

A fracture through the neck of a Charnley Elite-Plus femoral component: a case report

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Citation

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Abstract

Fracture of the femoral stem component following hip arthroplasty is an uncommon but recognised complication. The prevalence ranges between 0.23%, according to Charnley, and can be as high as 11% with other stem designs^{1,2}.

. With the improvement of our understanding of biomechanics and the development of stronger metal alloys the prevalence of stem fractures has reduced. Fractures of the neck of femoral stems are even more rare with only a few cases reported².

. We report a case of a fracture through the neck of a Charnley Elite-Plus femoral stem. To our knowledge this is the first reported case involving this stem.

INTRODUCTION

Fracture of the femoral stem component following hip arthroplasty is an uncommon but recognised complication. The prevalence ranges between 0.23%, according to Charnley, and can be as high as 11% with other stem designs^{1,2}.

With the improvement of our understanding of biomechanics and the development of stronger metal alloys the prevalence of stem fractures has reduced.

Fractures of the neck of femoral stems are even more rare with only a few cases reported².

We report a case of a fracture through the neck of a Charnley Elite-Plus femoral stem. To our knowledge this is the first reported case involving this stem.

CASE PRESENTATION

A 60-year old obese but active woman, weighing 95 kg and with a BMI of 34, underwent a cemented left total hip replacement for osteoarthritis in 1998. She did not have any significant past medical history. The implant inserted was a modular Elite plus stem, flanged 3, with a 28 mm metallic head and a 28mm inner diameter by 47mm outer diameter polyethylene cup.

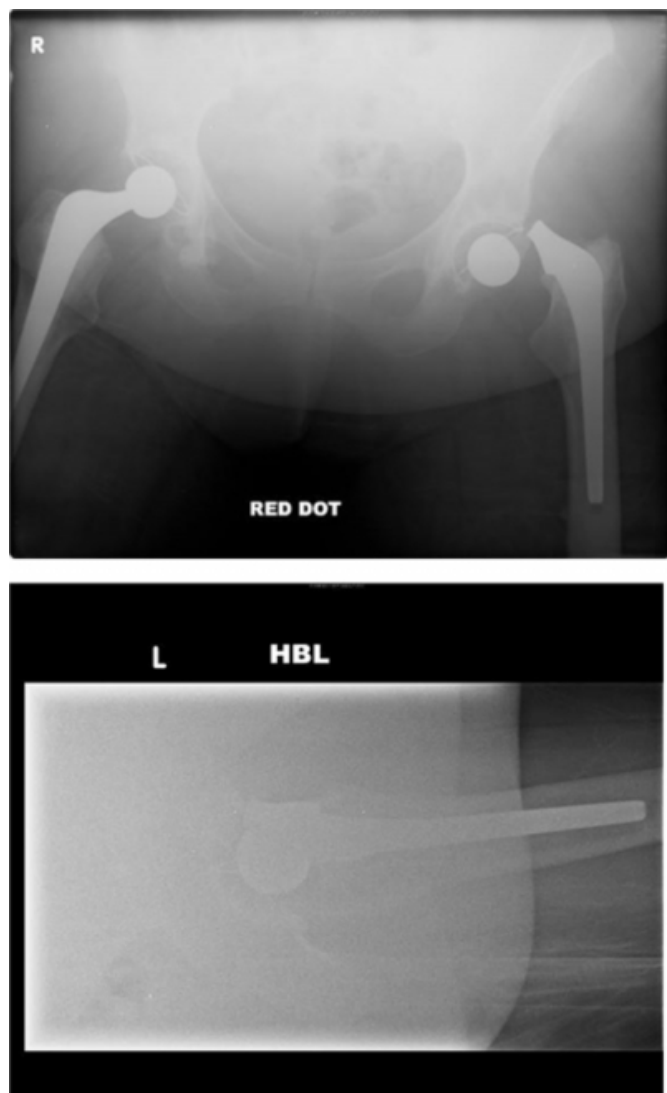
Her immediate post operative recovery was unremarkable. Post operative images showed a satisfactory position of the

prosthesis.

Ten years later she presented with an acute episode of severe left hip pain and inability to weight bear on that side. There was no history of trauma. Over the period of 10 years her weight had increased further to 115kg and her BMI to 41. She had also become more active as her mobility had improved. Radiographs of the left hip joint revealed a fracture through the neck of the femoral stem at the junction between the head and the neck (fig1).

Figure 1

Fig 1 AP and Lateral radiographs of the left hip revealing the fractured stem



Intra-operative photographs of the failed prosthesis (fig2) show the exact position and the pattern of the fracture through the neck of the prosthesis.

Figure 2

Fig 2 Intra operative picture of the removed stem showing the fracture at the junction of the head and neck



She underwent a revision total hip replacement with a cemented Exeter stem. She made a satisfactory recovery.

DISCUSSION

Charnley arthroplasty has an excellent record and is still regarded by many orthopaedic surgeons as the gold standard of hip replacements. The Charnley Elite Plus was introduced based on the successful Charnley hip implant. Its design attempted to improve proximal load transfer, resist subsidence, and reduce wear.

However, its early results were mixed with some reviews showing early and unacceptable rates of aseptic loosening^{3,4} and other reviews showing excellent early survivorship^{5,6}.

Cementing technique and the use of low viscosity cement have also been implicated as causes for early failure while the use of high viscosity cement seems to yield better results⁶.

Despite claims of early failures with the Charnley Elite-Plus stems, to our knowledge, there have not been any reports of a failure due to a fracture through its neck.

Factors implicated with femoral stem fractures include, high levels of patient's activity, increased patient's weight, cantilever bending resulting from good distal fixation with inadequate proximal support, varus orientation of the stem, stress riser and material defect⁷.

In our case there was no evidence of poor surgical or cement technique and there was no evidence of a stress riser. As the stem failed 10 yrs later and no other similar cases have been

reported it is unlikely that the fracture was due to a design or fabrication fault or even due to a defect in the material of the stem. However, there weren't any metallurgy studies performed on the prosthesis to prove this.

The most likely explanation is that of increased stresses on the stem due to increasing patient weight and increased activity. As Charnley Elite-Plus is designed to optimise proximal load transfer and the femoral neck is a significantly loaded region, a weak point was created at the neck, which fractured due to fatigue under the continues high stresses of the patient's weight and activity.

The development of more advanced stems has greatly reduced the prevalence of femoral stem fractures². However, from our case becomes apparent that surgeons should be aware of this complication especially when dealing with obese and active patients.

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