ABSTRACT:
BACKGROUND: Acute appendicitis is referred to as the inflammation of the vermiform appendix. Calculus appendicitis is a known cause, when the calculus is greater than 2 cm is termed giant and giant calculi causing appendicitis is rare.

AIM: This is to report three cases of giant appendiceal calculi and review of literature.

CASE REPORTS:
First case. A 27 year old male presented with a history of right-sided anterior abdominal pain. There was no abdominal distension. On examination, blood pressure was 110/70, pulse was 90 beats per minute. Working diagnosis was acute appendicitis. He had emergency appendicectomy following resuscitation. The findings were: Grossly inflamed appendix with calculus measuring 2.5 by 3 by 4.2 cm in three dimensions respectively. His out-patient follow-up has been uneventful.

Second case. A 25-year-old male patient presented to the emergency department with 3 day history of intermittent colicky abdominal pain mainly in right lower quadrant. The patient also had few episode of non-bilious vomiting on the first day of onset of the pain. He had nausea, fever, anorexia and no abdominal distension and change in bowel habits. The examination of abdomen revealed tenderness in right iliac fossa, hypogastrium and right renal angle. His temperature was 37.8 °C, heart rate was 104/min and blood pressure was 120/70 mm Hg. He had emergency appendicectomy following resuscitation. The findings were: Grossly inflamed appendix, abscess and a calculus measuring 2.1 by 3.2 by 4.1 cm in three dimensions. His out-patient follow-up has been uneventful.

Third Case. A 51yr old woman who presented with a history of abdominal pain of a week duration. She was managed conservatively for an appendix mass but had interval appendicectomy after four weeks, the findings were: Perforated appendix with calculi measuring 3.2 by 3.5 by 4.5 cm in three dimensions. Her out-patient follow-up has been uneventful.

CONCLUSION: The giant calculus causing appendicitis is rare in our environment. Identifying the predisposing factor will help to reduce the incidence.

KEYWORDS: Appendiceal calculi, Giant appendicolith, Appendicitis.

INTRODUCTION. Acute appendicitis affects approximately 7% of the general population in a lifetime and accounts for about 1% of all surgical operations. Calculus appendicitis could also be termed appendicitis resulting from appendicoliths or Appendicolithiasis which is a condition characterized by a concretion or calcified deposits in the vermiform appendix (It is also called appendiceal calculi, appendiceal enterolith, or coprolith). Most are fecaloliths, which are tightly packed stool material, while, small minority are actual calculi, stone containing mineral deposits. Usually they are small (< 1 cm). Giant appendicoliths can be defined as calculus greater than two centinmeters in diameter (> 2 cm size).
Very few cases have been reported in literature. There are considerable variation in prevalence of appendicoliths with appendicitis. Initial studies done prior to 1970's have described high prevalence rate of 33-44%, but large studies after 1970 have demonstrated low prevalence rate of 1.54-15%\(^2\). Although acute appendicitis is one of the most common surgical emergencies worldwide, but acute appendicitis caused by giant appendiculith is rare. Three cases are hereby reported.

**First Case.**
A 27 year old male presented with a history of right sided anterior abdominal pain. There was no abdominal distension. He had anorexia but there was no abdominal distension, vomiting and fever. On examination, his blood pressure was 110/70 millimetre mercury, pulse was 90 beats per minute. His chest was clear clinically and only the first and second heart sounds were heard. There was marked abdominal tenderness and guarding especially on the right iliac region. Bowel sounds were present and normal. Digital rectal examination revealed an empty rectum. A working diagnosis of acute appendicitis was made. His haemoglobin was 12g/dl. There was leucocytosis. Random blood sugar and urinalysis were normal. He had emergency appendicectomy following resuscitation. The findings were: Grossly inflamed appendix with calculus measuring 4.2 cm in widest diameter (2.5 by 3 by 4.2 cm in dimensions). Fig 1. His out-patient follow-up has been uneventful.

**Second Case Report.**
A 25-year-old male patient presented to the emergency department with 3 days history of abdominal pain described as intermittent colicky pain mainly in right lower quadrant and suprapubic region with some radiation of pain to the groin. The patient also had few episode of non-bilious vomiting only on the first day of onset of the pain and no dysuria. He had nausea, fever, anorexia and no abdominal distension, change in bowel habits, hematuria or urethral discharge. The examination of abdomen revealed soft non-distended abdomen with mild tenderness in right iliac fossa, hypogastrium and right renal angle. There was some guarding on deep palpation of lower abdomen. The groin examination did not show any hernia and external genitals were normal. There were normal bowel sounds on auscultation of abdomen. His temperature was 37.8 °C, heart rate was 104/min and blood pressure was 120/70 mm Hg. The blood reports were unremarkable (hemoglobin 12.8 g/dL, white blood cell count 9.6, and normal renal functions). He had emergency appendicectomy following resuscitation. The findings were: Grossly inflamed appendix, abscess and a calculus measuring 4.1 cm in its widest diameter (2.1 by 3.2 by 4.1 cm in dimensions) Fig 2, 3. His out-patient follow-up has been uneventful.

![Fig 1 Grossly inflamed appendix and calculus.](image)

![Fig 2. Grossly inflamed appendix and abscess.](image)
Third case.
A 51yr old woman who presented with a history of abdominal pain of a week duration. The patient also had vomiting, nausea, fever, anorexia and no abdominal distension. She did not give a history of change in bowel habits, hematuria or urethral discharge.

The examination of abdomen revealed soft mildly distended abdomen with tenderness worse in right iliac fossa, hypogastrium and right renal angle. There was some guarding on deep palpation of lower abdomen. A tender mass measuring 8 cm in widest diameter was palpable in the right iliac region. The groin examination did not show any hernia and external genitals were normal. There were normal bowel sounds on auscultation of abdomen. Her temperature was 38 °C, heart rate was 98/min and blood pressure was 120/80 mm Hg. The blood reports were unremarkable (hemoglobin 10.0 g/dL, white blood cell count 10.2, and normal renal functions).

She was being managed conservatively for an appendix mass but had interval appendicectomy about the fourth week due to persistence of symptoms. The findings were: Perforated inflamed appendix and a calculus measuring 4.5 cm in widest diameter (3.2 by 3.5 by 4.5 cm dimensions)Fig 4-6. Her out-patient follow-up has been uneventful.

DISCUSSION.
The most commonly accepted theory for appendicitis is that it results from obstruction followed by infection. The obstruction could be due to calculus, lymphoid hyperplasia, foreign body, worms, stricture or tumor. Traditionally, calculi have been considered as main cause of appendicular obstruction; however, Singh et al in his study concluded against this aetiology. Non obstructive conditions can occur especially ischemic conditions of the supplying vessel.

The terms primary and secondary calculi were not
clear in literature as this will require further studies. Study done to detect presence of stones or calculi of the appendix preoperatively, has shown remarkable findings; When these calculi are detected in presence of abdominal pain, there is 90% probability of acute appendicitis and 50% higher risk of appendiceal perforation and abscess formation. In the third case being reported, perforation occurred. The significance of incidental finding of appendicolith in imaging without abdominal pain or CT scan findings of appendicitis is still debatable. Rabinowitz et al in his study of 75 patients with appendicololiths concluded that appendicoliths may be associated with increased risk of appendicitis but is not a pure indication of appendicectomy. Most studied showed that they are more commonly associated with complicated appendicitis with perforation and abscess formation (prevalence of 39.4-50%).

Grimes et al in her study concluded that recurrent right iliac fossa pain may be associated with calculi of the appendix and routine removal of normal looking appendix during diagnostic laparoscopy for right iliac fossa pain will pick up 10-15% patients that contains fecaloliths and offers potential cure, prevent recurrent admissions and is economically beneficial for the patient.

Calculous appendicitis appear to be more common in male patients than female and in retrocecal appendix position. This is similar to our cases were two were male and one female and appendix were retro-cecally located in all of the reported index cases.

Clinical features of appendicitis resulting from calculus vary depending on the type and size of patients. Some other factors like early or late presentation are yet to be determined. Anorexia is a known constant feature in acute condition. Sometimes features may mimic other conditions such as urological problems: colicky abdominal pain can occur with radiation to right testes and tenderness in right renal area with presence of microscopic hematuria. However, these findings may sometimes be associated with perforated appendix. Microscopic hematuria and leucocytes could be reactionary inflammation of bladder or ureter.

The diagnosis of acute appendicitis is usually a clinical one, supported by laboratory and radiological investigations as required. In cases of calculi causing appendicitis, ultrasonography may be useful but is observer dependent and computerize axial tomographic (CT) scan has a higher sensitivity. Radio opaque calculi has been reported. Ultrasonography done in index cases did not clearly reveal calculus and CT was not done in any of the cases. Findings of stones in index cases did not correlate with nature of symptoms or presentations. The chemical composition were not determined. The calculi were sent for analysis but as the time of this report, none of the results were received.

Treatment of this condition remains emergency approach and also surgeon or patient dependent. Laparoscopy may be used, in the cases presented, two cases had open appendicectomy via Lanz incision while one had open via low midline subumbilical incision. No complications were noted during follow up of these patients.

Conclusion: The giant calculus causing appendicitis is rare in our environment. Three cases were reported to increase awareness of giant calculi. Identifying the predisposing factor will help to reduce the incidence.
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Authors declare no conflict of interest

REFERENCES.