

Appendicectomy: rethinking best practice

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How close are we to reaching the combined goal of low perforation rates and low rates of unnecessary surgery in patients with suspected acute appendicitis?

Acute appendicitis remains the most common intra-abdominal condition requiring emergency surgery and carries a lifetime risk of approximately 6%.¹ In 1990, the mortality rate in Australia from this condition was one of the lowest in the developed world (0.0001%).² While early diagnosis and intervention has reduced the mortality rate for uncomplicated appendicitis to less than 0.1%, this has been at the expense of increased rates of removing appendices that are subsequently found to be normal. Some studies put the rate of these negative appendicectomies at greater than 20%.³

In addition, there is an increased mortality rate with complicated appendicitis (e.g. 0.6% for gangrenous appendicitis and 5% for perforated appendicitis),⁴ with an attendant mortality increase in children less than 2 years of age or adults more than 65 years with appendicitis.

Clinical diagnosis

Since the original description of perforated appendicitis by Fitz in 1886⁵, surgeons have been evaluating patients with right iliac fossa pain to weigh up the risk of appendiceal perforation against the prospect of unnecessary appendicectomy. More than 100 years later, diagnosis of acute appendicitis is still primarily clinical. A thorough history and careful examination usually allow differentiation of cases needing surgical intervention and those requiring observation. An elevated white cell count (greater than 75% neutrophilia) supports a clinical diagnosis of appendicitis.⁶ However, other investigations may be useful in patients with atypical symptoms and signs mimicking appendicitis.

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Ultrasound has proven to be a safe and reliable method of diagnosing acute appendicitis, with a sensitivity of 75 to 89% and a specificity of 86 to 100%.^{2,6} If the appendix is seen on ultrasound examination, this may indicate acute appendicitis; if the appendix cannot be seen, appendicitis is usually excluded. Ultrasound may also exclude diseases that do not require surgery (especially gynaecological disorders such as a ruptured Graafian follicle). However, in 3 to 11% of cases, ultrasound is of nondiagnostic quality because of pain or tenderness using the probe, obesity, guarding or overlying gas.⁶ Other disadvantages of ultrasound are that it is operator dependent

and may not be readily available after hours.

Recently, thin section helical computed tomography for examining patients with suspected acute appendicitis has been shown in prospective trials to be highly accurate (up to 98%), rapid and cost-effective.⁷⁻⁹

Diagnostic laparoscopy has been advocated but this procedure requires anaesthesia and carries morbidity and mortality rates equivalent to open appendicectomy.^{10,11} Its potential benefits are improved diagnostic accuracy (93 to 100%) and a reduced negative appendicectomy rate.¹² The latter is aided by adopting a policy of removing either an inflamed appendix or a normal appendix in the absence of other pathology.¹³ However, several prospective randomised trials have shown little difference between open appendicectomy and laparoscopic surgery regarding postoperative pain and in-hospital stay.¹⁴ However, there was a significantly reduced wound complication rate when open appendicectomy was compared with laparoscopic surgery (20% *v.* 5%). Laparoscopic appendicectomies were also generally preferable cosmetically; however, a muscle-splitting incision may still be required if the appendix is inflamed and the procedure cannot be completed laparoscopically.

When to 'wait and see'

The presentation of appendicitis is commonly atypical, unusual findings are common and there are diverse rates of disease progression. Therefore, a surgeon may elect to observe the patient to improve diagnostic accuracy. Intensive in-hospital observation may reduce the frequency of unnecessary appendicectomy without adversely affecting the frequency of perforation.^{6,15,16} As there is no single confirmatory preoperative test for acute appendicitis, it is not surprising that a number of patients have an alternative diagnosis or no obvious intra-abdominal pathology. However, 'overdiagnosis' results in a reduction in the number of gangrenous or perforated appendices. Estimations of morbidity as high as 15% of cases for negative appendicectomy have been more acceptable than the higher morbidity of 26 to 47% of cases associated with a perforated appendix.^{5,17,18}

The negative appendicectomy rates in Australia are between 22 and 29%.⁴ This may be partly due to a significantly high 'on table' diagnosis of false-positives (i.e. negative appendicectomies) by surgeons that could be attributed to:

- secondary appendiceal serosal inflammation
- 'rough handling' during mobilisation of the appendix causing it to become inflamed and oedematous
- self-denial that the wrong diagnosis was made.

Perhaps closer attention to clinical information may improve performance.

Studies have shown that there seems to be a positive, linear

relationship between the rate of perforation and diagnostic accuracy.⁵ Neutra reported in a cost-benefit analysis that 20 to 50% of normal appendices would be an acceptable figure to give rise to the lowest possible morbidity and mortality rates.¹⁶ In other words, a diagnostic accuracy of 50 to 80% would probably be desirable if one weighs the risks of a perforated appendix by delaying surgery. Nonetheless, 15 to 40% of patients with right iliac fossa pain undergo operations that demonstrate neither appendicitis nor surgically correctable disease.^{19,20} Most of these patients have acute nonspecific abdominal pain.²¹ It has been suggested that in cases where no cause of abdominal pain is found at surgery, a culture of the peritoneal fluid may indicate a mild form of primary peritonitis.²²

Gender and appendicitis

There is a significantly higher proportion of negative appendicectomies in women compared with men (33 to 39% *v.* 12 to 21%).^{4,18,23} This can be attributed to:

- pelvic inflammatory disease mimicking appendicitis in women
- the increased likelihood of operating on women of reproductive age who are at a significant risk of secondary infertility following perforated appendicitis.

There is still no clinically useful objective test that has a high degree of sensitivity, specificity and accuracy for detecting appendicitis.

The sex differential in negative appendicectomy rates may indicate a greater need for diagnostic accuracy and a reduced propensity to operate in women. This may involve greater use of investigative methods such as ultrasound and laparoscopy along with a more conservative approach and active observation of females with suspected appendicitis.

Previous reports have indicated that 5 to 30% of all appendicitis cases perforate.^{18,23} The higher proportion of men with perforated appendices may not necessarily be due to delay in diagnosis but may reflect a delay in seeking medical attention. This may indicate that a lower threshold for surgical intervention in men should be adopted. Jess and colleagues reported a postoperative complication rate of 39% in patients with perforated appendices, compared with 8% in patients with nonperforated acute appendicitis.²³ Scher and Coil also reported a two-fold increase in hospital stay and a three-fold increase in hospital costs when perforation occurs.¹⁷

Geographical variation

The accuracy of histological diagnosis (the correlation between operative findings and histology) in hospital audits conducted nationally ranged between 75.6 to 86.3%.^{4,24} Internationally, the diagnostic accuracy for acute appendicitis from investigations in Austria and Germany were 25% compared with 70 to 80% in the USA.²⁵ This variation may not only be due to differing opinions concerning the appropriate time of surgical intervention but also to variations in the organisation and function of medical services in different countries.

An audit approach to best practice

Ongoing audit is a mandatory exercise in maintaining improved standards and outcome of care, as demonstrated by Krivenko and Chodroff.²⁶ They found the following key characteristics implemented by the 'best practice' hospitals:

- extensive and frequent peer review
- an attitude that perforated appendicitis or appendiceal abscess and suspected appendicitis were distinct clinical entities and they could be managed differently – ruptured appendix as a surgical emergency and suspected appendicitis by active observation

- training of junior medical and nursing staff to monitor patients with suspected appendicitis
- ongoing education programs on presentations of difficult cases of appendicitis
- peer group pressure to attain a low negative appendectomy rate.

Their hospital's low rates of negative appendectomy (4.1%) and perforation (7.8%) support this approach.

Conclusion

Rates of perforation and negative appendectomy have been relatively stagnant over half a century despite many advances in technology. Yet, there is still no clinically useful objective test that has a high degree of sensitivity, specificity and accuracy for detecting appendicitis. Without adopting an audit approach to best practice, negative appendectomy rates will remain the same. An audit approach, including elements of improved doctor education, will also lead to significantly reduced perforation rates, as will patients seeking earlier intervention when they have acute abdominal pain. **MT**

References are available on request from Medicine Today.

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