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ORIGINAL RESEARCH

Audit to evaluate the clinical presentation and surgical management of acute appendicitis at a secondary-level hospital in the Western Cape

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Background: Acute appendicitis is a frequent cause of abdominal emergencies, with delayed presentation and diagnosis increasing the risk of perforation and postoperative morbidity. In South Africa, the accessibility to healthcare and referral to surgical services can impact patient outcomes.
Methods: All patients treated for acute appendicitis at George Regional Hospital during the period January 2024 – December 2024 (1 year) were included in the study. Patients who were admitted with acute appendicitis but discharged with an alternative diagnosis were excluded.
Results: The sample consisted of 218 patients. The majority (88.5%) underwent surgical management, with the remainder managed conservatively. Patients referred from district hospitals had a significantly higher rate of perforated appendicitis compared to local patients (57.9% vs 40.2%, $p = 0.014$). Delayed presentation with symptoms beyond 72 hours was strongly associated with perforation (IQR 2.0–4.5; $p = 0.034$). Laparoscopic appendicectomy was performed in 66.3% of cases, with a 20.3% conversion rate to open surgery, predominantly in cases of perforation. The median length of stay was longer in patients with perforated appendicitis (IQR 3–6 days; $p < 0.001$). No in-hospital mortality was observed.
Conclusions: Delayed presentation was significantly associated with a higher risk of perforated appendicitis and greater operative complexity. Patients referred from district hospitals experienced higher rates of perforation likely due to delays in recognition, referral, and access to surgical care. Improving early diagnosis and streamlining referral pathways may reduce the incidence of complicated appendicitis and improve patient outcomes in our region.
Keywords: appendicitis, perforated appendicitis, laparoscopic appendicectomy

Introduction

Appendicitis is one of the most common causes of an acute abdominal emergency and if neglected, can progress to perforation, leading to severe intra-abdominal contamination and sepsis.[1]

The incidence of the disease in South Africa seems to be increasing and occurs at a rate 9 cases per 100 000 people, with a peak incidence between the ages of 10 and 30.[2]

Delays in presentation and diagnosis are associated with increasing rates of perforation of the appendix.[1,3,4]

Perforated appendicitis is a severe complication which can lead to significant intra-abdominal contamination, requiring aggressive surgical management.[4]

In developed countries, the mortality rate for acute appendicitis is negligible and is approximately 0.1%. In contrast, in developing regions, it is reported to be several times higher. This is almost certainly due to delays in seeking medical care and inadequate healthcare services.[5]

In a resource-limited setting where access to computed tomography (CT) is limited, clinical and laboratory findings become the basis of diagnosis for acute appendicitis.[1] The management of acute appendicitis has changed over the last three decades with the open approach gradually being replaced by a laparoscopic approach.[6] There is good evidence that laparoscopic appendectomy is associated with a lower incidence of postoperative complications compared to open appendectomy.[6] More recently there has been a move towards the non-operative management of uncomplicated acute appendicitis by use of antibiotics. Enthusiasm for this approach must be tempered by reported failure rates ranging between 15% and 20%.[7] This retrospective audit aims to document the acute appendicitis in the Eden District and to compare findings with both national and international data.

Methodology

George Provincial Hospital is a secondary-level public facility in the Western Cape that serves as the primary referral centre for the Eden District.

Due to limited surgical capabilities at district-level hospitals, appendicectomies are rarely performed outside George Hospital (< 1 per month at district hospitals). Only select cases meeting specific patient criteria are managed operatively at peripheral sites, with most patients referred for definitive care.

The medical records of patients diagnosed with acute appendicitis at George Regional Hospital between 1 January and 31 December 2024 (12 months) were added to a manually kept database. This database is password-protected and uses number identification. The HREC of the University of Cape Town has ethical approval for its use.

Inclusion criteria consisted of all patients admitted with a clinical and/or radiological diagnosis of acute appendicitis, regardless of whether they were treated operatively or non-operatively. Patients who underwent laparoscopic appendectomy with no evident pathology but had the appendix removed were included. Patients were excluded if they were discharged with an alternative diagnosis. Patients who were managed in the district were excluded from this audit.

Comparisons were made between ruptured appendicitis and the region from which the patient was referred. The duration of symptoms was captured.

We compared the number of laparoscopic appendicectomies to open appendicectomies and the conversion rate from laparoscopic to open procedure.

Data analyses were performed using IBM SPSS statistics version 30. For categorical data, appropriate descriptive statistics were reported in frequencies and percentages.

Inferential statistics were performed using the independent samples t-test or Mann-Whitney U test for numerical data and Pearson's chi-square or Fischer's exact test for categorical data. In the analyses, *p*-values less than 0.05 denoted statistical significance.

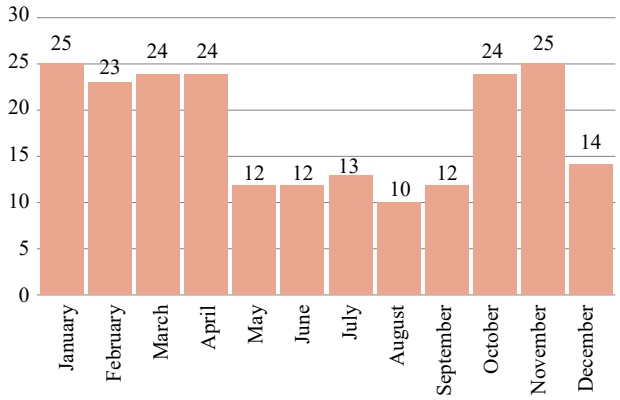

Figure 1: Monthly distribution

Results

The sample consisted of 218 patients. 193/218 (88.5%) patients had undergone surgery.

A subset of 25/218 patients (11.5%) were managed non-operatively. Radiological drainage (pigtail catheter insertion) was used in 2/218 cases (0.9%). Of the patients who were managed conservatively, 10/25 had radiological confirmation of acute appendicitis.

The mean age was 22.5, with ages ranging from 3 to 63. There were 120 males (55%) and 98 females (45%).

The cases demonstrated a seasonal trend (Figure 1), peaking in the summer months in January (25 cases) and lowest in the winter months (June 12 cases and August 10 cases, respectively).

Most of the patients originated from surrounding districts, with Oudtshoorn (44/218; 20.2%) and Knysna (28/218; 12.8%) representing the highest regional contributions (Figure 2). There was a statistically significant difference in the prevalence of perforated appendicitis between George (40.2%) and other regions combined (57.9%) (*p*-value 0.014).

There was no statistically significant association between younger age and the incidence of perforated appendicitis ($p = 0.176$). Perforation was observed intraoperatively in 58.3% of patients under 12, 52.7% aged 13–19, and 43.7% over 20 years (Figure 3).

Symptom duration was recorded for all patients.

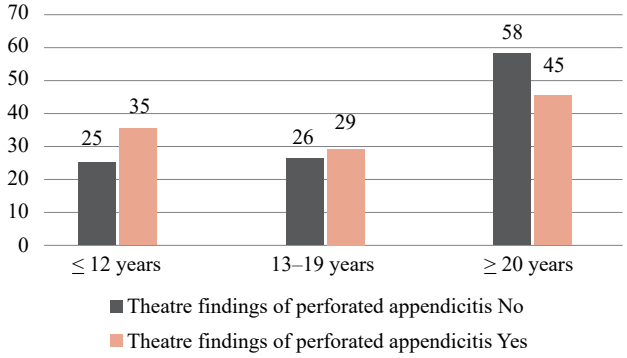

Figure 3: Prevalence of perforated appendicitis for age

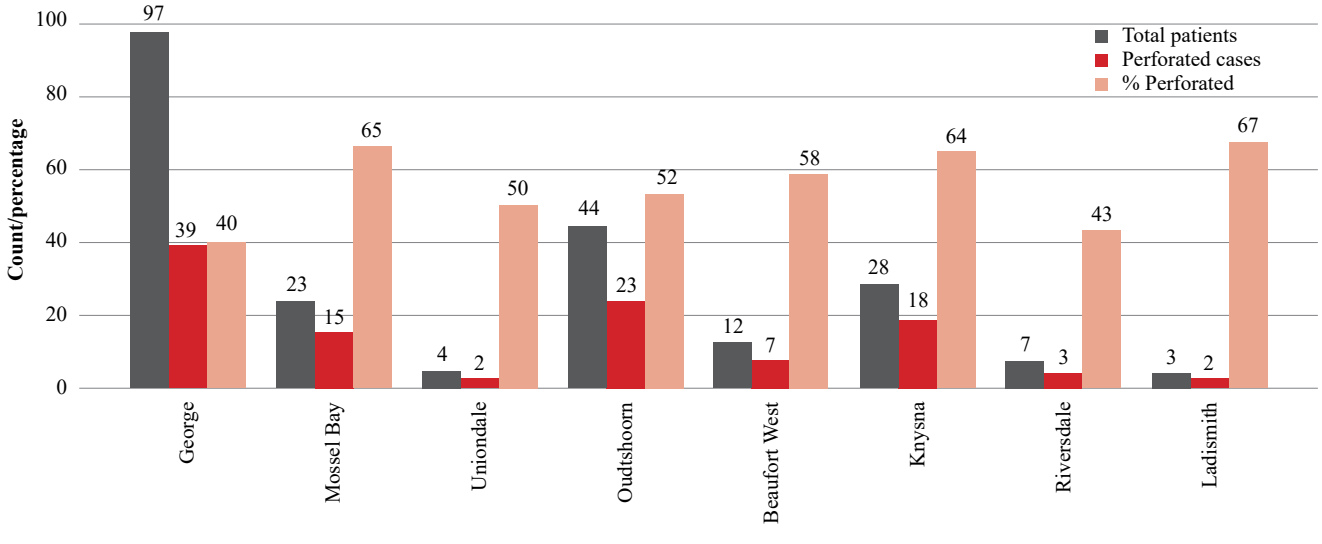

Figure 2: Perforated appendicitis prevalence by region

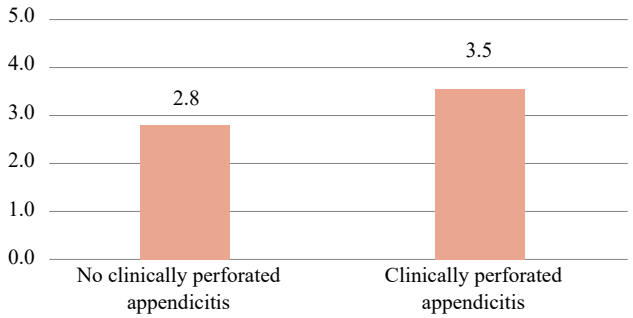

Figure 4: Mean duration of symptoms

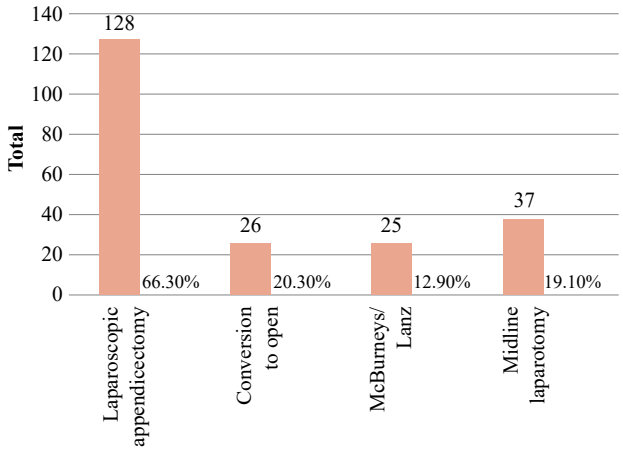

Figure 5: Operation totals

Most patients presented within the first 72 hours (IQR 2.0–4.5): 116/218 (53.2%) presented within 0–2 days, 78/218 (35.8%) within 3–6 days, and 24/218 (11.0%) after 7 days.

Those who presented with symptoms of more than 72 hours (IQR 2.0–4.5) (Figure 4) had a higher rate of perforation ($p = 0.034$).

An elevated white cell count (WCC) (> 12 ×10⁹/L) was documented in 65.6% of cases. The prevalence of intraoperative findings of perforated appendicitis was significantly higher among patients with WCC > 12 (58%) compared to those without WCC > 12 (34.8%) ($p = 0.002$).

Of the patients who had surgery (193/218), most underwent laparoscopic appendicectomy: 128/193 (66.3%), with a conversion rate to open appendicectomy in 26/128 (20.3%). Open appendicectomy was performed in 62/193 (32.1%), of which 37/62 (59.6%) required midline laparotomy (Figure 5).

Of those that required conversion to open surgery, 23/128 (17.9%) had features of perforated appendicitis. Of this category, 17/23 (73.9%) were reported to have pus in more than one quadrant.

Perforated appendicitis was demonstrated intraoperatively in 109/193 (56.4%) cases and confirmed histologically in 87/193(45%) (Figure 6). Intra-abdominal pus involving more than one quadrant was found in 67/193 (34.7%). Relook laparotomies were required in 25/193 patients (12.9%).

The mean length of hospital stay (LOS) was 4.2 days. The median LOS was significantly longer for patients with perforated appendicitis (4 days, IQR 3–6 days) compared to those without perforated appendicitis (2 days, IQR 2–3 days) ($p < 0.001$). There were no deaths in this study.

All appendicectomy specimens were histologically evaluated (Figure 6). A total of 72/193 (37.3%) had acute appendicitis without perforation. Of note, 2/193 were due to parasites. Eighty-seven over one hundred and ninety-three 87/193 (45.0%) of patients had perforated appendicitis. Thirty-three patients (17%) showed no features of appendicitis, of which 3/193 (1.5%) were periappendicitis, and 11/193 (5.7%) showed lymphoid hyperplasia. One case of appendiceal malignancy was identified.

Discussion

George Regional Hospital accounted for the highest number of appendicitis cases ($n = 97$), with a prevalence of perforated appendicitis in 40.2% of cases. In contrast, peripheral regions such as Mossel Bay (65.2%), Oudtshoorn (52.3%), and Beaufort West (58.3%) had significantly higher perforation rates despite lower absolute case numbers.

There was a statistically significant difference in the prevalence of perforated appendicitis between local (George) and referred patients (40.2% vs 57.9%, $p = 0.014$), suggesting a persistent discrepancy in access to timely surgical care. These findings are similar to reports from East London (urban 35% vs rural 63%) and Pietermaritzburg (19% vs 71%), $p < 0001$,[5,8] which show that rural patients are more likely to present with generalised peritonitis (76%), and to require ICU admission and relaparotomy compared to urban patients.[8] Delayed presentation is a significant risk factor for perforation in our cohort, with just under half of all patients (46.8%) who presented after 72 hours having a statistically higher perforation rate than patients presenting earlier ($p = 0.034$). This is in keeping with other local reports.[9]

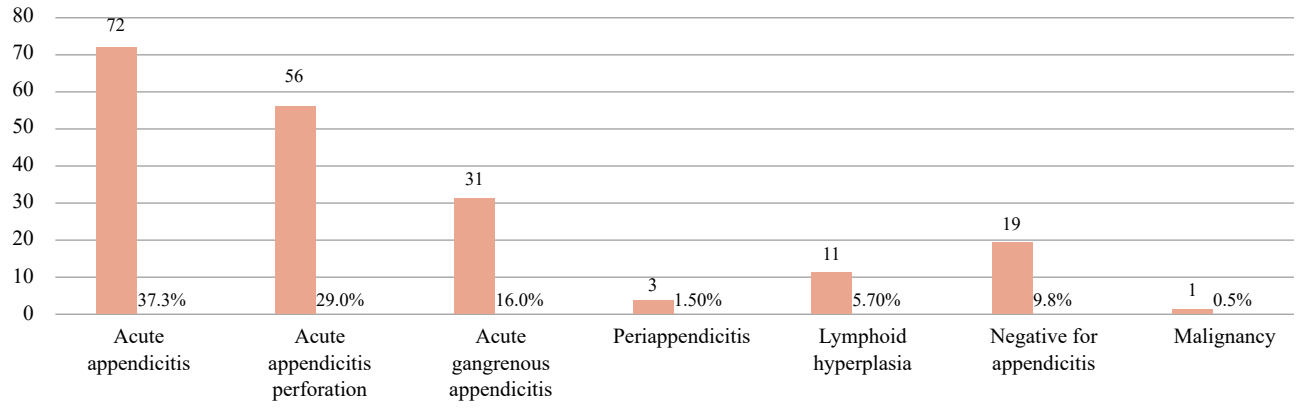

Figure 6: Histology analysis of appendix specimen

Data suggests that rural patients experience longer delays in presentation, higher rates of perforation and are more likely to need laparotomy, repeat-laparotomy, and ICU care.[10] The factors contributing to these delays include health-seeking behaviours, geographic remoteness, and limited access to primary healthcare.[9,10] Even after presenting to a healthcare facility, delays are compounded by failure in timely referral and transportation.[10] This increases the clinical risk to patients and the financial burden on the healthcare system.[11] The cost of managing acute appendicitis increases exponentially with disease severity.[11]

The American Association for the Surgery of Trauma (AAST) recently developed an anatomical severity grading system for appendicitis to standardise assessment of disease severity.[12] A multicentre validation study in South Africa, showed that the AAST grading system is reliable and generalisable in a low-resource setting. Increasing grade strongly correlates with increasing complication rates, mortality, and LOS.[13,14] This has been shown to apply to paediatric patients as well.[14] The AAST grading should be applied in future studies to improve risk stratification and benchmarking.

The prevalence of perforation was significantly higher among patients with WCC > 12 (58%) compared to those without WCC > 12 (34.8%) ($p = 0.002$). This once again is in keeping with other reports from South Africa.[15] Although this study did not interrogate the association, other local authors have correlated elevated C-reactive protein (CRP) levels with increasing severity of disease.[15]

Laparoscopic appendectomy was the predominant operative modality (66.3%), with a 20.3% conversion rate. This corresponds to the trend in other local institutions like New Somerset Hospital in Cape Town, where laparoscopic surgery uptake increased from 29% to 68% over three years.[16] Our conversion rate is slightly higher than that of Cape Town (19%), possibly reflecting differences in surgeon experience and disease severity.[16]

Other provinces have a different experience. A retrospective analysis from Pietermaritzburg of 851 patients with of acute appendicitis over six years (2013–2019) revealed that laparoscopic appendectomy was performed in only 15% of cases.[17]

There is evidence to suggest that South African surgical trainees have limited exposure to laparoscopic appendectomy, with key barriers including resource and mentorship constraints.[18]

A recent prospective, multicentre observational study from United States of 3 597 patients with acute appendicitis, reported that 90% of patients underwent CT and 91% underwent laparoscopic appendectomy. The median LOS was 1 day.[19] Of the 219 patients who received primary non-operative antibiotic management, 35 (16%) required surgical intervention during the same hospital admission and 12 (5%) underwent appendectomy within 30 days. The cumulative failure rate of antibiotic therapy was 21%.[19] A retrospective cohort study of trends over 15 years in North England between January 2002 and December 2016 showed a dramatic increase in the use of CT scan from 0.8% to 21.9% ($p<0.001$) and increased uptake in laparoscopic appendectomy from 4.1% to 70.4% ($p<0.001$).[20] Patients undergoing laparoscopic surgery had a shorter median hospital stay compared to those managed with open surgery or non-operatively.[20] Our findings support global and local literature that affirms the benefits of laparoscopic appendectomy in uncomplicated and complicated appendicitis, provided surgical expertise is available.

Conclusion

In our environment, delayed presentation is common and is significantly associated with an increased risk of perforated appendicitis. Patients referred from district hospitals experienced higher perforation rates than local patients likely due to barriers in timely recognition, transport, and limitations in diagnostic resources. Perforated appendicitis is associated with greater operative complexity, mandating higher rates of conversion to open appendicectomy. Efforts to improve recognition and referral are essential to reducing the burden of complicated appendicitis in our setting.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Ethical approval was obtained from the University of Cape Town, Faculty of Health Sciences, Human Research Ethics Committee. Ref: 184/2025

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