

Acute Diverticulitis - CRP can safely guide the utilisation of high quality CT imaging

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Aims and objectives

Acute diverticulitis is the commonest emergency admission to the Lothian Colorectal Unit, the largest colorectal unit in the UK. The incidence of complicated diverticular disease, associated with abscess and/or perforation is increasing [1,2]. Surgical intervention in acute, complicated disease often results in stoma formation, which can remain permanent [5]. Therefore, attempts to eradicate intra-abdominal collections and control sepsis as either a preparatory step to elective surgery or as a definitive mode of treatment are gaining popularity. This may be achieved by percutaneous CT guided drainage [3,4] or laparoscopy and peritoneal lavage [6,7].

However the accepted "routine" is that all diverticulitis cases undergo a CT scan at admission. Whilst this has been pivotal in the assessment of acute diverticulitis, it may result in a not insignificant cohort of patients with uncomplicated disease being imaged unnecessarily at the acute presentation.

The aim was therefore to study the pathways of management and imaging of consecutive patients admitted to our unit with acute diverticulitis over a one year period, and to assess the potential value of the biochemical marker of acute inflammation, C-reactive protein (CRP) measurement, at the time of presentation as a potential tool to guide us toward more selective CT scanning [8,9].

Methods and materials

Data for a one year period, April 2013 - 14 inclusive, was collected for all acute colonic diverticulitis admissions from Lothian Surgical Audit (LSA) a prospective surgical database. The investigative and management pathways for all cases were searched on TRAK (the electronic hospital records and results) and PACS (the radiology picture archiving and communication system).

The radiological and surgical management pathways of all cases were scrutinised and demographic, clinical, imaging, intervention and outcome data was collected. The CRP (mg/L) within 24 hours of admission was recorded for each case.

The cohort of patients was divided into two groups: (1) uncomplicated and (2) complicated disease (diverticulitis with abscess, perforation or obstruction).

Results

234 consecutive acute diverticular cases over a 1 year period:

•195 (74%): simple uncomplicated (Hinchey Ia) •34 (13%): Complicated with abscess/perforation (Hinchey Ib, II) •5 (2%): complicated by large bowel obstruction

Surgery in the Acute Episode

Surgical intervention was required in 51 (20%) of all acute diverticular presentations

Complicated Diverticulitis - Abscess /Perforation

13 (39%) of the cohort with perforation/abscess at index admission required emergency surgery.

•All had abscess >4 cm maximum diameter (range 4 - 17cm) •Stoma rate of 54%

Percutaneous drainage (PCD) and Laparoscopy and lavage

Laparoscopy and lavage was performed in 2 acute cases with 6 cm and 7 cm collections not suitable for PCD. Both failed to progress and required Hartmann's resection.

PCD was used for only 5 of the 235 patients. 3 underwent PCD at presentation then required open intervention. A further 2 patients underwent PCD of postoperative collections.

CRP measurements (mg/L)

1.The CRP at admission was significantly raised in the cohort with complicated diverticulitis compared to those with CT diagnosed simple/uncomplicated diverticulitis: median 246 vs 48 mg/L respectively; $p < 0.0001$ (Fig.1).

2.The CRP was also significantly higher in the cohort with complicated diverticulitis who required surgical intervention: median 284 vs 214 mg/L; $p < 0.03$. (Fig.2).

If a "threshold" admission CRP may had been utilised to "trigger" a CT Scan, the burdens on inpatient radiology service would be greatly reduced and significant savings could be made by institutions, without the risk of missing patients with complicated diverticulitis. The cost of an urgent CT scan in our institute is over £200 pounds. The total cost of 195 CT scans for the cohort with simple uncomplicated (Hinchey 1a) diverticulitis in a 1 year period was therefore £39,000. The cost reduction by utilising a CRP threshold of > 150mg/L to trigger a CT scan at presentation would equate to a saving over a 1 year period on the current expenditure in the uncomplicated simple acute diverticulitis cohort of £35,880. At the lower threshold of CRP >50mg/L a saving of £20 670 could be achieved with no risk of missing a complicated case.

Images for this section:

Threshold CRP	Effect on radiology service	Annual Cost Savings of Reduced CT scanning
CRP > 170mg/L	92% reduction in CT scans	£ 35,880
CRP > 150 mg/L	89% reduction in CT scans	£ 34,710
CRP > 50 mg/L	53% reduction in CT scans	£ 20,670

Fig. 3: Projected annual cost savings at three different CRP thresholds for performing a CT scan on patients with diverticulitis.

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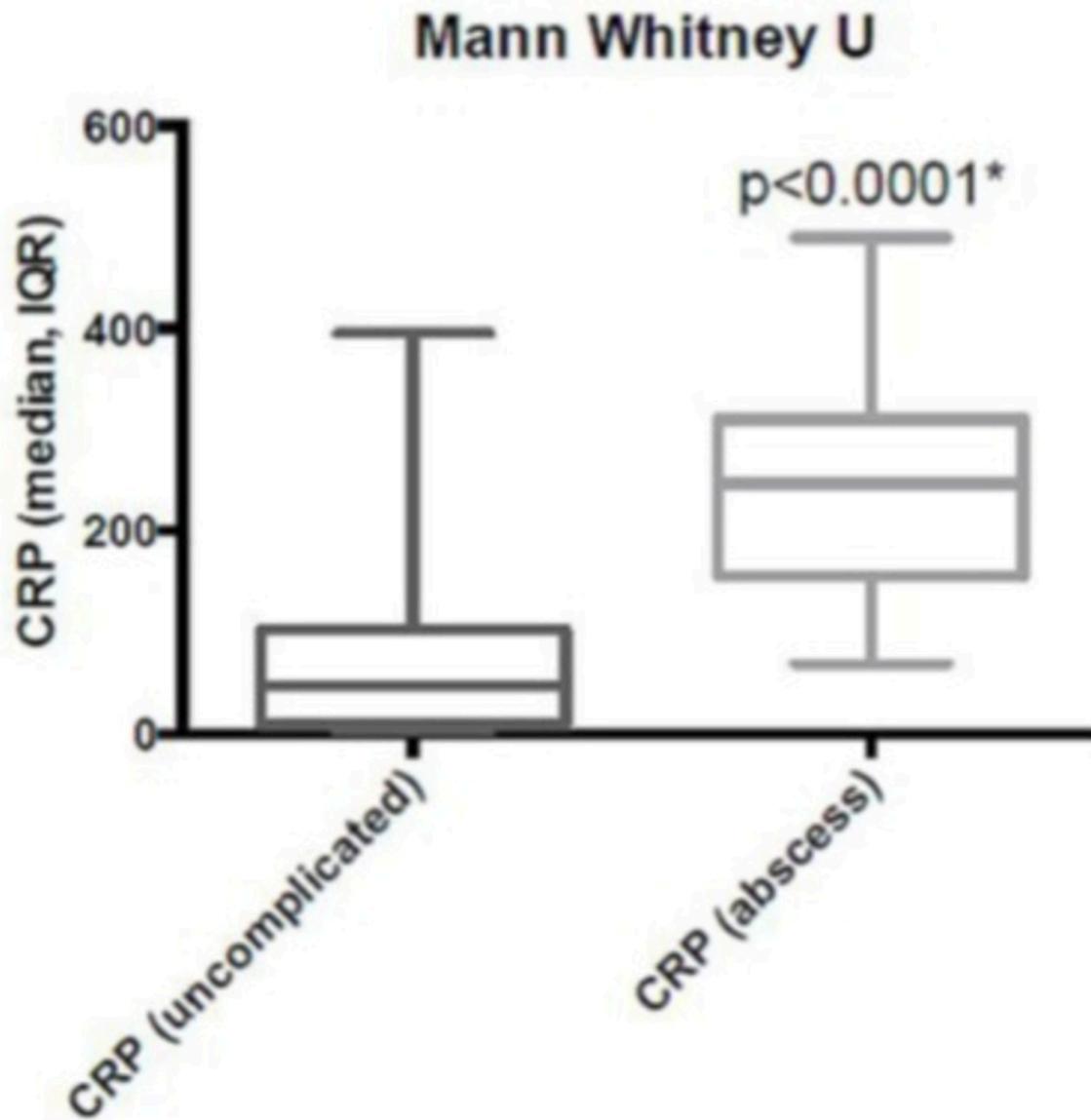


Fig. 1: CRP at admission in patients who had CT proven complicated diverticulitis was significantly higher than in those with uncomplicated diverticulitis

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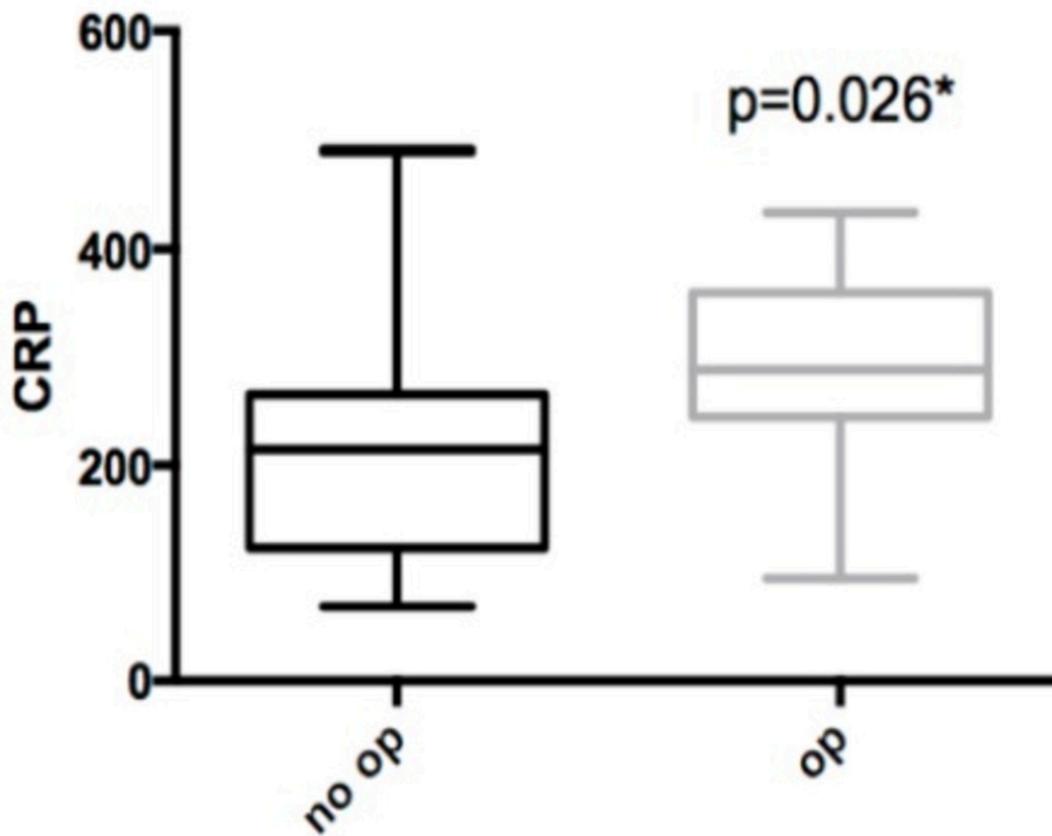


Fig. 2: CRP at admission in patients who required surgical intervention was significantly higher than in those who did not.

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Conclusion

The increasing incidence of colonic diverticulitis, particularly in the 45-55 year old cohort, creates clinical and financial burdens on surgical and radiological services within all colorectal departments. This appears to be an upward trend with regards to complicated disease.

The clinical and financial implications of utilising CRP as a tool to trigger or prevent CT scanning deserves further assessment. CT imaging for the diverticulitis cohort can potentially be more selectively utilised when guided by the admission CRP [figs xyz 8,9]. With a threshold as low as 50mg/L we could safely reduce the CT workload by 53% whilst ensuring we missed none of the complicated diverticulitis cases, which as a cohort tend to be overtly more clinically complex as well as having significantly greater CRP on admission. This would relieve financial pressures on institutions and service pressures on overstretched radiology departments.

CT is a powerful diagnostic tool and a guide for referral to interventional radiology for PCD of intra-abdominal collections, with the aim of controlling sepsis and potentially reducing the laparotomy rate. As such it can act as a bridge to elective surgery and may reduce the appreciable stoma rate, which is still permanent in a population of individuals [3,5]. Although the numbers were small, we found no convincing evidence from our study that laparoscopy and lavage as the primary mode of treatment was clinically beneficial as a primary treatment or as a bridge to surgery.

Further work will elucidate whether percutaneous drainage as the only intervention can effectively control sepsis to a level which negates the need for resectional surgery altogether, particularly in a young patient cohort with acute complicated diverticulitis who have an appreciable relapse rate [2].

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