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## Original Article

# Fracture of cobalt chrome, fully-coat beaded femoral revision long stem, a clinical outcomes study



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## ABSTRACT

**Background:** Femoral bone loss during revision total hip arthroplasty poses a challenging problem. Bypass fixation over the diaphysis has achieved clinical success in cases of proximal femoral bone loss. Fracture of cementless, fully bead-coated femoral stem is an uncommon complication. The purpose of this study is to analyze the patients with and without fracture stem and find out the possible risk factors.

**Methods:** From 2006 to 2012, a total of 251 revision long stems (Zimmer, Warsaw, IN) were implanted. In the same period, 17 broken stems that underwent treatment were included for analysis. Patients' demographic data, pattern of femoral bone loss, stem size, medial calcar support in the proximal region of the stem, and the timing of stem breakage were collected and analyzed.

**Results:** The stem size in patients with a broken stem was smaller ( $p < 0.001$ ), and medial calcar defect was 12.4% and 100% ( $p < 0.001$ ), respectively. The bone defect was greater in broken group ( $p = 0.024$ ). The mean duration between revision surgery and stem breakage was  $58.07 \pm 36.98$  months. Smaller stem size, greater bone defect, and inadequate medial calcar bone support were major risk factors for stem breakage.

**Conclusions:** Bypass fixation in the distal diaphysis with a long stem prosthesis without adequate bone support over medial calcar area may cause stress concentration in the long stem and a fatigue fracture. Use of a smaller prosthesis is the major risk of stem broken. It is essential to repair the proximal femoral bone deficiency and implant selection for better metaphyseal engagement to prevent further stem complications.

**Level of evidence:** Level III, case control study.

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### At a glance commentary

#### Scientific background on the subject

Bypass fixation over the diaphysis has achieved clinical success in cases of proximal femoral bone loss. Fracture of cementless, fully bead-coated femoral stem is an uncommon complication. The purpose of this study is to find out the possible risk factors.

#### What this study adds to the field

Fatigue fracture of diaphysis engaged long stem prosthesis may happen if there were inadequate medial calcar bone support or smaller stem size. Repairing the proximal femoral bone deficiency and choose better metaphyseal engagement could prevent this kind of stem complications.

Femoral bone loss during revision total hip arthroplasty (THA) poses a challenging problem. Bypass fixation over the diaphysis has achieved clinical success in cases of proximal femoral bone loss [1]. Extensively porous-coated femoral

stems allow adequate bone ingrowth in addition to having the advantage of achieving diaphyseal fixation. Satisfactory outcomes have been reported with the use of these revision long stems [2–7].

Fracture of the femoral stem over stem body was first reported in 1970 by Muller et al. [8]. Most of the reported stem fractures involved cemented prostheses and occurred probably because proximal cement loosening and a distally well-fixed stem allows for cantilever bending forces on the stem over subtrochanteric level [8–14]. Fracture of cementless, fully porous-coated femoral stems is a rare complication that causes catastrophic failure of a previously well-functioning prosthesis. Review of the literature revealed that 14 cases of femoral stem breakage at subtrochanteric level involving extensively porous-coated stems have been reported [15–18].

Multiple factors may result in stem fracture, and the etiological factors that have been studied include inadequate support for the implant in the proximal femur, increased patient weight, small-sized femoral stem, and nonunion of the osteotomy site [15–19]. However, firm conclusions regarding its etiology have not been drawn due to the small number of cases studied. We hypothesized that gender, BMI, implanted stem size, severity of femoral bone defect, and calcar support may contribute to breakage of long stem.

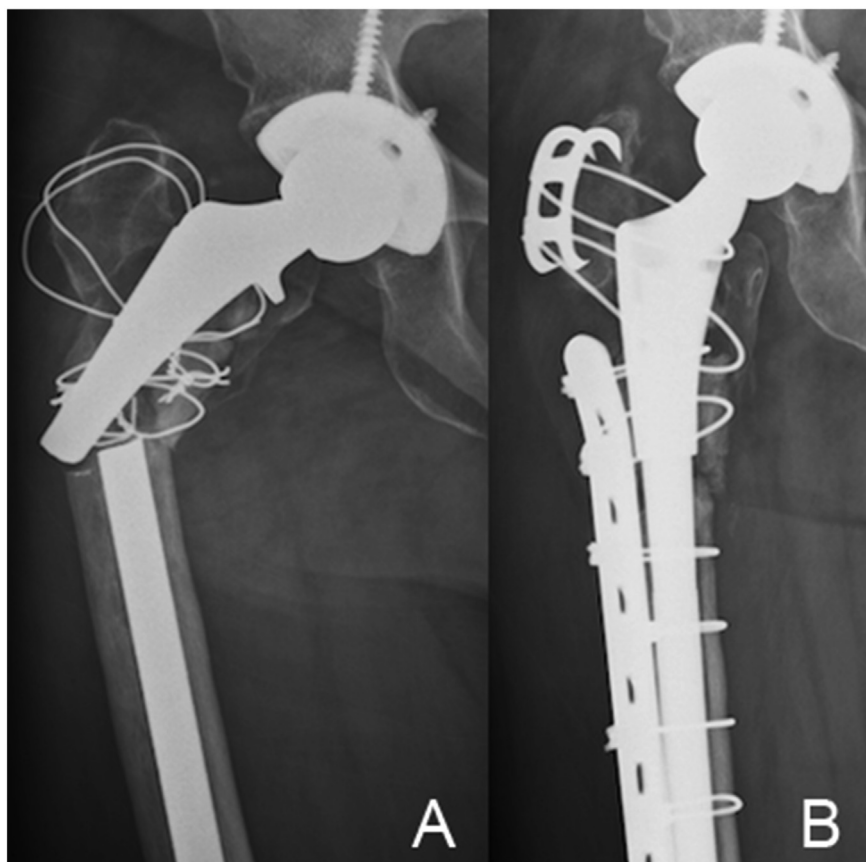


Fig. 1 (A) A 76-year-old woman who had previously undergone noncemented revision THA in 2010 due to insert wear with massive proximal femur osteolysis. The femoral component was revised with a 12-mm diameter long stem. 30 months after the revision, the patient presented with thigh pain of sudden onset that occurred during daily activity. (B) An anterior femoral cortical window was made to remove distal well-fixed prosthetic segment, and revision stem with ZMR (Zimmer, Warsaw, IN) was done. A cable plate and grip were used for fracture and osteotomy site fixation.

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