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Sonographic Evaluation of the Relationship Between Hepatobiliary and Pancreatic Ascariasis with Intestinal Ascariasis in Pediatric Patients

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Abstract: ***Introduction: Ascariasis is the most common helminthic infection in human beings. Ultrasound is the diagnostic tool of choice in hepatobiliary ascariasis. We undertook this study to observe the relationship of hepatobiliary and pancreatic ascariasis with intestinal ascariasis in paediatric patients. Materials and methods: All paediatric patients with sonographic evidence of abdominal ascariasis between July 2013 and Dec 2015 were respectively analysed. Results: 166 of children with sonographic evidence of ascariasis infection were retrospectively analyzed. 146 of them had evidence of intestinal ascariasis by imaging. The youngest age is 1 year and the oldest age included in the study is 13 years. Males constitute 77 and females 89 (M: F=0.86). The maximum distribution is in the age group of 5 to 9 years (76/166=45.8%). Out of 35 children with hepatobiliary and pancreatic ascaris infection, 57.1 % (20/35) have no sonographic evidence of intestinal ascariasis while 42.9 % of hepatobiliary invasion occur in association with evidence of intestinal ascariasis (15/35). Conclusion: Though hepato-biliary and pancreatic ascariasis can occur in isolation without evidence of intestinal infection by ascariasis, yet there is a highly statistically significant association between intestinal ascariasis (IA) and hepatobiliary ascariasis (HBA).***

Keywords: Ascariasis; Common bile duct; Gall bladder diseases; Pancreatic ducts

1. Introduction

Ascariasis is the most common helminthic disease encountered in human beings. Patients with hepatobiliary ascariasis may present with biliary colic, acute cholecystitis, acute cholangitis, acute pancreatitis, and hepatic abscess. They may also present later as intrahepatic duct calculi due to recurrent biliary invasion [1].

Ultrasound is the investigation of choice in acute abdomen. Ultrasound also is the investigation of choice for hepatobiliary ascariasis. [2] Based on these evidences, we undertook this study.

The aim is to observe the relationship of hepatobiliary and pancreatic ascariasis with intestinal ascariasis in paediatric patients.

2. Materials and Methods

This retrospective cross-sectional study was conducted at Ganesh Das Hospital, Shillong, in the Department of Radiology and Imaging, from July 2013 to Dec 2015. Institutional permission for this study was availed and since this is retrospective study consent was not needed. 166 children of age less than 13 years with sonographic evidence of ascariasis infection were analyzed. All the ultrasound examinations were performed using Philips HD7 diagnostic ultrasound system, Bothell, WA, USA, using curvilinear (3–5 mHz), trans-vaginal (4–8 mHz) and linear transducers (12-13 mHz).

Ascariasis in the biliary tract can have any of the following imaging features on sonography [3].1. Inner-tube sign: The round worm may be seen as a thick echoic stripe with a central, longitudinal anechoic tube (gastrointestinal tract of the worm) in a gall bladder or CBD. 2. Coil of worm in the gall bladder. 3. Strip sign: Thin non shadowing strip without an inner tube in the CBD or gall bladder. 4. Spaghetti sign: Overlapping longitudinal interfaces in the main bile duct.

Adult intestinal round worms are seen as tubular structures outlined by intestinal fluid or as echogenic strip with an inner, anechoic, longitudinal canal. [4]

3. Results and Observations

A total 166 children with sonographic evidence [Figure 1&2] of ascaris infection are analysed. Intestinal ascariasis was seen in 87.9% % of them (146/166).

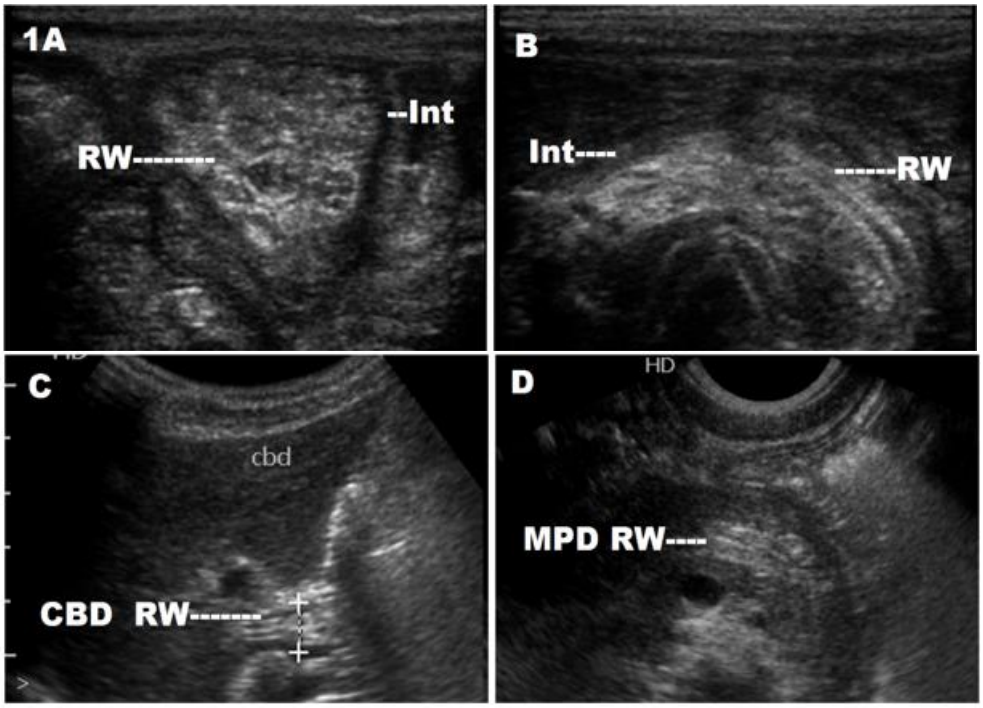

Figure 1: Sonography of Ascariasis. A. Sonography using linear probe showing multiple intestinal (Int) round worms (RW) in cross section forming bag of worms. B. Sonography using linear probe showing multiple intestinal (Int) round worms (RW) seen in long section as tubular structures with 'Inner tube sign'. C. Sonography using curvilinear probe showing round worm (RW) in the common bile duct (CBD). D. Sonography using transvaginal probe showing round worms (RW) in the main pancreatic duct (MPD).

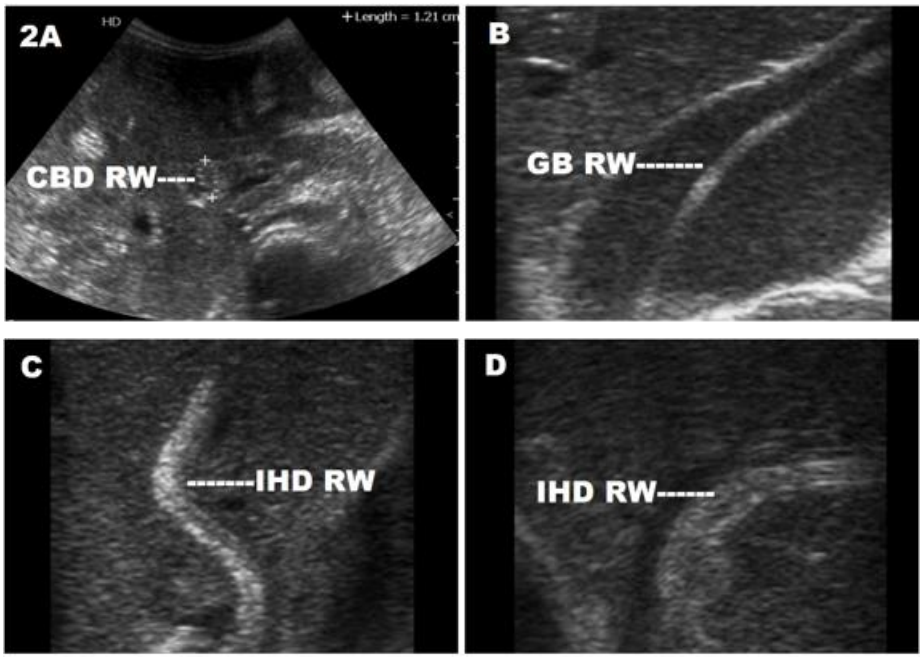

Figure 2: Sonography of Ascariasis. A. Sonography using curvilinear probe showing common bile duct (CBD) round worms (RW) in cross section. B. Sonography using linear probe showing round worm (RW) in the gall bladder (GB) seen as a non-shadowing strip without the inner tube 'Strip sign'. C&D. Sonography using linear probe showing round worms (RW) in the intrahepatic ducts (IHD).

The youngest and the oldest patient in the study is 1 and 13 years respectively. Males constitute 77 and females 89 (M: F=0.86). The Maximum distribution is in the age group of 5 to 9 years (76/166=45.8%). [Table 1].

Table 1: Showing distribution of Hepato-biliary and Pancreatic ascariasis with intestinal ascariasis (IA) according to age of the patient

	1-4 years	5-9 years	10-13 years	TOTAL
IA without Hepatobiliary and pancreatic ascariasis	42	59	30	131
Hepatobiliary or pancreatic ascariasis with evidence of IA	2	7	6	15
Hepatobiliary or pancreatic ascariasis without evidence of IA	2	10	8	20
Total	46	76	44	166

Of the total of 166 ascariasis infection, 21.1 % involve the hepatobiliary and pancreatic tree (35/166). [Table 1]

Out of 35 children with hepatobiliary ascaris infection 57.1% (20/35) have no sonographic evidence of intestinal ascariasis, while 42.9% (15/35) of hepatobiliary ascaris invasion occur in those having evidence of intestinal ascariasis. [Table I].

There is a highly statistically significant association between intestinal ascariasis (IA) and hepatobiliary ascariasis (HBA) in this sample ($\chi^2 = 85.06$, df = 1, $p < 0.001$).

Out of the 146 children with evidence of intestinal ascariasis, 10.3% (15/146) have invasion of the hepato-biliary and pancreatic tree.

Of the total 35 hepatobiliary, pancreatic and gall bladder ascariasis, 71.4% (25/35) involve the CBD and intrahepatic ducts without invasion of the gall bladder or MPD. [Table 2]

Table 2: Showing distribution of Hepato-biliary and pancreatic ascariasis with and without sonographic evidence of intestinal ascariasis

Sites of involvement	With Intestinal ascariasis (N=15)	Without intestinal ascariasis (N=20)	Total
CBD/IHD/both	12	13	25
CBD/IHD/both & MPD	1	1	2
CBD/IHD/both& GB	0	1	1
MPD only	2	4	6
GB only	0	1	1
TOTAL	15	20	35
Abbreviations: CBD-common bile duct, IHD- intrahepatic duct, MPD- main pancreatic duct, GB- gall bladder.			

Of the 2 cases of gall bladder ascariasis, none is associated with intestinal evidence of ascariasis, 1 is seen in isolation and the other in association with invasion of the CBD and intrahepatic ducts. [Table 2]

Of the 8 MPD round worms seen, 62.5 % (5/8) have no evidence of associated intestinal ascariasis. [Table 2]. 75% of MPD round worms occurs without biliary tree invasion (6/8). [Table 2]

4. Discussion

Globally an estimated 819 million are infected with ascaris lumbricoides [5], out of which the potentially endemic countries include all countries in Asia, Oceania, Latin America, Carribean, North Africa, middle east and. Sub Saharan Africa.

Children from households with high hygiene and sanitation indices had a lower risk of infection than those from households in the low categories. Young children are more likely at risk to get the infections due to poor hygiene and other risk behaviours [6] Our study show maximum distribution in the age group of 5-9 years likely due the sanitary risk behaviours in this age group.

The larvae of ascaris after being hatched in the intestines travel to the lungs where they mature and travel up the tracheobronchial tree to be swallowed again into the gastrointestinal tract (GIT). Adult Ascaris worms because of their wandering nature began to explore orifices immediately after reaching the GIT where the ultimately reach the hepato-biliary tree and pancreatic duct via the ampullary opening. This will result in a wide spectrum of songraphic imaging and clinical symptoms due to biliary colic.

Another population of the worms will travel into rest of the the small intestines and mate producing eggs thereby completing the life cycle.

Wani et al studied 198 cases (11%) of biliary ascariasis out of 1,800 children of worm infestation in the age group of 4 to 15 years. We encountered a higher value at 21.1 % hepatobiliary and pancreatic ascariasis out of all ascaris infections.

Wani et al found biliary ascariasis to be more common in female children (Wani), which is similar to our study where M:F ratio is 0.86.

The important finding in our study is that of all hepato-biliary and pancreatic tree involvement, the majority (57.1 %) occurs without the sonographic evidence of intestinal ascariais. These can be explained by the fact that after travelling up the tracheobronchial tree and re-entering the GIT, the round worms may have travelled directly into the hepato-biliary and pancreatic tree through the ampullary opening in their juvenile stage without reaching distal to the second part of duodenum.

This interesting findings in children can lead to the conclusion that most of the biliary tree ascariasis are the first past journey of the juvenile round worms to the bile ducts

and not those adult worms in the small intestines travelling up the GIT.

5. Conclusion

In this study we found out that many of our paediatric patients have hepatobiliary and pancreatic ascariasis without sonographic evidence of intestinal ascariasis. Gall bladder or main pancreatic duct infection by ascariasis can occur in isolation. This may point to the hypothesis that some of the round worms may have travelled directly to the hepatobiliary and pancreatic ducts on their first journey through the second part of duodenum while they were in their juvenile stage when they can easily negotiate through the biliary duct opening. Further and larger study is advocated to corroborate the above concept.

Conflict of Interest: Nil

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