Biliary Ascariasis

A Common Cause of Biliary and Pancreatic Disease in an Endemic Area

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We prospectively evaluated the incidence, clinical features, radiographic findings, and course of biliary and pancreatic disease caused by ascariasis in an endemic area in India. Ascariasis was an etiologic factor in 40 (36.7%) of the 109 patients studied who had biliary and pancreatic diseases. Disease was prevalent in adult women and was associated with recurrent biliary colic in 38 patients (95%), recurrent pyogenic cholangitis in 27 patients (68%), acalculous cholecystitis in 9 patients (23%), and pancreatic disease in 6 patients (15%). Vomiting of roundworms during biliary colic occurred in 19 patients (48%) and often led to confirmation of biliary ascariasis by direct visualization of the biliary tree. Endoscopic retrograde cholangiopancreatography was an excellent diagnostic tool and often demonstrated worms in the dilated common bile duct and intrahepatic ducts. The worms moved actively into and out of the biliary tree from the duodenum. Thirty-six (90%) patients recovered on symptomatic treatment followed by anthelmintic therapy once acute symptoms subsided. Surgery was needed in 4 patients, as the worms were trapped in the ducts and had led to the formation of common bile duct and intrahepatic duct stones with the worm fragment as the nidus.

Ascariasis is one of the most common helminthic diseases in humans (1). It involves hundreds of millions of people in countries where the standards of public health and personal hygiene are low. The adult roundworm *Ascaris lumbricoides* usually lives in the intestinal lumen without any significant symptoms. However, when aggregated into masses they may cause intestinal obstruction, volvulus, or perforation of the bowel. They may also enter any accessible passage and cause local disturbances (2).

Ascaris invasion into the biliary tree is known to cause biliary colic, recurrent pyogenic cholangitis, cholecystitis, and pancreatitis (3,4). There may be formation of biliary calculi that contain ova and fragments of adult worms (5). The diagnoses of the reported cases have been made either at laparotomy or at autopsy. The magnitude of the problem of biliary ascariasis in an endemic area may be underestimated in the reported cases, as the worms move actively into and out of the biliary tree from the duodenum (6,7) and are usually not present in the ducts at the time of surgery.

This study was undertaken to assess the role of ascariasis in the causation of biliary and pancreatic disease in an endemic area. Endoscopic retrograde cholangiopancreatography (ERCP) was frequently used to demonstrate roundworms in the biliary tree and in the pancreatic ducts. Forty of the 109 patients with biliary and pancreatic symptoms had disease related to ascariasis. In the present study the clinical features, the radiographic findings by ERCP, and the course of this entity are documented.

Materials and Methods

During the period from December 1982 to May 1983, 2836 patients were evaluated for gastrointestinal symptoms at the Sher-i-Kashmir Institute of Medical Sciences, Soura, Srinagar, India and 134 patients were diagnosed as having biliary or pancreatic disease. The patients in the latter group were studied on a prospective basis and constitute the study population. Routine hemogram, liver function tests, and serum amylase determinations were carried out by standard methods. Oral cholecystography

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Abbreviations used in this paper: ERCP, endoscopic retrograde cholangiopancreatography.

was performed in all anicteric patients with an intact gallbladder. Scintiscan was obtained with ^{99m}Tc sulfur-colloid using a γ-camera. Esophagogastroduodenoscopy was performed using an Olympus GIF-Q panendoscope (Olympus Corporation of America, New Hyde Park, N.Y). Endoscopic retrograde cholangiopancreatography was obtained using a JFB3 side-viewing duodenoscope. Endoscopic retrograde cholangiopancreatography was attempted in 119 patients. Both pancreatic duct and biliary tree were visualized in 65 patients; pancreatic duct alone was visualized in 24 patients whereas biliary tree was visualized in 23 patients. Percutaneous transhepatic cholangiogram, using the Chiba needle, was obtained in 5 patients. Operative findings of biliary tree and pancreatic duct were noted in patients who underwent surgery.

Of the 134 patients, 109 had proven biliary or pancreatic disease. The cause of biliary or pancreatic disease in the 109 patients is shown in Table 1. Forty (36.7%) cases were related to ascariasis. On ERCP, the worms were outlined in the biliary tree in 21 patients and in the pancreatic duct in 1 patient. All patients were symptomatic and all were studied by ERCP within 48 h of hospitalization. Another 18 patients were grouped under suspected biliary ascariasis on the following criteria: (a) history of biliary symptoms similar to those of patients with proven biliary ascariasis; (b) ERCP visualization of roundworms in duodenum but not in the biliary tree; (c) relief of biliary symptoms after effective anthelmintic therapy; and (d) no other apparent cause for biliary symptoms. The symptoms pertaining to biliary disease in these patients had subsided for >3 wk at the time of ERCP. Recent invasion of the biliary tree by the roundworms, which had found their way back into the duodenum, was suspected as the cause of biliary disease in this group of patients. Repeat ERCPs in 3 of the 18 patients during subsequent biliary colic revealed roundworms in the biliary tree.

Table 1. *Etiologic Causes of Biliary and Pancreatic Disease*[a]

Patients	No. of cases (%)
Suspected biliary/pancreatic disease	134
Other diagnoses (not biliary or pancreatic)	25
Proven biliary or pancreatic disease	109
Biliary or pancreatic ascariasis	40
Proven biliary (worms in bile ducts)	21
Suspected biliary (worms in duodenum)	18
Proven pancreatic (worms in pancreatic duct)	1
Other biliary or pancreatic diagnoses	69
Biliary stones	38
Pancreatitis	12
Carcinoma	9
Miscellaneous	10

[a] The patients were seen at the Institute from December 1982 to May 1983.

Results

Biliary Ascariasis

Biliary ascariasis was predominantly a disease of adult women. The study comprised 34 women and 5 men with a mean age of 31 yr (range 12–55 yr). The duration of symptoms was 5.2 ± 4.0 yr (mean ± 1 SD) with a range from 1 mo to 20 yr. Biliary colic associated with recurrent pyogenic cholangitis was present in nearly all patients (Table 2). Pyogenic cholangitis was defined as a symptom complex comprised of biliary pain, high fever with rigors, and jaundice. Vomiting of roundworms during biliary colic was a frequent presenting complaint. Sixteen (40%) patients had already undergone biliary surgery. The roundworms were absent from the biliary tree at the time of surgery in all except 1 patient. Acalculus cholecystitis, confirmed by histology, was a frequent finding at surgery.

Laboratory Findings

Stool examination revealed ova of *Ascaris lumbricoides* in 38 patients (Figure 1). Serum bilirubin elevation >3 mg/100 ml was a feature in those patients who had associated stones or stricture of the biliary tree. Elevation of serum glutamic pyruvic transaminase and alkaline phosphatase was usually minor, and the serum amylase was elevated only in those patients who had abnormal pancreatograms.

Endoscopic Retrograde Cholangiopancreatography

All 21 patients with proven biliary ascariasis had radiographic features of roundworms in the biliary tree (Figure 2). The roundworms in the biliary tree were outlined as smooth, long linear defects with tapering ends. The worms were frequently located in the duodenum, across the papilla, and in the common bile and intrahepatic ducts but rarely in the gallbladder (Figures 3 and 4). A single worm was present in the biliary tree of 8 patients, two worms in 4 patients, three worms in 4 patients, and multiple worms in 5 patients. In addition, 3 patients had stones in the common bile and intrahepatic ducts (Figure 5) and 1 patient had stricture of the bile duct.

The roundworms were visualized in the duodenum of all 18 patients with suspected biliary ascariasis. However, cholangiograms in these patients were normal.

Pancreatograms were obtained in 29 patients. Five patients with proven biliary ascariasis had abnormal pancreatograms. In 2 of these 5 patients, the main pancreatic duct along its entire length revealed marginal irregularity with dilatation of side branches.

Table 2. Clinical Features of 39 Patients With Biliary Ascariasis

	Number of patients		
	Proven (n = 21)	Suspected (n = 18)	Total (n = 39)
Biliary colic recurrent	20	18	38
Recurrent pyogenic cholangitis	17	10	27
Bile culture positive	(15)	(2)	(17)
Vomited roundworms	13	6	19
Previous biliary surgery	10	6	16
Stones found	(4)	(2)	(6)
Worms found	(1)	(0)	(1)
Acalculus cholecystitis	(5)	(4)	(9)
Icteric at the time of diagnosis	7	0	7
Tender enlarged liver	6	0	6
Gallbladder lump	2	0	2

Similar changes were restricted to the tail of the pancreatic duct in another 3 patients.

Treatment and Follow-up

All 21 patients with proven biliary ascariasis were hospitalized and needed intravenous fluids, antibiotics, and antispasmodics to relieve pain and treat cholangitis (Figure 6). Five patients with acute pancreatitis recovered on conservative treatment. Surgical exploration of the biliary tree was performed in 7 cases only. Soft pigment stones were recovered from the common bile and intrahepatic ducts of 3 patients and histologic examination revealed gravid roundworm segments in the center of these stones.

Anthelmintic treatment for ascariasis (Mebendazole 100 mg b.i.d. for 3 days, Janssen Pharmaceutical Co., Piscataway, N.J.) was administered to all patients and repeated after 10 days. Treatment success was checked by repeated examination of stools for ova of *Ascaris*. Afterwards patients were advised to take anthelmintic treatment every 2 mo.

Thirty-eight patients were symptom-free on follow-up. The mean follow-up time was 7.6 ± 3.0 mo. Abnormalities in the biochemical tests had returned to normal. Twenty-one repeat ERCPs were performed at varying intervals on 11 patients in whom earlier ERCPs revealed roundworms in the biliary tree and who had recovered on anthelmintic therapy alone. The worms had moved out of the biliary tree in all 11 patients. At 1 wk, the worms had shifted inside the biliary tree in 2 patients and had moved out of the biliary tree in the third patient. Remaining follow-up ERCPs were performed within a 2-wk–6-mo period and in only 1 patient were worms found in the biliary tree. The presence of worms in the biliary tree at 6 mo in this patient was due to reinfection as an earlier repeat ERCP had shown no worms in the ducts.

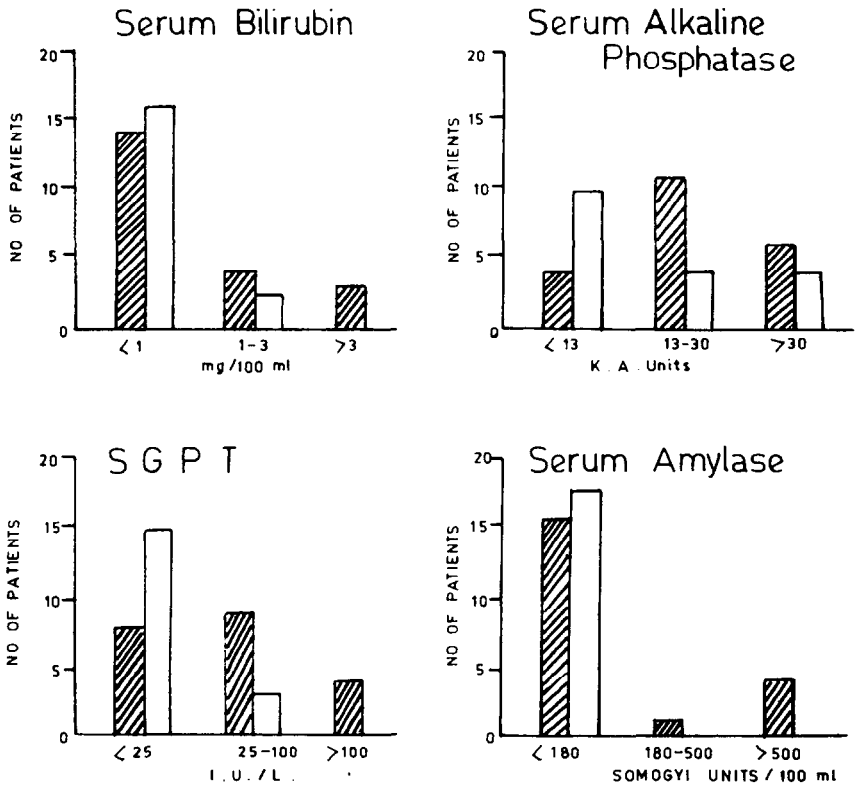

Figure 1. Biochemical data of patients with biliary ascariasis (*shaded bars*) and suspected biliary ascariasis (*unshaded bars*).

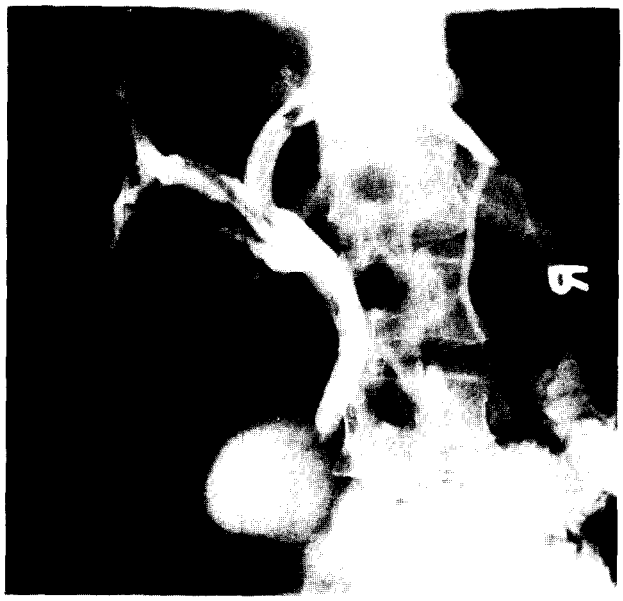

Figure 2. Endoscopic retrograde cholangiopancreatography. Biliary ascariasis. Three long, linear, smooth filling defects (roundworms) are seen in the common bile duct and hepatic ducts (arrows).

Pancreatic Ascariasis

Six (15%) of the 40 patients with biliary and pancreatic disease related to ascariasis had pancreatitis. One patient had clinical acute pancreatitis with the ERCP documentation of a linear defect within the pancreatic duct, and 5 additional patients with biliary ascariasis had abnormal pancreatograms. The patients with abnormal pancreatic ducts also had elevated serum amylase. The pancreatic disease in patients with biliary ascariasis was presumably due to a blockade of the sphincter of Oddi by worms entering the bile duct. However, previous involvement of the pancreatic duct by *Ascaris* worms cannot be excluded.

Discussion

The present study prospectively analyzed etiologic cause of symptomatic biliary and pancreatic disease from an area where ascariasis is highly endemic. Ascariasis (36.7%) was equal to gallstones (34.8%) as a causative factor of adult biliary disease. Biliary disease caused by roundworms is common in South Africa, the Far East, and Latin America (3–7). Ascariasis is rare in many parts of Europe and the United States and only occasional cases of *Ascaris* invasion of the bile ducts are encountered (8). However, increased movement and migration of Afro-Asians make it necessary for clinicians in these countries to be aware of this entity.

Ascariasis is known to cause pancreatitis (9) and was the probable etiologic factor in 6 of 18 patients (33%) with pancreatic disease among the total of 109 patients. The worm rarely migrates into the main

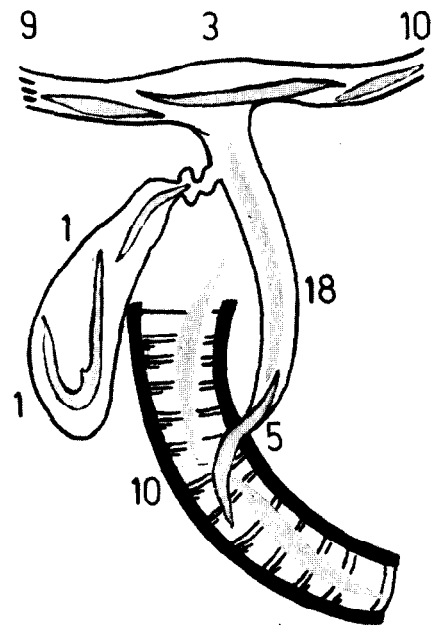

Figure 3. The location of worms in the duodenum and biliary tree in 21 patients with proven biliary ascariasis. Figures denote the number of patients with worms at that particular site.

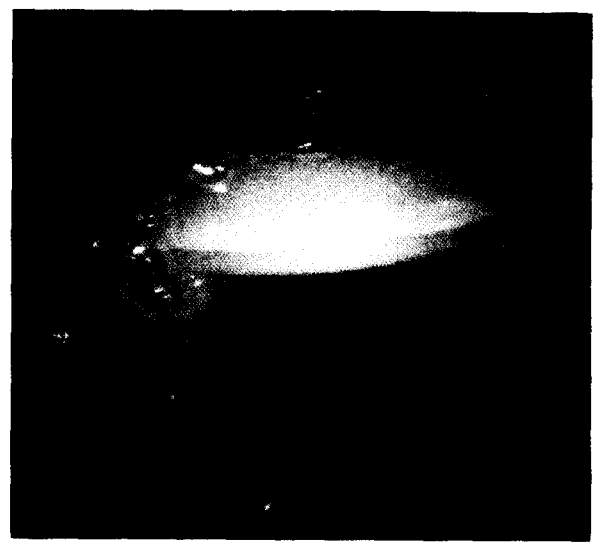

Figure 4. Photograph taken during duodenoscopy showing biliary ascariasis. A roundworm is visualized in the duodenum and has entered the ampulla of Vater. Endoscopic retrograde cholangiopancreatography revealed the remaining portion of roundworm in the common bile duct.

Figure 5. Endoscopic retrograde cholangiopancreatography. Biliary ascariasis. Two smooth, long, linear filling defects are seen in upper half of the common bile duct and extend up into the hepatic ducts. The lower half of the common bile duct reveals three defects of varying shapes (stones). Gallbladder is dilated but free of worms or stones.

pancreatic duct and rarely causes necrotizing pancreatitis (2). More often entry of the worm into the bile ducts causes a block at the sphincter of Oddi with concurrent obstruction to the pancreatic duct. This presumably leads to bile regurgitation and introduction of enteric organisms into the pancreatic duct.

Although children are more susceptible to roundworm infection, biliary ascariasis was predominantly prevalent in adult women. As all patients with symptomatic biliary and pancreatic disease were prospectively evaluated, this observation could not be an artifact of case selection. Children may escape invasion of the biliary tree by worms due to their narrow biliary passages. However, abdominal colic in children needs further study to assess the occurrence of biliary ascariasis in this age group.

Endoscopic retrograde cholangiopancreatography is an excellent tool in the diagnosis of biliary ascariasis. When used during or immediately after biliary symptoms, worms were demonstrated in the biliary tree. In patients examined during symptom-free periods worms were visualized in the duodenum and not in the biliary tree. Endoscopic retrograde cholangiopancreatography is also useful in documenting the movement of worms out of the biliary tree in patients with proven biliary ascariasis to avoid unnecessary surgical interventions. Intravenous cholangiography has been used by others to demonstrate worms in the bile ducts. Using this technique, worms were demonstrated in only 48.9% of the cases (6,7). Oral cholecystography has little diagnostic value in biliary ascariasis as the worms rarely enter the gallbladder.

The present study has stressed the limitation of surgery in the diagnosis of biliary ascariasis. The worms move actively into and out of the biliary tree from the duodenum and are usually not found at biliary exploration. Sometimes the worms are trapped in the ducts and cause persistent biliary symptoms. For such patients surgery is rewarded by finding dead worms in the biliary tree.

Biliary parasites, *Ascaris lumbricoides* and *Clonorchis sinesis*, are well known to cause biliary lithiasis (5). The biliary calculi in 3 of our patients were of pigment type, localized in the common bile and intrahepatic ducts, and contained worm fragment as the nidus. Bile stasis and ascending bacterial infection of the biliary tree are additional factors presumably operating in the formation of biliary calculi. Intrahepatic calculi are found primarily in South America (10) and the Orient (11,12), where there is high incidence of parasitic infection. Examination of the stones has revealed either *Ascaris* ova or immature parasites as the nidus in 10%–66% of these patients (5,10). Although rare, *Ascaris* calculi have been reported in the United States (8).

In parts of the tropics where gallstones are uncommon, and this applies to most developing countries, any adult person presenting with symptoms and signs of biliary or pancreatic disease should be suspected of having biliary ascariasis. Vomiting of roundworms during biliary colic may give a strong clue to the diagnosis. The clinical spectrum includes

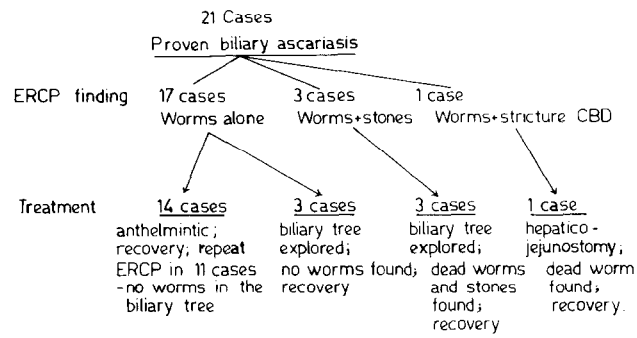

Figure 6. Treatment and follow-up of 21 patients with proven biliary ascariasis.

recurrent pyogenic cholangitis, acalculus cholecystitis, pancreatitis, and even liver abscesses. Jaundice is not a presenting feature of the disease, as obstruction at the sphincter of Oddi is presumably intermittent and bile can flow into the duodenum. However, jaundice may be a dominant clinical feature once the disease is complicated by biliary calculi.

Conservative treatment of biliary ascariasis consists of intravenous fluids, antibiotics, and antispasmodics. The worms migrate out of the biliary tree into the duodenum and are then amenable to anthelmintic therapy. These drugs have no action on the worms inside the ducts. A repeat ERCP is performed after 2 wk. If the worms are still present in the biliary tree with clinical symptoms then surgery is planned, as there is a distinct possibility that the worms are dead. As reinfection rates are surprisingly high in an endemic area, 2-mo anthelmintic therapy is needed to avoid recurrence of the disease. The duration of treatment has to be determined after long-term follow-up of the disease, taking into account continuous reexposure to the parasites and cost and side effects of therapy.

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