Parasites have been known to be a cause of disease ever since the beginnings of human history. They are found mainly in developing countries where people from different social status have uneven access to benefits such as proper hygienic and sanitary conditions or adequate diet, or where different cultural patterns prevail. Parasites predominate in tropical and subtropical regions and affect both rural areas and large urban centers. Over recent years an increase in parasite-induced conditions has been observed partly because they appear as opportunistic infections in immunosuppressed host, especially in AIDS patients. Dissemination is also favored by the increase in both domestic and foreign migrations. In our country there is a continuous domestic migration from rural to urban areas of people seeking jobs and better standards of living. However, quite often urban centers lack the adequate infrastructure to admit large masses of people: this determines that no proper hygienic and sanitary conditions are available. Knowing the biological-epidemiological cycle, the clinics, diagnosis and management of the parasite means having the necessary weapons available to fight this scourge.

Ascaris lumbricoides are the ones that most affect man. They can be divided into: 1. Protozoan (unicellular) and 2. Helminthes (multicellular). Within the helminthes, worldwide distributed Ascaris lumbricoides is the one that most frequently affects man.

This roundworm has been known since the beginnings of civilization: it is already mentioned in the Egyptian Papyrus of Ebers as far back as 1550 B.C.. About a quarter of the world population is infected, specially in areas where sanitation, personal hygiene and public health standards are low. The

MISE AU POINT

Ascaris lumbricoides: role of ultrasound in diagnosis and management of abdominal manifestation

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SUMMARY

Ascariasis is an endemic parasitosis that is predominant in warm regions but has a worldwide distribution. It affects particularly those areas where hygienic and sanitary conditions are poor. The ascaris is a helminth that usually lives in the intestinal lumen where its remains because of its intense active motility. This motility leads it to occasionally invade small orifices opening into the intestinal lumen. Major complications occur when the parasite invades the bile or the pancreatic ducts. This may cause obstructive biliary conditions, cholangitis, liver abscess, cholecystitis or pancreatitis. Ultrasound has at present a fundamental role not only to diagnose these complications but also to monitor response to therapy. Different ultrasound findings of ascariasis as well as impact of ultrasound on management surveillance are reviewed.

alterations. In adult state ascaris may measure up to 40 cm in length and 6 mm in diameter, depending on its age and sex (females are larger than males). The average adult parasite is about 20 cm long. The adult roundworm has active antiperistaltic movements that allow it to live in the intestinal lumen in spite of peristaltic waves (fig. 1). It usually does not cause any significant symptoms. Occasionally ascaris worms are vomited up or eliminated with the feces. Because of their active motility they can form masses or bolus causing intestinal obstruction or volvulus [1] and they may penetrate any available orifice and cause perforation. They can also cause obstruction of nasogastric tubes, ventriculoperitoneal shunts and drainage catheters [2, 3]. The most important complication is the worm invasion of the biliary or the pancreatic ducts. Biliary ascariasis predominates in young women although young children are the most affected by ascaris infection. This may be due to the narrow lumen of the biliary duct in children which would hamper penetration [4]. The biliary duct may be invaded by one or several parasites at the same time. Although there are cases described in the literature of asymptomatic subjects with biliary ascariasis the invasion of the biliary ducts usually provokes biliary obstruction, acute cholangitis, pancreatitis, cholecystitis, or liver abscess [5, 6, 7, 8]. Almost all the patients with ascaris induced biliary duct obstruction will present biliary colics. Vomiting of ascaris during these colics is a frequently presenting complaint [4]. Biliary pain, high fever with rigors and jaundice are present in cases of pyogenic cholangitis [5].

ROLE OF ULTRASOUND IN THE DIAGNOSIS

When ascariasis is suspected the stool examination can detect the presence of ascaris lumbricoides ova and X-ray examination can show the adult parasite at intestinal level [9] (fig. 2). For the erratic locations the main diagnostic tools currently available are ultrasound and ERCP. The role of CT Scan and MRI in the diagnosis of ascariasis is until not well established. Abdominal echography is the first step in the diagnostic algorithm because of its availability, low cost, and no invasivity.

Both intestinal location as well as biliary and pancreatic invasion can be successfully detected by ultrasound. At the gastric or intestinal levels, ascaris worm appear ultrasonographically as echogenic, tubular structures, without posterior shadow, specially visible when organs are filled with fluid [1, 10]. Several reports have described the ultrasonographic appearance of biliary ascariasis. When parasites are scanned in their longitudinal axis they appear as echogenic, linear structures, without posterior acoustic shadow [11-20] (fig. 3, 4, 5, 6). In transverse section they may show a “bull’s eye” appearance [21]. Sometimes an hypoechogenic linear structure in the center of the worm surrounded by the echogenic body wall can be appreciated: this hypoechogenic center was described as the “inner tube sign” and corresponds to the digestive tract of the parasite (fig. 7). In some cases overlapping of several ascaris worms or of several segments of the same parasite (coiling of the worm) will determine that multiple echogenic, linear structures appear: this has been reported as the “spaghetti sign” (fig. 8). When ascaris induced biliary obstruction lasts over a long period of time it may lead to pyogenic cholangitis and if this in turn is not resolved it may result in liver abscess formation [8, 22]. The abscess will be ultrasonographically imaged as single or multiple mixed masses, hypo, iso or hypoechogenic, of a pseudo-solid or liquid appearance. In some cases it is possible to observe ascaris worms in the center of the abscess. Ascaris imaging in the biliary duct will help etiologic diagnosis in unclear cases.

Stippled echogenic images with posterior acoustic shadowing in projection of the intrahepatic biliary ducts have also been described [4, 23, 24]. These images correspond to pigment lithiasis resulting from an old ascaris induced infection. Presence of roundworm segments was observed in the center of these stones in a pathological study [4]. Another important complication, ascaris induced pancreatitis, is caused when the passage of worms produce spasm or mechanical obstruction of the sphincter of Oddi, and sometimes through direct worm invasion of the pancreatic duct. Ultrasound is used routinely in patients with acute pancreatitis, even in uncomplicated cases, in order to identify biliary tract stones as the probably etiological factor. In endemic areas ascariasis is another important cause of acute pancreatitis to be considered. It should be remembered that in China, for example, ascaris induced obstruction is considered...
the most common cause of pancreatitis [25]. In much the same fashion, in India ascariasis is regarded as the cause of at least one third of the cases of acute pancreatitis [4, 26]. Diagnosis is made by imaging the worm in the duodenum or in the biliary tree by endoscopy or ERCP, or by ultrasonographic imaging of ascariis worms in the biliary duct, in the gallbladder or in Wirsung’s...
duct. The presence of the worm in the main pancreatic duct shows four bright, echogenic lines: the outer pair corresponding to the Wirsung’s walls and the inner pair to the ascaris’ walls. This appearance has been described as the “four lines sign” [27] (fig. 9). The four lines sign and the above mentioned findings of ascaris in the biliary duct should be known and searched for in patients with pancreatitis who live or come from endemic areas [7, 25, 28, 29].

Another possible ultrasonographic finding is ascaris lodged within the gallbladder. This complication can be easily diagnosed through ultrasound: its typical morphology and its active movements are very characteristic (fig. 10). Ascaris presence within the gallbladder has been described in asymptomatic individuals as well as in patients with acute cholecystitis, cholangitis, and acute pancreatitis [6, 30-32].

ROLE OF ULTRASOUND IN MANAGEMENT MONITORING

Ascariasis management of both its primary intestinal manifestation and its complications tends to be conservative, by means of orally-administered anthelmintic drugs. Ultrasound is quite useful for patient surveillance since it allows: 1- assessing whether response to therapy is adequate: parasite immobilization and parasite disappearance can be
ultrasonographically observed; 2- in cases where the patient remains symptomatic in spite of therapy, with biochemical indicators of persistent obstruction, should ultrasound show persistence of the parasite trapped in the biliary duct, other therapeutic approaches such as ERCP or surgery may be followed. Balloon removal through retrograde endoscopy is usually the most efficient method for these cases [25, 33-36]. Surgery is currently more restricted and is usually indicated only for those cases that cannot be resolved with either medical or endoscopic management.

CONCLUSIONS

It can be difficult to quantify the role of biliary ascariasis in an endemic area as an etiological factor of different pathological conditions in the pancreas or in the biliary duct owing to the parasite’s active movement. The worm can invade either the biliary or the pancreatic duct as easily as it can turn back quickly towards the duodenum: this can lead to a sub-diagnosis in those cases in which, although it has been the causative factor, the ascaris is no longer present in the ducts at the time ultrasound, ERCP or surgery are performed. Strict hygienic measures as well as easy access of all of the population to proper sanitary conditions will yield a decreased in infection rates. Meanwhile, ultrasound is currently a very useful tool not only for diagnosis, but also for surveillance and selection of the therapeutic approach of biliary-pancreatic ascariasis.

REFERENCES