Pneumoperitoneum: an unusual presenting finding of perforated appendicitis in children

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Pneumoperitoneum is rarely encountered as a radiographic finding in association with perforated appendicitis in children, and may lead to diagnostic errors. In this paper, we present pneumoperitoneum as a presenting finding of perforated appendicitis in a 2-year-old boy.

The term pneumoperitoneum frequently indicates perforation of an intra-abdominal hollow viscus. However, it is rarely encountered as a radiographic finding in association with perforated appendicitis. The cases reported in the literature are mostly adult patients, but the relevant data in children are limited. Here, we present a case of a 2-year-old boy with perforated appendicitis who presented with pneumoperitoneum. The patient was taken into the operation theater with an initial diagnosis of gastrointestinal perforation. Surgical exploration indicated a perforated appendix and an appendectomy was performed. Appendicitis is one of the most common surgical abdominal emergencies in children. However, very young children often pose a diagnostic dilemma for the clinician. Pneumoperitoneum is a confusing finding in perforated appendicitis, and may lead to diagnostic errors. However, it may be considered as a favorable sign because it will result in the patient's immediate surgical exploration and cure. ***Ann Pediatr Surg*** **10:20–21 © 2014 Annals of Pediatric Surgery.**

Annals of Pediatric Surgery 2014, **10**:20–21

Keywords: appendicitis, children, pneumoperitoneum

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Received 21 July 2013 **accepted** 26 October 2013

Introduction

Appendicitis is one of the most common surgical abdominal emergencies in children. Although the diagnosis of appendicitis is usually straightforward in adolescents and adults, very young children often pose a diagnostic dilemma for the clinician. Moreover, pneumoperitoneum is a confusing finding in such a case because it is an unusual radiographic finding in association with a perforated appendicitis. Here, we have reported a case of a 2-year-old child with perforated appendicitis who presented with pneumoperitoneum.

Case report

A 2-year-old boy was referred to our hospital with abdominal pain, vomiting, and anorexia that had gone undiagnosed for 5 days. His vital signs were as follows: temperature 37.8°C, pulse 158/min, and blood pressure 128/84 mmHg. Physical examination indicated mild dehydration, abdominal distention, generalized diffuse tenderness, and guarding. Laboratory investigations indicated mild leukocytosis (white blood cell, 14 200/mm^3). Plain upright abdominal radiograph showed subdiaphragmatic free air (Fig. 1). Abdominal ultrasonography also showed high-density free fluid collections in the perihephatic, perisplenic, pelvic, and interloop areas. The patient was taken into the operation theater with an initial diagnosis of gastrointestinal perforation. Exploratory laparotomy through an abdominal midline incision indicated a perforated appendix with diffuse purulent fluid collections in the peritoneal cavity. There were also fibrinous adhesions around the appendix. A dropped fecalith was observed in the right iliac fossa after adhesiolysis. Appendectomy and thorough peritoneal toilet were performed, and a Penrose drain was placed. Peroperative aerobic culture obtained from the intraperitoneal purulent material was positive for *Escherichia coli* and *Enterococcus* spp. After the surgery, the patient made a successful

Fig. 1

Plain abdominal radiograph showing free air beneath the right leaf of the diaphragm (white arrows).

1687-4137 © 2014 Annals of Pediatric Surgery DOI: 10.1097/01.XPS.0000438122.09782.b7

recovery with antibiotic treatment (Meropenem, Linezolid, Clindamycin) and was discharged from the hospital on the 12th postoperative day.

Discussion

The term pneumoperitoneum refers to the presence of air within the peritoneal cavity, and frequently indicates perforation of an intra-abdominal hollow viscus. However, it is rarely encountered as a radiographic finding in association with perforated appendicitis. Its incidence in adulthood has been estimated to be 0–7.1% of all patients presenting with pneumoperitoneum [1–3]. However, data are missing in children. This suggests that it is an extremely rare clinical entity in children.

Two mechanisms have been propounded to explain the relationship between pneumoperitoneum and perforated appendicitis [3,4]. The first mechanism is that luminal air can escape from the perforation site. However, the appendiceal lumen is usually obstructed by lymphoid hyperplasia secondary to an infection or a fecalith in any case of appendicitis [5]. Because of the luminal obstruction, luminal air does not usually pass into the peritoneal cavity. However, a dropped fecalith was observed in our case. In this respect, we can speculate the following scenario. The appendiceal lumen was initially obstructed by a fecalith. After the perforation, it dropped into the right iliac fossa, which allowed luminal air to pass into the peritoneal cavity. The second mechanism is that intraperitoneal air may be caused by gas-producing anaerobic bacteria in the peritoneal abscess. Although diffuse purulent intraperitoneal fluid collections were observed in our case, we have no evidence supporting this mechanism because of the lack of anaerobic culture.

The diagnosis of acute appendicitis in the first years of life is a challenge for the clinician. Abdominal pain, vomiting, fever, and anorexia are the most frequent presenting symptoms in very young children. These symptoms are not specific and frequently resemble many other acute diseases occurring in the first years of life [6,7]. Therefore, younger children with appendicitis more commonly present with perforation, as occurred in our patient. Plain abdominal radiographs are generally not useful during the evaluation of appendicitis. The most specific sign is the presence of a fecalith, which can be visualized on plain films in 10–20% of the patients [5]. However, pneumoperitoneum is an unexpected finding in perforated appendicitis for the clinician. Such a patient is frequently misdiagnosed with gastrointestinal perforation. Patients with gastrointestinal perforation generally present with large free air on imaging, whereas minimal free air was noted on imaging in our case. This is consistent with the study of Kumar *et al.* [8], in which perforated appendicitis was found to be most frequently associated with a small amount of pneumoperitoneum.

Conclusion

This paper highlights an extremely rare cause of pneumoperitoneum in children. Pneumoperitoneum is a confusing finding in perforated appendicitis and may pose diagnostic errors. However, it may be considered as a favorable sign because it will result in the patient receiving immediate surgical exploration and cure.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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