

The Importance of Fecaliths in the Aetiology of Acute Appendicitis

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Rezumat

Importanța fecaliților în etiologia apendicitei acute

Scop: Fecalitiile, hiperplazia limfoidă, paraziți, reziduurile vegetale nedigerate și corpii străini sunt luați în considerare în etiologia apendicitei acute. În articolul nostru am discutat despre fecaliți, formarea fecaliților, și valoarea etiologică.

Metode: Pacienții care au fost operați de apendicită acută între 2009-2010 sunt analizați retrospectiv.

Rezultate: Vârsta medie a fost de 29,3. 261 (36,1%) cazuri au avut fecaliți. Dintre cazurile cu fecaliți au fost decelate 19 apendicite acute, 95 flegmoane, 30 de apendicite acute perforare.

Concluzii: Patologia intraluminală joacă, probabil, un rol major în dezvoltarea apendicitei acute. Constatările intraluminal patologice pot fi, de asemenea, observate la persoanele sănătoase și această condiție nu presupune existența apendicitei acute. Boala progresează de la fecalit intraluminal, fără inflamație, la perforație, de la început. Există o mulțime de explicații cu privire la formarea fecaliților. Diagnosticul de fecalit se poate face cu ecografie abdominală, tomografie computerizată și tehnici de imagistică prin rezonanță magnetică. În caz de fecalit intraluminal demonstrat prin examinare ultrasonografică la un pacient cu simptome clinice de apendicită acută, apendicectomie trebuie să fie efectuate în

opinia noastră cât mai repede. Apendicectomia precoce scade morbiditatea și mortalitatea.

Cuvinte cheie: apendicită, infecții bacteriene, motilitate gastro-intestinală, intervenții chirurgicale gastro-intestinale, imagistică medicală, ecografie, tomografie computerizată, imagistică prin rezonanță magnetică

Abstract

Aim: Fecaliths, lymphoid hyperplasia, parasites, undigested plant residues and foreign bodies are considered as part of the aetiology of acute appendicitis. In our article we discussed about fecaliths, fecalith formation, and its aetiological value.

Methods: Patients which have been operated on for acute appendicitis between 2009-2010 are analysed retrospectively.

Results: The average age was 29,3. The number of cases with fecalith was 261 (36,1%). Out of these, 19 acute appendicitis, 95 phlegmons, and 30 perforations were detected.

Conclusions: Intraluminal pathologies probably play a major role in the development of acute appendicitis. Intraluminal pathological findings may also be seen in healthy persons without necessarily pointing to acute appendicitis. Disease progresses from intraluminal fecalith with no inflammation to perforation from the beginning. There are many explanations regarding the formation of fecaliths. Diagnosis of the fecalith may be decided with ultrasonography, computed tomography and magnetic resonance imaging techniques. In case of preoperatively demonstrated intraluminal fecalith through ultrasonographic examination with clinical symptoms of acute appendicitis, early appendectomy must be performed in our opinion. Early appendectomy lowers morbidity and mortality rates.

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Key words: appendicitis, bacterial infection, gastrointestinal motility, gastrointestinal surgery, medical imaging, ultrasonography, computed tomography, magnetic resonance imaging

Introduction

Acute appendicitis is the most frequently detected pathology of acute abdomen in general surgical practice. Acute appendicitis is 1.3 to 1.6 times more common in males than in females. Lifelong probability of acute appendicitis development for a person is 7-10%. It is mostly seen between 20-40 ages. Despite the controversies and relative lack of knowledge regarding the function of this organ, surgical approaches have been thoroughly developed. There are numerous articles and theories about the constitution of appendicitis and many more experimental studies have been performed in order to reveal the physiopathology development of this disorder. Nowadays, the evacuation of luminal content blockages is the generally accepted mechanism. Ongoing secretion despite of an outlet plugging leads to increased intraluminal pressure and diminishes appendix wall perfusion. If this pathologic condition persists long enough, secondary inflammation processes cause tissue damage on the appendix wall even ending with perforation, which is a condition surgeons encounter frequently. Lymphoid hyperplasia, fecaliths, intraluminal parasites, undigested plant residuals and foreign bodies, tumours are the main factors determined. Fecaliths, their development and role in the aetiology of appendicitis are discussed in this article. However not all fecaliths in the appendix lumen can cause appendicitis and, on the other hand, not every appendicitis is supposed to contain fecaliths. This article discusses the preoperative evaluation of appendicitis, based on fecalith formation and its relation to the surgical pathology of appendicitis (1,2,3,4).

Material and Method

Patients which had been operated on for acute appendicitis between 2009-2010 in Izmir Buca Seyfi Demirsoy Large State Hospital General Surgery Department were explored retrospectively. Specimens were kept in 10% formalin solution and sent to the pathology department for microscopic evaluation. Fecalith containing cases were included in this study.

Results

Between January 2009 and December 2010 there were 723 patients admitted to the hospital with acute appendicitis. The average age was 29,3. Fecalith containing tissue number was 261 (36,1%). Out of these cases 95 had phlegmon, 30 perforation and 19 histo-pathologic acute appendicitis additional findings. No deaths were recorded.

Discussions

The appendix is a luminal organ resident at the base of cecum. Average length is 8-13 cm. Its blood supply originates from the ileocolic artery and venous drainage runs down to the ileocolic vein as estimated. The mesoappendix contains lymphatic nodules performing lymphatic drainage of the appendix itself. The base of the appendix has a definite anatomical position, having been described as pre-ileal, post-ileal, pelvic, or retrocecal etc. The base of the organ lies on top of the unification of the 3 teniacoli, which helps surgeons locate the appendix during the operation. The histological layers of the appendix are the mucosa, sub-mucosa, muscular layer, and serosa. (5,6,7,8)

Abdominal pain, loss of appetite, nausea, vomiting, weakness and sometimes diarrhea are some well-known signs and symptoms. Pain traditionally starts from the epigastrium and descends to the right lower quadrant of the abdomen and settles there. Tenderness and rebound are generally absent when the pain first appears in the epigastrium, but are experienced later when the pain settles in the right lower quadrant of the abdomen. Tenderness and rebound suggest that the inflammation has reached the parietal peritoneum beyond the appendix's wall. Retrocecal located appendix inflammation may not lead to obvious peritoneal irritation, but the relation between the intensity of hematuria and the proximity to the ureter is perhaps the most important diagnostic finding regarding appendicitis in urinalysis (6,9).

According to current consensus, luminal obstruction plays an important role in the physiopathology of appendicitis. On going secretion production and luminal exit obstruction secondarily cause increased intraluminal pressure and bacterial overgrowth. This pressure increment reduces appendix wall tissue perfusion and apparent congestion and edema appear. Inflammation and bacterial overgrowth are the cause of macrophage and neutrophil migration, rather than phlegmon. Continuing pressure increment and tissue edema lead to reduced tissue perfusion, and result in necrosis or even perforation. Perforation leads to intraluminal material scattering in the peritoneal cavity. Microorganisms, parasites, undigested food, plant seeds and foreign material are some certain components of appendix luminal content. An intra-abdominal abscess formation can be the outcome of appendix perforation. Fecaliths retained intra-abdominally may harbor microorganisms in a blood proof area and this results in resistant infections and recurrent intra-abdominal abscesses. For this reason, all fecaliths must be removed from the abdominal cavity. Besides fecaliths, lymphoid hyperplasia is also a major cause event in the physiopathology of acute appendicitis. Lymphoid hyperplasia itself can cause luminal obstruction. Besides bacteria, some viruses are said to be responsible for acute appendicitis physiopathology to some extent (10,11,12,13,14).

The fecalith itself is a rigid stool particle collection seen in the appendicular lumen. Orally ingested food passes through to the cecum from the small intestine and starts to be converted into feces. Some small stool pieces may enter the

appendicular lumen. These stool pieces may leave the lumen spontaneously and this expected movement outside the appendix lumen depends greatly on the viscosity of the stool. Viscous and sticky stools are a good candidate to produce fecaliths. High water content of the stool leads to less fecalith production, as has been estimated. Food fiber content level is a major determinant of the stool's water percentage and its viscosity. Some authors advocate that the prevalence of fecaliths is higher in developed countries than developing countries. The low-fiber diets followed in developed countries lead to fecalith formation. They develop faster in people that consume a diet deficient in fiber, because their stools are more tenacious. A high-fiber diet speeds stool transit times, reduces faecal viscosity, and inhibits fecalith formation. Fecaliths may tend to enlarge gradually. Materials entering the lumen of the appendix may be plastered around the fecalith. The expansion of a previously negligible fecalith can obstruct the lumen outflow and result in acute appendicitis (1,15,16).

Mucosal inflammation is another event believed to be responsible for outflow plugging, as the materials in the lumen may erode the appendix wall. Broken integrity of the wall tissue gives opportunity to bacterial translocation. Microorganisms passing through the mucosal layer infiltrate the whole layer and cause acute appendicitis (17,18).

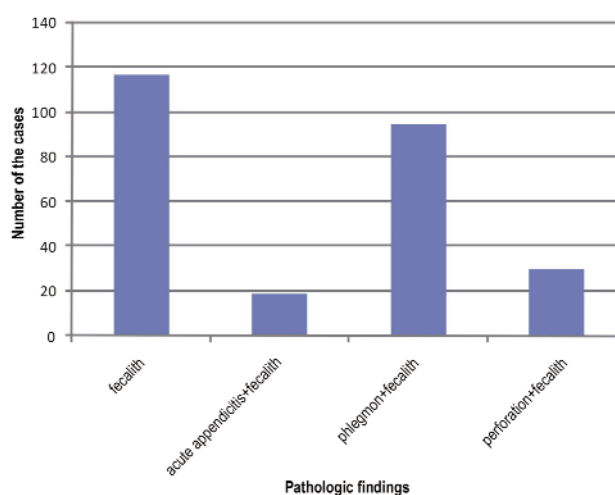
Based on the information provided above we can say that as a fecalith in a normal person may block the appendicular lumen outflow, increased inside pressure, bacterial overgrowth, overall inflammation of the appendix wall can together result in an acute appendicitis scene. Intraluminal fecaliths do not point to an acute appendicitis condition themselves, as silent intraluminal fecaliths have been discovered before in a radiological study. Performing appendectomy and demonstrating the presence of a fecalith in the appendix lumen can only determine that fecaliths are an etiologic factor in acute appendicitis cases (2,10,18). In addition to inflammation, phlegmon appendicitis specimens show polymorph nuclear leukocyte infiltration without necrosis (19).

A case with complete obstruction of the appendicular lumen exit is presented in an intra-operative photography (Fig. 1). Fecalith impaction as the cause of appendicitis was seen in the same patient (Fig. 2). Appendix lumen outflow obstruction triggers a sequence of events beginning with pressure rise and bacterial overgrowth, these two factors linking the condition to inflammation, phlegmon and finally perforation. If gross examination of the appendix specimen reveals only fecalith with no additional findings of appendicitis pathology, we can say that the operation was performed at the very beginning of the disease course. The percentage of acute appendicitis with fecalith inside is 36,1% in our series, according to medical literature. After the onset of typical clinical complaints of the patient, the evolution continues with fecalith detection, to perforation at the end. There were 261 fecalith containing appendix cases in our series out of which 19 (7,3%) were accompanied by histo-pathologic acute appendicitis, 95 (36,4%) by phlegmon, 30 (11,4%) by perforation. The number of specimens containing fecalith as a unique histopathologic finding was 117 (44,9%) (Graphic 1). According

Figure 1. Appendix lumen is obstructed by fecalith



Figure 2. Fecalith is seen in the lumen



Graphic 1.

to some clinical researches, appendixfecaliths are associated with complicated appendicitis (perforation and abscess). The presence of fecaliths is associated with earlier and higher rates of perforation (20,21).



Figure 3. Imaging of the appendix in preoperative period through ultrasonography. Fecalith and shadow is seen

Computed tomography and magnetic resonance imaging technique can be used to demonstrate the presence of a fecalith. Radiologist explore the enlarged appendix calibre (greater than 6 mm), periappendicular fat tissue infiltration, free fluid around the appendix and fecalith presence on the images. An appendix that cannot be not compressed during probe compression during ultrasonographic examination is a key finding for the radiologist in acute appendicitis. In obese patients and in the case of a retrocecal appendix, ultrasonography may offer limited help and in these conditions CT scan is more helpful. The major disadvantage of CT is radiation emission which makes its necessity controversial, especially for young or pregnant patients for whom USG and/or MRI are non-invasive. Sensitivity and specificity of USG for detecting acute appendicitis is 88% and 99%, respectively. CT sensitivity ranges from 77% to 98% and a specificity ranging from 83% to 100% in appendicitis diagnosis. Sensitivity and specificity of MRI are 100% and 99% respectively (3,22,23,24,25).

A preoperative USG image of fecalith and its acoustic shadow of the case shown on figure 1 and 2 were seen clearly (Fig. 3).

As a conclusion, the obstruction of the lumen is the dominant etiologic factor in acute appendicitis. Fecaliths are the most common cause of appendicular obstruction. Increased intake of fibre in diets reduces fecalith formation and appendicitis development probability. To our opinion, in case of fecalith demonstration on radiologic images of a patient with early complaints of appendicitis, appendectomy must be performed without a waste of time. Early appendectomy reduces morbidity and mortality.

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