

CASE REPORT

FRACTURE OF AN EXETER™ V40™ STEM THROUGH THE INSERTION GUIDE HOLE AND REVISION USING CEMENT-IN-CEMENT TECHNIQUE

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Fracture of the Exeter™ V40™ stem is uncommonly reported in the literature. The cement-in-cement femoral revision is a described technique for revising well-cemented femoral components during revision hip arthroplasty. We present our experience using this technique in managing a fractured Exeter™ V40™ stem. There have been 24 reported Exeter™ V40™ stem fractures: 12 at the body and 12 at the neck. 3 of the reported fracture at the neck cases have occurred at the superior aspect of the neck-shaft junction which is an unusual site for failure of this stem. Our patient's fracture pattern matches this unusual presentation. This report has added to the limited evidence indicating the area around the insertion guide hole as a potential site through which stem fracture may begin and propagate inferiorly. The cement-in-cement technique may be successfully employed in managing Exeter™ V40™ stem fractures, without need for extended trochanteric osteotomy or cortical window.

Keywords: Hip prostheses; Fracture; Total hip arthroplasty

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INTRODUCTION

The Exeter™ stem (Stryker, Newbury, UK) is still thought by many to be the premier cemented prosthetic stem for total hip arthroplasty (THA). It is the most commonly used femoral THA component in the United Kingdom and other countries worldwide.¹ First designed in 1969 by Ling and Lee, it has undergone multiple modifications, with its most current version being the Exeter™ V40™.¹

Fracture of the Exeter™ V40™ is rarely reported, with incidence rates of ~0.3%.¹ Due to its rarity, proposed causes of stem fracture are often multifactorial and there is no clear consensus as to underlying mechanisms. Proposed risk factors include: high body mass index, incorrect stem size and stem malposition.² We present our experience in managing such a fracture which occurred in one of our patients without trauma.

CASE PRESENTATION

An 80-year-old woman (body mass index [BMI] = 27 kg/m²) presented with a right hip pain preceding a mechanical fall. She reported feeling her hip give way immediately prior to the fall. She denied any pain in or around her left hip. She had undergone right THA 15 years previously with an Exeter™ V40™ stem. Comorbidities included primary hyperparathyroidism, basal cell carcinoma, postural hypotension and hyperlipidaemia. Radiographs showed an Exeter™ V40™ in situ, and a cemented cup, with apparent fracture of the stem at the junction

of the proximal 1/5th and distal 4/5th [Figure-1]. The distal stem appeared well-fixed, with no osteolysis around the cement mantle.

Following a fully informed discussion, the patient underwent revision THA with a posterior approach. A stem breaks concurrent to that seen on the radiographs was noted [Figure-2]. A 22mm head, with an Exeter™ V40™ stem (size-0, 44mm offset, length 150mm) was in situ. Fracture fragments were still attached at the inferior aspect [Figure-3]. The stem was extracted very carefully without need for a cortical window or extended trochanteric osteotomy. Both fracture fragments separated with minimal force [Figure-4]. The cement mantle was noted to be pristine. A small area of proximal cement clearance was carried out. Wear was noted on the acetabular component; hence the cup was also revised. The socket was reamed out and cement was extracted without causing bone loss. The acetabulum was sequentially reamed up to 51mm. A definitive 45x28 Marathon™ cup (DePuy Synthes, MA, USA) was inserted using CMW2 cement. Trial with size 1 C-stem™ (DePuy Synthes, MA, USA) and a 28mm +0 head was satisfactory. A definitive size 1 standard offset C-stem™, with 28mm +0 metal head, was inserted using CMW1 cement using cement-in-cement technique. The hip was stable on reduction. Routine closure was performed.

Post-operative radiographs were satisfactory [Figure-5]. She was advised to mobilise with two sticks for six weeks at least. At six weeks she was

fully weight-bearing comfortably but was advised to continue using one stick as precaution. She was unable to attend 3-month follow up. At six months, she was mobilising extremely well and back to baseline activity level. Radiographs were satisfactory with the implant in situ in her right, but also indicated some asymptomatic early medial left hip osteoarthritis [Figure-6]. She is still doing very well at most recent follow-up at 12 months.



Figure-1: Antero-posterior & lateral radiographs indicating fractured Exeter™ stem

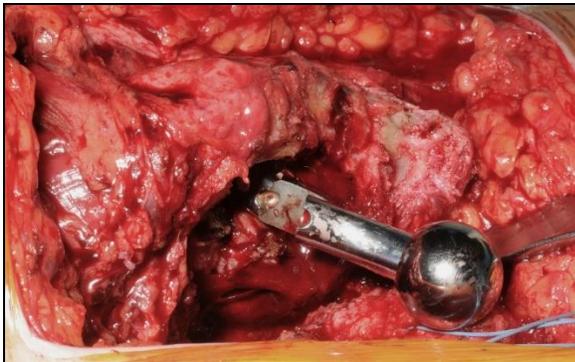


Figure-2: Intra-operative image of prosthetic fracture



Figure-3: Intra-operative stem retrieval. Fracture fragments still attached at inferior neck-shaft aspect



Figure-4: Fracture fragments separated with minimal force

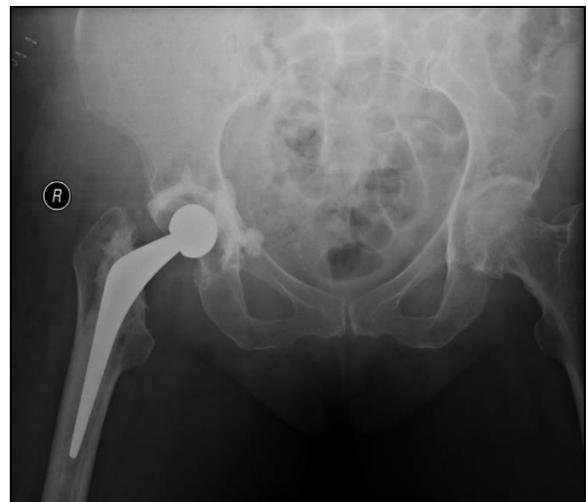


Figure-5: Post-op revision hip arthroplasty radiograph



Figure-6: Six-month follow up. Some early medial left hip osteoarthritis noted. Prosthesis position satisfactory



Figure-7: Stem retrieval image indicating fracture at neck-shaft junction

DISCUSSION

The Exeter™V40™ stem is a tapered, collarless stainless steel femoral implant, with consistent successful use over long periods of time.¹ Fractures are very rare and may be divided into fracture at the neck or fracture at the body of the stem.

There are 12 reported cases where the Exeter™V40™ fractured at the body.²⁻⁷ Proposed aetiologies include: undersized stem implantation (seen with implantations into femurs with narrow canals and thick cortical walls), and also proximal loosening at the trochanter, which is thought to create significant stress at the point at which the implant is firmly fixed, eventually leading to stem fracture.⁷

There are 12 reported cases where the Exeter™ V40™ fractured at the neck.^{5,7-10} In nine, the fracture occurred immediately distal to the stem trunnion. This was thought to be due to use of larger prosthetic heads (≥ 36 mm) with extended neck lengths (+5 mm to +10 mm) in overweight patients,^{7, 8} leading to an augmented moment arm pivoting around the stem trunnion, eventually leading to implant failure at the neck.⁸ Our patient's initial implant had a 22-mm head.

The three other reported cases occurred at the neck-shaft junction.^{7,9,10} These atypical fractures are thought to begin around the insertion guide hole at the antero-superior neck and propagate inferiorly.¹⁰ In one case, a 71 kg patient underwent primary THA using cemented 44-mm offset size 0 Exeter™ V40™ and 28mm +0 head, which eventually fractured.¹⁰ In another case, a patient (BMI 27.8 kg/m²) underwent cement-in-cement revision THA with a 44-mm offset 125mm ("small") Exeter™ revision prosthesis, which subsequently fractured.⁹ In the third, the patient (BMI

37.4 kg/m²) underwent cemented primary THA using 44-mm offset size 3 Exeter™ V40™ 150mm with 28-mm stainless steel +0 head, which eventually fractured.⁷

Our patient's fracture matches this previously described unusual pattern [Figure-7].^{7,9,10} Due to the sudden nature of her presentation, it is difficult to determine if the stem fracture happened gradually or if due to sudden stem failure. However, sudden stem failure is more likely, considering she reported experiencing no pain, weakness or altered sensation in her right hip prior to feeling it give way.

Obesity has been cited as a cause for this atypical fracture.⁷ However this proposition is disputed by another case where the patient was described as "healthy and lean".¹⁰ Our patient was not obese, which also disputes this notion. Other proposed contributing factors are: poor proximal support, narrow canal morphology, poor microstructural homogeneity and surface corrosion.¹⁰ We believe fatigue wear and surface corrosion are possible contributors to this atypical fracture pattern, but further research will be needed to confirm this hypothesis.

The Exeter™ V40™ remains a viable implant choice. Despite its outstanding success, the significance of fracture should not be overlooked, as revision THA conveys notable morbidity and mortality risk. This report adds to the limited evidence indicating the area around the insertion guide hole as a potential point through which a fracture may begin and propagate inferiorly; indicating this area to possibly signify an aspect of the implant which may be susceptible to failure.

Cemented femoral implants are still being widely used worldwide. With the increasing number of revisions THA cases, orthopaedic surgeons will more frequently have to undertake revision surgery involving well-cemented femoral components. Although there is significant paucity in the literature concerning fractured Exeter™ V40™ stems, a cement-in-cement technique may be successfully employed in its revision surgery, without the necessity of an extended trochanteric osteotomy or a cortical window.

Conflicts of Interest

None declared

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