Historical Review of Intestinal Ascariasis: Surgical History

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***Abstract*-Ascariasis is a helminthic infection of global distribution. This infestation is considered as a staggering worldwide public health problem. It is estimated that more than 1.4 billion people are infected with ascaris lumbricoides, representing 25 percent of the world population . Ascaris lumbricoides was well known in the ancient times; Romans called it lumbricus teres. In the Old World, thereare records of ascaris lumbricoides in a Middle Kingdom Egyptianmummy dating from 1938 to 1600 BC and from China in theMing Dynasty between 1368 and 1644 AD. The important details of its life cycle and epidemiological factors were known in early part of this century. Even at the turn of this century with advanced medicine it continues to cause symptoms, illness and death. This has been attributed to illiteracy, ignorance, poor personal hygiene and callous attitude during its uncomplicated infestation.**

I. HISTORICAL REVIEW OF LITERATURE

Ascariasis is an ancientinfection, and ascaris lumbricoides eggs have been found in humancoprolites from Peru dating from 2277 BC and Brazilfrom about 1660 to 1420 BC [1]. There are extensive written records of ascaris lumbricoides in Egyptian medical papyri, the works of Hippocrates in thefifth century BC, Chinese writings from the second and thirdcenturies BC and texts of Roman and Arabic physicians[2].. It was not until the late 17th centurythat the detailed anatomy of the worm was described, first byEdward Tyson(1683), an English physician ,in Philosophical Transactions of the Royal SocietY[3]. Ascaris lumbricoides, the large roundworm, was one of six wormslisted and named by Linnaeus (1758)[4]; its name has remained unchangedever since. The mode of transmission is by ingesting eggs was demonstrated bythe French medical scientist Casimir Joseph Davaine(1862) and later by the Italian scientist Giovanni Battista Grassi(1881),who infected himself with the eggs of A. lumbricoides and subsequentlyfound eggs in his feaces[5,6]. Watson(1920)reported two cases of intestinal obstruction due to ascaris lumbricoides. Both patients were operated and enterotomy was done in each case [7]. The life cycle in humans, includingthe migration of the larval stages around the body, was discoveredonly in 1922 by a Japanese pediatrician, Shimesu Koino, whoinfected both a volunteer and himself and realized what washappening when he found large numbers of larvae in his sputum.[8] Levin et al (1923) reported four cases of acute abdomen , three with provisional diagnosis of appendicitis and fourth one of intestinal obstruction. All these four patients were operated, and in all ascariasis was the cause of ailment.Jujenum was the site of impaction of ascaris in all . Three patients required enterotomy by longitudinal incision in jejunum and resection anastomosis was done in one case[9]. Surgical aspects of ascariasis was given by Greene et al in 1931. Eosinophilia of 40% was present in one of their case. The patient was managed conservatively and had passed about 400 worms[10].Kirk et al (1935) reported a 10 year old child with intestinal obstruction after he had taken chenopodium (antihelminthic). The patient was managed conservatively. They said the effect of antihelminthic on the worms, in therapeutic dose is narcotic, though this may be preceded by a transient stimulation. It is possibly this which tends to make the worms entangle themselves into doughy masses found at operation or autopsy of these obstructions, the bowel is unable to relieve itself[11]. Swartzwelder (1946) carried analysis of the clinical and laboratory data from case record of 202 patients with clinical evidence of ascariasis admitted to the charity hospital of Louisiana during period of about decade meeting certain criteria framed by them. In this series abdominal pain was present in 139 cases, fever 56 cases, constipation 56 cases, abdominal distension 59 cases, abdominal tenderness 71 cases, abdominal rigidity 9 cases, palpable mass 9 cases, diarrhea 26 cases, pallor 1 cases and jaundice in 1 case. Pain abdomen was colicky and recurrent, commonly in region of epigastria and umbilicus.Eosinophlia was present in 2 cases and was more than 6 %.Intestinal obstruction was present in 18 cases[12]. Barber (1947) did a studyof three cases of ascaridial intestinal obstruction. Patients were in the age group of the 3-13 years. Two patients of them were subjected to surgery and one of the operated patients died. He said if worms cannot be milked into colon and resection is not indicated, the worms may be removed through enterotomy[13]. Skapinker (1949) made the diagnosis of intestinal ascariadis by plain x- ray picture of the abdomen .He found two worms in dilated loop of small intestine in addition to several masses of impacted masses of worms to the right and left of umbilicus. There were numerous air fluid levels. From this radiograph, a diagnosis of intestinal obstruction was made[14].Karlen (1950) reported three cases of ascariasis , all three died. Autopsy in two patients showed the worm in intestinal tract and hepatobiliary system. Whereas in the third patient, who had features of encephalitis, beside intestinal ascariasis, one ascariasis was seen penetrating the left side of brain, near the optic chiasm[15].Radiological diagnosis in 100 cases of small intestine having ascariasis infestation was given by Francke W(1956).Stool examination for ova was positive in 20% of these cases .Eosiniphilia was found in 95% cases. Ascaris lumbricoides was found in 80% cases and reported

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that roentgenogram taken after using contrast material was of great value in infestation of small intestine in cases of obscure symptoms [16]. Aiken DW et al (1957) studied ten patients with intestinal obstruction due to ascaris lumbricoides.The most common complication resulting from ascaris infestation was obstruction of small intestine .The roentgenograhic findings showed closely packed,short , irregular wisp like or "wingly" radiolucent lines in somewhat parallel arrangement within a more dense shadow, representing a mass of ascarides.Nine cases of this series were children.They said medical treatment can usually prevent serious complications.It appears likely that in cases of intestinal obstruction by ascarides where the intestine is not dilated or its circulation impaired , treatment with piperazine via nasogastric tube would make surgery unnecessary.They recommended , if the intestine is not dilated and completely obstructed , enterotomy is probably unnecessary. If it is dilated, completely obstructed , questionably viable and covered with exudates ,enterotomy can be difficult and septic and its closure unsafe[17]. Mc Cort JJ (1958) reported two cases of ascaris illeus.He said practically all reported cases of illeus involve infants and children[18].In 1959, Singha HSK presented five cases in which mesenteric adenitis was associated with hyperinfestation with round worms. All the cases except one were diagnosed at operaton.Correct diagnosis was made preoperatively in one case only[19].Twenty four cases ascariasis were studied by Cole (1965).Male to female ratio was 1:3.The chief complaints were pain abdomen ,vomiting ,constipation ,diarrohea ,previous history of passing worms fever and vomiting of worms. Seventeen patients out of twenty two had surgery. Two of patients died, one within hours after admission and one five days after surgery. The number of patients who had surgery might have been smaller had the diagnosis been more certain. In the absence of any serious complications, a trial of conservative therapy for 48 hours was always indicated whether surgery was necessary. He further recommended that enterotomy should be avoided, as in almost all cases the mass of worms can, with patience, be fragmented and managed onwards. Where this is impossible, resection should be seriously considered as alternative to enterotomy; the peritoneal contamination is considerably less and procedure probably quicker [20]. De Sa AE (1966) describe the principal surgical complications of ascariasis . The complication are attributed to obstruction and perforation of intestine wall or by the obstruction of biliary and pancreatic duct .He presented ascaridial obstruction in four forms: a) Mechanical, by a large worm bolus b) Spastic c) Intussusceptive and d) Ascaridial Volvulus. He mentioned the special characteristic of ascaridial lump as the aggregation of two or three lumps into single central mass or its break up under medical treatment into several small lumps. Description of the naked eye appearance in cases of intestinal obstruction by the conglomerate bolus of worms was given. The surgical methods for dealing with the ascaridial bolus are enterotomy, proximal to obstructing mass, kneading of the mass of worms and expressing it through illeocaecal valve into colon. External illeostomy after evaluation of the bolus .Resection with double illeostomy in cases with gross infestation [21].Reddy et al (1969) studied forty-five children in the age group of 3-12 years for recurrent abdominal pain. Recurrent abdominal found in six cases(13.33%) was caused by ascaris lumbricoides [22] Piggot et al (1970) studied the complications of ascaris encountered in 437 cases accessioned at the Armed Forces Institute of pathology.399 patients had ascariasis lumbricoides worms in the lumen of intestine at the autopsy. In the 38 cases, ascaris caused the death or was the major cause of illness.5 patients with massive ascariasis died of intestinal malnutrition and emaciation. The heaviest infestation in their series was 92 worms in the illeum found in a three-year-old child [23]. Surgical complications of ascariasis in children were described Waller et al (1970) In his study ,the age of patients varied from six months to fourteen years with most below 3 years of age. There were 25 males and 20 females. They recom mended that majority of patients respond to conservative treatment. They recommended that at the time of surgery milking of worms into colon in the presence of viable bowel of involved bowel segment should be done . In case of noncompliance of milking, enterotomy is the option [24].Dasmohapatra et al (1971) gave the clinical appraisal of 200 cases of ascariasis .In their series, 102 were from rural areas, 98 from urban areas. Of them 68 % were <10 years of age, 76 % had pain abdomen, 52% had vomiting and 35% had constipation. Exploratory laparotomy was done in 66 cases .Intestinal obstruction was present in 44 cases, appendicitis in 4 ,volvulus in 2, intusussception in 4, perforation with peritonitis in 2 ,biliary ascariasis in 2, and liver abscess in 2 cases[25].A case of appendicular perforation due to ascaris in a four year old girl, resulting in generalised peritonitis was reported by Sinha et al. (1974) .The case was managed surgically .Twenty seven worms were found in peritoneal cavity which had escaped through perforated appendix[26].Mathur SC et al (1975) reported three cases of small bowel perforation. They classified ascaridial bowel perforation into primary and secondary. In the former the parasite penetrates through healthy intestinal wall. It has been suggested that the worm produces certain lytic substances capable of producing inflammation and necrosis. This combined with the traumatic action of parasitic can produce perforation of the gut wall. In the secondary type, there is associated intestinal disease such as, enteric fever or tuberculosis of the intestine. In their study, two patients underwent surgery. Worms were found in peritoneal cavity. In both cases there was no history of tuberculosis or prolonged fever. Therefore, both these patients probably had primary intestinal perforation by ascariasis[27].Dayalan et al (1976) gave the pattern of intestinal abstraction with special preference to ascariasis in children. The study comprised of 2295 cases of intestinal ascariasis with symptoms severe enough to warrant hospitalization. Of these 2295 cases, 159 (7%) were classified as cases of ascariasis producing definite obstruction. According to them the diagnostic criteria of ascaridial infestation are :1) Primary history of ascaridial infestation i.e either passing roundworms in motion or

vomiting of round worms.2) Abdominal colic3) Vomiting 4) A palpable mass Radiological investigation will reveal fluid levels, dilated bowel loops and at times roundworms[28]. The clinical study of pain abdomen in 200 children of the age group of 2 – 12 years was presented by Kulshrestha et al (1976). Of them 114 were males and 80 female children. Rural 21% and urban 79%. 49 cases (24.5%), suffered with worm infestation. Out of these 49 cases, 37 cases had history of worms in stool or vomit. All these patients were managed conservatively [29].Schuster et al (1977) said that severe complications of ascariasis are varied and occur at all stages of worm development. The acute condition within the abdomen heralds the presence of intestinal, pancreatic or biliary tract obstruction secondary to the physical presence by the adult parasite. Larvae may be responsible for acute respiratory disease. They said though primary therapy is medical; there are specific indications of surgical intervention [30].Roa PLNG et al (1978) presented a study of 189 cases of acute intestinal obstruction. In 10 cases (5.29%) obstruction was caused by ascariasis. Out of these, 6 cases were treated conservatively and 4 cases needed resection anastomosis of gut[31].The kwaba (1979) presented three cases of ileal perforation caused by ascaris lumbricodes. The perforations were round, punched out, with surrounding induration. Multiple ascaris worms are known to cause induration of bowel wall by pressure, trauma and possibly by their toxic secretions. Direct pressure by the bolus of worms, ulceration and necrosis seem to be the most obvious mechanism of perforation of bowel. The three cases presented were in the age group of 6 – 8 years[32]. Analysis of radiographs from 30 children with intestinal obstruction caused by a bolus of ascaris was done by Ellman et al (1980). Worms could be seen outlined against intestinal gas; the interface between worm bolus and adjacent gas shadows was irregular. Recognition of the worm infestation in asymptomatic patients is important because intestinal malabsorption may contribute to nutritional deficiency[33].Misger et al (1981) reported 50 cases of ascaridial small bowel obstruction and concluded that fragmentation of worm masses and massaging of worms onwards into large bowel was definitely the better method of management over the method of removal of worms through the enterotomy wound[34].Review of 454 patients to get an idea of various surgical complications of ascariasis and its high mortality rate was carried by Pinus J (1982).He observed that the surgical complications of ascariasis are the most important and common severe manifestations producing a picture of an obstructive, inflammatory or perforated acute abdomen. They further said if there is no response to medical treatment or if clinical picture is that of acute abdomen, the treatment must be surgical[35].In 1982 Davies MRQ et al studied 1090 cases of ascariasis over a period of 20 years. Intestinal ascariasis was found in 57%, biliary ascariasis in 39% and pancreatic ascariasis in 4%of cases [36].Evaluation of the effects of ascaris lumbricodes infestation on growth of childrenwas studied by Fernado et al (1983).Ascaris is known to interfere with the digestion and absorption of nutrients, and cause increased faecal loss of nitrogen. They said the mean weight and weight attained at yearly intervals were higher in the treatment group; mean mid-arm circumference was higher especially among girls in the treatment group, from 3rd year onwards. They therefore concluded that the children who were deliberately kept worm free showed higher rates of growth in both height and weight but changes in height is a more sensitive index than weight in detecting chronic nutritional deprivation[37]. Coulaud et al (1984) used single dose of albendazole in the treatment of ascariasis. The results as a cure rate were 96.3% ,84.9% and 100% for light infection, moderate infection and heavy infection respectively[38].The use of gastrograffin in the treatment of sub-acute intestinal obstruction due to ascariasis lumbricoides was advocated by Bar -moar et al (1984) . They treated ten patients suffering from sub-acute intestinal obstruction with gastrograffin and found excellent results. Gastrograffin is hyperosmolar agent; absorbs fluid from intestinal wall into bowel lumen. This excess fluid in the vicinity and around the worms probably separates them from each other. It also contains a wetting agent which makes gut more slippery" enabling them to pass beyond the region of obstruction[39]. Retrospective review of 29 patients presenting with small bowel volvulus secondary to intestinal ascariasis was carried by Wiersma et al (1988). All patients were in the age group of 9 months to 10 years. All patients were subjected to surgery. Seven were managed by enterotomy,22 required resection anastomosis They stressed that though plain radiology failed to show typical features in 69 percent of patients who were known to have enteric volvulus, radiology still remains an essential investigation[40]. Routine prior deworming of all patients admitted for elective surgery was recommended by Desh Mukh et al (1988). They said that in high prevalence group of patients, routine prevention by means of prophylactic antihelminthic is justifiable[41]. Stephenson L et. al. (1989) suggested that the treatment of hookworms, trichuriasis trichurua and ascaris lumbricoides infection with a single dose of Albendazole may improve child growth in areas where protein energy malnutrition and high degree of polyparisitism are common[42].Pal JC (1990) said that the usual habitat of ascaris lumbricoides is jejunum though it is also found in digital reaches of the small intestine and colon. Quoting Mokidono in Hiroshima and examining a large number of patients by radiological methods estimated locaton of ascaris worms very accurately and it was noted that 87.6% of the total ascaris population was located in jejunum, 11.3% in ileum ,0.34% in stomach and 0.51% in duodenum. Localization of worms in upper small bowel is probably, determined by the fact that area has least active peristalsis.. He said that complications can be 1) Round worm obstruction;(a) subacute intestinal obstruction.b)acute intestinal obstruction (2) Round worm perforation, perforation can be of any part of gut. The diagnosis of ascariasis is made by symptomotlogy examination of the patient, laboratory and radiological examination.. Regarding treatment he said initial treatment should be conservative in ascariasis without any surgical complication, surgery should

not be delayed where complications caused by ascariasis are diagnosed or suspected [43].Goyal BB (1991), presented a case of intestinal obstruction with gangreneous necrosis by massive ascariasis in a three year old child. Laparatomy revealed a half litre of foul smelling reddish brown fluid in the peritoneal cavity. Gangreneous gut was resected along with removal of rest of the worms and end to end anastomosis performed[44].Ramachandran PK (1992) reported a case of intraluminal intestinal obstruction produced by a bolus of worm in a 9 year old child causing gangrene of distal 1.5 feet of ileum, resection of the affected segment with removal of worms via open ends was done[45].Kesarwani RC (1993) reported three cases of small bowel obstruction with infarction of affected segment in 5-11 year old children. Two patients had intestinal perforation and peritonitis in addition to the intestinal obstruction and gangrene [46].Maung et al (1995) presented a study of 82 children with volvulus. Ascariasis was commonest cause (28%).Of them, the commonest age group affected was 1 – 5 years. They suggested enterotomy rather than milking the worms into large gut for this condition[47].Yousuri et al (1995) presented a study of surgical complications of intestinal ascariasis and recommended large scale prevention, especially in endemic areas[48].Sreevatsha MR et al (1996) reported a case of Meckel's diverticulum caused by roundworm incarceration, adding to the long list of other foreign bodies that had been recognized in Meckel's diverticulum with diverticulitis[49].

The importance of early detection and early operative intervention in small bowel volvulus complicating intestinal ascariasis was stressed by Madiba et al (1996)They presented a study of 50 patients with volvulus .They said that volvulus complicating ascariasis still carries high mortality and morbidity [50] .A retrospective clinical study to evaluate the effects of paralyzing vermifuges on the course of intestinal obstructions complicating ascariasis was performed by Salman AB (1997) . In his series, he had 42 patients, out of which 26 patients with partial and 16 patients with complete intestinal obstructions. Out of 26 patients with partial intestinal obstruction, 24 patients were not given paralyzing vermifuges ,two patients with partial obstructions received flaccid paralyzing agent. 12 of 16 patients with complete obstruction received spastic paralyzing agent and the remaining patients received flaccid paralyzing agent. From his observations he inferred that paralyzing agents, especially those causing spastic paralysis, should be avoided in patients with abdominal symptoms presumed to be related to ascariasis because of the risk of causing complete obstruction and making surgery more complex[51].Analysis of the retrospective study of 250 cases of results of conservative treatment , especially the use of hypertonic saline enema ,and surgical treatment of gastrointestinal ascariasis admitted in paediatric surgical wards of Govt. Medical College, Jabalpur was carried Tondon et al (1999). The success rate of conservative treatment was 95.6% in their series. They proposed use of hypertonic saline enema in the conservative treatment of gastrointestinal ascariasis as it is safe and effective .They highlighted that hypertonic saline enema is grossly underutilized part of conservative treatment and deserves to be known and used on wider scale[52].

Vasquez et al (2000) in a retrospective study analyzed the clinical records of 199 children aged one month to sixteen years hospitalized, with the diagnosis of intestinal ascariasis. The purpose of the study was to evaluate the use of anthelmintic drugs as a risk factor of intestinal obstruction by ascaris lumbricoides.Of the probable risk factors analyzed in their study, the only one capable of influencing and predicting the presentation of intestinal obstruction by ascaris lumbricoides in children, was the prior anthelmintic treatment particularly with mebendazole[53].Mukophaday et al(2001) had study over a period of 4 years from January 1993-December 1997 , 509 patients treated for abdominal colic with or without intestinal obstruction and a history of passage of adult roundworms either in the stool or in vomitus. All patients were below the age of 10 years, the youngest 6 months old, and were treated successfully with antispasmodics and normal saline enemas. When the pain subsided, an anthelminthic drug was given. Of 209 patients admitted to the hospital, 105 responded to conservative management and 104 (50%) required surgical intervention. The procedures used in surgical intervention were squeezing out of worms, resection and anastomosis, and treatment of other pathologies like acute appendicitis, tubercular stricture of the small intestine, etc. Five patients died in the postoperative period due to various complications. There were no deaths among those treated by conservative management. They emphasized that early recognition of the condition can prevent serious surgical complications and morbidity [54].

Sarah et al (2002) gave first evidence that individual quantitative trait loci influence variation of Ascaris burden in humans. This was the first genome scan for susceptibility to infectionwith roundworm.This paper presented data on 375 genetic markers generated for each of 444 members of a genetically isolatedNepalese population, the Jirels. Ascaris worm burden as assessedby egg counts was measured in these same individuals by usingthe Kato Katz thick smear method. The extensive genealogical dataavailable for the population allowed assignment of all 444 individualsto a single pedigree that contained 6,209 pairs of relative's thatwere informative for genetic analysis. A variance components linkageanalysis resulted in the unequivocal localization of two genes (one on chromosome 1 and another on chromosome 13) with clear,significant effects on susceptibility to Ascarisinfection.. These results are the first linkages reported for genes influencing susceptibility to infection with A. lumbricoides. Thequantitative trait loci on chromosomes 1 and 13 provide strongevidence for the influence of at least two discrete genes onAscarisburden[55]

A non-randomized, cohort and comparative study of 45 patients with the diagnosis of intestinal obstruction due to ascaris lumbricoides was designed by Soomro et al (2003) evaluated and analyzed three different non-operative modalities of treatment of intestinal obstruction due to ascaris lumbricoides. They were divided in 3 groups of 15 patients each. Group I patients were given intravenous

fluids only, group II patients were given hyoscine butylbromide in infusion and group III patients were given hypertonic saline enema.The outcome of all groups was compared in terms of improvement in obstruction and hospital stay.They recommend that hypertonic saline enema is a better non-operative treatment modality of intestinal obstruction, due to ascaris lumbricoides, in patients who do not have peritonitis. It is associated with early improvement of obstruction coupled with reduced hospital stay[56].Rodgriuez et al. (2004) analysed the risk factors and mortality for partial and complete bowel obstruction caused by ascaris lumbricoides as well as diagnostic validity of eosinophilia in peripheral blood. They studied 50 patients with partial or complete bowel obstruction as well as 50 patients as controls; no patient had a negative coproparasitoscopic study. Their observations found no statistical difference between partial and complete bowel obstruction for different variables studied with the exception of age. They found that 3% or more of eosinophils in peripheral blood strongly suggests the etiology of the obstruction as ascaris lumbricoides at prevalence sites of this parasite [57].Lamghari et al (2005) demonstrated the relationship between ascariasis in children and their proximity to wastewater effluents. Their study was supported by the results of an epidemiologic study of a group of children living near an area of wastewater effluents. The subjects of this study were schoolchildren. It was found that 71% of the exposed children were suffering from this acute parasitic infection. Boys, particularly those aged 7–10 years, appeared to be the most vulnerable to contracting ascariasis. This study demonstrates the relationship between ascariasis in children and their proximity to wastewater effluents [58].Balakumar (2005) stressed the use of a higher frequency high-density probe of 5 - 10 MHz for scanning in intestinal ascariasis. The detection of intestinal ascariasis is difficult by routine abdominal probes, as the bowel loops are just under the abdominal wall. This was illustrated in a 7 year old child who was referred for sonography for vague abdominal pain. In the author's opinion, when the crowded worms form a ball like mass, the ultrasound sectional view can be called as the "stacked tubes sign". The diagnosis is specific for this large nematode mass, if these signs are discernable. This child was cured after a course of antihelminthic drug[59].

Corrales et al (2006) identified demographic, behavioural and environmental determinants of intestinal parasitic infection and evaluated the impact of a variety of dry sanitation systems on intestinal parasitic infection, and safety of using stored biosolids in agriculture in order to guide future sanitation interventions in rural areas of El Salvador. They observed that contact with inadequately treated latrine biosolids was associated with an increased risk of Ascaris infection and concluded that Solar latrines of households where latrine biosolids were used in agriculture had a higher prevalence of infection than those where biosolids were buried [60]. Bethony et al 2006 reported that the three main soil-transmitted helminth infections, ascariasis, trichuriasis, and hookworm, are common clinical disorders in man. The gastrointestinal tract of a child living in poverty in a less developed country is likely to be parasitised with at least one, and in many cases all three soil-transmitted helminths, with resultant impairments in physical, intellectual, and cognitive development. The benzimidazole anthelmintics, mebendazole and albendazole, are commonly used to remove these infections. The use of these drugs is not limited to treatment of symptomatic soil-transmitted helminth infections, but also for large-scale prevention of morbidity in children living in endemic areas. As a result of data showing improvements in child health and education after deworming, and the burden of disease attributed to soil-transmitted helminths, the worldwide community is awakening to the importance of these infections. Concerns about the sustainability of periodic deworming with benzimidazole anthelmintics and the emergence of resistance have prompted efforts to develop and test new control tools [61].In 2006 Andrew Pylant et al reported CT findings of intestinal ascariasis. The findings consisted of both cross sections and longitudinal sections of worms within the lumen of the small intestine. Contrary to previously reported CT findings, they revealed a conspicuous lack of oral contrast within the bowel of the worm. The longitudinal sections showed worms of at least ten cm. within the patient's intestine, while the axial sections showed 0.4 cm tubular structures with a central lumen non enhanced with contrast. This incidental finding of ascaris lumbricoides on abdominal CT should remind that diseases prevalent elsewhere in the world should also be considered in our differential diagnoses of recent immigrants and travelers[62].Piyush K et al (2007) made diagnosis of intestinal ascariasis by wireless capsular endoscopy. Wireless endoscopy with gastric emptying time of 7 minutes and small bowel time of 2 hours and 32 minutes was used. They started at 21 min. and 40 seconds and identified two long slender structures, few mm.thick, pinkish white worms with both ends tapered in a female patient. For the next two minutes worms were seen on multiple images with some frames showing the worms wrapping around multiple times in the lumen of small bowel.Both had diagnostic characteristic of ascaris lumbricoides.The patient was treated with albendazole .They concluded that capsule endoscopy is a low risk procedure and is extremely valuable in the diagnostic work up of unexplained gastrointestinal pathology[63]Getachew et al (2007) conducted a study to determine the role of non-biting cyclorrhaphan flies as carriers of intestinal parasites in slum areas of Addis Ababa . A total of 9550 flies, comprising of at least seven species were collected from four selected sites and examined for human intestinal parasites using the formol-ether concentration method. Ascaris lumbricoides along with T. trichiura were the dominant parasites detected both on the external and in the gut contents of the flies. Among the flies, C. rufifacies and M. sorbens were the highest carriers of the ascaris parasites.The public health significance of these flies associated with carrier of ascaris lumbricoides was highlighted [64]

Gheorghe et al (2007) discussed the Olympus capsule endoscopy, recently developed, technology based on a charge-coupled device and with electronic enhancement of image quality, having high-resolution CCD and an external real-time image viewer monitor .This video capsule endoscope allows direct examination of the inaccessible part of the gastrointestinal tract in a safe, noninvasive and well-tolerated manner and has become the gold standard in the diagnosis of suspected diseases of the small bowel. They said that it can be used in the diagnosis of intestinal ascariasis[65]

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