



Misdiagnosis of occult hip fracture is more likely in patients with poor mobility and cognitive impairment

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The diagnosis of occult hip fracture is frequently missed. We wished to investigate if patients in whom occult hip fracture was initially misdiagnosed had any distinct features, and their outcome. We reviewed 297 patients who presented with hip fractures over a two-year period. There were 24 occult hip fractures, the diagnosis was initially missed in 9 patients and correctly made in the other 15. Of the correctly identified patients, 8/15 were independently mobile and 9/15 were living in their own home compared to 0/9 independently mobile and 2/9 living in own home among those with missed diagnosis ($p < 0.001$). Seven of nine patients with a missed diagnosis had mental confusion but none in the other 15 ($p < 0.001$). Eight of the nine patients with missed diagnosis of fracture had intra-capsular fractures, of which 6 secondarily displaced. Three of those nine patients died within one year from their fracture. We suggest a low threshold of investigation for occult hip fracture in the elderly, infirm and mentally confused who present to the accident department with suspected occult hip fracture.

Keywords : occult hip fracture ; cognitive impairment.

sense of security and, if the threshold for clinical suspicion is not sufficiently low, the treating physician may discharge the patient without further investigation. Patients may then re-present later with a displaced fracture. Magnetic resonance imaging (MRI) has been proven reliable and effective in identifying occult hip fractures (1). There are, however, no clear guidelines regarding which patients should be admitted and investigated for suspected occult fracture. We noted that a number of patients who had initially presented with occult hip fracture, were discharged without further investigations and presented later with radiologically obvious displaced hip fracture. We are not aware of any recent report investigating the prevalence, clinical presentation or outcome of patients with missed diagnosis of occult hip fractures.

We were interested to learn why in spite of recognition of occult hip fracture, some patients were incorrectly not suspected of the occult fracture

INTRODUCTION

Hip fractures are not always identifiable on initial radiographs. With the advent of MRI scan there is now increasing recognition and investigation of occult hip fracture (1,3). Patients with occult hip fracture present a diagnostic challenge. Apparently normal radiographs may give a false

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and not investigated further. We wished to know if there were any particular clinical or demographic features that made this group distinct from the patients in whom occult hip fracture was suspected and investigated further. Our thoughts were that if we did find any distinct clinical features, then drawing attention to the finding might help to reduce clinical error associated with "missed occult fracture". Our null hypothesis was that there was no difference in demographic or clinical features between patients correctly and incorrectly suspected of having sustained occult hip fracture. We performed Fisher's exact test, and p value was deemed significant at 0.05.

METHODS

Over a two-year period we followed all patients admitted with a fracture of the neck of the femur to identify, from the emergency notes, those patients who initially had a missed diagnosis of occult hip fracture. The criteria for missed diagnosis were if the patient had recently presented with a painful hip with or without a history of fall, had normal radiographs, was not suspected to have an occult hip fracture, and had been discharged after assessment, either from the accident and emergency or the orthopaedic department (and later presented with a displaced fracture). We also identified all patients admitted over the same time period with suspected occult hip fracture and normal radiographs, in which the diagnosis was subsequently confirmed on MRI scan. Clinical and radiological details from initial admission were recorded and treatment was monitored. We recorded patients' personal details and also noted the clinical findings. Personal details recorded included: age, gender, residential status, indoor and outdoor mobility, mental confusion. Since some of these patients might develop acute mental confusion for various medical reasons we ignored a clinical diagnosis of acute confusion and only graded as "confused" those with a documented history of confusion. Clinical details recorded included: ability to weight bear, straight leg raise test, pain on passive rotation. We also noted the type of fracture, fracture displacement, delay from the initial presentation, status of the initial treating physician, type of treatment, length of hospital stay and one year mortality. Our hospital has a policy of next day review by a consultant radiologist of all radiographs of patients reviewed in the Accident and Emergency department and deemed not to have

sustained any bony injury. None of these patients were recalled due to radiologist review.

RESULTS

A total of 24 patients presented over two years with occult hip fracture. The diagnosis was missed in nine of these patients and correctly identified in 15 patients. Over the same time period a total of 297 patients presented with hip fractures. Incidence of missed occult fracture was 3%. On initial presentation seven patients had been discharged from the accident department and two patients were admitted under orthopaedic care before being discharged. There was no obvious history of a fall in two patients. Table I compares the clinical and personal details of the missed occult fracture patients against patients admitted with correct suspicion of occult hip fractures confirmed on MRI over the same period. Although both groups had similar mean age, the missed fracture group appears physiologically less robust. Compared to the occult fracture group, they were less likely to live in their own home and were less independent for activities of daily living (both $p < 0.001$, Fisher's exact test). All patients had preexisting poor mobility. Two patients were bed bound. Four patients needed substantial walking aid. The other three patients were mobile indoors with a Zimmer frame. Mental confusion was also more prevalent in the missed fracture group ($p < 0.001$, Fisher's exact test). All but one patient were admitted on the second attempt. One patient was brought twice in Accident and Emergency with persistent complaint of a painful hip and was discharged twice before successfully presenting on her third attempt with a displaced sub-capital fracture (fig 1a & 1b). All patients presented within ten days from the index visit (range: 3-10). Ischaemic heart disease, chronic obstructive airway disease and cerebrovascular disease were the commonest medical co-morbidities.

All but one patient had intra-capsular fracture. Three fractures remained undisplaced. Patients with displaced intracapsular fractures underwent Austin-Moore hemiarthroplasty. Three patients had significant medical co-morbidity. Two of them refused surgery following discussion of treatment

Table I. — Comparison with occult hip fracture group

Clinical details	Occult hip fracture (n = 15)	Missed occult fracture (n = 9)
Mean age (years)	81	79
Gender (female:male)	14:1	8:1
ASA Grade	II(6),III(7), IV(2)	III(4),IV(5)
Living in own home	9/15	2/9
Independent for daily living	7/15	2/9
Mobile independently	8/15	0/9
Confusion	3/15	6/9
Able to weight bear despite pain	5/15	5/9
Unrestricted straight leg raise	7/15	5/9
Pain on passive rotation	7/15	2/9
1 year mortality	33%	33%

options with the patient and the family members ; both of them had limited mobility prior to presentation. The other patient was deemed not fit for surgery. Mean hospital stay was 21 days. These patients were not actively followed up after discharge but we were able to track their clinical journey through our hospital based computerized patient tracking system Patient information Management System (PiMS). Maximum follow-up was 18 months (range 13-18 months) and three of them died within one year.

DISCUSSION

There is an increasing recognition of the need to provide high-quality care to patients with hip fracture (6,9). A number of national databases and nationwide audits have been established in this regard (4,10). Surely, improved diagnosis would be an important aspect of improved overall care. We felt that in this scenario it is important to draw attention to this little investigated aspect of hip fracture management. We wish to emphasise that clinical identification of patients with occult hip fractures can be extremely difficult (3). Many of these patients are able to weight bear in spite of pain and some widely used clinical criteria like inability to perform unrestricted leg raise may not be present. Pain on axial loading may also be absent. A high index of suspicion is necessary to identify these patients. If clinical suspicion persists

in spite of apparently normal radiographs, these patients should be carefully re-assessed and investigated further. Magnetic resonance scan, if available, remains the investigation of choice to exclude occult hip fracture (1,7).

We wished to investigate if the “missed occult fracture” group had any demographic or clinical features that made them distinct, and we were also interested in the eventual outcome of delayed diagnosis and treatment in this group of patients. Previous studies have demonstrated a high rate of failure to identify hip fractures. Five percent of patients with hip fracture had the diagnosis “missed” after assessment by hospital staff in a study by Pryor *et al*, and similarly 2% of 374 fractures in another study before availability of MRI scan (2,8). Comparison of our findings with these historical data indicates that the rate of detection of occult hip fractures has not really improved in spite of the widespread availability of the MRI scan and appreciation of the occurrence of radiologically occult hip fracture. Although not large, this series is comparable in size to a previously published series on delayed diagnosis of femoral neck fractures (2). Although that article investigated the comprehensive causes and consequences of delay in diagnosis of femoral neck fractures and as such included patients who sought medical advice late as well as patients who had delayed investigation or detection, it is possible to identify nine patients in their series over a three year period who had missed occult



Fig. 1a. — Initial unremarkable radiograph



Fig. 1b. — Same patient 10 days later

fractures, of whom six fractures had displaced (2). Our observation that most of the patients with missed occult hip fracture have a sub-capital fracture is supported by the results of a previous study (11).

Our data shows that although of similar age, patients with a missed diagnosis of occult hip fracture appear physiologically less robust compared to the patients who are correctly suspected and investigated for presence of occult hip fracture. The patients with missed diagnosis have higher ASA grade and their mental confusion, restricted mobility and dependence for activities of daily living are significantly different compared to patients in whom the diagnosis is correctly suspected. These patients with missed diagnosis are also almost exclusively not living alone. Clinical features can be confusing. The two patients admitted under orthopaedic care had been assessed by consultant orthopaedic surgeons before discharge and at least another two patients discharged from Accident and Emergency department had also been assessed by consultant A&E physicians. Some patients were clearly documented to have suspicious clinical features (four patients had restricted straight leg raise ability) which did not lower the bar of suspicion

enough to warrant admission and investigation for occult hip fracture. We speculate that this is because of patients' poor cognitive status and poor pre-fracture mobility. It is difficult to elicit clinical signs with any degree of certainty in this group of patients. Because of the restricted pre-fracture mobility, the difference between pre and post fracture mobility might not have been striking enough to raise enough clinical suspicion.

In spite of significant co-morbidities, late identification of injury and late treatment, patients' hospital stay was comparable to a standard series. This may be because most of these patients were already resident in residential or nursing home and it was possible to return them back to their pre-injury residence. However, a significant drawback of missed diagnosis was fracture displacement which resulted in hip hemiarthroplasty. If the fracture was identified earlier a less invasive procedure like cannulated screw fixation might have sufficed in six out of nine patients.

A drawback of our study is that we did not perform any validated mental score to identify patients with low cognitive status. This would have given a more objective measure of patients' cognitive status. This is not the standard practice in our

department. Besides many of these patients present with acute confusional state, which subsequently improves. However, since we only documented as “confused” those patients who had previous documented mental confusion this would avoid undue observer bias.

It may be useful to reflect on the best strategy to avoid missing these fractures. Next day radiologist review of all apparently normal radiographs is definitely a step forward. Our unit also has a policy of next day consultant-led review of A&E referrals to fracture clinics, where A&E team would discuss and seek advice for suspicious cases not necessarily referred to the clinic. Others have also found such a review helpful in reducing clinical mistakes (12). However, we do not know the actual incidence of patients who present to A&E with a painful hip and are correctly assessed as not requiring admission. It is clearly not feasible to discuss all such cases of painful hips, nor is it possible to review all cases in the fracture clinic. Bearing in mind that these patients are almost exclusively looked after by carers and re-visit A&E within one week of index presentation, an option might be to produce an information leaflet for carers. The leaflet could educate carers regarding the likelihood of presence of occult fractures in spite of initial “normal” radiology, without attempting to sound too alarmist. The leaflet could recommend careful mobilisation and monitoring for up to a week after injury. A return visit to the local A&E could also be advised if there was persisting suspicion of pain and/or difficulty on weight bearing.

Our reported series is small and one may rightfully be circumspect in drawing any firm conclusions from this study. With the small numbers of patients available, we did not find any difference in mortality between the two groups. This is related to type II error. Since the study was a prospective audit in a district hospital, we could not recruit enough patients to test for any difference in mortality between the two groups. A larger study might be able to answer if the delay in diagnosis results in increased mortality. There is, however, enough evidence that delay in treatment is associated with worse outcome in patients with femoral neck fracture (6), and all patients with missed diagnosis had

delayed treatment in this series. However, in spite of the low numbers the difference in mental confusion or mobility was so large between the two groups that this was found to be statistically significantly different.

Our data indicate that compared to patients who were previously mobile and did not have mental confusion, a sub-group of patients with occult hip fractures who are physiologically less robust and have restricted mobility and mental confusion are at higher risk of having a missed diagnosis of occult hip fracture on presentation. These patients will not be suspected of sustaining a hip injury in spite of many of them showing clinical signs of injury. Most of these patients have sub-capital femoral neck fractures and in all likelihood will return with a displaced fracture. In spite of increasing recognition and identification of occult hip fractures, the prevalence of missed occult hip fractures remains nearly the same compared to historical series from before the availability of MRI scan. We suggest that treating physicians should have a low threshold for suspicion of occult hip fracture in the elderly and infirm. A history of fall may not be present. We also suggest a policy of producing an information leaflet – to be given away to carers – advising careful attempt at mobilisation on return for up to a week and a return visit, should it be perceived that patients were in persistent discomfort or having difficulty on mobilisation.

REFERENCES

1. **Chana R, Noorani A, Ashwood N *et al.*** The role of MRI in the diagnosis of proximal femoral fractures in the elderly. *Injury* 2006 ; 37 : 185-189.
2. **Eastwood HD.** Delayed diagnosis of femoral neck fractures in the elderly. *Age Ageing* 1987 ; 16 : 378-382.
3. **Hossain M, Barwick C, Sinha AK, Andrew JG.** Is Magnetic Resonance Imaging necessary to exclude occult hip fracture ? *Injury* 2007 ; 38 : 1204-1208.
4. **National Hip Fracture Database.** www.nhfd.co.uk
5. **National Health Service.** Delivering quality and value : focus on fractured neck of femur, Institute for Innovation and Improvement, NHS 2006. <http://www.networks.nhs.uk/194>
6. **Novack V, Jotkowitz A, Etzion O, Porath A.** Does delay in surgery after hip fracture lead to worse outcomes ? A multicenter survey. *Int J Qual Health Care* 2007 ; 19 : 170-176.

7. **Pandey R, McNally E, Bulstrode C.** The role of MRI in the diagnosis of occult hip fractures. *Injury* 1998 ; 29 : 61-63.
8. **Pathak G, Parker MJ, Pryor GA.** Delayed diagnosis of femoral neck fractures. *Injury* 1997 ; 28 : 299-301.
9. **Sahota O, Currie C.** Hip fracture care : all change. *Age and Ageing* 2008 ; 37 : 128-129.
10. **Scottish Hip Fracture Audit.** NHS Scotland. www.shfa.scot.nhs.uk
11. **Sernbo I, Johnell O.** Consequences of a hip fracture : a prospective study over 1 year. *Osteoporos Int* 1993 ; 3 : 148-153.
12. **Sharma H, Bhagat S, Gaine WJ.** Reducing diagnostic errors in musculoskeletal trauma by reviewing non-admission orthopaedic referrals in the next-day trauma meeting. *Ann R Coll Surg Engl* 2007 ; 89 : 692-695.