



A vast increase in the use of CT scans for investigating occult hip fractures



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ABSTRACT

Background: Early diagnosis in neck of femur fractures has been shown to improve outcome. The National Institute for Clinical Excellence recommends if an occult hip fracture is suspected then an MRI should be performed and if not available within 24 h a CT should be considered. At our centre, emergency MRI is rarely available and so CT is commonly used.

Objectives: Our study aims to analyse the trends in CT use over a five year period for the diagnosis of neck of femur fractures.

Methods: Both the number of patients with a hip fracture and those undergoing a CT hip to diagnose an occult injury were identified across two district general hospitals between 2006–2007 and 2010–2011. The time from initial radiograph to CT and initial radiograph to operation were calculated.

Results: In 2006–2007, of 547 hip fractures, 20 CT hips were performed and 6 reported as a fractured neck of femur (30%). In 2010–2011, of 499 hip fractures, 239 CT hips were performed and 65 fractures were recognised (27%). The mean time from radiograph until CT scan was 2.0 days in 2007 and 3.2 days in 2011, which was a statistically significant difference ($p < 0.001$). For those diagnosed using a CT scan the mean time from admission X-ray to surgery was 1.2 days in 2007 and 3.6 days in 2011.

Conclusion: Clinicians are becoming increasingly reliant on CT for the diagnosis of hip fractures with our data suggesting further imaging is one factor that can delay time to diagnosis and theatre.

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1. Introduction

The management of patients with a neck of femur fracture is well publicised and has a huge financial impact on the National Health Service, with an estimated cost of £12,163 for each patient over the age of 60 years [1]. This group has a high morbidity, with one prospective study reporting mortality rates of 9%, 19% and 30% at 30 days, 90 days and one year post surgery. In this cohort a delay to surgery had a significantly detrimental effect on patient mortality at both 90 days and one year [2].

The diagnosis can usually be identified through patient history, clinical examination and plain radiographs. Occasionally further investigation is necessary and these cases are termed 'occult fractures' with a reported prevalence of 3–4% [3]. A readily available and accurate test is required to obtain an early diagnosis and avoid

a delay to or unnecessary surgery. The choice of imaging modality used is mainly dependent on the facilities available locally but magnetic resonance imaging (MRI) has been recognised as the gold standard by the National Institute of Clinical Excellence (NICE) [3]. Studies have shown that MRI has a significantly higher sensitivity (99%) than CT (53%) in detecting insufficiency fractures [4], and that if performed within 48 h an experienced radiologist can achieve 100% accuracy [5]. MRI puts patients through no further ionising radiation and is more accurate than other modalities [6,7]. The T1 images highlight trabecular disruption and T2 images demonstrate oedema or haemorrhage that would be present in a fracture. An additional advantage is that MRI reveals possible alternative diagnoses including soft tissue injuries [8].

Alternative investigations include radionuclide bone scans with a reported sensitivity of 75–98% and specificity of 100% but the best results are obtained at 72 h post injury [9,10]. A delay of three days is considered unacceptable as it leaves a patient in pain unnecessarily, may increase the associated morbidity and will reduce the compliance with the Best Practice Tariff. Computed tomography (CT) provides an easily accessible method to aid diagnosis, but as recognised in the NICE guidelines, there are no relevant large studies that help clarify its role in the occult hip fracture population [3]. Concerns remain that fractures may be missed if occurring between

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scan slices or due to the osteoporotic nature of the trabecular bone. One study that compared the use of CT and MRI revealed that CT underestimated severity of bony injuries in 4 of 6 cases with occult hip fractures [6]. The cost of these investigations vary and figures published by the Department of Health price a radionuclide study at £205, CT scan £101, and MRI £206 in 2011 [11].

The 2011 NICE guidance concluded if an occult hip fracture is suspected then an MRI should be performed and if not available within 24 h then a CT scan should be considered [3]. In our practice, availability of MRI is limited and reserved for those cases with equivocal CT images, which is the first line investigation. Our experience is that more patients are now having CT scans than 5 years ago to confirm or refute a neck of femur fracture. At our centre a diagnostic CT is not always immediately available and it is currently routine practice for a patient to be admitted awaiting a CT which can take a few days to obtain due to a lack of availability. In our study, we aim to assess the trend of CT usage in diagnosing hip fractures at our centre, the pick-up rate of occult fractures in this group and analyse whether this trend has any affect on the time taken to diagnose and treat the fracture.

2. Methods and materials

We retrospectively identified all patients undergoing CT scan of the hip or pelvis for a suspected occult hip fracture in two separate one year periods; 1 November 2006 to 31 October 2007 and 1 November 2010 to 31 October 2011 in two district general hospitals. This was achieved by electronically searching and reviewing the indications for all CT scans of the pelvis or hip during these periods. At our centres CT scans can either be requested by the emergency or orthopaedic physician, however only a minority of patients received a scan without being seen by an orthopaedic specialist. Whichever department is responsible for the request, the case must be discussed with an on-call radiology consultant prior to having the scan authorised, although this is not necessarily a musculoskeletal radiology specialist.

Patients were only included if the clinician had queried a neck of femur fracture in the request. If CT was requested to help define fracture configuration or decide on surgical treatment then these were excluded from the study. Patients were also excluded if they had undergone previous surgery on the involved hip or if the scan was performed as part of a trauma series. There were no age criteria for inclusion into the study. At our centres it is not Emergency Department policy to obtain oblique radiographs in the investigation of hip fractures. The total number of neck of femur fractures

admitted to the hospital during these periods, diagnosed by any modality, was also identified from a separate electronic database.

The imaging archive system and the theatre list database (both electronic) were analysed for those patients undergoing CT for timings of the initial radiograph, CT scan, further imaging (including MRI) and any operative intervention.

At our centres both Toshiba 16 slice and Toshiba 320 slice scanners are used to produce the CT images. Axial, coronal and sagittal images are available but 3-D reformats were not produced. The only clinical information available to the radiologist was information provided on the scan request. A consultant radiologist was responsible for reporting all CT scans but this was not universally performed by a musculoskeletal specialist as at our centres this is the duty of the on call radiologist. The radiology reports from the CT scan were reviewed and the presence of a neck of femur fracture or any additional injuries was recorded.

Two example cases are given in Figs. 1 and 2 where plain radiographs were deemed to be inconclusive and CT scans were obtained to confirm the diagnosis of neck of femur fracture.

3. Results

In the first study period (2006–2007) there were a total of 547 hip fractures diagnosed by any modality. During this period only 20 CT scans were performed, the mean age of this cohort was 81.2 years and 75% were female. 6 of these scans (30%) were reported as a fracture and 14 (70%) as no fracture. In comparison, there were 499 hip fractures in total during the second study period (2010–2011). 239 CT scans were performed, the mean age of this cohort was 83.4 years and 71.1% were female. 65 of these scans (27.2%) were reported as a fracture, 3 (1.3%) were equivocal and 171 (71.5%) as no fracture. Although this group of 65 were 'occult' to the admitting physician as they had required further imaging to diagnose their neck of femur fracture, 41 had their radiograph reported later by radiologist as a hip fracture, leaving only 24 as truly 'occult.'

In 2011, 51 of the 65 cases (78.5%) reported as a fracture on CT underwent operative intervention compared to 5 of 6 (83.3%) in 2007. Of the 14 patients not undergoing surgery in the 2010–2011 cohort the majority were intracapsular fractures (71.4%). The reasons for patients not undergoing surgery included being too medically unwell, having a terminal illness and a late diagnosis resulting in conservative management being chosen.

No MRI scans were undertaken in 2006–2007 to diagnose a neck of femur fracture and only 3 were performed in 2010–2011 after an equivocal CT scan, with only one reported as a fracture. Patients undergoing surgical treatment for neck of femur fractures in both

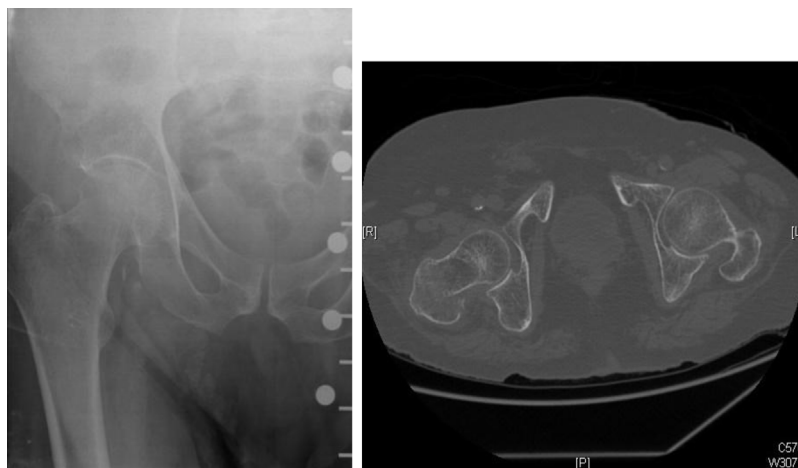


Fig. 1. First example of a right sided 'occult' hip fracture requiring CT for diagnosis.

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