

A Retrospective Review Of Appendicectomy Management In A UK Teaching Hospital

P Rajan, D Sharma, C Watson

Citation

P Rajan, D Sharma, C Watson. *A Retrospective Review Of Appendicectomy Management In A UK Teaching Hospital*. The Internet Journal of Surgery. 2005 Volume 7 Number 2.

Abstract

Background: Acute appendicitis is common and making the diagnosis can be difficult.

Methods: The hospital databases and records of 102 patients who underwent appendicectomy were analysed.

Results: Age range was 6 to 82years ($\mu=30$ years); 38% females, 69% less than 40years. Diagnostic accuracy was higher in males (90.5%) than females (71.8%). Negative appendicectomy rate (total=11.8%) was higher in females (21%) than males (6.3%). Migratory right iliac fossa pain was 57.6% sensitive and 92.3% specific to appendicitis. Pyrexia was 38.8% sensitive and 83.3 % specific and guarding was 81.1% sensitive and 43.8% specific. Elevated white cell count was 85.9% sensitive but only 36.4% specific. Radiology was of little benefit apart from CT, which revealed appendiceal pathology in 4/5 cases.

Conclusions: The judgement of an experienced clinician is an adequate diagnostic tool in the most cases. CT can be useful in selected cases. Further laparoscopy could reduce negative appendicectomy rates in females.

BACKGROUND

Acute appendicitis is one of the commonest clinical presentations in emergency surgical practice. Historically, early recognition and prompt surgical intervention was thought to provide the only chance of survival as mortality was high. Despite structured scoring and computer-aided systems¹, the diagnosis can pose a challenge to even the most experienced clinicians with negative appendicectomy rates of up to 20% reported in some centres². Some clinicians advocate delaying surgery to improve diagnostic accuracy in selected doubtful cases; however there have previously been reports that may lead to increased perforation rates³ and significant mortality^{4,5,6}. Proponents of "active observation and repeated re-evaluation", claim a reduction in negative appendicectomy rates with no significant increase in perforation rates⁷, or other morbidity⁸.

Plain radiology has little role in the diagnosis of appendicitis⁹, but ultrasonography, in experienced hands can be accurate, although false-negatives can occur¹⁰. It is probably most useful in excluding gynaecological pathology^{11,12}. Computed Tomography (CT) is not so operator dependent and is the investigation of choice, with reports of up to 100% accuracy and negative

appendicectomy rates of 7%¹³. High radiation exposure make it undesirable for the paediatric population, and CT tends to be reserved for more difficult cases, at the extremes of age, where more sinister pathologies exist. Within the overburdened UK National Health Service (NHS) and in areas of the world where these technologies are unavailable, the onus still remains on clinical examination.

Diagnostic laparoscopy has been advocated for uncertain cases, and has been shown to reduce negative appendicectomy rates¹⁴. It is most useful in young females to exclude gynaecological pathology. Laparoscopic appendicectomy has also been shown to significantly reduce the incidence of most post-operative morbidity compared to open procedures, apart an increase in intra-abdominal abscesses¹⁴. This might be a result of inexperienced laparoscopists operating on perforated appendices¹⁵.

The aim of this study was to review the appendicectomy management in our unit. By comparing our results to the published data we hope to identify the optimum management strategy.

METHODS

We conducted a retrospective review of the hospital databases and records of one hundred and two patients who underwent appendicectomy at Addenbrooke's Hospital, Cambridge. The list of patients was obtained from the operating theatre database, and the clinical records and investigations database were subsequently reviewed. For the purpose of emergency general surgical admissions, Addenbrooke's operates as a district general hospital, serving the local population.

The pre-operative clinical diagnosis in all cases was acute appendicitis, based on history, clinical examination, laboratory tests and if necessary, radiological investigations. Appendicectomy was either laparoscopic or open, depending on the preference of the operating surgeon. Where there was a high clinical index of suspicion, surgery was performed on the same day as admission after review by the on-call Registrar or Consultant. In uncertain cases, patients were actively observed on the ward overnight and assessed the next morning by a senior member of the team before a decision was made to operate. All appendices were removed and sent for histological examination. Records were studied, noting the features of the clinical presentation, results of investigations, operative findings, morbidity, mortality and final histology.

Accuracy of diagnoses was defined as the number of histologically confirmed cases per 100 procedures. The chi-squared test was used to examine differences in proportion with a significance accepted as $p < 0.05$.

RESULTS

One hundred and twenty two consecutive appendicectomy procedures were performed for presumed acute appendicitis between October 2000 and January 2001. We were able to review the notes of 102 patients. The age range was from 6 to 82 years with a mean age of 30 years; 62% males and 38% females, of which 69.2% were less than 40 years of age. Total diagnostic accuracy was 85.3%, and was significantly higher in males (90.5%) than females (71.8%) ($p < 0.05$). The negative appendicectomy rate was 11.8%, and was significantly lower in males (6.3%) than in females (21%) ($p < 0.05$). The mean length of inpatient stay was 2 days.

The most common clinical presentation (51%) was migratory right iliac fossa (RIF) pain, with localised RIF pain (26%) and pain elsewhere (24%) being the next most common presentations. 67% of patients had symptoms of nausea and vomiting, but anorexia was a poorly documented

symptom and present in only 30% of cases. The mean duration of symptoms was 32 hours. Febrile symptoms and pyrexia were only present in 26% and 38% patients respectively. Guarding and rebound was elicited in 77% and 61% of patients respectively. Table 1 shows the sensitivity and specificity of the signs and symptoms, and laboratory investigations elicited in the history and clinical examination.

Figure 1

Table 1: A comparison of the sensitivity and specificity of clinical signs, symptoms and laboratory investigations in this study and previously published literature.

	This review		Current Literature		
Symptoms	Sensitivity/%	Specificity/%	Sensitivity/%	Specificity/%	Study
RIF pain	78.8	37.5	81	53	17
Migratory pain	57.6	92.3	64	82	17
Nausea			58-68	37-40	17-18
Vomiting			49-51	45-69	17-18
Nausea or Vomiting	70.4	33.3			
Signs					
Fever	38.3	83.3	67	69	17-18
Rebound	63.1	43.8	63	69	17-18
Guarding	81.0	43.8	39-74	57-84	17-18
Investigations					
WCC	85.9	36.4			
CRP	67.1	63.6			

WCC = white cell count CRP = C-reactive protein RIF = right iliac fossa

29 patients were subjected to plain radiology, 3 of which revealed only non-specific features. Ultrasonography and CT scanning revealed appendiceal pathology in 1 out of 7 cases and 4 out of 5 cases respectively. 95 patients received pre-operative antibiotics (cefotaxime and metronidazole) (not documented in 4 cases, not given in 1 case).

Operating took place in a dedicated CEPOD₁₆ theatre with 24 hour medical and nursing staff. Two-thirds of the operating took place from 8am to 8pm; the remainder out of hours. 3 procedures were performed by the Consultant only, with the majority of cases being shared between the on-call Registrar (55%) and SHO (41%). 5 laparoscopic cases were performed by the Registrar, 4 of which were performed on females under the age of 40 years. 9 appendices were described as macroscopically normal, 7 of which were confirmed as normal on histology. The mean time to theatre was 2 days from the onset of symptoms, and there was no significant increase in perforation rates in those operated on after this threshold ($p > 0.05$).

Only 10 patients had positive microbiology cultures from intra-abdominal swabs. Furthermore, there were only 6 reported cases of wound infection, of which 4 progressed to have significant wound-related problems (pain or dehiscence). All of these patients had received pre-operative

antibiotics.

DISCUSSION

Clinical examination and investigation yielded total diagnostic accuracy of 85% and is comparable to published data. The total negative appendicectomy rate of 12% was similar to results from centres that adopt a policy of active observation⁷. It is unsurprising that there was a significant difference in these results between males and females as the majority of females were of an age where gynaecological pathology is common. Diagnostic accuracy and negative appendicectomy rates could potentially be improved with further use of radiology or laparoscopy.

The sensitivities and specificities of the various clinical signs and symptoms were comparable with the literature^{17,18}. Although RIF pain proved to be a sensitive indicator of acute appendicitis, migratory pain was much more specific. Laboratory tests appear to aid what is primarily clinical diagnosis, or in uncertain cases, provided a baseline for sequential investigations. We found that although WCC was a highly sensitive indicator of acute appendicitis, it was by no means specific, as has been reported by other centres¹⁹. CRP was found to be only moderately sensitive or specific, in keeping with recent reports²⁰.

As per NCEPOD₁₆ guidelines, the majority of operating took place within daylight hours and by more senior surgeons or by juniors under close senior supervision, with only 20% of cases being performed by SHOs without a senior surgeon scrubbed. There was no significant increase in perforation rates in patients where the operation was delayed, either due to purposeful active observation, or a late presentation.

CONCLUSIONS

We conclude from our study that the judgement of an experienced clinician is an adequate diagnostic tool in the majority of cases. We followed a policy "active observation and repeated re-evaluation" which yielded results comparable to published data without significant morbidity. We found that laboratory investigations provide an adjunct to what is primarily a clinical diagnosis, although cross-sectional radiology can be of assistance in difficult cases at the extremes of age. Our results suggest that optimum management could include further use of diagnostic radiology and laparoscopy to reduce negative appendicectomy rates particularly in females of child-bearing age. This has implications on radiology resources and training of juniors in laparoscopic skills, however may

provide further evidence in favour of a truly consultant-based emergency surgical service.

CORRESPONDENCE TO

Mr Prabhakar Rajan, Department of Urology, Freeman Hospital, High Heaton, Newcastle-upon-Tyne, NE7 7DN, UK. Tel. +44 191 233 6161; Fax. +44 191 213 1968; E-mail address: prabs_rajan@yahoo.co.uk

References

1. Körner H, Söndena K, Söreide JA, Andersen E, Nysted A, Lende TH: Structured data collection improves the diagnosis of acute appendicitis. *Br J Surg* 1998, 85:341-4
2. Chan MY, Teo BS, Ng BL: The Alvarado score and acute appendicitis. *Ann Acad Med Singapore* 2001, 30:510-2
3. Malt RA: The Perforated Appendix. *N Engl J Med* 1986, 315:1546-7
4. Von Titte SN, McCabe CJ, Ottinger LW: Delayed Appendectomy for appendicitis: Causes and consequences. *Am J Emerg Med* 1996, 14:620-2
5. Rusnak RA, Borer JM, Fastow JS: Misdiagnosis of acute appendicitis: common feature discovered in cases after litigation. *Am J Emerg Med* 1994, 12:397-402
6. Graff L, Russell J, Seashore J et al: False-negative and false positive errors in abdominal pain evaluation: Failure to diagnose acute appendicitis and unnecessary surgery. *Acad Emerg Med* 2000, 7:1244-55
7. Jones PF: Suspected acute appendicitis: trends in management over 30 years. *Br J Surg* 2001, 88:1570-7.
8. Kirby CP, Sparnon AL: Active observation of children with possible appendicitis does not increase morbidity. *ANZ J Surg* 2001, 71:412-3
9. Rao PM, Rhea JT, Rao JA, Conn AK: Plain abdominal radiography in clinically suspected appendicitis: diagnostic yield, resource use, and comparison with CT. *Am J Emerg Med* 1999, 17:325-8
10. Douglas CD, Macpherson NE, Davidson PM, Jani JS: Randomised controlled trial of ultrasonography in the diagnosis of acute appendicitis, incorporating the Alvarado score. *BMJ* 2000, 321:919-22
11. Balthazar EJ, Birnbaum BA, Yee J, Megibow AJ, Roshkow J, Gray C: Acute appendicitis: CT and US correlation in 100 patients. *Radiology* 1994, 190:31-5
12. Pickuth D, Heywang-Kobrunner SH, Spielmann RP: Suspected acute appendicitis: is ultrasonography or computed tomography the preferred imaging technique? *Eur J Surg* 2000, 166:315-9
13. Rao PM, Rhea JT, Rattner DW, Venus IG, Novelline RA: Introduction of appendiceal CT: impact on negative appendicectomy and appendiceal perforation rates. *Ann Surg* 1999, 229:344-9
14. Sauerland S, Lefering R, Neugebauer EAM: Laparoscopic versus open surgery for suspected appendicitis. *Cochrane Database Syst Rev* 2002, 1:CD001546
15. Benjamin IS, Patel AG: Managing acute appendicitis. *BMJ* 2002, 325:505-6
16. National Confidential Enquiry into Peri-operative Deaths: The 2002 Report of the National Confidential Enquiry into Peri-operative Deaths. 2002, 59
17. Wagner JM, McKinney WP, Carpenter JL: Does this patient have appendicitis? *JAMA* 1996, 276:1589-94
18. Jahn H, Mathiesen FK, Neckelmann K, Hovendal CP., Bellstrom T, Gottrup F: Comparison of clinical judgment and diagnostic ultrasonography in the diagnosis of acute

appendicitis: experience with a score-aided diagnosis. Eur J Surg 1997, 163:433-43

19. Thompson MM, Underwood MJ, Dookeran KA, Lloyd DM, Bell PR: Role of sequential leucocyte counts and C-

reactive protein measurements in acute appendicitis. Br J Surg 1992, 79:822-4

20. Hallan S, Asberg A: The accuracy of C-reactive protein in diagnosing acute appendicitis - a meta-analysis. Scan J Clin Lab Invest 1997, 57:373-380

Author Information

Prabhakar Rajan, MA MRCS

Clinical Research Fellow, Department of Urology, Freeman Hospital

Dinesh C. Sharma, MD FRCS

Consultant Surgeon, Department of Surgery, The Royal Free Hospital

Christopher J.E. Watson, MD FRCS

Senior Lecturer and Honorary Consultant Surgeon, Department of Surgery, University of Cambridge, Addenbrooke's Hospital