

Prospective randomised study of immediate Multi-Slice Computerised Tomography (MSCT) in the management of patients with acute abdominal pain of unknown cause.

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Introduction

Acute abdominal pain of unknown cause is a common surgical emergency requiring admission and in hospital assessment.

With increasing pressures on in-patient beds throughout the NHS, attention has been focused on making accurate early diagnosis in these patients in order to best optimise patient care and in-patient stay. Early multi-slice computerised tomography has been advocated in various randomised controlled trials in improving diagnostic certainty and patient management^{1,2}.

Purpose

To assess impact of early abdomino-pelvic MSCT in patients with acute abdominal pain of unknown versus conventional management procedures with regards to changes in management, time to surgery and length of inpatient stay.

Methods and Materials

Ethical approval was obtained from the local research ethics committee.

76 patients were consented and prospectively randomised to early CT (within 24 hours of admission) or conventional management (other investigations including endoscopy and other imaging). The exclusion criteria used is detailed in (Table 1).

Patients were given an injection of intravenous contrast material (100mL iopamidol 300mg/mL (Niopam; Bracco, High Wycombe) via a pump at 3ml/s with a 60 second delay. A multislice computed tomographic acquisition was obtained using a 16-slice Toshiba Aquilion from diaphragm to symphysis pubis with 500mm FOV collimation, a pitch of 23 and reconstructed a 1mm intervals.

The scans were reported by 1 of 3 participating Consultant Radiologists.

Patients were followed up for an average of 3 months (total 2-6 months) using clinical notes and surgical follow-up in order to determine final diagnosis, rapidity of diagnosis and total length of in-patient stay.

Table 1 : List of exclusion criteria used in patient selection

Exclusion Criteria	
1.	Patients who required immediate surgery or who felt CT was the immediate investigation of choice
2.	Pregnancy
3.	Patient's under 20 years of age
4.	Suspected non-perforated peptic ulcer disease or uncomplicated gallstone disease
5.	Risk of iodinated contrast reaction

Results

76 people were consented for the study, 3 were withdrawn and a further 10 patients lost to follow-up. A total of 63 were included in the analysis (37 female, 26 male, mean age 55 years (age range 20-89)) and of these 30 patients were randomised to early MSCT and 33 randomised to conventional treatment. Of those, randomised to conventional treatment, 17 had subsequently had a CT in their in-patient stay after other investigations.

Initial versus final diagnosis

In the early MSCT group, the initial clinical diagnosis remained unchanged in 9/30 (30%) of patients at time of discharge. Following MSCT, the diagnosis was upgraded to a more serious diagnosis in 10/30 (33%) of patients. Diagnosis was downgraded to a less serious diagnosis in 11/30 (37%) patients. Final diagnosis at 3 months compared to at time of discharge changed in 2 patients.

In the conventional group, the initial diagnosis was changed in 13/33 (39%) of patients. A total of 17/33 subsequently had CT in their progressive management. Diagnosis was upgraded in 8/33 (24%) and downgraded in 12/33 (75%), and 11 of the changes in diagnosis of these 20 were made due to subsequent MSCT examination including occult perforation, leaking AAA and sigmoid carcinoma. The final diagnosis at 3 months compared to time of discharged change in 1 patient.

MSCT and surgery

13 patients had a definitive surgical procedure during admission. 6/13 (46%) were in the early MSCT arm vs. 7/13 (54%) in the conventional treatment arm – of the 7 in the conventional treatment arm, 2 had a MSCT as part of the diagnostic work-up. Mean time to surgery in the MSCT arm was 1.8 days (range 1-3) vs 2.3 days (range 1-4) in the conventional treatment arm (p=0.35 t-test).

Of the patients in the MSCT arm, 100% correlation between CT diagnosis and surgical diagnosis was made. In the conventional arm, 3/7 procedures were as a result of MDCT diagnosis in their eventual investigation. 1 out of the 7 operations was deemed unnecessary (normal appendicectomy).

Number of investigations

In the MSCT arm, total number of investigations (including MSCT) was a total of 34 investigations. The additional 4 were endoscopic procedures. The conventional group had a total of 51 investigations including 7 endoscopic procedures.

Duration of admission

Mean duration of admission for those randomised to early MSCT was 4.5 days (range 1-35). Mean duration of admission was 8.6 day (range 1- 23) in the conventional treatment arm. p=0.15 (t-test).

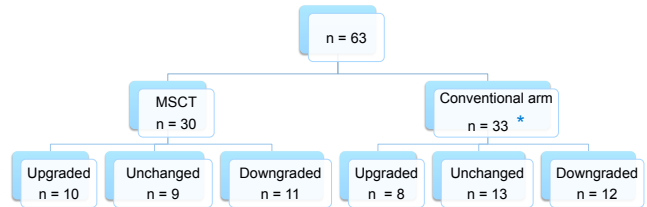
Cost estimation

Using £300 as the costs for an abdomino-pelvic CT and £450 as the daily cost of inpatient stay, it is estimated that the reduced cost in the MSCT group was £2325 as compared to the conventional group on reduced in-patient stay (this does not include costs of other in-patient investigations). This is a estimated potential reduction per patient of £1545.

Table 2 : Patient demographics and results for each of the two study groups.

	MSCT arm (n= 30)	Conventional arm (n =33)
Gender	11M : 19F	13M:20F
Age (years)	53 (range 22-87)	50 (range 23-93)
Mean length of stay (days)	4.5 (range 1-35)	8.6 (range 1-23)
Number of inpatient investigations	33 (av. 1.1 /patient)	51 (av. 1.55/patient)
Total number of pt undergoing surgery	8	7
Average time to surgery (days)	1.8 (range 1 – 3)	2.3 (range 1 - 4)

Chart 1 : Flow diagram demonstrating changes in diagnosis in the patient groups at time of discharge.



* 11/20 (53%) of the significant changes in diagnosis were due to MSCT as part of the eventual diagnostic work-up

Table 3 : Final diagnosis at time of discharge

Diagnosis	MDCT arm (n=30)	Conventional arm (n=33)
Diverticular disease	1	3
Appendicitis	4	3
Biliary colic/cholecystitis	4	0
Bowel obstruction	1	2
Pancreatitis	1	0
Malignancy	0	3
Perforated viscus	0	2
Peptic ulcer disease	1	5
Gynaecological	1	0
Urological	2	2
Irritable bowel syndrome	0	1
Ruptured AAA	0	1
Pelvic AVM	0	1
Ischaemic bowel/colitis	1	1
Abdominal collection	0	1
NSAP	13	6
Other	0	1

Figure 1 : MSCT finding of acute on chronic pancreatitis in the MSCT group
 Figure 2 : Right retroperitoneal haematoma in a patient in the MSCT arm with initial working diagnosis of renal colic

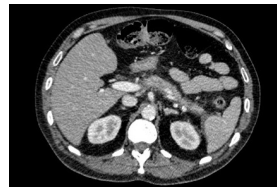


Figure 1



Figure 2

Conclusion

This study suggests that early MSCT with patients with acute abdominal pain of unknown cause can improve rapidity of diagnosis and accuracy at time of surgery. Although not statistically significant, there was a reduction in in-patient stay and cost estimation suggest that it may also be a cost-effective management in the investigation of the acute surgical patient.

References:

1. Ng CS, Watson CJE, Palmer CR et al. Evaluation of early abdominopelvic computed tomography in patients with acute abdominal pain of unknown cause : prospective randomised study. *BMJ* 2002; 325 : 1387-9
2. Saia E, Watson CJE, Beadsmoore C et al. A randomised, controlled trial of routine early abdominal computed tomography in patients presenting with non-specific acute abdominal pain. *Clin Rad* 2007; 62 : 961-969