

# Audit of atypical hip fractures at the Royal Berkshire Hospital

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**Background:** There is increasing evidence suggesting an association between bisphosphonate use and the occurrence of atypical femoral fractures, which account for less than 1% of hip and femoral fractures overall. The aim of this audit was to assess the prevalence of atypical, bisphosphonate-related femoral fractures and adherence to regional (Fracture Reduction in South Central England [FRiSC]) guidelines in our departmental cohort.

**Methods:** We retrospectively reviewed 1,803 patients from the National Hip Fracture Database (NHFD) with femoral fractures admitted to a district general hospital during a 49-month period. We studied all subtrochanteric fractures in patients admitted on bisphosphonates. Corresponding hip radiographs were examined for features of atypical fractures according to the American Society for Bone and Mineral Research diagnostic criteria.

**Results:** The mean age of the patients included was  $63 \pm 8.08$  years. One hundred and sixty-one femoral fractures were identified in patients on bisphosphonates; 73 intertrochanteric, 68 intracapsular, and 20 subtrochanteric. Ninety-three percent of these fractures were in women. Radiographs of the 20 subtrochanteric fractures were reviewed and five were classified as atypical, bisphosphonate-related fractures according to American Society for Bone and Mineral Research diagnostic criteria. Adherence with FRiSC guidelines was inconsistent. A repeat dual-energy X-ray absorptiometry scan was performed in only two cases. The bisphosphonate was stopped in only two of the five patients following fracture. No clinical assessment of the contralateral femur or radiological assessment was done in any of the five cases.

**Conclusion:** Overall, five atypical femoral fractures were found in a cohort of 1,803 patients at our district general hospital. This is 0.3% of the population studied, consistent with the incidence reported in the literature. Improvements in adherence with local guidelines for the management of atypical femoral fractures, along with increasing awareness of the nature of these fractures is necessary amongst rheumatologists, orthopedic surgeons, and geriatricians.

**Keywords:** fracture, bisphosphonate, atypical

## Introduction

Bisphosphonates are widely used for secondary prevention of osteoporotic fractures. Atypical femoral fractures have recently been reported and seem to increase with the length of bisphosphonate exposure. The overall incidence has been documented as under 1% of all hip and femoral fractures.<sup>1,2</sup> This is likely to be under-reported due to lack of awareness by clinicians and under-reporting by radiologists.<sup>3</sup>

The American Society for Bone and Mineral Research (ASBMR) has reviewed the published reports of atypical femoral fractures and developed diagnostic criteria for identification of these fractures. The task force defined major and minor features of complete and incomplete atypical femoral fractures (Figure 1).<sup>4</sup> In view of this

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Major features	Minor features
Location: subtrochanteric region or femoral shaft	Cortical thickening
Transverse or short oblique orientation	Periosteal reaction of the lateral cortex
Minimal or no associated trauma	Prodromal pain bilaterally
Presence of a medial spike when the fracture is complete	Concomitant bisphosphonate exposure
Absence of comminution	

**Figure 1** American Society for Bone and Mineral Research features of atypical fractures.

emerging problem, it is important that clinicians and their patients are made aware of the possibility of atypical femoral fractures occurring secondary to bisphosphonates.

The Fracture Reduction in South Central England network (FRiSC) consists of primary and secondary care providers and patient representatives across South Central England. The network is able to collate local data on secondary prevention of fragility fractures in South Central England. The FRiSC network has developed a set of guidelines<sup>5</sup> for both the medical and surgical management of atypical femoral fractures, which were used as our audit standard. The medical guidelines for management of atypical femoral fractures advise stopping the bisphosphonate and starting either strontium or teriparatide treatment. Blood tests for bone and renal profile should be checked and a dual-energy X-ray absorptiometry scan should be performed. Surgical guidelines advise clinical assessment of the contralateral femur (presence and severity of thigh pain) and radiologic assessment (with femoral radiographs and magnetic resonance imaging). In addition, reaming should be considered as part of the surgical management, and postoperatively, patients should be advised to weight-bear fully on the side of the fracture to prevent contralateral fractures.

The National Hip Fracture Database (NHFD) is a joint venture of the British Geriatric Society and the British Orthopaedic Association. The NHFD aims to improve the quality and cost-effectiveness of hip fracture management in the UK and keeps a record of all hip fractures admitted via the National Health Service to each secondary care trust.

## Materials and methods

We retrospectively reviewed 1,803 patients from the NHFD with femoral fractures admitted to the Royal Berkshire Hospital Trust during a 49-month period (January 2007 to February 2011). We selected all subtrochanteric fractures in patients who had been admitted on a bisphosphonate.

Mid and distal femoral fractures had not been included within the NHFD database so we were unable to analyze this subgroup of patients. Corresponding hip radiographs were examined by the same consultant musculoskeletal radiologist for features of atypical fractures according to the ASBMR diagnostic criteria as outlined above. We then examined adherence of fracture management with FRiSC guidelines in the patients with atypical fractures.

## Results

The mean age of the patients included was  $63 \pm 8.08$  years and the female to male ratio was 3.1:1. Of the 1,803 patients admitted with femoral fractures, 161 of these fractures were identified in patients on a bisphosphonate; 73 intertrochanteric, 68 intracapsular, and 20 subtrochanteric. One hundred and fifty-nine (93%) of these fractures were in women. Radiographs of the 20 subtrochanteric fractures were reviewed by a consultant musculoskeletal radiologist, and five of these were classified as atypical according to ASBMR diagnostic criteria. Of the five atypical fractures identified, two fractures had occurred on the contralateral sides of the same patient.

The bisphosphonate was stopped in only two of the five patients following fracture. No patients were treated with strontium or teriparatide as recommended by the FRiSC guidelines. Bone and renal profiles were checked in all five cases, and a repeat dual-energy X-ray absorptiometry scan was performed in two cases.

No clinical assessment of the contralateral femur (presence and severity of thigh pain on opposite side) or radiologic assessment (magnetic resonance imaging) was done in any of the five cases. Reaming was considered in all five cases, with all having gamma nails fitted. No patients had documentation of full weight-bearing postoperatively to reduce load on the contralateral side and there was no radiologic assessment of the contralateral femur (full femoral radiograph or magnetic resonance imaging).

## Discussion

Five atypical fractures were found in the 161 patients on bisphosphonates. Overall, we found that adherence with FRiSC guidelines (medical and surgical) was inconsistent. Bisphosphonates were stopped in only two of the five cases, and no patients were treated with strontium or teriparatide as recommended by the guidelines. No clinical assessments (presence and severity of thigh pain on opposite side) or radiologic assessments of the contralateral femur were documented in any of the five cases. This is important as patients who develop atypical fractures on one side are at high risk of fracturing on the contralateral side. Prophylactic surgery may be undertaken to prevent further fractures if features of imminent atypical fracture are present on magnetic resonance imaging.

## Positive aspects of the audit

We were able to study a large number of fractures (1,803 in total). In addition, hip radiographs were verified by a consultant musculoskeletal radiologist using validated ASBMR criteria.

## Limitations

Because the review we conducted was retrospective, there was potential for selection bias.

Atypical fractures as outlined by the ASBMR criteria include mid and distal femoral shaft fractures. The NHFD data do not include femoral shaft fractures (down to the supracondylar flare). This may have led to possible underestimation of the prevalence of atypical fractures within our cohort.

## Audit recommendations

Several audit recommendations have been developed from this audit which are listed as follows:

- increase awareness and recognition of atypical fractures

- improve adherence with FRiSC guidelines for atypical fracture management
- increase availability of FRiSC guidelines within the trust by including them on the hospital intranet
- increase awareness among orthopedic surgeons by presenting audit findings at the trust governance meeting
- all patients with suspected atypical femoral fractures will be reviewed by a specialist in metabolic bone disease.

## Conclusion

Five atypical femoral fractures were found in a cohort of 1,803 patients at our district general hospital. This is 0.3% of the population studied, consistent with the incidence reported in the literature. Adherence with local guidelines (FRiSC) and increasing awareness of this type of fracture amongst patients and clinicians should improve the management of patients presenting with atypical femoral fractures.

## Disclosure

The authors report no conflicts of interest in this work.

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