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RESEARCH ARTICLE

Pancreatic duct ascariasis: clinical presentation, management and outcome.

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Abstract

Background: Infection with ascaris is seen globally. The adult roundworms frequently migrate into the biliary tree from the small intestine. Migration into the pancreatic duct is a rare event due to its narrow caliber and tortuosity. The aim is to present the incidence, clinical features, diagnostic modalities and outcome of pancreatic duct ascariasis.

Methods: This is a retrospective cum prospective study over a period of 18 years. During this period 3357 cases of hepatobiliary and pancreatic ascariasis were seen and 51 had pancreatic duct ascariasis.

Interpretation: There were 28 females; 10(19.6%) patients were below 18 years of age. The mean age was 38 ± 5.3 years (range 7- 48 years). Three types of pancreatic duct ascariasis were identified. a) Isolated pancreatic duct ascariasis (15 patients); b) concomitant pancreatic and bile duct ascariasis in (27patients); c) worm across ampulla of Vater entering into the pancreatic duct (9 patients). Pancreatitis was mild in 43(84.31%) and severe in 8 patients (15.69%).Ultrasonography is an excellent diagnostic tool. Majority of patients responded to conservative management. Endoscopy was performed in 23 patients with severe pain and in 9 patients' worms hanging across the ampulla was extracted. Endoscopic retrograde cholangiopancreatography was performed in 11patients with pyogenic cholangitis, severe pancreatitis and worsening cholecystitis. Surgery was done in 2 patients. Patients with concomitant worms in the biliary tree and pancreatic duct had significantly higher incidence of severe pancreatitis ($p < 0.05$), more complications and need for surgery ($p < 0.05$).Mortality was 1.9%.

Conclusions: Endoscopic management is useful in patients with complications.

INTRODUCTION

The adult worm, (Ascaris lumbricoids) is the most widespread helminth worldwide, globally affecting over a billion people.[1] Tropics and subtropics are worst hit due to the moist soil, , overcrowding and unhygienic conditions prevailing in these areas. [2] In endemic areas, the prevalence may be as high as 80% among children and 30% in adults [3, 4, 5]. It is estimated that about 20,000 people worldwide succumb to this infection annually [6]. The disease is highly endemic in Asia, Africa, and Latin America [7, 8]. In the West, the prevalence is low and the disease is seen mostly amongst immigrants from the Asian and African countries and amongst tourists visiting these countries [7.]

The worms usually reside in the small intestine, but because of its wandering lust and propensity to explore small openings, it frequently migrates into the biliary tree[9, 10.] The invasion of the roundworm into the biliary tree can lead to biliary colic, obstructive jaundice, cholangitis, pancreatitis, cholecystitis and liver abscesses [9, 10, 11,12,13,14]. However, migration into the pancreatic duct (PD) is a rare event due to its narrow caliber and tortuosity[12].Migration of the worm into the pancreatic duct incites an inflammatory reaction and leads to a cascade of events leading to pancreatitis. In India, the Kashmir valley is a highly endemic zone for ascariasis. .The incidence, clinical features and outcome of biliary ascariasis have been well described in previous studies.[2,9,10,14,15,16]However, literature gives scanty information about pancreatic duct ascariasis(PDA) and most of the available data are restricted to mere case reports and case series.[17,18,19,20,21]Khuroo et al conducted a prospective study of 500 cases of hepatobiliary and pancreatic ascariasis(HBP) and found that (PDA) accounted for only 7 cases (1.4%) of Hepatobiliary pancreatic ascariasis (HBPA).[2]

Most cases of acute pancreatitis (AP) in adults are attributed to gallstones and alcohol [22]. However, in Kashmir valley, ascariasis was found next only to gallstones as a cause of AP. Khuroo et al reported that ascariasis accounted for 59 of 256 patients (23.0 %) with acute pancreatitis. Of these patients only 8 had worms in the pancreatic duct.[12]In a study by Sandouk etal[11] only 7 (2.3%) cases of ascaris invading the PD were observed out of 300 cases of HBPA .From these studies it can be fairly concluded that PD ascariasis is quite rare.

We aim to present the pattern of presentation, imaging features, management, complications and outcome of pancreatic duct ascariasis in a population with a high burden of ascariasis.

MATERIAL AND METHODS

Study design and patient population

The present study was a conducted in the department of Medical gastroenterology and department of surgical gastroenterology, department of Radio diagnosis at Sher-I-Kashmir Institute of Medical Sciences, Kashmir (India). This was an 18years (1996 to 2013) hospital-based cohort study. The study was approved by the Institutional Ethics Committee and all patients or responsible guardian had given written informed consent at the time of admission. Retrospective study was from 1996-2004 and prospective study from 2004-2014. All patients with clinical, radiological features of HBPA were analyzed and patients with PDA, with or without concomitant worm in the biliary tree were selected for the present study.

Inclusion criteria

Retrospective data: Complete case records of patients with evidence of roundworm in the pancreatic duct with or without concomitant worm in the biliary tree at ultrasonography (USG), their demographic and clinical data including age at initial illness, sex, clinical presentation, treatment modalities, complications, morbidity, mortality and surgical records and course of the disease need for endoscopic retrograde Cholangiopancreatography (ERCP) and/or surgery with a minimum of 1 year of follow-up were analyzed.

Prospective data: Patients admitted with evidence of worm in the PD with or without concomitant worm in the biliary tree at USG.

E**xclusion criteria** Incomplete medical records for demographic, clinical and laboratory parameters. Patients admitted with evidence of worms in the biliary tree but no worm in the PD. Ampullary ascariasis entering into the common bile duct only.

The laboratory evaluation included haemogram, liver function tests, serum amylase and stool analysis for ova and parasites. USG was available in each case. Other investigations such as esophagogastroduodenoscopy (EGD), ERCP and computerized tomography (CT) abdomen were done in selected cases. For patients who had an ERCP, the following information was recorded: type of sedation or anesthesia, therapeutic procedure done and complications. All patients in prospective group underwent USG within 3 hours of admission and thereafter every 1-3 days to detect complications and to assess for disappearance of worm from the PD and biliary tree. CT abdomen was done if response to treatment was not satisfactory and to look for any complications of pancreatitis.

Definitions

Pancreatic duct ascariasis: The diagnosis of PDA was made on the basis of evidence of worm in the PD at USG as described[21, 2](Figure 1, 2) or at ERCP, the worm being visualized as a linear filling defect in the PD[23] (Fig 3). Pancreatitis was diagnosed in these patients having appropriate clinical picture (abdominal pain with or without radiation to back, nausea, vomiting of worms or passage of worms with stools and diffuse tenderness of abdomen), and serum amylase greater than three times of the upper limit of normal. Severity of AP was classified as mild or severe according to Atlanta classification.[24]

Recurrence: Documentation of reappearance of worms in Hepatobiliary and pancreatic duct by USG after initial exit of worms and complete clinical recovery.

Treatment

All patients were managed with fluid therapy, analgesia, correction of metabolic and electrolyte disturbances and nutritional support as required. Antibiotics were given in those with associated cholangitis and for treatment of infectious complications. The mainstay of treatment was an early administration of the anthelminthic therapy.[25] (pyrantelpalmoate 10-15 mg/kg once a day for three consecutive days) was administered early within 24 hours of hospitalization (except in patients who had recurrent vomiting or who had ileus) the anthelminthic were repeated several times in order to keep adequate drug available in the gut lumen .Since live worms have propensity to move back into the duodenum where the drugs are most effective.

Emergency upper gastrointestinal endoscopy was performed in cases of intractable pain not responding to the usual conservative measures, to look for impacted worm across the papilla of Vater. Endoscopy was performed under intravenous sedation with the vitals monitored with the help of pulse oximeter. ERCP was performed under intravenous sedation or under anesthesia in children below 18 years of age with JF-IT20 Olympus duodenoscope (Olympus Ltd, Tokyo Japan).Papilla was patulous in all patients allowing free passage of accessories thus obviating the need of papillotomy. Worms from CBD were removed with basket or balloon while worms in PD were extracted with balloon. Emergency surgery was performed in patients with associated liver abscess or impacted dead worm in the cystic duct.

Follow up

The response and success of treatment was judged and monitored by resolution of clinical symptoms (abdominal pain, fever, jaundice, passage of worms) and biochemical parameters (normalization of total leukocyte count, serum amylase) and radiological evidence of exit of worm from the PD on USG. All patients were followed in the outpatients department every 2 months for a period of 3 year and then yearly to look for any recurrence of ascariasis and were advised to report to hospital in case of pain, fever or jaundice. Patients were advised regular deworming every 2 monthly and were educated to improve their personal hygiene and sanitation. Deworming of other family members was also advised.

Statistical analysis

Summary statistics for quantitative data were expressed as mean ± standard deviation P value <0.05 was considered statistically significant. All statistical analysis was performed with the statistical package for social sciences (SPSS 10) Chicago, USA software

RESULTS

Patient characteristics, Clinical features, and laboratory tests

During the study period, a total of 3357 cases of HBPA were seen, of these 51 (1.5%) met the criteria for diagnosis of PDA. The radiological diagnosis of presence of worm in the PD was made at USG in 48 (94.1%) Three patients who were missed at USG had diagnosis of CBD worms at USG, but they were found to have concomitant worms in the PD at ERCP which was done for therapeutic reasons. Demographic data revealed that females were slightly more than males with a ratio of 1.2:1. There were 10 (19.6%) children below 18 years of age. The mean age was 38 ± 5.3 years with a range from 7 to 48 years. Abdominal pain was the dominant symptom seen in all (100%) patients followed by nausea and vomiting. Jaundice was observed in 10 patients, out of which 2 had presentation of suppurative cholangitis (Table 1)

Types of Pancreatic Duct Ascariasis

Three types of PDA were identified: a) isolated pancreatic duct ascariasis in 15 patients; b) concomitant pancreatic and bile duct ascariasis in 27patients c) worm across ampulla of Vater entering into the pancreatic duct in 9patients. Acute Pancreatitis was graded as mild in 43 (84.31%) and severe in 8 (15.69%). Patients with severe AP had multiple organ failure in the form of renal failure (n=5), hypotension (n=6) and respiratory failure (n=6).AP was significantly mild in patients with PD worm invasion alone when compared to those with worms across ampulla or concomitant worms in the biliary tree and PD who had significantly higher incidence of severe AP ($p < 0.05$), EGD was done in 23 patients with intractable pain to rule out worm across the ampulla and worms were seen in 9 patients hanging across the papillary orifice entering into PD and were removed in all 9 patients with immediate relief in pain(Table 2).Eleven patients underwent ERCP and worms were completely removed from PD, CBD or both in8 patients. Two patients underwent endoscopic nasobiliary drainage (ENBD) for associated suppurative cholangitis and when cholangitis subsided worms were removed from the CBD and PD .Emergency surgery was done in 2 patients, indications being associated liver abscess in 1 and dead cystic duct worm in 1 patient. (Table 3)

Mortality: One patient of sever acute pancreatitis died due to multiple organ failure. This patient had concomitant worms in PD and CBD.

Long term follow up

Patients were on regular follow up in the outpatient department (OPD) every 3 months for 3 years and then yearly. Patients were advised regular deworming every 2 months. Deworming of other household members was also advocated. Recurrence of ascariasis in patients of pancreatic duct worms was reported in 9 patients but none had PDA.

Table 1 Demographic features of patients with pancreatic ascariasis.

Characteristics	Number of patients	Percentage of patients
Age, mean (range)Years	38 ± 5.3(7-48)	
Sex Male Female	 23 28	
Abdomen pain	51	100%
Nausea	37	72.6%
Vomiting	28	54.9%
Vomiting of worms	17	33.3%
Passage of worms with stools	8	15.6%
Fever	28	54.9%
Jaundice	10	19.6%
Dyspnea	6	11.7%
Decreased urine output	5	9.8%
Ascites	1	2%
Hypotension	6	11.7%

Table 2 Presenting features, complication and management of various types of pancreatic ascariasis.

Type of PD ascariasis	**Isolated PD ascariasis**	**CBD & PD ascariasis**	**Ampullary ascariasis entering into the pancreatic duct**
Number of patients	15	27	9
Age distribution	Adults=13 Children=2	Adults= 20 Children=7	Adults=8 Children=1
Sex (M= males; F=females)	M=7 F = 8	M=12 F=15	M=4 F=5
Severity of pancreatitis	Mild = 14 Severe=1	Mild =20 Severe=7*	Mild =9 Severe=0
Complications	Hypoxia=1 Renal failure=1	Hypoxia=5 Renal failure=4 Hypotension=6	Nil
Intractable abdominal pain requiring EGD	6	8	9
Removal of worm across papilla on endoscopy	Nil	Nil	9

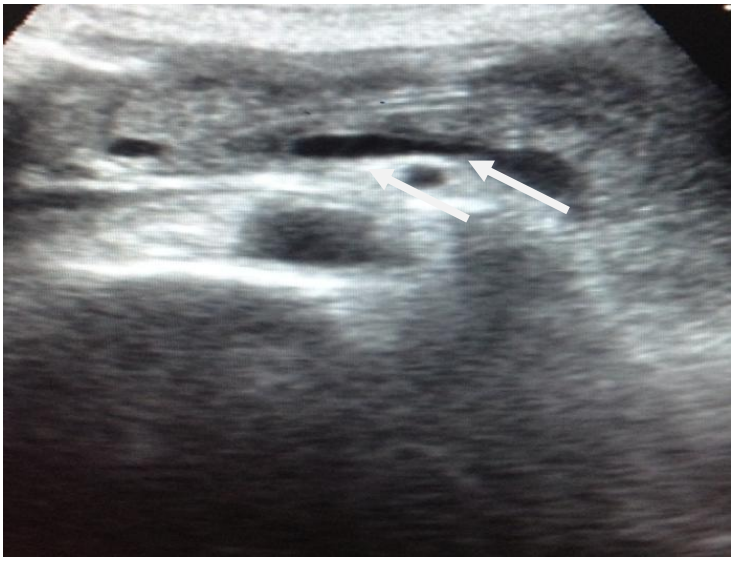
*One patient died of multiple organ failure

Table 3 Indications for ERCP and surgery in various types of pancreatic ascariasis.

	Isolated PD ascariasis n=15	**CBD & PD ascariasis n=27**	**Ampullary ascariasis entering into the pancreatic duct n=9•**
ERCP	1	10 2 had suppurative cholangitis requiring ENBD*	Nil
SURGERY		2 Liver abscess=1 Dead cystic duct worm =1	

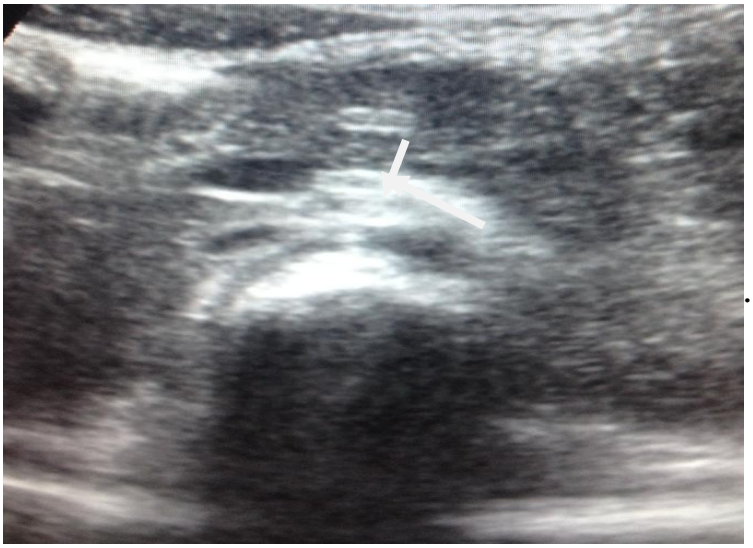
* Endoscopic nasobiliary drainage (When cholangitis subsided worms were removed at ERCP from CBD and PD).
•These worms were removed at upper GI Endoscopy

Figure1:



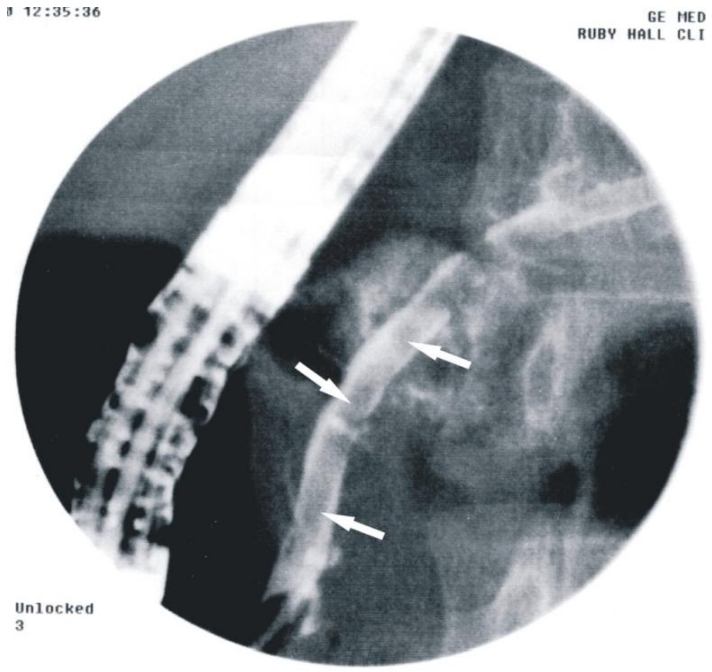
USG showing "four lines sign" in pancreatic duct. (Worm inside pancreatic duct)

Figure2:



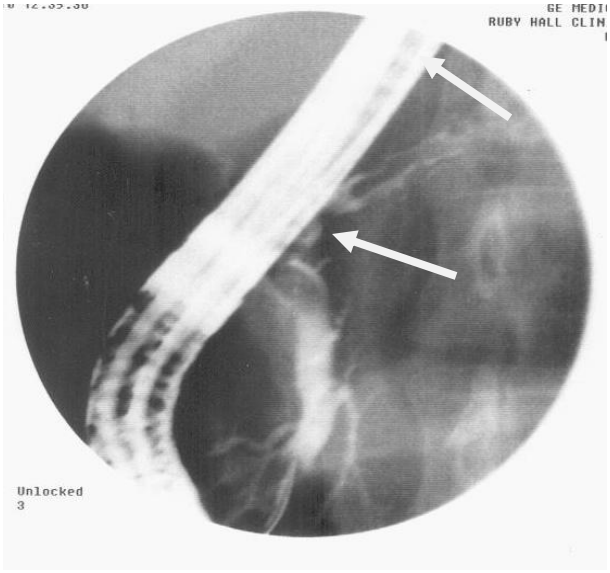
USG showing worm in pancreatic duct with bulky pancreas.

Figure3:



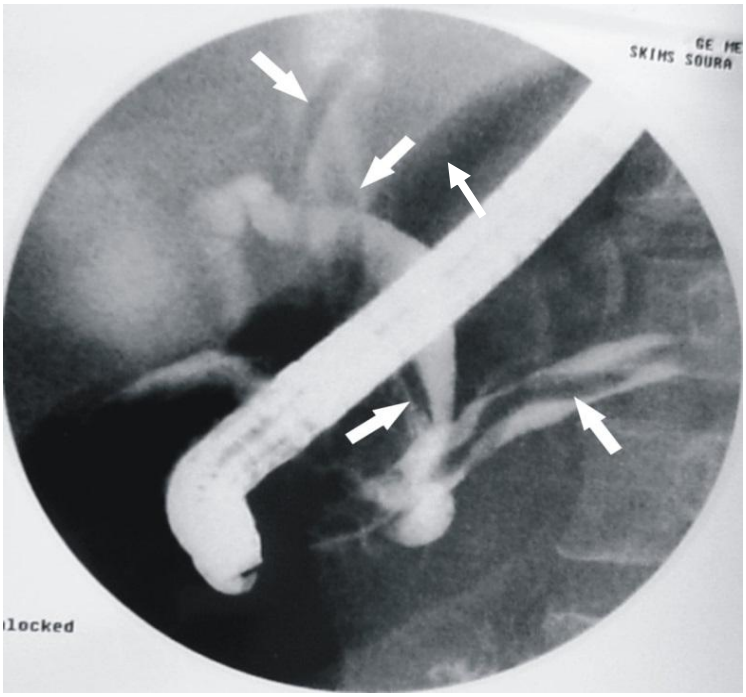
Pancreatogram showing a linear filling defect pancreatic duct (black arrow) suggestive of worm in PD.

Figure4:



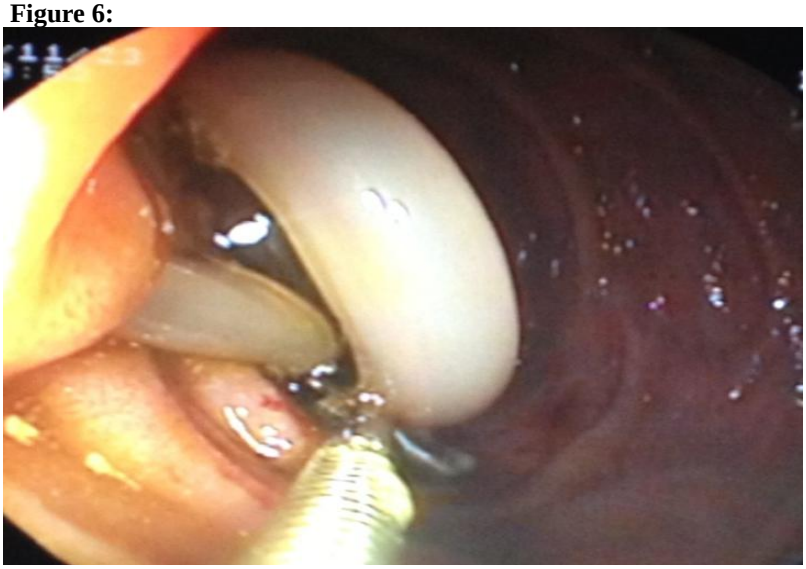
Pancreatogram showing a linear filling defect in pancreatic duct (PD) suggestive of worm in PD up to lower end suggesting part of worm across ampulla.

Figure 5:



Cholangiopancreatogram showing linear filling defect in pancreatic duct (PD) With multiple linear filling defects in Common Bile Duct.

Figure 6:



Worm across papillae caught with forceps being extracted at endoscopy

DISCUSSION:

The present study highlights the magnitude, clinical features and outcome of PDA in a population with high endemicity for ascariasis. This study depicts that PDA accounted for only 1.5% of cases of HBPA Three types of presentations were observed. Patients who had worms across the papilla had severe form of pancreatitis due to blockade of ampulla leading to pent up secretions with rise in biliary and pancreatic duct pressures and causing severe pain, it also leads to reflux of bile into PD causing severe inflammation of pancreas. Patients with PDA who had concomitant worms in the CBD when compared with isolated PD worm had associated cholangitis needing ERCP intervention. Patients with isolated PDA had a mild disease the reason might be that worms cause only partial obstruction of the PD allowing pancreatic juices to move out thereby leading to a milder course of pancreatitis.

Worms can die in the biliary tree, these dead worms serve as nidus for stone formation and lead to complications and these dead worms need to be extracted by ERCP[26, 27, 28] However, we have not observed any case of dead worms in the PD though there are case reports of dead worm in PD[18]. We postulate that the pancreatic juices are irritating for the worm and probably the worm tries to move away from the pancreatic duct; this along with narrow and tortuous PD might be another factor responsible for the rarity of PDA.

The valley of Kashmir is a highly endemic zone for ascariasis. The prevalence of biliary ascariasis is 30% in adults and 60% in children [9]. The burden of ascariasis is seen mostly amongst the school going children.[5]Early Vermifuge therapy was the most effective treatment modality for PDA. We advocate early and repeated antihelmenthic therapy for all cases of ascariasis The response was judged by resolution of symptoms, expulsion of worms with stools, radiological exit of worm on USG and biochemical resolution with normalization of leukocyte count and serum amylase levels. Patients presented with intractable abdominal pain with biochemical evidence of acute pancreatitis when the worm was across the ampulla into the PD. The worm causes a complete mechanical obstruction by blocking the ampullary orifice leading to intractable abdominal pain. We subjected these patients, in whom we suspected worm across the ampulla, to emergency EGD. (Figure 6) There was quick relief of pain with the extraction of worm. In patients of HBPA with intractable pain, EGD should be performed early to diagnose ampullary worms and extract them as advocated by other authors [12,26,27,28].

Those patients who had concomitant cholangitis received antibiotics, anti-helmenthic, analgesics, and vitamin K to correct coagulopathy. ERCP was done in 11 patients in our series. The indications for ERCP were intractable pain, multiple worms in the CBD leading to obstructive jaundice and suppurative cholangitis. ENBD was established in 2 patients to decompress the biliary tree. ERCP is very useful tool for managing HBPA. Similar observations have been made by other observers.[12, 16]we should not instill anti-helmenthic into CBD to kill the worm inside because live worm is less dangerous than dead worm as live worms wriggle out of the ducts.[29] Surgery was performed in 2 patients, indications being associated cystic duct worm leading to cholecystitis (n=1), associated liver abscess (n=1).

In our series, we had fifteen patients of isolated pancreatic duct ascariasis and we found different clinical presentation with patients of concomitant worms in biliary tract, or ampullary worm. In patients with isolated PDA, majority had mild pancreatitis and only 1 patient required ERCP for extraction of PD worm. It is the patients of CBD and PDA worms which require intervention by ERCP and surgery while patients of ampullary worm entering into the pancreatic duct have severe pain and respond to endoscopic removal of worm. The timing of performing USG is important and should be performed immediately or otherwise the diagnosis will be missed as worms move across the ducts quickly and probably that is reason for higher pickup rate of worms than other series [2, 12, 28] since USG was performed within 3 hours of admission. Early EGD in patients, who have severe pain at presentation, is both diagnostic as well as therapeutic. ERCP intervention is required to remove worms from biliary system, to alleviate the symptoms of pyogenic cholangitis, worsening cholecystitis, severe pancreatitis and not to leave dead worm inside hepatobiliary system, as dead worms are nidus for stones leading to recurrent cholangitis[30]. In rest of patients the worms migrated out of pancreatic or a biliary duct spontaneously, thus defining the type of PDA at presentation, defines the management of each subset of patients.

Recurrence of HBPA is a recurring problem in endemic areas due to high infection rates, unclean drinking water and unhygienic conditions. In 9 patients of PDA who had recurrence, 4 did not take antihelmenthic as advised. However

none of these patients had PDA. Repeated deworming therapy and improvement of hygiene is the best way of preventing recurrence.

Ascariasis is very common in South East Asian countries and is rare in Western countries but may occur in travelers or in migrant population. This disease might be of increasing significance in the west, [7, 31] thus the clinicians, radiologists, surgeons in West must be aware of this entity in view of increase in travel and influx of migrants. We also propose that people travelling to endemic areas should take anthelminthic treatment during their stay in these countries and another course after return to clear the gut of worms.

Limitation; our study was partly retrospective and partly prospective and underestimated the true incidence of PDA. Since our inclusion criteria were strict, we took only those patients of PDA who had features of AP. Based on our experience, many patients of PDA have mild pancreatitis not reporting to hospital and recover after worms migrate out of biliary and pancreatic duct and do not seek hospitalization.

Conclusion:

Pancreatic duct ascariasis is very rare even in areas with high endemicity of ascariasis. The narrow and tortuous caliber of PD along with the irritable pancreatic juices makes it an unfavorable dwelling site for the worm. But when the worm finds its way into the PD, it incites an inflammatory cascade leading to pancreatitis. Most of the cases have a mild pancreatitis. Although it can occasionally present with severe pancreatitis or even cholangitis when an associated CBD worm is present or can lead to intractable pain when the worm moves across the papilla. USG is simple noninvasive diagnostic modality for diagnosis of PDA, but some patients may yet be missed. Endoscopic removal of worm across papilla leads to immediate relief for pain. Management consists of regular and repeated deworming along with IV fluids, analgesics antibiotics and antiemetics. ERCP is a therapeutic tool in those not responding to conservative methods. If worms persist in ducts on U/S for a period of more than 6 weeks it is presumed to be dead and requires to be removed at ERCP/Surgery as it can lead to stone formation. Surgery is rarely required. Regular deworming and improvement of sanitation and hygiene is the most effective way of preventing recurrence in endemic areas.

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