Traumatic Stem Fractures in Short Stem THA-A Rare Case Series

Carl Haasper, MD, PhD, MSc · Daniel O. Kendoff, MD, PhD · Matthias Gebauer, MD, PhD, MBA · Akos Zahar, MD · Thomas Kreibich, MD · Eduardo M. Suero, MD · Thorsten Gehrke, MD

Received: 24 September 2011/Accepted: 29 November 2011 /Published online: 27 April 2012
© Hospital for Special Surgery 2012

Abstract Adequate trauma of a well-fixed total hip prosthesis might cause relevant osseous injuries. Concomitant occult fractures of the implant itself are very rare. We report on two patients admitted to our institution and who were previously treated with similar types of short-stem total hip arthroplasty (THA). Both were unable to walk after an adequate trauma, although the initial admitting hospital misdiagnosed the exact diagnosis. Detailed reexamination later revealed a prosthetic neck fracture of the cement-free stem. Both patients were treated with a stem revision. In THA patient, special attention should be drawn to the implants after relevant trauma. A single examination shortly after trauma seems to be insufficient to diagnose implant-related injuries. A secondary follow-up several weeks after trauma, including at least X-rays, has to be recommended.

Keywords hip · arthroplasty · implant failure

Introduction

Short stem prostheses that preserve the femoral neck have become more and more popular in total hip arthroplasty (THA). They were introduced as cementless implants offering the possibility of a less invasive implantation and

were especially designed for younger patients. Recently, the frequency of use of this type of prosthesis has increased, particularly in young, active patients [7].

There is a huge variety of neck preserving implants currently available, with various published series indicating good outcomes [9]. Good-to-excellent short- and midterm results have been reported for most of them. One such example is the Mayo short stem (Zimmer, Warsaw, Indiana, USA) [3]. The concept of femoral neck preserving hip replacement was introduced in the 1990s and has been discussed in the literature, often demonstrating many advantages [6]. Although current design and material improvements have principally reduced the number of implant-related failures, fractures and complications still seem to exist in rare cases. As a recent example, complications related to the implanted material were reported for the Metha® short stem (Braun, Aesculap, Tuttlingen, Germany) [5], which consists of a modular neck-shaft junction. In a small series of this modular implant, fractures of the femoral neck cone adapter were observed. Consequently, this junction seemed to be the limiting biomechanical factor, and technical improvements were performed by the company as remediation. In our experience of implanting the Collum Femoris Preserving (CFP, LINK, Hamburg, Germany) prosthesis, we have yet to encounter such mechanical failures. Besides the promising 10-year results of an ongoing series of more than 5,400 patients, an initial retrospective study of 155 patients who underwent total hip replacement with the CFP prosthesis demonstrated excellent to good radiographic and clinical results at 6 years postoperatively. Special attention was drawn to bone remodeling, complication rate, and patient satisfaction in this retrospective clinical trial [2].

In spite of this, we identified two patients from our database who sustained trauma to the implanted hip joint. Only delayed secondary radiographic evaluation confirmed, in both cases, direct implant breakage, which was initially misdiagnosed when evaluated at outside hospitals. We wish to present an analysis of these two patients who sustained these stem fractures. Both required femoral component revision.

C. Haasper, MD, PhD, MSc (✉) · D. O. Kendoff, MD, PhD · M. Gebauer, MD, PhD, MBA · A. Zahar, MD · T. Kreibich, MD · E. M. Suero, MD · T. Gehrke, MD
ENDO Clinic Hamburg,
Holstenstr. 2, 22767,
Hamburg, Germany
e-mail: Carl.Haasper@damp.de

E. M. Suero, MD
Hospital for Special Surgery,
535 E 70th St.,
New York, NY 10021, USA

Fig. 1. Plain postoperative pelvic radiographs of case 1 (43 year old female) after primary THA for secondary osteoarthritis due to hip dysplasia (CFP stem and cemented MARK III acetabular cup plus structural bone autograft, LINK, Hamburg, Germany)

Method and Patients

Our institutional database includes a series of more than 5,400 implanted CFP prostheses since 1999. Two patients (0.037%) revised at our institution were identified as having suffered a stem fracture.

Case 1

A 43-year-old woman presented herself as an emergency admission to our hospital seven and half years after primary hybrid THA performed as treatment for secondary osteoarthritis due to hip dysplasia (CFP stem and cemented MARK III acetabular cup plus structural bone autograft, LINK, Hamburg, Germany; Fig. 1). Two days before admission, she complained of sudden groin pain without antecedent trauma, which made her unable to walk. Careful examination including X-ray revealed a stem fracture of the femoral prosthesis (Fig. 2). An extended past medical history revealed a distinct ski accident 5 months before that resulted in a severe

Fig. 2. Plain pelvic radiographs of case 1, 7 years after primary THA showing the stem fracture

Fig. 3. Explanted implant, case 1 (CFP stem, LINK, Hamburg, Germany)

hip sprain, with pain lasting for a period of more than 3 weeks. No other acute or chronic trauma to the hip was detected.

She was treated with femoral stem revision using a non-cemented, tapered straight stem after removal of the fractured implant (Zimmer CLS, Freiburg, Germany; Figs. 3–4). Intra-operatively, the cup showed no signs of loosening. Further postoperative care was uneventful. She was discharged 7 days after admission and had regained full function and weight bearing 6 weeks after surgery.

Case 2

A 56-year-old man presented to our outpatient clinic after experiencing sudden groin pain while on a shopping tour with his wife. Trauma was initially denied. Two years before, he had been treated with cementless THA (CFP stem and T.O.P fit acetabular cup, LINK, Hamburg, Germany; Fig. 5) for osteoarthritis. Radiographs detected a stem fracture of the prosthesis (Fig. 6). The patient's past medical history did not reveal any acute or chronic trauma to the affected limb. However, the wife reported that the patient had sustained a severe fall on the affected hip

Fig. 4. Plain postoperative pelvic radiographs after stem change to a longer cement less variant (Zimmer CLS, Freiburg, Germany)

Fig. 5. Plain postoperative pelvic radiographs of case 2 (56-year-old male) after primary THA for osteoarthritis (CFP stem and T.O.P fit acetabular cup, LINK, Hamburg, Germany)

Fig. 7. Explanted implant, case 2 (CFP stem, LINK, Hamburg, Germany)

6 weeks before, with pain and bruising in the right groin for several days and for which the patient did not seek medical attention.

This patient was treated with a hybrid THA revision. The broken stem was revised to a cemented system (SP II, LINK, Hamburg, Germany; Figs. 7–8) because of relatively poor quality, osteopenic femoral bone detected intraoperatively. When discharged 10 days after admission, the patient was free of complaints and had regained full activity 5 years after treatment.

Discussion

Short stem-related complications in THA have been reported previously as unexpected and might have been correlated to implant-related mechanical failures [5]. In a reported series of implant failures without prior trauma, the modular connections within the femoral necks were identified as the possible cause of failure. The proposed advantages of generally reduced head-neck impingement, reduced dislocation rate, and better reconstitution of leg length and offset were compelling. However, numerous case reports exist of fractures of titanium modular femoral necks, with an estimated fracture rate of 1.4% in a series of 5,000 patients. Fractures occurred more

frequently in heavy men (>100 kg) around the 2-year postoperative mark. Thus, it was concluded by some authors that based on the literature, the proximal modular neck in short proximal anchoring stem THA might be a bridge too far [4]. In our estimation with respect to the prosthesis used in our cases, the transition zone between the longitudinal columns as they coalesce into arches at the base of the neck and just above the collar fixation point could lead to high shear stress in the implant predisposing to stem fracture.

Our non-modular short stem prosthesis showed excellent to good results in a retrospective clinical trial [2]. Additionally, we were able to review a series of more than 5,400 implanted CFP prostheses in our own institution. Thus, we were able to rule out implant-related problems, such as those that occur with a modular neck system.

In cases of atraumatic occurrence of groin pain in THA patients, one should consider a differential diagnosis which includes implant-related complications such as loosening or stem fracture. Thus, the symptom of pain itself requires a high degree of suspicion especially after THA. Diagnosis may be confirmed via bone scan after ruling out alternative causes. Although unusual complications after THA, like sudden groin

Fig. 6. Plain pelvic radiographs of case 2, 2 years after primary THA, showing the stem fracture on admission

Fig. 8. Plain postoperative pelvic radiographs (SP II stem and T.O.P fit acetabular cup, LINK, Hamburg, Germany)

pain, are reported in the literature, they tend to be rare [8]. Stress fractures of the pelvis are considered to be relatively rare occurrences in association with THA. They are likely secondary to a rapid postoperative increase in patient activity following years of disability. Traumatic cases with periprosthetic fractures are reported even more often [1].

More importantly, however, a careful questioning to rule out trauma to the affected hip should be performed. In the two cases presented here, we discovered traumatic events not initially reported by the patients. Special attention should also be drawn to the implant itself during the evaluation of a THA after trauma. A single examination shortly after the injury seems to have been insufficient to diagnose the implant fractures in these cases of short stem implant types. A secondary careful examination, including conventional radiographs in two planes is highly recommended following trauma. Consequently, if an initial negative diagnosis is made but persistent pain or dysfunction occurs, then reevaluation should be recommended.

Disclosures Two authors (DK and TG) are Consultants for the company Waldemar Link GmbH, Hamburg, Germany and may receive payments or benefits from a commercial entity related to this work.

Each author certifies that his or her institution either has waived or does not require approval for the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research.

References

1. Biggi F, Di FS, D'Antimo C, Trevisani S (2010) Periprosthetic fractures of the femur: the stability of the implant dictates the type of treatment. *J Orthop Traumatol* 11:1–5
2. Briem D, Schneider M, Bogner N, Botha N, Gebauer M, Gehrke T, Schwantes B (2010) Mid-term results of 155 patients treated with a collum femoris preserving (CFP) short stem prosthesis. *Int Orthop* 35(5):655–60
3. Chen HH, Morrey BF, An KN, Luo ZP (2009) Bone remodeling characteristics of a short-stemmed total hip replacement. *J Arthroplasty* 24:945–950
4. Dunbar MJ (2010) The proximal modular neck in THA: a bridge too far: affirms. *Orthopedics* 33:640
5. Kohler S, Ratayski H, Zacher J (2010) Implant-Related Fractures of the Femoral Neck Cone Adapter of a Modular Short-Stem Hip Prosthesis—Patient Management and Operative Technique. *Z Orthop Unfall* 149(2):185–90
6. Pipino F, Molfetta L (1993) Femoral neck preservation in total hip replacement. *Ital J Orthop Traumatol* 19:5–12
7. Renkawitz T, Santori FS, Grifka J, Valverde C, Morlock MM, Learmonth ID (2008) A new short uncemented, proximally fixed anatomic femoral implant with a prominent lateral flare: design rationals and study design of an international clinical trial. *BMC Musculoskelet Disord* 9:147
8. Smith D, Zuckerman JD (2010) Bilateral stress fractures of the pubic rami following THA—an unusual case of groin pain. *Bull NYU Hosp Jt Dis* 68:43–45
9. Vendittoli PA, Lavigne M, Roy AG, Lusignan D (2006) A prospective randomized clinical trial comparing metal-on-metal total hip arthroplasty and metal-on-metal total hip resurfacing in patients less than 65 years old. *Hip Int* 16 Suppl 4:73–81