

Introduction

Acute appendicitis is the most common surgical emergency, and accounts for one third of the patients presenting to the emergency department with an acute abdomen, requiring approximately 50,000 admissions every year^{1,2}. It has such a high morbidity and mortality that surgeons will tolerate relatively high negative appendicectomy rates¹. Preoperative ultrasonography and CT have been associated with reduced negative appendicectomy rates³.

Methodology

This was a retrospective audit including all the patients that underwent an appendicectomy over a 6 months period (January – June 2019). Pre-operative CT and US imaging reports, were correlated with post-operative histopathology reports. These were collected from PACS and iCare.

Positive CT or US were considered those including in the report “suggestive of appendicitis”. Negative histopathology reports were considered those included in the report “Normal appendix”

Target

1. Sensitivity value for CT should be >90%⁴
2. For US overall sensitivity value should be >70%, for the paediatric subgroup should be >85%¹
3. The positive predictive value (PPV) should be >92%⁵
4. The negative appendicectomy rate (NAR) should be <10%⁵

Results

Comparison between imaging modalities

Imaging modality	Scans	TP	FP	TN	FN	Sen	PPV	NAR
CT	48	41	0	5	2	95%	100%	0%
Ultrasound	58	22	0	18	18	53%	100%	0%
US Paediatric	24	13	0	6	5	72%	100%	0%

Patients that proceeded to surgery without pre-op imaging

No pre-op Imaging	Number of cases	Confirmed Appendicitis	NAR
Adults	56	48	14.3%
Paediatrics	19	19	0%
Total	75	67	10.7%

Comparison between reporters

Imaging modality	Scans	TP	FP	TN	FN	Sen	PPV	NAR
CT Local radiologist	21	19	0	1	1	95%	100%	0%
CT OOH Service	27	22	0	4	1	96%	100%	0%
US Sonographer	31	11	0	10	10	52%	100%	0%
US Consultant	25	10	0	8	7	59%	100%	0%

True positive= Positive scan + Positive histology (TP), False positive= Positive scan + Negative histology (FP), True negative= Negative scan + Negative histology (TN), False negative= Negative scan +Positive histology (FN). Sensitivity (Sen).

References

- 1 Collins, G. B., et al. (2014). The accuracy of pre-appendectomy computed tomography with histopathological correlation: a clinical audit, case discussion and evaluation of the literature. *Emergency radiology*, 21(6), 589–595. <https://doi.org/10.1007/s10140-014-1243-z>
- 2 Hospital Episode Statistics. Admitted Patient Care–England 2018 –2019. Total Procedures and Interventions. <https://digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity/2018-19>
- 3 National Surgical Research Collaborative. Multicentre observational study of performance variation in provision and outcome of emergency appendicectomy. *Br J Surg*. 2013;100(9):1240-1252. doi:10.1002/bjs.9201.
- 4 Eng, K., et al. (2018). Acute Appendicitis: A Meta-Analysis of the Diagnostic Accuracy of US, CT, and MRI as Second-Line Imaging Tests after an Initial US. *Radiology*, 288(3), pp.717-727.
- 5 Dude JB, et al. (2012) Computed tomography mimics of acute appendicitis: predictors of appendiceal disease confirmed at pathology. *J Clin Imaging Sci* 2(73):1–8.
- 6 D'Souza N, et al.(2014) The value of ultrasonography in the diagnosis of appendicitis. *Int J Surg*. 2015;13:165-169. doi:10.1016/j.ijsu.2014.11.039.
- 7 Yuan F, Necas M. Retrospective audit of patients presenting for ultrasound with suspicion of appendicitis. *Australas J Ultrasound Med*. 2015;18(2):67-69. doi:10.1002/j.2205-0140.2015.tb00044.x

Discussion

1. For CT, Sensitivity, PPV and NAR meet the target.
2. There was no significant difference on sensitivity between CT reporters.
3. Sensitivity of US was below expected; The target on the literature is for an interval scan after initial US screening. This is not routine practice in our hospital.
4. Overall, preoperative imaging is associated with lower NAR.

43% of the patients proceeded to surgery without preoperative imaging, compared with the reference article where imaging is used routinely as part of the pre-operative workup, this suggests that patients referred for imaging are those with lower clinical suspicion of appendicitis, explaining the low sensitivity for US.

NAR for patients that underwent preoperative CT with positive report was 0%, below the national average (8,9%)³

In the reference studies all patients investigated for appendicitis underwent a screening US followed by a second US, CT or MRI according to every particular case. In recent articles, published in the UK and New Zealand, they report US sensitivity for appendicitis around 50%.^{6,7}

Proposed action plan

1. Present findings in the departmental audit meeting and the discussion of specific cases of radio-pathological discrepancy.
2. Update the RCR Audit live template to include more recent references and audit targets.
3. In cases of equivocal initial USS, consider an interval USS in young patients and female patients of reproductive age.