ORIGINAL ARTICLE

Plain abdominal radiographs in acute medical emergencies: an abused investigation?

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Plain abdominal radiographs are commonly requested for acute medical emergencies on patients with non-specific abdominal symptoms and signs. In this study 131 plain abdominal radiographs performed on the day of admission were prospectively analysed. In only 16 cases (12%) the reasons for requests conformed to the recommended guidelines by the Royal College of Radiologists. The reason for the request was stated in the case notes in only three cases. In 62 cases (47%), there was no comment made on the film by the requesting clinician. There was a discrepancy in the interpretation of the radiograph between the clinician and the radiologist in 31 cases (24%). The clinical management was influenced by plain abdominal radiographs in only nine cases (7%). The majority of plain abdominal radiographs requested on acute medical emergencies is inappropriate. There is a need to ensure guidelines are followed to prevent unnecessary exposure of patients to radiation as well as preventing expenditure on irrelevant investigations.

Often plain abdominal radiographs are performed routinely as part of the initial investigation battery on the day of admission, mainly by the admitting junior doctor. However, the diagnostic value is questionable and very often there is no clear indication.¹ In the majority of cases the results are negative or non-specific.²⁻³ There are only few indications in which the plain abdominal radiograph is helpful, such as small bowel obstruction.⁴ In addition, only a few doctors are aware of the relative high radiation of an abdominal film, which is equal to 50 chest radiographs.⁵ The use of computerised requests, as in our hospital, makes the request even easier, without clear cut questions to the radiology department.

METHODS

Wirral Hospital is a district general hospital with more than 15 000 medical emergencies annually. To determine the clinical indications and value of plain abdominal radiographs we investigated all requests over a four week period. The case notes were identified on a daily basis from the acute medical take, after the consultant physician's post-take ward round.

Age and sex of the patient, clinical diagnosis by the admitting junior doctor, and clinical diagnosis by the consultant on the post-take ward round were recorded. It was also established who requested the abdominal radiograph. The reason for the request on the computer was noted and compared to that stated in the medical notes. The case notes were also reviewed for the clinical comment on the film. All films were reported by a consultant radiologist to determine if there was agreement with the clinical view of the film. We also determined if the Royal College of Radiologists' guidelines (table 1) were being followed and whether the outcome of the abdominal radiograph influenced the clinical management.⁵

RESULTS

There were 1309 medical admissions during this period, consisting of 861 admissions to the Department of Medicine and 448 admissions to the Department of Medicine for the Elderly. Emergency admissions arranged by general practitioners were usually first seen by the on-call preregistration house officer (PRHO) and then reviewed by the on-call medical registrar. Patients referred medically from the accident and emergency department were admitted by the on-call senior house officer

Table 1 Indications for plain abdominal radiographs: Royal College of Radiologists, London

Indicated	Not indicated
Acute abdominal pain	Acute gastrointestinal bleed
? Perforation	Haematemesis
? Obstruction	Palpable mass (renal or colon)
Acute inflammatory bowel disease	Constipation
Haematuria	Gallstones
Renal calculi/colic	Acute pancreatitis
	Urinary tract infection

(SHO) and registrar review was only necessary on request. All patients were reviewed within 24 hours by the on-call consultant in the form of a post-take ward round.

Altogether 131 plain abdominal radiographs were requested (10% of medical admissions). Of the 131 patients who had abdominal films performed, 59 (45%) were male and the mean age was 64 (range 18-91). The grade of the doctor requesting was: PRHO 68 films (52%), accident and emergency SHO 38 films (29%), medical SHO nine films (7%), specialist registrar 12 films (9%), staff grade two films (2%), and consultant two films (2%).

The clinical diagnoses are summarised in table 2 and the reason for the request stated on the computer request form is listed in table 3. The reason for the request was stated in the case notes in only three cases (2.3%). The clinician commented on the film in 69 cases (53%). Comments were made by PRHOs 10 cases, by the SHOs in 30 cases, by the registrars in 28 cases, and in 10 cases by the consultants on the post-take ward round.

In only 16 cases (12%) was the abdominal radiograph indicated according to the guidelines (see table 1). The clinician's opinion concurred with that of the consultant radiologist in 38 cases (30%). The relationship between the clinician's and radiologist's opinion is shown in table 4. The abdominal radiograph influenced the clinical management in only nine cases

Abbreviations: PRHO, preregistration house officer; SHO, senior house officer

Table 2 Clinical diagnosis on admission on patient who had abdominal radiograph requested

	Admitting junior doctor	Consultant
Not stated	1	45
Gastritis/peptic ulcer	16	11
Gastroenteritis	11	4
Gastrointestinal bleed	14	13
Constipation	9	9
Obstruction	3	2
Neoplasm	10	3
Inflammatory bowel disease	6	2
Pneumonia/chest infection	8	5
Urinary tract infection/retention	9	3
Cerebrovascular accident	4	2
Renal colic/stones	2	1
Cardiac disease	8	7
Liver disease	5	2
Diabetes mellitus/diabetic ketoacidosis	2	2
Epilepsy	2	3
Pancreatitis	4	1
Pulmonary embolism	1	1
Cholecystitis/gallstones	2	1
Perforated viscus	2	1
Others	12	13

Table 3 Reason for request of abdominal radiograph as stated on the computer request form

	No (%)
Obstruction	33 (25)
Perforation	34 (26)
Constipation	17 (13)
Neoplasm	17 (13)
Pancreatitis	13 (10)
Renal colic	3 (2)
Gallstones	8 (6)
Inflammatory bowel disease	6 (5)
Total	131 (100)

Table 4 Relationship between the clinician's and radiologist's opinion on abdominal radiography

	No (%)
Both agreed, film normal	29 (42)
Both agreed, film abnormal, same diagnosis	9 (13)
Both agreed, film abnormal but different diagnosis	5 (7)
Radiologist normal, clinician abnormal	24 (35)
Radiologist abnormal, clinician normal	2 (3)
Total	69 (100)

(7%). The radiological diagnosis of the films not reviewed by the clinician was normal in 47 cases (76%), however in 15 cases potentially serious pathology was reported by the radiologist (gallstones, renal stones, perforation, abdominal aortic aneurysm).

DISCUSSION

Our results indicate that most plain abdominal radiographs in acute medical emergencies are inappropriate. Most films were normal (fig 1), the minority showing significant pathology (fig 2). This has previously been shown in similar studies where there has been an attempt to rationalise their use in the accident

Figure 1 A normal plain abdominal radiograph.

and emergency department.⁶ Overuse results in unnecessary expense and radiation for the patient. In a prospective study Boleslawski *et al* showed that in only 6% of cases did plain abdominal radiography change the suspected diagnosis and therapeutic management, and this is confirmed in our study.⁷ Suggestions have been made for a sensible approach to avoid radiography if conditions are unlikely to be associated with radiological signs, such as gastrointestinal haemorrhage, or if no change in clinical management is expected.^{8,9} Previous studies showed that in patients with clinical diagnoses other than bowel obstruction, renal calculi, trauma and ischaemia, who have no or only mild abdominal tenderness, the plain abdominal radiograph is not useful in detecting unsuspected diagnoses and should not be ordered.¹⁰ In a prospective analysis of 1254 patients with acute abdominal pain Bohner *et al* showed that 42.6% of abdominal radiographs could have been avoided by focusing on clinical variables relevant to the diagnosis of bowel obstruction.¹¹

Figure 2 A plain abdominal radiograph showing intestinal obstruction. There are dilated loops of large bowel seen.

Our results show that it is mainly doctors in training who contribute to the overuse of abdominal radiography. However, it is these doctors in particular who failed to review the films and to document findings in the case notes. There was no correlation between the diagnosis entered in the medical notes and the indication given for the abdominal film on the hospital computer. Lack of interpretation skills was obvious and in some cases significant pathology was missed. Therefore, all films should be reviewed by the consultant on the post-take ward round as well as by a consultant radiologist and a written report should be issued. Also there appeared to be a lack of working differential diagnosis written in the notes, particularly at the consultant's post-take ward round (table 2). This is a concern as patients are frequently handed over to different teams in a ward based system and many doctors are involved in their care. There is a need to give guidance to doctors on the hospital computer when they request an abdominal radiograph. This is now being developed to prevent inappropriate requesting of films. There is also a need for further training of doctors in the interpretation of abdominal radiographs and the importance of accurate and full record keeping in medical notes.

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