Chapter

Faecoliths in Appendicitis: Does It Influence the Course and Treatment of the Disease in the Acute Setting?

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Abstract

Luminal obstruction has been widely considered as one of the major causes of appendicitis. Faecolith, in this case called appendicolith, is a hardened lump of faeces in varying sizes, have over the years been closely associated with appendicitis as a potential cause of luminal obstruction. There are varying opinions with regards to role of appendicolith in both uncomplicated and complicated acute appendicitis. While some authors have reported that the presence of appendicolith is a predictive factor for high failure rates, others are of the opinion that appendicolith does not necessarily predict non-operative treatment failure, and even if so, not as an independent factor. Opinions also seem to be divided on the correlation between complicated appendicitis and the presence of appendicolith. This chapter seeks to discuss the evidence available and attempt to clarify the controversies surrounding the role of appendicolith in acute appendicitis using current evidence available.

Keywords: Faecolith, Appendicitis

1. Introduction

There are numerous theories with regards to the aetiology of acute appendicitis. These theories include genetic factors, environmental influences, luminal obstruction and infections. However, of all these theories, the debate between luminal obstruction with possible secondary infective process and primary infective causes has been the fiercest. With the latter raising more questions than answers.

Even though many infectious agents have been linked with acute appendicitis, quite a number of them are still unknown and this makes the understanding of the pathophysiology even more difficult [1–3]. In addition to the aforementioned, most organisms isolated from patients are typically normal colonic flora and that is in sharp contrast to the original postulation of the temporal and geographic distribution of organisms.

Luminal obstruction of the appendix results from a variety of causes and is associated with increased pressure within the lumen. Causes of appendiceal luminal obstruction include lymphoid hyperplasia due to inflammatory bowel disease or infections (commonly viruses), parasites, foreign bodies, neoplasms and faecoliths. The increased pressure results from continuous secretion and stagnation of fluids

and mucus from the mucosal epithelial cells. This serves to provide a conducive milieu for intestinal flora to multiply and flourish. This multiplication leads to local increase in bacteria load, with its accompanying translocation and the subsequent inflammatory process which ensues, resulting in the formation of pus and a further increase in intraluminal pressure.

Appendiceal venous outflow obstruction occurs as the intraluminal pressure rises above the appendiceal venous pressure. A further increase in luminal pressure also impairs arterial blood flow to the appendix. The above-mentioned vascular compromise gives rise to a loss of epithelial integrity and wall ischaemia, which in addition to the luminal bacteria overgrowth, and rapid bacteria translocation are often complicated by peritonitis, perforation, gangrene of the appendix and/or peri-appendicular abscess with or without peritonitis.

2. Faecoliths as a causal agent of acute appendicitis

Faecolith, also known as appendicolith, appendiceal calculi/enterolith or corpolith, is a combination of firm, dense stool and mineral or calcified deposits which usually has a laminar structure [4]. Although the formation of a faecolith is not clearly understood, there have been previous instances where foreign bodies and gallstones have been implicated [5, 6]. As a matter of fact, for a long time, there was a myth which seemed to have suggested that accidental swallowing of seeds could cause acute appendicitis.

Early on, faecoliths were noted to be one of the most common causes of acute appendicitis resulting from luminal obstruction. In the early 19th century Volz observed faecoliths to be a "pathognomonic agent" for typhlitis [7]. Later that century, Fitz revealed that in patients who presented with perforated appendicitis, 47% of them had hardened stools in the lumen of the appendix [8]. These findings raised enough suspicions which linked faecoliths to acute appendicitis and possibly its complicated forms. As a result, many other observations were published [9–11]. Most of these studies, however, remained experimental until Bowers conclusively showed in the late 1930s that obstruction by a faecolith was a major cause of acute appendicitis [12].

The other issue with respect to faecoliths in acute appendicitis has to do with its consistency. This has led to the suggestion that faecoliths should be classified based on consistency and calcium content due to their correlation with perforation. On the contrary, other authors have also suggested that even the softer form presents more commonly with appendicitis than the harder ones [13, 14].

In fact, the prevalence of faecoliths in the vermiform appendix has been recently reported to be 3% in a population study by Jones et al. [15]. In this study, the investigators observed an increased incidence in populations with increased intake of low-fibre diets. Other studies have shown higher prevalence in paediatric and young adult population, with increased male preponderance [16]. There are also reports of increased incidence of faecoliths among patients with a retrocaecal appendix, but these are yet to be substantiated.

From the discussions so far, it can therefore be concluded that the presence of faecoliths does not confirm a diagnosis of acute appendicitis without the presence of appendiceal wall inflammation involving the muscularis propria on histological assessment or peri-caecal inflammatory changes/appendiceal wall enhancement clinically. On this matter, there have been numerous conflicting reports on the relationship between the presence of faecoliths and appendicitis especially in different age groups [17–19]. There are reports by some authors that up to 49% appendices with luminal obstruction were normal on histological assessment. The same study

also found that 49% of appendices with luminal obstruction had microscopic evidence of acute inflammation even though they looked normal macroscopically. Some of these studies initially led to the performance of an appendicectomy in asymptomatic patients with a faecolith by some surgeons. This practice, however, is currently controversial. At the moment, the widely accepted evidence is what Butler et al. [20] reported. They found faecoliths in 10% of patients, with 90% of them subsequently going on to develop appendicitis. The purpose of this chapter is however to look at the effect of faecoliths on the disease process of acute appendicitis.

The discussion on the role of faecoliths in appendicitis, in general, could be as old as the disease process itself and as result many theories have been postulated in times past. This chapter will be broken down into subheadings on important aspects of the role of faecoliths in acute appendicitis.

3. Incidence and diagnosis

The incidence of faecoliths in population and patient studies have been generally discussed in previous paragraphs of this chapter. With the introduction of modern abdominal imaging modalities from plain abdominal radiography, ultrasound examination, computed tomography (CT) scan to magnetic resonance imaging, the association of faecoliths as an important cause of luminal obstruction in acute appendicitis have become very clear and recent data reports prevalence of about 20% in pathological specimens either with or without the presence of acute appendicitis.

Faecoliths are usually one the main causes of non-specific intermittent abdominal pain. In some cases, it even mimics genitourinary conditions such as urolithiasis. They are usually less than a centimeter in diameter and those that are more than two-centimeters are classified as giant faecoliths. Even though those greater than two-centimeters are considered uncommon, the largest ever recorded is 3.5 cm [21, 22].

A study by Ishiyama et al. [23] to investigate the significance of appendicoliths as an exacerbating factor of acute appendicitis using multivariate analysis resulted in very interesting findings. First of all, they were able to show that the presence of a faecolith is usually associated with more severe disease. In addition, the study identified a significant relationship between severe disease and size, and location of the faecolith. The larger the size and/or the more proximal the location in the vermiform appendix, the more likelihood of severe disease. The radiological characteristics of faecoliths associated with acute appendicitis were recently described by Khan [24]. He and his colleagues concluded that, in addition to a faecolith of 5 millimetres or more, multiple faecoliths were also identified to be an independent factor associated with acute appendicitis.

The diagnosis of acute appendicitis in a patient who presents with abdominal pain has markedly improved with the advent of numerous imaging modalities. In the presence of a faecolith, an abdominal plain radiography study alone can be considered as adequate when there is associated abdominal pain, with a specificity of 100% [25]. The use of CT scans in the assessment of patients suspected to have appendicitis has shown that the incidence of faecoliths is higher in the general population than previously reported. Two studies by Balthazar et al. and Rao et al. reports of incidence between 43 and 50% in predominantly adult patients diagnosed with acute appendicitis [26, 27]. In the paediatric population, Lowe and her friends showed that the incidence of faecoliths in patients with confirmed acute appendicitis was 65% [28]. This detection rate could be diminished by the administration of oral contrast. CT scans have been extensively used in the diagnosis of acute appendicitis.

At the time of writing this chapter, there was no study or literature dedicated to the diagnostic capabilities of ultrasound (US) scan in faecolith-related acute appendicitis. However, in general, the accuracy of US scan in the diagnosis of acute appendicitis is between 71–95% with sensitivity and specificity of 94.7% and 88.9% respectively when graded compression ultrasonography is done [29, 30]. Magnetic Resonance Imaging (MRI) has the advantage of no ionizing radiation exposure and the absence of nephrotoxic contrast agents. Availability and cost are among the main reasons why it is underutilised, although it has a sensitivity and specificity of 96.8% and 97.4% respectively. At the moment, there is very little data on its role and position in the workup of appendicitis, except in very special circumstances [31].

4. Role of faecoliths in disease presentation and failure of conservative treatment

Literature on what role and effect faecoliths have on clinical scoring systems in acute appendicitis was very scanty to come by and therefore this chapter cannot provide a comment on that currently. Nonetheless, some studies, like that of Ishiyama and colleagues as mentioned in the previous paragraph have observed severe disease presentations in patient with faecoliths compared to those without.

In addition, faecoliths have been known to be more frequently associated with perforations and abscess formation [32]. Flum et al. found that the presence of faecoliths was identified to be a significant contributor of post treatment complications and adverse effects in patients who received antibiotics alone compared with those who had surgery. They also realised that though the perforation rate was high in patients initially treated with antibiotics, this high rate was attributable to patients with a faecolith. They reported about a 3-fold rise in perforations among the faecolith group. This, however, did not lead to a higher rate of extensive resections in the antibiotic group. Looking at the group that had appendicectomy done as initial treatment, there was not much difference in the perforation rate between patients with faecoliths and those without.

As a result, the finding of an appendicolith may be sufficient evidence to perform an appendectomy in patients earmarked for conservative management, given the higher rate of perforation at the time of failure of antibiotic treatment. This position is so explicitly stated in the recommendations made in the Jerusalem guidelines of 2020 and seems to be consistent with what Von and his friends found. It is however the author's strong believe that every patient's situation should be uniquely assessed, and a tailored treatment advocated with the patient's express consent of course.

5. Effect on treatment and complications

In the management of acute uncomplicated appendicitis using laparoscopy, Finnerty et al. [33] showed that age, presence of diabetes, raised BMI, presence of imaging confirmed complicated appendicitis, male gender and ethnicity were independent predictor of failure in laparoscopic management of acute uncomplicated appendicitis. At the moment, there is no evidence to support which method of treatment is best in the presence of faecolith in acute uncomplicated appendicitis, even though current evidence favours laparoscopy in the management of uncomplicated acute appendicitis generally. The presence of faecolith has been shown to have significant effect on therapeutic interventions and therefore the treating surgeon must be informed about the presence of faecolith for certain considerations

to be taken into account. For instance, there have been several studies and case reports to show that dropped faecolith is a major contributor of post interventional morbidity with increased incidence of pelvic abscesses especially after laparoscopic appendicectomy.

The results from the CODA trial showed a noninferiority in managing patient with acute appendicitis conservatively with antibiotics in terms of 30-day post treatment health status, which was the primary outcome of the study. At 90-day post treatment, 29% of patients in the antibiotic arm had undergone appendicectomy. When a subgroup analysis was done, the number of patients with faecolith who required appendicectomy in the antibiotic group was almost twice patients without faecolith in the same subgroup. Even though all these are evolving areas of controversy, the surgeon's awareness of the presence of faecolith is key to enable adequate decision making and planning for possible retrieval of faecolith if so needed [32, 34, 35].

6. Faecolith as a predictor for extensive resection

The Gridiron incision, also known as McBurney's incision, is the most commonly used open method in the management of acute uncomplicated appendicitis. In addition to this type of incision offering a minimally invasive and direct access to the diseased appendix, it provide good cosmesis and in lean (healthy BMI) patients, it is usually comparable to laparoscopic technique in terms of access, time of surgery, hospital stay and cosmetic advantage. In situations of delayed presentation or complications, McBurney's technique becomes extremely challenging and, in such situations, larger laparotomy incisions are made with accompanied extensive bowel resection in some cases. The most common extensive bowel resection in acute appendicitis is ileocaecectomy with or without primary anastomosis of bowel. Recent evidence suggests that appendiceal mass, non-visualization of appendix, delayed admission, and CRP are strong predictors of extensive resection in acute appendicitis [36]. Additionally, faecolith was also identified as a preoperative predictor of extensive resection for acute appendicitis. Other preoperative predictors of extensive resection found in these studies included age, ascites, and extraluminal air. The role of faecolith in predicting the possibility of extensive resection obviously require further robust research but should not be underestimated.

7. Role of routine interval appendectomy in the presence of faecoliths

Consensus on routine interval appendicectomy after conservative management of acute appendicitis is another highly debated subtopic in acute appendicitis. As a principle, surgeons are more inclined to do routine interval appendicectomy especially in patients in their mid-forties and above as there is an increased risk of malignancy in this groups. However, one can question the essence of this practice especially when there are very accurate diagnostic imaging modalities available to assist with confirming the presence of a tumour. While some have argued for routine interval appendicectomy when a faecolith is involved because of its possible association with increase recurrence rate, others have suggested otherwise as there have not been adequate evidence to support this idea especially when patients remained asymptomatic [37, 38].

To conclude, the role of faecoliths in causing acute appendicitis, and not just the disease but the worse form of it cannot be underestimated. Its ability to accelerate complications in the disease process and in addition cause significant headaches for

surgeons and patients cannot be in dispute. The several contrasting opinions with regards to what to do with it confirms how complicated the situation is. It is the author's firm opinion that more focused research should be done on this subject. Also, a lot of commendations should go to the designers and authors of the CODA trial who have thrown more light on this subgroup of patients.

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