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CASE REPORT

Stem fracture of a collarless, polished, double-taper cemented femoral prosthesis : A case report

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We report a case of stem fracture of a collarless, polished, double-taper cemented stainless steel femoral prosthesis. Scanning electron microscopy showed fatigue striations, indicating failure by fatigue. This case study highlights that stem fracture can still occur with modern implants. Size 0 *CPT* stem should be avoided in patients with high body mass index. To our knowledge this is the first case report of a *CPT* stem fracture used for primary total hip replacement.

Keywords : total hip arthroplasty ; femoral stem ; fracture.

INTRODUCTION

The collarless, polished, double-taper design concept used in the CPT hip system (Zimmer UK Ltd) has been in clinical use for more than 15 years (*3*). This distinctive design philosophy is based on the use of natural compressive forces to help ensure that the implant is firmly seated and wedged within the cement mantle. Yates *et al* (*4*) reported 100% survival at ten years with revision of the CPT stem for aseptic loosening as the endpoint and 95.9% survival with revision of the stem for any reason. Fracture of the femoral component is rare (*1,2*). We believe that this is the first case report of a *CPT* stem fracture used for primary total hip replacement.

CASE HISTORY

A 63-year-old lady with a height of 165 cm and a weight of 92.5 kg underwent cemented total hip replacement (THR) for primary osteoarthritis through an anterolateral approach. Her Body Mass Index was 33.9. A size 0 stainless steel collarless polished double tapered stem (*CPT*, Zimmer UK Ltd) and an Elite plus acetabular component (Depuy UK Ltd) were used. In the early post-operative phase, recovery was complicated by a wound infection and septicaemia. The wound was explored in theatre. It was noted that the infection was superficial. The wound was thoroughly washed out and closed and the patient received intravenous antibiotics. The infection resolved completely. She was discharged from the hospital four weeks post-operatively.

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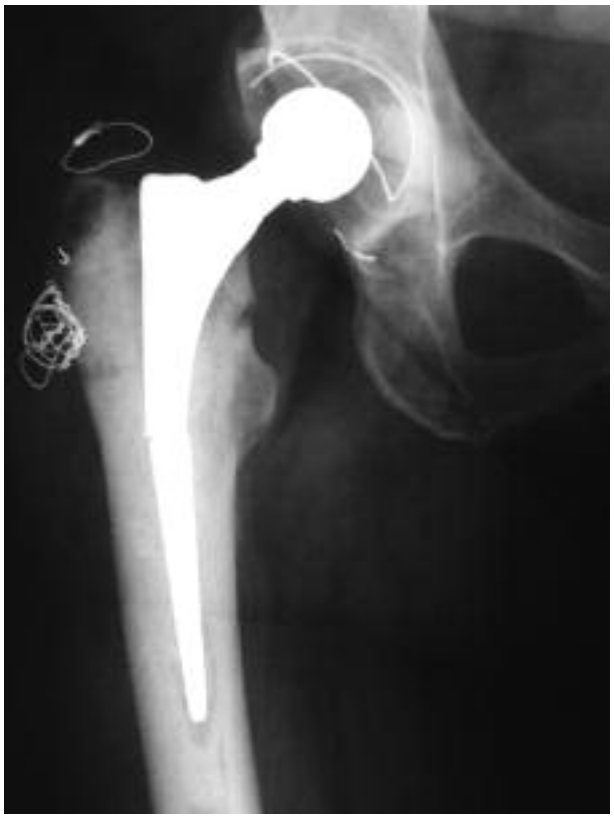

Fig. 1. — Antero-posterior radiograph showing fracture of the stem.

Eighteen months later she underwent wound exploration once more, as her gait had remained abnormal, with a positive Trendelenburg test. The abductor mechanism of the hip had failed. It was repaired, but this procedure was unsuccessful. She had a revision of the abductor mechanism repair a few months later using wires rather than sutures. Subsequently, the patient reported a good function and could walk unaided.

Unfortunately, she developed pain and restriction of mobility, approximately three years after primary hip replacement arthroplasty. She was complaining of pain over the lateral aspect of the hip, groin and buttock. Pain was radiating to the knee joint. The patient was unable to walk for more than 15 minutes, despite the aid of two crutches. Inflammatory markers (CRP and ESR) and white cell count were within normal limits. Plain radiographs showed a fracture of the stem of the prosthesis, with loosening of the proximal part of the component (fig 1). The hip was aspirated in the operating theatre under aseptic conditions. Sterile fluid was obtained. The patient went on to have a revision of the fractured component. Clinically, there was no evidence of infection. The distal part of the stem was found to be well fixed, and a femoral split was required to remove it. The femur was reconstructed with a long uncemented ZMR stem (Zimmer UK Ltd) and Dall-Miles cables. The acetabular component was revised to an uncemented Trilogy cup (Zimmer UK Ltd). The microbiology and histology reports confirmed that there was no evidence of infection. Rehabilitation consisted of physiotherapy and progressive protected weight bearing over a three-month period. Six months following revision surgery, the patient was walking moderate distances with the aid of one stick. The femoral osteotomy was uniting radiographically.

An analysis of the fractured stem was undertaken by the manufacturer. No divergence from their specifications was found. The stem had fractured 6.5 cm from the tip. Scanning electron microscopy showed fatigue striations, indicating failure by fatigue.

DISCUSSION

Fracture of the stem of a femoral prosthesis is an unusual mode of failure after a total hip replacement, particularly for the current generation of implants. The Exeter femoral stem (Stryker UK Ltd), which has a similar design, did have a fracture rate of 3% (with a minimum follow-up of 20 years) in its original form (*1*). The original stems were polished, double tapered, slim in section and manufactured from a ductile stainless steel (EN58J). The alloy was changed to the high fatigue strength 'Orthinox' (Rex734) in 1984. There is no published report of any fracture of an Exeter stem manufactured from Orthinox.

Harvie *et al* (*2*) reported three cases of fracture of the titanium JRI-Furlong hydroxyapatite-ceramic (HAC)-coated femoral component. These breakages were the result of fatigue in a metallurgically-proven normal femoral component. All the cases of failure of the femoral component had occurred in

patients with a body mass index of more than 25 in whom a small component, either size 9 or 10, had been used. The authors concluded that in patients with a body mass index above normal, size 9 components should be avoided and the femoral canal should be reamed sufficiently to accept a large femoral component to ensure that there is adequate metaphyseal fixation.

The manufacturer originally put a maximum weight limit on size 0 CPT stem to 70 kg. In this case the patient was 22.5 kg beyond the maximum weight limit. We feel that this could be a major factor contributing to the stem fracture. The short offset obtained with the small prosthesis results in increased abductor forces in order to maintain normal gait and may have resulted in the failure of the abductor mechanism. Failure of the abductor mechanism is a recognised complication of the anterolateral approach to the hip. In this case two further procedures were required to repair the abductors. Post-operatively, the patient had superficial infection. This could also be a contributory factor to the failure of the abductor mechanism. It is thought that abnormal abductor function increases the stresses to which the femoral component is subjected, thus increasing the risk of fracture.

This case study highlights that stem fracture can still occur with modern implants. In an overweight patient, size 0 CPT stem should be avoided.

REFERENCES

1. **Gie GA, Ling RS, Timperley AJ.** Stem fracture with the Exeter prosthesis. *Acta Orthop Scand* 1996 ; 67 : 206-207.
2. **Harvie P, Haroon M, Henderson N, El-Guindi M.** Fracture of the hydroxyapatite-ceramic-coated JRI-Furlong femoral component : body mass index and implications for selection of the implant. *J Bone Joint Surg* 2007 ; 89-B : 742-745.
3. Swedish Hip Arthroplasty Register : *http://www.jru.orthop.gu.se/*
4. **Yates PJ, Burston BJ, Whitley E, Bannister GC.** Collarless polished tapered stem : Clinical and radiological results at a minimum of ten years' follow-up. *J Bone Joint Surg* 2008 ; 90-B : 16-22.