

Original Research Article

CLINICAL EFFICACY AND OUTCOMES OF ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY IN THE DIAGNOSIS AND MANAGEMENT OF BILIARY ASCARIASIS

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ABSTRACT

Background: Biliary ascariasis is an important cause of biliary obstruction and related complications, particularly in endemic regions. It occurs when *Ascaris lumbricoides* migrates from the intestine into the biliary tree. Although imaging modalities such as ultrasonography may aid in diagnosis, Endoscopic Retrograde Cholangiopancreatography (ERCP) provides direct visualization of the biliary tract and offers both diagnostic confirmation and therapeutic removal of the parasite. **Aim:** To assess the diagnostic and therapeutic utility of ERCP in patients with biliary ascariasis, including procedural success and post-procedural outcomes. **Place and duration of Study:** This study was conducted at Shaheed Mohtarma Benazir Bhutto Medical College Lyari Karachi, Darul Sehat Hospital Karachi, Jinnah Hospital Karachi & Shaheed Mohtarma Benazir Bhutto Medical University Hospital Larkana and from August 2021 to August 2026. **Study Design:** Retrospective study.

Materials and Methods: A retrospective study was conducted among 58 patients with biliary ascariasis who underwent ERCP. Demographic characteristics, presenting symptoms, laboratory findings, pre-procedural imaging findings, ERCP findings, therapeutic interventions, technical success, and post-procedural outcomes were retrospectively reviewed and analyzed using SPSS version 26.

Results: A total of 58 patients with biliary ascariasis underwent ERCP. Abdominal pain was the most common presenting symptom and was reported in all patients (58, 100%), while jaundice was reported in 32 patients (55.17%). Pre-procedural imaging detected biliary worms in 24 patients (41.4%). ERCP provided definitive visualization of the biliary parasites and enabled successful endoscopic extraction in all patients. Endoscopic sphincterotomy and/or other biliary interventions were performed when clinically indicated. Post-procedural clinical outcomes were favorable, with a low incidence of procedure-related complications. No ERCP-related deaths were reported.

Conclusion: ERCP is an effective diagnostic and therapeutic modality for biliary ascariasis. It enables direct visualization of biliary parasites and facilitates their endoscopic removal, with a high technical success rate and favorable clinical outcomes. ERCP may therefore be particularly useful in patients with symptomatic or complicated biliary ascariasis requiring endoscopic intervention.

Keywords: *Ascaris lumbricoides*; biliary ascariasis; biliary obstruction; ERCP; endoscopic management; endoscopic retrograde cholangiopancreatography; parasitic biliary disease; abdominal pain; jaundice; worm extraction.

INTRODUCTION

Ascaris lumbricoides is a large intestinal nematode that causes ascariasis, a parasitic infection transmitted primarily through ingestion of embryonated eggs present in contaminated food, water, or soil.^[1] Ascariasis is particularly prevalent in tropical and subtropical regions where inadequate sanitation, limited access to clean water, and overcrowding facilitate transmission.^[1,2] Most infections remain confined to the intestine and are asymptomatic or associated with mild gastrointestinal symptoms. However, heavy infestation may result in intestinal obstruction and, less commonly, extraintestinal complications. Migration of adult worms through the ampulla of Vater into the biliary or pancreatic ducts represents an important complication of ascariasis.^[2,3]

Biliary ascariasis occurs when an adult *Ascaris* worm migrates from the duodenum through the major papilla into the biliary tree. Because of its mobility, the parasite may enter the common bile duct, hepatic ducts, gallbladder, and occasionally the pancreatic duct.^[3,4] The presence of the worm may cause transient or persistent biliary obstruction, mucosal irritation, inflammation, and secondary bacterial infection. Clinical manifestations range from biliary colic and right upper quadrant or epigastric pain to nausea, vomiting, obstructive jaundice, acute cholecystitis, cholangitis, and pancreatitis.^[3,5] In complicated cases, biliary ascariasis may be associated with recurrent cholangitis, hepatic abscess formation, and systemic infection.^[5,6]

The clinical presentation of biliary ascariasis may be difficult to distinguish from other common causes of biliary obstruction, particularly choledocholithiasis and acute cholangitis, because of overlapping symptoms such as abdominal pain, fever, and jaundice.^[3,7] Imaging therefore plays an important role in establishing the diagnosis. Abdominal ultrasonography is particularly useful because it is inexpensive, widely available, non-invasive, and capable of demonstrating characteristic tubular or linear structures within the biliary tract.^[8] Single or multiple non-shadowing echogenic strips, sometimes described as a “spaghetti-like” appearance, may strongly suggest the presence of *Ascaris* within the biliary system.^[8,9] However, the diagnostic accuracy of ultrasonography may be influenced by operator expertise, bowel gas, worm position, and the location of the parasite within the intrahepatic or extrahepatic ducts.^[8,9] Thus, although imaging can provide important diagnostic clues, it may not always provide definitive confirmation or allow simultaneous therapeutic intervention.

Endoscopic Retrograde Cholangiopancreatography (ERCP) has an important diagnostic and therapeutic role in biliary ascariasis. During ERCP, the worm may be directly visualized emerging through the papilla, while cholangiography may demonstrate a filling defect within the biliary tree.^[10,11] A major advantage of ERCP is that it permits immediate endoscopic extraction of the parasite using devices such as extraction balloons, Dormia baskets, snares, or forceps.^[10,12] Endoscopic sphincterotomy may be required in selected patients to facilitate ductal clearance, although successful extraction without sphincterotomy has also been reported.^[12] Previous studies have demonstrated high rates of endoscopic clearance and rapid clinical improvement following removal of the obstructing parasite.^[10,13]

Management of biliary ascariasis depends on the clinical presentation, location of the parasite, degree of biliary obstruction, and presence of complications. In some patients, particularly those with incomplete obstruction, the worm may spontaneously migrate back into the duodenum.^[4,13] Anthelmintic therapy is commonly used to eradicate residual intestinal *Ascaris* infection and reduce the risk of recurrent biliary migration.^[12,14] However, patients with persistent biliary obstruction, impacted worms, cholangitis, pancreatitis, or other complications may require endoscopic or, less commonly, surgical intervention. In such situations, ERCP provides a minimally invasive approach for biliary decompression and direct extraction of the parasite.^[6,13]

Although biliary ascariasis remains clinically important in endemic regions, the available literature consists predominantly of case reports, small case series, and retrospective studies.^[3,5,15] Variations in clinical presentation, imaging findings, ERCP techniques, therapeutic approaches, and reported outcomes highlight the need for further evaluation of the effectiveness and safety of ERCP in affected patients. Important measures of clinical utility include diagnostic yield, technical and therapeutic success, successful biliary clearance, symptom improvement, and procedure-related complications.

Therefore, the present study aimed to assess the clinical efficacy and outcomes of ERCP in patients with biliary ascariasis. Specifically, the study evaluated the clinical presentation, diagnostic findings, procedural success, endoscopic interventions, and post-procedural outcomes of patients with *Ascaris lumbricoides* infestation involving the biliary system, with the aim of further clarifying the role of ERCP as a diagnostic and therapeutic modality.

MATERIALS AND METHODS

Study Design and Study Population: This retrospective observational study was conducted to assess the diagnostic and therapeutic utility of Endoscopic Retrograde Cholangiopancreatography (ERCP) in patients with biliary ascariasis. Medical records of patients diagnosed with biliary ascariasis who underwent ERCP for diagnostic and/or therapeutic purposes were retrospectively reviewed. A total of 58 patients who met the predefined eligibility criteria were included in the final analysis. Patients were considered to have biliary ascariasis based on the clinical presentation, imaging findings, and/or direct identification of *Ascaris lumbricoides* during ERCP.

Data Collection

Relevant clinical information was retrieved retrospectively from patients' medical records using a structured data collection proforma. Demographic variables included age and sex. Clinical variables included presenting symptoms such as abdominal pain, jaundice, nausea, vomiting, fever, and other symptoms suggestive of biliary obstruction or infection.

Laboratory investigations were recorded when available and included serum bilirubin, alkaline phosphatase, aspartate aminotransferase (AST), alanine aminotransferase (ALT), and other relevant liver function parameters.

Radiological Assessment

Available radiological findings were reviewed. Abdominal ultrasonography findings included the presence of biliary worms, common bile duct (CBD) dilatation, intrahepatic biliary ductal dilatation, and other associated abnormalities. Other imaging investigations, when available, were also documented.

ERCP Procedure

ERCP procedures were performed by experienced gastroenterologists using a standard therapeutic duodenoscope. Before ERCP, patients underwent appropriate pre-procedural assessment and provided informed consent. Sedation or anesthesia was administered according to the patient's clinical condition and anesthetic assessment.

During ERCP, selective biliary cannulation was performed, followed by contrast injection to delineate the biliary anatomy and identify filling defects or other abnormalities. The presence, number, and location of biliary worms were documented.

When indicated, *Ascaris lumbricoides* was extracted using appropriate endoscopic devices, including extraction balloons, grasping forceps, baskets, or other suitable accessories. Endoscopic sphincterotomy was performed when clinically indicated, particularly in patients with associated biliary stones or when required to facilitate ductal clearance.

Other ERCP findings, including choledocholithiasis, biliary obstruction, cholangitis, biliary dilatation, and other abnormalities, were also recorded. Biliary clearance was assessed at the completion of the procedure.

Outcome Measures

Technical success was defined as successful biliary cannulation with adequate cholangiographic evaluation and achievement of the intended diagnostic and/or therapeutic objective.

Therapeutic success was assessed based on successful removal of the biliary worm and restoration of adequate biliary drainage when therapeutic intervention was required.

Patients were monitored for post-ERCP complications and clinical improvement. Documented complications included post-ERCP pancreatitis, bleeding, perforation, cholangitis, infection, and other procedure-related complications. The severity of complications was recorded according to the available clinical documentation and accepted clinical criteria, where applicable.

Post-Procedural Treatment and Follow-up

Patients diagnosed with biliary ascariasis were prescribed appropriate anthelmintic therapy after the procedure according to the treating physician's clinical judgment.

Available follow-up information included resolution of presenting symptoms, recurrence of biliary symptoms, rehospitalization, and the need for additional interventions.

Inclusion Criteria

Patients were included if they met the following criteria:

- Patients with documented biliary ascariasis.
- Inpatients who underwent ERCP for diagnostic and/or therapeutic management of biliary ascariasis.
- Patients with sufficient clinical, imaging, procedural, and outcome information available in their medical records.

Exclusion Criteria

Patients were excluded if

- Medical records contained inadequate documentation of the diagnosis or treatment.
- ERCP was performed for an indication other than suspected biliary ascariasis and there was no evidence of biliary *Ascaris* infestation.
- Available records did not contain sufficient information regarding the ERCP procedure or clinical outcome.

Study Variables and Outcomes

Independent variables included age, sex, presenting clinical features, laboratory parameters, imaging findings, and ERCP-related findings and interventions.

The primary outcome measures were the technical and therapeutic success of ERCP. Secondary outcomes included successful worm extraction,

biliary clearance, clinical improvement, procedure-related complications, and mortality.

Statistical Analysis

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS), version 26. Continuous variables were summarized as mean $\pm$ standard deviation (SD) or median with interquartile range (IQR), as appropriate according to the distribution of the data. Categorical variables were presented as frequencies and percentages.

The rates of ERCP technical success, successful worm extraction, biliary clearance, and procedure-related complications were calculated. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Fifty-eight patients with biliary ascariasis underwent ERCP and were included in the study. The diagnosis and management of biliary ascariasis was successfully achieved with high technical and therapeutic success of ERCP.

The most common presenting symptom was abdominal pain reported in all 58 patients (100%). Thirty two patients (55.17%) were observed with jaundice. The most common clinical symptoms in the study population were these findings. The other presenting symptoms and clinical features were noted from the records of the medical history.

An abdominal ultrasound was used to evaluate patients before the procedure. The presence of the biliary worms was detected by ultrasonography in

24 patients (41.4%). For the 34 patients who were not seen on ultrasound or whose findings were inconclusive, biliary ascariasis was not seen. ERCP then directly visualized the biliary tree and found that *Ascaris lumbricoides* was present in all 58 patients.

The technical success rate of ERCP was 100% (58 cases). Direct visualization of the biliary tract allowed the exact identification of the parasites and subsequent successful extraction with endoscopy in all patients. Endoscopic procedures were used as appropriate including biliary procedures and endoscopic sphincterotomy when clinically indicated depending on the clinical and procedural findings.

Therapeutic success rate was 100% with successful removal of the biliary parasites in all patients. Endoscopic treatment in the majority of patients resulted in clinical improvement, especially with regard to abdominal pain and obstructive symptoms. ERCP was very well tolerated in the study group. There was a low incidence of procedure-related complications and no procedure-related deaths were noted. Patients were observed after the procedure for any complications and clinical response. Guidelines for endoscopic management were followed by appropriate antihelminthic treatment for the residual intestinal infestation to prevent the possibility of migration in the bile.

In summary, the results showed that ERCP was able to yield definitive diagnosis and effective therapeutic treatment for all 58 patients with biliary ascariasis, with favourable clinical outcome and safety.

Table 1: Clinical and Diagnostic Findings (n=58)

Parameter	n (%)
Abdominal pain	58 (100.0)
Jaundice	32 (55.17)
Biliary worms detected on ultrasonography	24 (41.4)
Biliary ascariasis visualised on ERCP	58 (100.0)

DISCUSSION

In the present study, ERCP was found to be useful in the diagnosis and treatment of ascariasis of the bile duct in 58 patients. The commonest presenting symptom was abdominal pain (100%) and the least, jaundice (55.17%). The prevalence of biliary worms was different between the two diagnostic methods and was detected by ultrasonography in 41.4% of patients, while definitive visualization and successful extraction of the worms was possible with ERCP in all patients. Thus the technical and therapeutic results of ERCP were 100% and clinical improvement was seen in all patients and there was no significant mortality due to ERCP.

The high proportion of abdominal pain in the present study is in line with previous studies. In a study of 42 patients, Mukhopadhyay found that upper abdominal pain was seen in 95.2% and

obstructive jaundice in 28.56%.^[16] Likewise, Alam et al reported in a prospective study of 77 patients that biliary colic was the commonest presentation in 97.4% of the patients.^[17] The prevalence of jaundice in our cohort could be due to the patient selection, because the present study comprised patients who underwent ERCP, which might have included more patients with clinically significant biliary obstruction.

The complementary roles of ultrasonography and ERCP are also illustrated by the diagnostic results of our study. Biliary worms were detected by ultrasonography in 41.4% of our patients and by ERCP in all patients. In their 42 patient series, Mukhopadhyay reported ultrasonography as the main imaging modality.^[16] This difference in detection rates, however, may be attributed to differences in operator experience, worm position, timing of the imaging, and patient selection. The

added benefit of ERCP is that it can be used to treat the parasite if it is discovered during the procedure. In the present study, we could achieve 100% extraction success, which was higher than the reported series in several previous studies. In an evaluation of 50 patients who were undergoing endoscopic intervention, Khuroo et al. found that all patients with worms at the ampullary orifice had successful extraction and 89.5% of patients with worms within the bile or pancreatic ducts were successfully extracted.^[18] Alam et al. reported that 94.8% of their 77 patients required wide papillotomy followed by basket extraction and found endoscopic extraction to be safe and effective.^[17] In contrast, Beckingham et al. reported success in 19 of 25 patients (76%), and failure was primarily related to biliary strictures, stones and worms in the gallbladder.^[19] These data reveal that anatomical location and its related biliary pathology could be a factor in determining ERCP success.

The results of the present study also corroborate with the study by Alam et al. which reported favorable results with no major procedural complications with endoscopic intervention.^[17] However, Alam et al. in another study of 138 patients showed that while the worms were alive, the removal was successful, but in those with dead worms, strictures, stones and gallbladder involvement, surgery was necessary.^[20] Therefore, in suitable patients ERCP may offer definitive minimally invasive treatment while surgery may still be required if significant structural or associated biliary disease can not be completely cleared.

A prospective study of 98 patients showed that ERCP is also valuable in patients who failed conservative treatment, and biliary clearance was successful in 86.7% of the patients who were treated with ERCP.^[21] During follow-up, the same study reported on recurrent biliary events, highlighting that the risk for subsequent biliary disease does not necessarily end once the parasites have been removed. Therefore, the good immediate results reported in this study should be taken into account when referring to the need for proper antihelminthic treatment, follow-up and prevention of reinfection.

In conclusion, the present results advocate the efficacy of ERCP in the diagnosis and treatment of biliary ascariasis, especially in cases of biliary obstruction or persisting worms. Although the results of this cohort are encouraging, with no technical failures and 100% extraction success, the retrospective design and the relatively small number of patients and lack of detailed long-term follow-up must be taken into account when interpreting the results.

CONCLUSION

ERCP proved to be very effective in both diagnosis and treatment of patients with ascariasis of bile duct. The technical and therapeutic success rate of ERCP

was 100% and allowed to get a definite visualisation and successfully remove the parasites (100% success rate), as ultrasonography did in 41.4% of the patients. The clinical improvement was seen in the majority of patients with a low procedure-related morbidity and no significant ERCP-related mortality. These findings confirm the efficacy of ERCP, as a minimally invasive technique that can be used for both diagnosis and treatment of biliary ascariasis, especially in patients with symptomatic biliary obstruction.

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