at 10.7 g/dL, a leukocyte count of 28,540 with 90.8% neutrophils, platelets at 21,000 µL, creatinine at 3.41 mg/dL, BUN at 67.8 m/dL, AST at 82.6 U/L, ALT at 105.9 U/L, total bilirubin at 41.36 mg/dL, and direct bilirubin at 34.2 mg/dL.

Due to a decline in his overall health, the patient was transferred to the ICU for further management. A comprehensive abdominal ultrasound revealed cholelithiasis, acute cholecystitis, and choledocholithiasis, leading to a diagnosis of abdominal sepsis secondary to Tokyo III classified cholangitis.

The patient underwent an exploratory laparotomy, including cholecystectomy and bile duct exploration with T-tube and Jackson-Pratt drain placement. Surgical findings were notable for minimal ascitic fluid, edematous gallbladder, and cholelithiasis, without evidence of cholecystitis or bile duct stones. Intraoperative cholangiography did not identify any filling defects.

In light of his clinical instability and ambiguous symptomatology, a series of tests were conducted to identify possible infectious causes, effectively ruling out human immunodeficiency virus (HIV), syphilis, hepatitis B, hepatitis C, and cytomegalovirus. The patient exhibited coagulation abnormalities and continued thrombocytopenia, accompanied by bleeding from the surgical drain, necessitating a subsequent surgical intervention for hepatoduodenal ligament ligation.

Subsequent testing for IgM antibodies against leptospira returned positive, prompting the initiation of a targeted antibiotic regimen with ceftriaxone 2 g/day for seven days. This treatment led to a notable improvement in the patient's condition, culminating in his discharge from the hospital.

DISCUSSION

Leptospirosis is recognized as a zoonotic disease prevalent in both urban and rural settings, caused by the infection of spirochetes belonging to the genus *Leptospira*. This disease affects mammals and rodents[2], leading to epidemic or seasonal outbreaks[3]. Transmission occurs through direct contact with contaminated animal skin, mucous membranes, or bodily fluids, or indirectly through the ingestion of water tainted by infected animals[4]. It predominantly affects individuals in low-income areas, those lacking proper sanitation, individuals working in sewage systems, and those engaged in agricultural activities[1].

The clinical presentation of leptospirosis is notably nonspecific and varies depending on several factors, including the tropism of the causative agent, the stage of the disease, and the overall health condition of the patient. Approximately 90% of cases are either mild or anicteric, displaying nonspecific symptoms similar to those of various other febrile illnesses, hemorrhagic fevers, dengue, or bacterial infections[5]. Most of these cases resolve spontaneously without intervention[6]. In contrast, a smaller proportion of cases manifest in an icteric form, featuring conjunctival suffusion and acute kidney injury[7]. These cases tend to have more severe outcomes and may also present as Weil's disease or icterohemorrhagic fever, which are characterized by significant severity and high mortality rates[8].

Jaundice in leptospirosis results from hyperbilirubinemia and elevated liver enzyme levels, accompanied by acute nephropathy characterized by proteinuria, azotemia, pyuria, hematuria, anuria, and bleeding manifestations[9], including hemoptysis, hematochezia, hematuria, and predominantly purpuric lesions. Although jaundice due to hepatocellular dysfunction is a frequent manifestation of this infection, the development of obstructive biliary syndrome as a consequence is remarkably rare.

For patients confirmed with or suspected of having leptospirosis or Weil's disease, it is essential to assess their condition to determine the appropriate management strategy. In the first scenario, where the patient is clinically stable with mild or anicteric symptoms and no underlying comorbidities, outpatient treatment with doxycycline for seven days is recommended, alongside strict outpatient monitoring of symptoms. In the second scenario, where the patient exhibits clinical instability, generalized jaundice, oliguria, hematuria, or signs of respiratory distress, hospitalization is advised. This includes conducting a complete blood count, C-reactive protein test, renal and liver function tests, strict fluid balance monitoring, and starting antimicrobial therapy with intravenous ceftriaxone for seven days, coupled with goal-directed fluid resuscitation. Critically ill patients should be managed in an ICU setting[5].

Diagnosis of leptospirosis is primarily achieved through serological testing and isolation[4,10]. The microscopic agglutination test, performed under a dark-field microscope, is considered the reference serological test. In this test, antibodies from the patient's serum agglutinate live leptospira from a selection of reference serovars representative of the major pathogenic serogroups. A diagnosis is confirmed by seroconversion or a fourfold increase in the antibody titers from the convalescent phase sample compared to the acute phase sample[6,11].

Other serological methods include the detection of IgM antibodies through enzyme-linked immunosorbent assay (ELISA), typically negative in the first five days of illness. This test generally becomes positive before microscopic agglutination within the first four days following symptom onset[8,12].

In the first case, a patient with rodent exposure developed nonspecific symptoms and obstructive biliary syndrome, leading to the removal of multiple stones from the distal

common bile duct via ERCP due to choledocholithiasis. Unfortunately, she was diagnosed with leptospirosis only after developing acute kidney injury and gastrointestinal bleeding. Combined with her hemodynamic instability, this led to her death. This outcome contrasts with that of the second and third patients, who also experienced nonspecific symptoms, acute kidney injury, and obstructive biliary syndrome necessitating endoscopic and surgical intervention but without initial symptom improvement. However, through detailed reassessment of exposure factors and comprehensive diagnostic evaluations, they were timely diagnosed with leptospirosis and received targeted antibiotic therapy, resulting in satisfactory clinical improvement.

The third case highlights a patient from a rural area in the department of Caldas, employed as a farmer, who was admitted presenting general malaise, asthenia, adynamia, headache, and abdominal pain. Imaging findings supported a diagnosis of acute cholecystitis with significant risk for choledocholithiasis. Given the patient's hemodynamic instability and meeting the criteria for sepsis, surgical intervention was imperative, culminating in cholecystectomy and exploration of the biliary tract. Notably, cholangitis was excluded during this exploratory procedure. Subsequently, the patient was transferred to the intensive care unit for comprehensive supportive management and resuscitation measures. A comprehensive array of paraclinical studies ensued, leading to the definitive diagnosis of leptospirosis. Consequently, tailored antibiotic therapy, overseen by the infectious diseases service, was initiated, yielding resolution of both respiratory and renal insufficiencies, indicative of favorable patient prognosis.

To date, Colombia has not reported any cases of leptospirosis manifesting as obstructive biliary syndrome. Available literature describes mild to severe forms of leptospirosis across various regions. According to the World Health Organization (WHO), the Americas report an incidence of 12.5 cases per 100,000 inhabitants, with Brazil, Peru, and Nicaragua experiencing higher frequencies[13]. The initial documentation of severe human leptospirosis in Colombia dates back to 1966[2], with the first urban epidemic of severe leptospirosis reported in Barranquilla, Colombia, in 1995, amidst flooding.

Colombia has conducted multiple studies and reports concerning leptospira infection. An early study in the Atlántico department (1995-2004) found 8.6% of cases developed Weil's disease, albeit with no fatalities[3]. Another study in Barranquilla (2007-2009) reported 6.3% of cases as Weil's disease, including one presumed death from the condition[3]. A further study in the Quindío department (2005-2006) identified four presumed deaths due to Weil's disease.

CONCLUSIONS

Leptospirosis symptoms are inherently nonspecific and heavily dependent on the disease stage. Obstructive biliary syndrome in the context of advanced stages, such as Weil's disease, remains exceedingly rare. The scant literature and lack of reported cases in Colombia highlight the diagnostic challenges this presents to gastroenterologists and general surgeons.

Conflict of Interest

No conflicts of interest were declared in relation to this study.

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