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Risk of appendicitis in patients with incidentally discovered appendicoliths

Muhammad Sohaib Khan, MBBS,[a]
Mustafa Belal Hafeez Chaudhry, MBBS,[b]
Noman Shahzad, MBBS, FCPS, MRCS, MSc, Epi Bio,[a] *Marvi Tariq, MBBS,*[a]
Wasim Ahmed Memon, MBBS, MCPS, FCPS,[b]
and Abdul Rehman Alvi, MBBS, FCPS, FRCS, FACS[a,*]

[a] *Department of Surgery, Aga Khan University, Karachi, Pakistan*
[b] *Department of Radiology, Aga Khan University, Karachi, Pakistan*

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ABSTRACT

Background: An appendicolith-related appendiceal obstruction leading to appendicitis is a commonly encountered surgical emergency that has clear evidence-based management plans. However, there is no consensus on management of asymptomatic patients when appendicoliths are found incidentally. The objective of this study was to determine the risk of appendicitis in patients with an incidental finding of the appendicolith.

Methods: A retrospective matched cohort study of patients with appendicolith discovered incidentally on computed tomographic scan from January 2008 to December 2014 at our institution was completed. The size and position of the appendicolith were ascertained. The study group was matched by age and gender to a control group. Both groups were contacted and interviewed regarding development of appendicitis.

Results: In total, 111 patients with appendicolith were successfully contacted and included in the study. Mean age was found to be 38 ± 15 y with 36 (32%) of the study population being females. Mean length of appendix was 66 ± 16 mm, and mean width was 5.8 ± 0.9 mm. Mean size of the appendicolith was 3.6 ± 1.1 mm (1.4-7.8 mm). Fifty-eight percent of appendicoliths was located at the proximal end or whole of appendix, 31% at mid area, and 11% at the distal end of appendix. All patients of the study and control groups were contacted, and at a mean follow-up of 4.0 ± 1.7 y, there was no occurrence of acute appendicitis in either group.

Conclusions: Patients with incidentally discovered appendicolith on radiological imaging did not develop appendicitis. Hence, the risk of developing acute appendicitis for these patients does not seem higher than the general population.

Introduction

Acute appendicitis is one of the most common general surgical emergencies reported worldwide, with up to 292,000 cases reported annually in the United States.[1] Since the description of the term "appendicitis" by Fitz in the 19th century,[2] appendicoliths also known as fecaliths are considered the most important etiological factor. Appendicoliths are

* *Corresponding author*. Department of Surgery, Aga Khan University, Stadium Road, Karachi 74800, Pakistan. Tel.: +922134864751; fax: +922134934294
E-mail address: rehman.alvi@aku.edu (A.R. Alvi).
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hard, calcified fecal masses of variable sizes in the lumen of appendix. In 1939, Wangensteen and Dennis demonstrated obstruction of the appendix to be the most likely cause of appendicitis.[3] Since then, multiple studies have emphasized the role of appendicoliths in the pathogenesis of acute appendicitis.[4]

Although this association is well established, the management of incidentally found appendicoliths on radiological imaging is less clear. In 1966, Forbes and Lloyd-Davies recommended appendectomy for incidentally discovered appendicoliths, citing the reported incidence of appendicoliths in 0.8%-44% of patients with acute appendicitis.[4] However, more recently, Rabinowitz *et al*. studied 74 patients with incidental appendicoliths and concluded that although appendicoliths do increase the risk of appendicitis, it is not enough to warrant prophylactic appendectomy.[5] In another study, Rollins *et al*. reported that of 75 patients of pediatric age group having asymptomatic appendicoliths found incidentally, 5.8% developed acute appendicitis, making them conclude that prophylactic appendectomy is not indicated.[6]

Although acute appendicitis remains a clinical diagnosis, increased use of computed tomographic (CT) scans in the emergency departments across the world has increased incidental findings with no immediate clinically significant consequences.[7] Thus, from the prevailing concepts for etiology of acute appendicitis arises the question of the risk of appendicitis when appendicoliths are found incidentally. The objective of this study was to determine the risk of appendicitis in patients with appendicoliths found incidentally on CT scans performed for reasons other than acute appendicitis.

Materials and methods

This was a retrospective matched cohort study of patients in whom appendicoliths were found incidentally on abdominal CT scans performed from January 2008 to December 2014. All patients aged ≥16 y at the time of CT scan were included. Hospital radiology search software was used to identify CT scans that were performed for indications other than appendicitis but reported appendicoliths and no radiological evidence of appendicitis. The CT scans were reviewed by consultant radiologist and radiology resident who ascertained number, diameter, and position of the appendicoliths. Approval from institutional ethics review committee was obtained prior to the start of the study. As per the institutional policy, informed consent was taken on telephone in the presence of a witness. The consent was then documented and signed by both the interviewer and witness on the approved consent form.

Age- and gender-matched control group was identified from the radiology database and included those patients who had undergone an abdominal CT scan during the study period for indications other than appendicitis and had neither radiological evidence of appendicolith nor a clinical suspicion of appendicitis. Both groups were contacted by the authors for a standardized telephonic interview to determine the occurrence of appendicitis after being discharged from the hospital. The interview was conducted in Urdu language and included questions with regard to the occurrence of appendicitis at the time of CT scan or any time thereafter.

Statistical analysis

Data were collected and stored in Microsoft Excel (version 2010). Simple descriptive analysis was performed and reported as frequencies with percentages for categorical variables and means with standard deviations. Cases and controls were matched for age, gender, and dates of CT scan performed during the study period.

Results

Of the 200 patients identified as having incidental appendicoliths on radiological imaging, we could establish telephonic contact with 111 patients (55.5%), who were included in the study. A 1:1 matched control group of 111 patients was selected and also contacted for occurrence of appendicitis.

The mean age (± standard deviation) for the patients with appendicoliths was 38 ± 15 y with 36 (32%) being females (Table 1). Mean length of appendix was 66 ± 16 mm, and mean width was 5.8 ± 0.9 mm. Positions of the appendix were pelvic (21, 19%), postileal (13, 11.7%), preileal (17, 15.3%), promonteric (23, 20.7%), retrocecal (20, 18%), and subileal (17, 15.3%). Noncontrast-enhanced (neither intravenous nor oral) CT scan was performed in 98 patients (88%). The most common pathological finding in these CT scans was urolithiasis in 58 patients (52%), whereas 37 (33%) of the CT scans were within normal limits with no pathological findings.

Overall, single appendicolith was seen in 44 patients (40%), whereas 36 patients (32%) had two appendicoliths, nine (8%) patients had three appendicoliths, and three (3%) had more than 3 appendicoliths, whereas 19 (17%) had sludge (Table 2). Mean diameter of the appendicolith was 3.6 ± 1.1 mm (1.4-7.8 mm). Overall, 65 (58%) of appendicoliths were either at the proximal end or filled the entire appendiceal lumen, 34 (31%) at mid area, and 12 (11%) at the distal end of appendix.

At a mean follow-up of 4.0 ± 1.7 y (1.8-8.85), no patient in either the study group or control group developed acute appendicitis.

Table 1 – Patient demographics, type of CT scan, and the most common findings.

Variables	*n* (%)
Mean age	38 ± 15
Male	75 (67.5)
Type of CT scan	
Contrast enhanced	13 (11.7)
Noncontrast enhanced	98 (88.2)
Findings of CT scan	
Urolithiasis	57 (51.3)
Within normal limits	36 (32.4)
Others	17 (15.3)

Table 2 – Characteristics of appendix and appendicoliths.

Variables	*n* (%)
Position appendix	
Pelvic	21 (19)
Postileal	13 (11.7)
Preileal	17 (15.3)
Promonteric	23 (20.7)
Retrocecal	20 (18)
Subileal	17 (15.3)
Number of appendicoliths	
1	44 (39.6)
2	36 (32.4)
3	9 (8)
More than 3	3 (2.7)
Sludge	19 (17.1)
Position of appendicolith in appendix	
Proximal third and whole	65 (58.5)
Middle third	34 (30.6)
Distal third and tip	12 (11)

Discussion

The present study demonstrates that patients with incidental appendicolith did not have an increased risk of developing appendicitis compared with the general population. Appendicoliths or fecaliths have been considered to be the most common cause of appendicitis ever since the first successful removal of the appendix by Hancock in 1848,[8] description of "appendicitis" by Fitz in 1886,[2] and demonstration of the obstructive phenomenon in pathogenesis of acute appendicitis by Wangensteen and Dennis in 1939.[3] The association between the presence of appendicoliths and acute nonperforated or perforated appendicitis has been reported in multiple recent studies,[9-11] and all current textbooks describe the role of appendicoliths as an etiological factor in pathogenesis of acute appendicitis.[12,13] In contrast, incidental appendicoliths that have been reported to occur in up to 32% of asymptomatic population have not been well studied.[14] The earliest description of incidentally discovered appendicoliths was by Forbes and Lloyd-Davies in their study describing appendicoliths associated with appendicitis. They recommended to perform prophylactic appendectomy when appendicoliths are found incidentally.[4] Although it is clear that appendicoliths do have a role in pathogenesis of acute appendicitis, the threat posed by them in asymptomatic patients is less clear. Thus, scientific evidence to recommend any measures be it prophylactic appendectomy or reassurance is weak as the studies involving a larger sample size with a longer and more reliable follow-up have been lacking. The present study has reported no increased risk of acute appendicitis in these patients at a mid-term follow-up.

Understanding the risk of appendicitis in patients with incidentally discovered appendicoliths can help clinicians and patients take a more evidence-based approach while deciding on the management plan. With the most common successful outpatient-paid malpractice claims having been for diagnostic events,[15] it is even more important to understand the significance of any incidental findings. Once considered to be highly fatal, mortality rate had come down to 0.8% by the late 1970,[16] which has been further reduced to 0.07% with morbidity of 4.2% by modern laparoscopic management.[17] Despite of such a low morbidity and mortality rate, prophylactic appendectomy is still considered unreasonable, and based on the results of this study, we do not support the role of prophylactic appendectomy, and conservative management should be encouraged. However, patients should be informed about the findings of incidental appendicoliths. This will allow patients to seek early medical attention if symptoms do arise.

Limitations of the retrospective study design were encountered in this study. The follow-up period is midterm, and the lifetime risk of appendicitis in patients found to have appendicoliths discovered incidentally remains unknown. While a considerable number of patients were found to have asymptomatic appendicoliths on CT scans, all of them could not be followed because of the retrospective design, which could have impacted the outcome of this study. In addition, this study was focused on the adult population, majority of who were males. Thus, conclusions derived from this study may not be applicable to the pediatric population.

Conclusion

Patients found to have appendicoliths discovered incidentally did not develop appendicitis in our study at a mid-term follow-up. Therefore, prophylactic appendectomy cannot be recommended, and these patients can be reassured that they are not at an increased risk of appendicitis compared with the general population. Further studies that can determine the lifetime risk of appendicitis in patients with appendicoliths should be conducted. Studying the characteristics of appendicolith/s including the size, number, and position in patients with appendicitis can help in further elucidating the risk in asymptomatic patients.

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Authors' contributions: M.S.K. conceived, designed, executed, and analyzed the project. He also prepared and wrote the manuscript. M.B.H.C. conceived, designed, and executed the project. N.S. designed the project and analyzed the data. M.T. executed the project and participated in manuscript preparation. W.A.M. supervised the execution of project and manuscript writing. A.R.A. supervised the designing, execution, and analysis of project and manuscript writing.

Disclosure

The authors reported no proprietary or commercial interest in any product mentioned or concept discussed in the article.

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