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Research Article

Abdominal Pain in Children: When *Enterobius vermicularis* Mimicking Acute Appendicitis

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Abstract

Introduction: acute appendicitis due to *Enterobius vermicularis* is very rare, this small parassite is predominant in the pediatric population and can cause or mimick acute appendicitis.

Methods: a retrospective analysis of all simple appendicitis treated between January 2016 and May 2019 was made at the Departement of Pediatric Surgery, at University of Siena. Data including: age, sex, White Blood Cell (WBC) count, neuthrophil count, eosinophil count, C-reactive protein, and ultrasound results were analyzed.

Results: In total, 184 pediatric appendectomies were performed. 45% of patients were female and 55% were male. We divided the age into three range: 32% under 8 years, 34% between 8 and 12 years, 34% over 12 years. 10% were treated by open approach, 31% by TULAA, 59% laparoscopiclly; conversion was made in 8%, rispectively 3 in case of TULAA and 4 in case of laparoscopy surgery. In 6 cases we found at hystopathology the presence of *Enterobius vermicularis* (EV) in one case presented as abdominal recurrent pain, in 4 cases they presented with abdominal pain, fever as classical appendicitis, and in one case with fever, abdominal pain, vomiting, tenderness as peritonitis. None presented pruritus ani, augmented eosinophil count, intestinal occlusion or perforation.

Conclusion: EV was seen in 3% of our pediatric series of appendicitis treated since begin of 2016 in our Departement. CRP level, neuthrophil and eosinophil count, pruritus ani, could not predict EV infection in patients presented with right iliac fossa pain.

Keywords: Abdominal pain; Appendicitis; Children; *Enterobius vermicularis*

Introduction

Enterobius vermicularis (EV), also known as *Oxyuris vermicularis* or pinworm may cause infection of gastrointestinal tract and occurs approximately in 3-28% of children worldwide. The life cycle of EV is 2 to 4 weeks. Digestive secretions dissolve the egg-releasing larvae in the duodenum, then they mature into adult worms that inhabit and mate in the terminal ileum, caecum and ascending colon. At night the female migrates to the rectum and lays her eggs in the anal canal. Infection then occurs either by the faecal-oral route or by retroinfection, in wich the eggs hatch in the anus and the worms re-infect the colon by migration [1,2]. There is an increased prevalence in children living in overcrowded conditions and developing countries. Most children were asymptomatic, the most common presenting symptom was pruritus ani but infestation may presents with ileocolitis, enterocutaneous fistula, urinary tract infection, mesenteric abcess, salpingitis and appendicitis [3]. The association of EV and appendicitis remains unclear, the presence of pinworms in the appendix being shown to cause symptoms mimicking appendicitis or appendiceal "colic" but frequently without histological evidence of acute inflammation, through the presence of EV is associated with chronic inflammatory infiltrates and an eosinophilia [4,5].

The aim of our retrospective study was to compare patients with EV infection and those without EV infection. We postulated the following questions: What is the prevalence of EV in children presenting with symptoms suggestive of inflammatory bowel disease? How reliable are conventional diagnostic methods at

detecting EV? Is there an hystologic correlation with carriage of EV? Do symptoms improve with antiparasitic therapy?

Materials and Methods

In this retrospective study we analysed, from January 2016 to May 2019, data of our Departement of Pediatric Surgery of Siena, to identify all cases who underwent appendicectomy to treat an initial diagnosis of Acute Appendicitis (AA). Demographic, laboratory and clinical information were obtained from the hospital medical records Data collected included presenting features, numbers of prior admissions, Alvarado score (migratory Right Iliac Fossa (RIF) pain, anorexia, nausea, and vomiting, tenderness right lower quadrant, rebound tenderness of RIF, pyrexia, and leukocytosis), vital signs, full blood count and previus episodes of RIF pain (Figure 1). Patients who underwent appendicectomy as a part of another procedure were excluded from further evaluation and we exscluded also generalised peritonitis. The surgeon's diagnosis, clinical findings and pathology report were reviewed to ascertain whether cinical diagnosis correlated with hystopatological diagnosis or whether the latter provided new informations.

Alvarado Score	Score
Migration of pain	1
Anorexia	1
Nausea	1
Tenderness in right lower quadrant	2
Rebound pain	1
Elevated Temperature (>37,3°C)	1
Leukocytosis > 10,000/mm3	2
Neutrophilia >75%	1
Total	10

1-4	5-7	8-10
Discharge	Monitoring/Admission	Surgery
30% Appendicitis	66% Appendicitis	93% Appendicitis

Figure 1: Alvarado Score.

Results

A total of 184 pediatric appendicectomies were performed over this period. Overall, 45% of patients were female and 55% were male. We divided the age at presentation into three range: 32% under 8 years, 34% between 8 and 12 years, 34% over 12 years. All patients presented with right iliac fossa pain, 75% presented with vomiting, none with pruritus ani. Leucocytosis was found in 92% of patients, with positive CRP. Abdominal ultrasound scan was performed in all patients.

Operative Procedures

Surgical approach: 10% were treated by open technique, 31% by TULAA (trans-umbelical laparoscopic assisted appendicectomy), 59% laparoscopically. Conversion was necessary in 8% due to technical difficulty, rispectively 3 in case of TULAA and 4 in case of laparoscopy surgery (Figure 2).

OPEN	TULAA	LAPAROSCOPY	CONVERSION	TOTAL
10%	31%	59%	8% (3 in TULAA 4 in Laparoscopy)	184 cases

Figure 2: Classification of our data for surgical approach.

Appendiceal Histopathology Results

In 6 cases (3%) we found at hystopathology the presence of *Enterobius vermicularis* (EV): in one case presented as abdominal recurrent pain, in 4 cases they presented with abdominal pain, fever as classical appendicitis, and in one case with fever, abdominal pain, vomiting, tenderness as peritonitis. The comparison of clinical, biological and ultrasound findings between appendicitis due to EV and simple appendicitis showed no statistical significant differences. All patients with EV infestation of the appendix were

treated with antihelmintic drugs (with all components of the family using two somministration once a week for two weeks). There was a complete resolution of the symptoms post anti-hemlinthic treatment and no complications were noted at follow-up.

Discussion

Enterobius vermicularis commonly is responsible for a widespread parasistic infection, approximately 4% to 28% of children worldwide are reported to be infected. Infection via the fecal-oral route is the most common route of human trasfer, whereas eggs may remain viable for 2-3 weeks on clothing and bledding, facilitating easy spread among family members and groups of children. This infection is usually asymptomatic, suddenly when present, the most common symptoms are pruritus in the perineal region, ileocolitis, abdominal pain, urinary infection, rarely mesenteric abcesses, salpingitis and appendicitis [1-3]. This condition occurs in all ages and socioeconomic levels, but it is most common in children aged five to fourteen years. After ingestion, the eggs hatch in the stomach and then the coiled larvae appear. Larvae travel to the cecum, where they mature to adult pinworms measuring 1 cm in length. Gravid adult female worms migrate during the night to the perianal region, where they deposit up to 11.000 eggs. Eggs are infective whitin six hours after deposition. Life of a pinworm is between 11 days and 35 days [5-7].

There is much debate on how or wheather EV may cause serious disease in gastrointestinal tract or is only "passenger". A review by Arca, et al. [8] published reports over the last 30 years does not settle this controversy. EV infestation may cause a clinical picture resembling acute appendicitis by obstructing the lumen or causing a hypersensitivity reaction in the tissue. However, it is not clear whether the invading organism actually causes the inflammation or if the parassites are incidental findings in cases where inflammation is already present. Literature describes that these problems lead to surgery for clinical diagnosed acute appendicitis [9]. In our study the incidence of EV was 4% in all children operated. In accordance with other studies, laboratory blood test showed no correlation with EV infection. However, some studies suggest that eosinophilia may be helpful in predicting EV infection [2]. Probably, the observation that those with EV infestation had had multiple episodes of abdominal pain, can be associated with the known chronic clinical course of parasistic infestation and as a cause of RIF pain in children [10,11]. In the light of these data, we would suggest that, as part of diagnosis, children with persistent RIF pain should be tested for EV infestation and if found positive, empirical therapy extended to all family members, could be applicated to ensure eradication [12].

Conclusion

EV ifestation of the appendix should be considered in the different diagnosis of young patients who presents with recurrent RIF pain but don't have significantly raised blood test or Alvarado scores. Pruritus ani if present with normal neuthrophil count, normal CRP level at presentation could predict EV infection in children who present RIF pain. Careful examination, sympthomatology awareness, and high level of suspicion might prevent unnecessary appendectomies. Therefore, we strongly recommended that all appendicectomy specimens be examined histopatologically regardless of whether the specimens are macroscopically normal.

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