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Original Article

Evaluating the Role of Endoscopic Retrograde Cholangiopancreatography (ERCP) in the Diagnosis and Management of Biliary Ascariasis: Clinical outcomes and its Efficacy

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Abstract:

Background: Biliary ascariasis, caused by *Ascaris lumbricoides* invasion of the biliary tree, is a significant health concern in tropical regions like Pakistan. Although imaging plays a diagnostic role, Endoscopic Retrograde Cholangiopancreatography (ERCP) is increasingly employed for both diagnosis and treatment due to its minimally invasive nature.

Objective: This study aimed to evaluate the clinical efficacy, technical success, and outcomes of ERCP in managing biliary ascariasis.

Methods: A retrospective review of 29 cases of biliary ascariasis managed with ERCP between September 2017 and September 2024 was conducted at a tertiary care center in Karachi. Data on demographics, clinical presentation, imaging findings, procedural details, and outcomes were analyzed using SPSS v26.

Results: ERCP achieved a 100% technical success rate with no significant procedure-related complications or mortality. The most common symptoms were abdominal pain (100%) and jaundice (55.17%). Ultrasound identified worms in 41.3% of cases, while ERCP confirmed all. Adjunctive mebendazole therapy was administered post-procedure.

Conclusion: ERCP is a highly effective and safe modality for diagnosing and managing biliary ascariasis, reducing the need for invasive surgery. It should be considered the first-line intervention in endemic areas, supported by ant parasitic therapy to minimize recurrence.

Keywords: Biliary Ascariasis, Endoscopic Retrograde Cholangiopancreatography (ERCP), Ascaris lumbricoides, Parasitic biliary disease, Worm extraction, Abdominal ultrasound, Jaundice, Tropical infections, Non-surgical management, Diagnostic endoscopy.

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Introduction:

Background:

Biliary ascariasis is a major health condition; it occurs when the Ascaris lumbricoides settles in the bile ducts. This disease tends to prevail in tropical and subtropical regions, specifically because these countries have poor sanitary conditions. It comes with a set of severe complications, for instance, pancreatitis,

obstructive jaundice, cholangitis and biliary colic.

Ascaris eggs are present in contaminated food or water. The larvae hatch once it reaches the intestine and then travels through the lungs or the liver via the bloodstream route and eventually return back to the intestinal tract. Complications like inflammation and mechanical obstruction of the biliary system can also occur, if the adult worms invade the region[1]. This can result in a number of different conditions such as acute pancreatitis, where the pancreatic duct is obstructed[2].

Around the world, biliary ascariasis is considered as the second most common cause responsible for acute biliary symptoms, after cholelithiasis[3]. It is often associated with "Oriental Cholangiohepatitis", which is a collective term for chronic anemia, malnutrition and recurrent cholangitis[4]. Imaging techniques like stool examinations, CT scans and ultrasound are considered as gold standard for its diagnosis, although its management plan requires the manual removal of these worms via minimal invasive procedures[5].

Research states that Ascaris lumbricoides has a high prevadsawlence in regions like Latin America, Sub-Saharan Africa and South Asia, affecting around 1.2 billion people around the world; while it serves as a cause of death for 60,000 people annually[6]. Conventionally, surgical interventions were used for the elimination of biliary ascariasis, however, minimally invasive methods like ERCP (Endoscopic Retrograde Cholangiopancreatography) are now being increasingly used as an alternative due to their safety and efficacy[7]. However, there is yet limited data present in Pakistan which is specific to the treatment of biliary ascariasis. Hence to fill in this gap, this research would access the technical success rates and the clinical outcomes associated with ERCP as a treatment option for biliary ascariasis.

Statement of the Problem and Rationale:

Biliary ascariasis presents with a variety of symptoms and has potential complications, posing a therapeutic as well as a diagnostic challenge. While using conventional invasive surgical methods, the mortality and morbidity rates per patient would be quite high. However, there is no such date present which can account for the morality or morbidity rates for non-surgical techniques like ERCP, hence a definite need to establish this study. Our study aims to reduce the use of invasive surgical methods, while decreasing patient outcomes by evaluating the efficacy and safety of ERCP as a foremost treatment for biliary ascariasis[8].

Conclusion:

Having a deeper clinical insight to the role of ERCP as a treatment for biliary ascariasis would be an essential factor for healthcare workers in the Pakistani region, especially because such parasitic infections yet serve as a significant health challenge. The findings of this study will provide a critical view of diagnostic as well as treatment protocols to treat biliary ascariasis, focusing on overall patient well-being.

Purpose of the Study:

To access effectivity, technical success rates, clinical features and complications of using ERCP as a diagnostic as well as a treatment plan for biliary ascariasis.

Objectives:

1. To access the clinical features and demographics of biliary ascariases infected patients
2. To evaluate the technical success percentage of ERCP as a management plan for biliary ascariasis.
3. To determine any complications that are associated with ERCP treatment in biliary ascariasis infected patients
4. To analyze the effectiveness of ERCP as a non-surgical method in decreasing

the need of traditional surgical methods.

Methodology:

Study Design: This will be a retrospective study based on case series
Study Duration: September 2017 to September 2024.
Study Setting: Sindh Institute of Advanced Gastroenterology (SIAG), a tertiary care setup in Karachi, Pakistan.
Population: Patients who underwent ERCP for biliary ascariasis
Sample size: 29 cases series

Literature Review:

Ascaris lumbricoides (A. lumbricoides) is a type of helminth that causes ascariasis, a neglected tropical disorder. This is a public health concern globally that has been reported to impact over 1 billion people or approximately 24% of the world's population [9]. According to the World Health Organization (WHO), the sub-Saharan regions of Africa, China, South America, and Asia have some of the most reported infections. These parasitic infections majorly impact people from low socio-economic backgrounds who live in stark poverty in tropical and sub-tropical countries where clean water and proper sanitation facilities are not readily available[10] .

Moreover, as time passes, there has been a significant shift in the diagnostic and therapeutic approaches to biliary ascariasis with increasing focus on endoscopic techniques. Endoscopic retrograde Cholangiopancreatography (ERCP) is recognized as one of the most crucial diagnostic and therapeutic procedures for A. lumbricoides, particularly when other treatment options or imaging studies have been proven to be failed[11,12]. Even in some cases where Ultrasound and Magnetic Resonance. Cholangiopancreatography (MRCP) were not able to identify worms in the bile duct, ERCP remains capable of clearly identifying worms in the duct, facilitating treatment and worm extraction.

One temporal case reported the extraction of a wriggling parasite emerging from the ampulla during an ERCP surgery[11]. Another study showed that ultrasound could only visualize the presence of biliary ascariasis in 54%-85% of the cases, while ERCP was able to detect its position and reported ERPC as the most reliable method used for bile duct invasion confirmation in instances when the worms were not protruding into the duodenum[13]. Moreover, ERCP also aids in the differentiation of biliary ascariasis from other pathologies like choledochal sludge or tumours, even some which were previously described as cholangiocarcinoma [13].

In addition to diagnostic purposes, endoscopic retrograde Cholangiopancreatography (ERCP) plays a pivotal role in the treatment of biliary ascariasis, simultaneously providing access and treatment for the condition. As for the surgical adjunctive control of biliary ascariasis, ERCP plays an essential role since it permits immediate biliary decompression in about 65% to 86.7% of cases during sphincterotomy and Dormia basket extraction [12]. In another prospective study recruited 98 patients were recruited, 23.5% responded to treatment with only albendazole, while ERCP with worm removal achieved a success rate of 86.7% of the remaining cases [12]. Moreover, while most cases are managed by ERCP with no need for surgery, emergency surgery is occasionally required on the day for patients with persistent worms post-ERCP [14].

The literature also highlights an increasing awareness of long-term outcomes and the risk of recurrence. Successful endoscopic retrograde Cholangiopancreatography (ERCP) not only offers diagnostic clarity and effective treatment but also leads to rapid symptom

relief and normalization of liver enzyme levels. Long-term results of ERCP treatment for biliary ascariasis show that, while ERCP is very effective for initial biliary clearing (with success rates of roughly 86.7%), biliary events may return. A prospective study found that 24.5% (24 out of 98) of patients developed recurrent biliary problems, such as cholangitis or obstructive jaundice, throughout a 16-month follow-up period. The probability of recurrence was independently associated with lower socioeconomic position and longer duration of follow-up, demonstrating the impact of environmental and hygiene-related factors on reinfection rates [15]. Case reports further support that patients treated with ERCP followed by albendazole often experience rapid symptom relief and normalization of liver function tests, with sustained symptom resolution on follow-up[16,17].

In one notable case at Civil Hospital Karachi's S4 Ward in 2020, a female patient underwent ERCP for biliary obstruction and was found to have a remarkably high parasitic load, with 22 Ascaris worms extracted during the procedure. This rare and severe presentation underscores the clinical burden of biliary ascariasis in endemic regions and highlights the critical role of ERCP in both diagnosis and therapeutic management, as further explored in this study.

However, some studies have reported post-ERCP recurrence rates of 4% in females and 1% in males, suggesting that demographic and local factors may also play a role in long-term success [18]. Overall, ERCP is a safe and effective strategy for immediate therapy of biliary ascariasis; however, long-term outcomes depend on managing reinfection concerns and ensuring continuing follow-up[12,18].

Data Collection Method:

This was a retrospective research analysis which aimed to evaluate the efficacy of ERCP for biliary ascariasis. Prevalence of biliary ascariasis was evaluated out of 6070 patients who underwent ERCP procedure over a time span of September 2017 and September 2024, resulting in a total of 29 cases which were included in the study. Medical records if these 29 cases were further reviewed. Data was collected including variables like age, gender, comorbidities, previous medications or prior surgical procedures, indications for ERCP, clinical symptoms, lab results, imaging results and past treatment approaches.

All ERCP procedures were performed by specialized gastroenterologists with over two decades of experience, along with a specialized team with highly trained endoscopists. Written informed consent was obtained from all patients. The majority of ERCPs were conducted under conscious sedation using nalbuphine and midazolam, while a few required general anesthesia, all under the supervision of a senior anesthesiologist. Intravenous cephalosporins were administered as prophylactic antibiotics before the procedure.

ERCP was performed using a standard technique with an adult therapeutic duodenoscope (TJF 180: Olympus). Urograffin, an ionic contrast medium, was used to opacify the biliary and pancreatic ducts. Post-procedure, patients were monitored for a minimum of four hours, and those with complications were admitted under the care of a gastroenterologist or consultant surgeon. Complications were classified based on Cotton's criteria.

The primary diagnostic modality was abdominal ultrasound. Technical success was defined as obtaining diagnostic information or successfully performing endoscopic therapy. Data recorded included procedure indications, diagnostic and therapeutic findings, fluoroscopic observations, treatment measures,

procedural success, and complications. All patients diagnosed with biliary parasitosis underwent deworming therapy.

For follow-up, patients were encouraged to return for evaluation, and those who did not were contacted via telephone for a subjective follow-up. The study received approval from the hospital's institutional review board. Statistical analysis was conducted using SPSS version 26 (SPSS Inc., Chicago, IL, USA), employing descriptive and frequency analysis.

Inclusion/Exclusion Criteria

Inclusion Criteria:
- Patients diagnosed with biliary ascariasis.
- Cases where ERCP was performed successfully.

Exclusion Criteria:
- Patients with incomplete medical records.
- Cases with coexisting severe comorbidities unrelated to biliary disease.

Data Collection Tool:

Data were extracted from electronic medical records and included demographics, clinical features, laboratory findings, imaging results, and procedural outcomes.

Study Variables:

Independent Variables: Age, gender, clinical symptoms, and imaging findings. Dependent Variables: Technical success of ERCP, complications, and patient outcomes.

Data Analysis Procedure:

Data were analyzed using SPSS version 26. Descriptive statistics (mean, standard deviation) were calculated for continuous variables, while frequencies and percentages were used for categorical data. Chi-square tests assessed relationships between clinical features and outcomes.

Results:

Patient Characteristics

ERCP was conducted in 6070 patients between September 2017 and September 2024. In 29 cases (6070), the patients were diagnosed as having biliary ascariasis. Among them, 7(24.1%) were males, 22(75.9%) were females and majority of the patients were from Karachi, i.e., 25(86.2%) as displayed in Table 1.

Table 1. Demographic Characteristics of Patients with Biliary Ascariasis (n=29)

Variable	Value
Age	28.5±4.83
Gender	
Male	7 (24.1%)
Female	22 (75.9%)
Geographic origin	
Karachi	25 (86.2%)
Hyderabad	2(6.9%)
Sukkur	2(6.9%)

Clinical Presentation:

All patients had experienced abdominal pain; other symptoms were variable and ranged in duration from one week to 3 years.

The other clinical findings were reported as shown in Table 2 which can be summarized as:

Jaundice was observed in 16 cases (55.17%)

Hyperbilirubinemia in the same 16 patients, mean bilirubin level 7.7 mg/dL (range 2.16-26.7 mg/dL)

Originally raised ALP in 27 patients (93.1%), levels ranged from 140 to 2670 U/L (mean 448.4 U/L).

Imaging Findings (Refer to Table 2 for complete details)

Ultrasound findings revealed:

- 12 patients (41.3%) were found to have worms
- A large common bile duct (CBD) in 25 (86.2%) of patients
- Enlarged IHD (intrahepatic duct) 4 (13.8%)

Endoscopic observations on ERCP were as follows:

- A single linear filling defect in 18 pts (62.1%) due to worm wads causing severe CBD dilation.

Table 2. Imaging and Laboratory Findings(n=29)

Variable	Frequency n(%)%)
Worm detected on ultrasound	12 (41.3%)
Dilated CBD on ultrasound	25 (86.2%)
Dilated intrahepatic ducts	4 (13.8%)
Elevated ALP	27 (93.1%)
Mean ALP (U/L)	448.4
Mean bilirubin (mg/dL)	7.7

ERCP Procedure and Outcomes:

ERCP was successfully conducted in all patients and achieved 100% success. Worm extraction techniques used were balloon trawling and grasping forcep. Additional findings during ERCP included CBD stones in 5 patients (17.2%), Cholangitis in 2 patients (6.9%).. There were no significant procedure-related complications found, and no mortality was recorded. All patients received mebendazole therapy followed by post-procedure.

Discussion:

Biliary ascariasis is a parasitic infection of the biliary tree that is rare but has public health importance within certain populations. Commonly seen in tropical and subtropical areas where sanitation falls short, this infection is caused by Ascaris lumbricoides, a roundworm that occupies the small intestine and may migrate through the ampulla of vater into the biliary system (cystic duct or common bile duct). Even though it is relatively rare, biliary ascariasis is one of the most common forms of biliary obstruction in endemic areas after cholelithiasis [19].

In this study, we reported the clinical outcomes and technical success of ERCP in a subset of patients with biliary ascariasis. Most patients in this cohort who were infected with biliary ascariasis were female, 22 (75.9%), with a mean age of 28.5±4.83 SD, which is consistent with primary literature on biliary ascariasis prevalence, suggesting women are more affected [20]. This fact is likely linked to the greater exposure to contaminated soil and water that women in many developing regions endure [21]. Also, progesterone, while relaxing the smooth muscles of the bile duct, may elevate the risk of infection that facilitates the ingress of worms into the bile duct [22].

The most common symptoms for participants in this study were biliary colic (93.1%), followed by jaundice (55.17%) and nausea (30.7%). These symptoms are consistent with those of biliary ascariasis, where adult Ascaris worms cause a mechanical obstruction to the bile flow, leading to biliary colic, jaundice, and in some cases, severe cholangitis or pancreatitis [23]. Our findings are consistent with existing literature, which indicates that biliary ascariasis is a prevalent cause of biliary obstruction in tropical regions, often leading to destructive recurrent cholangitis and/or pancreatitis. [24]

Ultrasound is the most accessible and invaluable method of diagnosis regarding the presence of biliary ascariasis, especially in endemic areas. In our study, 41.3% of cases visually showed the presence of the worms on ultrasound, which supports other reports regarding the usefulness of ultrasound in diagnosing this condition [25]. While in some cases, worms were found by ERCP, which raises concerns regarding the diagnostic accuracy between ERCP and ultrasound. Furthermore, literature has reported limitations of using ERCP, specifically the long-term outcome. ERCP is still the most preferred

method for diagnosing and treating biliary ascariasis, as reported [26].

ERCP is of utmost importance in bile duct ascariasis since it permits both the visualization of the biliary ascariasis and the extraction of the worms with specialized instruments. In this cohort, endoscopic removal was successful in each case, and multiple instruments, including biliary extraction balloon, and grasping forceps were employed to grasp the worms safely. These results corroborate with other studies that have concluded ERCP provides high rates of technical success, 90 to 95% of worm removal from the bile ducts, and with a low rate of complications [27]. In our study, patients with concomitant biliary stones experienced effective outcomes when endoscopic sphincterotomy of the biliary sphincter was combined with balloon sweeping, which facilitated the removal of both worms and stones, resulting in symptom relief and optimal biliary drainage [28].

Additionally, administering mebendazole during the post-operative period proved effective for both deworming patients and preventing future infections. In several studies, patients who received a three-day course of mebendazole after endoscopic worm removal showed no recurrence of infestation on consistent follow-up [29]. This emphasizes that routine administration of anthelminthic therapy, such as mebendazole or albendazole, following endoscopic treatment should be part of the standard management for biliary ascariasis to may reduce the chances of reinfection and also it may reduce the morbidity and mortality risks linked to surgical interventions.

While ERCP is acknowledged as an effective method for the treatment of biliary ascariasis, it possesses limitations in treating complex cases like severely dilated bile ducts or those with multiple worms, that may require more advanced interventions, such as endoscopic papillary balloon dilation (EPBD) or multiple sessions of worm extraction and appropriate post procedural management [26].

We believe that ERCP can be regarded as a safe and effective, less invasive treatment option for biliary ascariasis and can serve as an invaluable intervention option with high prevalence of disease and regions with low socioeconomic profiles. Although it cannot be an exclusive treatment option for the disease, considering its limitations with complex cases, it can be regarded as the first-line treatment option for managing infection, especially in cases with an anticipated low rate of post-procedural complications, and less severe cases.

Conclusion:

In conclusion, ERCP proves to be an effective and safe modality for the diagnosis and management of biliary ascariasis, offering a non-surgical approach with high technical success rates and minimal complications. Our study demonstrates that ERCP can successfully remove *Ascaris lumbricoides* from the biliary tree, leading to the immediate resolution of symptoms such as biliary colic and jaundice. The procedure is particularly beneficial in areas with high prevalence of ascariasis, where surgical options may be limited or more invasive.

Given its ability to provide both diagnostic and therapeutic benefits, ERCP should be considered the procedure of choice in managing biliary ascariasis. In addition, adjunctive therapy with anti-parasitic medications such as mebendazole is essential to prevent reinfection and ensure long-term resolution. The findings of this study support the growing body of evidence advocating for the use of ERCP as a first-line treatment for biliary ascariasis, providing a promising alternative to traditional surgical interventions. Further research with larger patient cohorts is necessary to validate these findings and to explore potential improvements in ERCP techniques and post-procedure management. Given the endemic nature of ascariasis in many

regions of the world, optimizing the diagnostic and therapeutic strategies for biliary ascariasis will play a critical role in improving patient outcomes and reducing morbidity associated with this parasitic infection.

Budget:

No expenses are required for this research

Conflict of Interest:

The authors declare no conflicts of interest in conducting this study.

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