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Atraumatic fracture of the nonmodular femoral stem

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Summary

Introduction. Femoral stem fracture is a rare cause of revision total hip replacement. Nonmodular extensively porous coated stems, well-fixed and non-cemented, have significant bone adhesion.

Case report. A 56-year-old patient presented to the emergency room with a proximal fracture of a nonmodular stem in the portion of the neck, in absence of trauma or fall. The femoral stem was well fixed without any signs of osteolysis, with the result that the extraction instrumentation was ineffective to remove it. A transfemoral Wagner osteotomy was deemed necessary for removal of the femoral stem, and implantation of a Wagner revision stem. At 3 months of follow-up the patient walked without the aid of crutches and X-rays showed a correct integration of the implant.

Conclusions. No cases of atraumatic fracture of the proximal region of the nonmodular stem not associated with risk factors have been described in the literature. With a perfect integration of the proximal and distal prosthetic implant, a transfemoral osteotomy is necessary.

Key words: fracture, stem, prosthesis, hip, revision, osteotomy

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Introduction

Femoral stem fracture is a rare cause of revision total hip replacement [1]. This complication is reported in the literature mainly in revision prostheses with modular stems, as a consequence of stress and corrosion of the modular junction [2-4]. Predisposing factors for this type of prosthetic failure include obesity, high-level physical activity, femoral bone osteolysis, stress shielding, stem malpositioning and loosening [5-7]. In contrast, nonmodular extensively porous coated stems, well-fixed and uncemented, have significant bone adhesion. Fractures of these types of stems therefore represent a surgical challenge, because they are difficult to remove and a femoral osteotomy may be necessary. We present a clinical case in which the atraumatic fracture of a nonmodular stem occurred in the proximal portion of the neck, and illustrate surgical management and the clinical result obtained (Fig. 1).

Case report

56-year-old patient who underwent right total hip replacement in 2015 and left total hip replacement in 2017. He subsequently developed heterotopic ossifications in the right hip that were resistant to pharmacological therapy and were treated

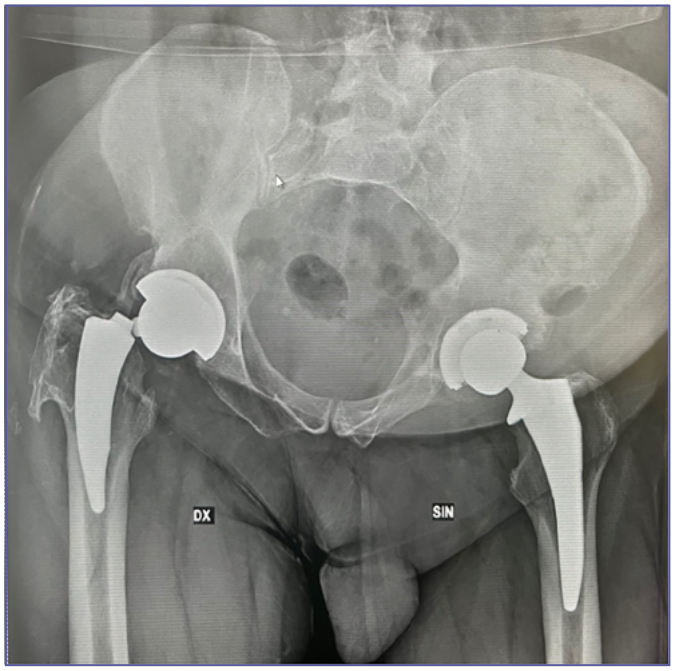

Figure 1 Pelvic X-ray showing fracture of the femoral stem near the neck.

surgically in 2019. He presented to our emergency room with sudden right groin pain while tying his shoes, in the absence of trauma or fall. X-ray of the pelvis showed proximal fracture of femoral stem (NANOS Neck Preserving Hip Stem, Smith & Nephew®) (Fig. 2).

During revision surgery, performed with a direct lateral approach, after the removal of the ceramic head, the stem appeared perfectly osseointegrated. The fracture was in the neck portion, thus making the anchoring of the femoral component extraction instrumentation ineffective. A transfemoral Wagner osteotomy was therefore deemed necessary for removal of the femoral stem, and implantation of the cementless Wagner revision stem 14/225 TAPER 12/14 (Zimmer Hip System Wagner SL Revision®), with ceramic head 36 S (Fig. 3). The femoral osteotomy was reduced and synthesized with two supercable polymer iso-elastic cerclages. The patient was discharged after 4 days with immediate motor re-education and non-weight bearing for 30 days. At 30 days the follow-up visit showed a good clinical and radiographic results. At 3 months of follow-up, the patient walked without the aid of crutches and X-rays showed correct integration of the implant.

Discussion

The literature reports a percentage of 0.8% of fracture of the modular stems, which typically occurs in the metaphyseal region of the junction, as the cyclic load generates micro-

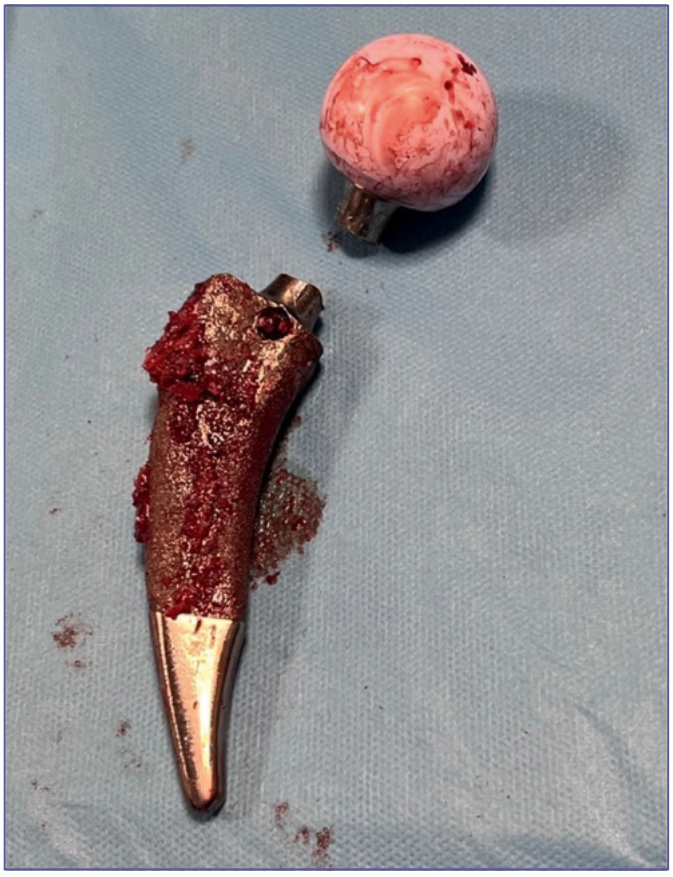

Figure 2 Removal of the prosthetic implant.

movements of the latter and notable mechanical stresses [8-10]. Another cause seems to be a consequence of material corrosion [11]. Such corrosion induced fractures have been widely described in modular total hip replacement with CoCrMo necks and titanium alloys femoral stems [12-15]. Nonmodular components can break mostly in the middle third, where the maximum lateral traction and medial compression forces develop [16]. The most important risk factor is proximal femoral bone osteolysis [1]. Overweight or obesity can increase implant stress. Charnley reported an extraordinarily high rate of stem fractures in patients weighing more than 88 kg [17]. Varus malpositioning of the stem is a further risk factor [18]. No article in the literature has cited cases of atraumatic fracture of nonmodular stems in the absence of risk factors as in our case. We assumed that a possible cause was a mechanical defect in the prosthetic implant which may have led to its failure. In our case, transfemoral osteotomy was deemed necessary since the implant was well fixed both proximally and distally without any sign of osteolysis. The transfemoral osteotomy according to Wagner allows adequate femoral exposure in revision hip arthroplasty [19], with a femoral window healing rate of 98.2% [20].

Figure 3 Post-operative X-ray.

This study has some limitations. Firstly, one patient was examined with a fracture of a nonmodular stem. This limitation is an inherent feature of all studies regarding implant breakage. Furthermore, this study does not include a long clinical follow-up, since the purpose of the case-report is focused on surgical management. This represents a limitation of the present study. The strength of this study is that no other article in the literature has reported on cases of atraumatic fracture of nonmodular stems in the absence of risk factors as in our case. Determination of the mechanism of failure would require examiation of the prosthetic components and periprosthetic tissues.

Conclusions

Nonmodular femoral stem fracture is a rare cause of revision total hip replacement. No cases of atraumatic fracture of nonmodular stems not associated with risk factors have been described in the literature. With a perfect integration of the proximal and distal prosthetic implant, a transfemoral osteotomy is necessary.

Conflict of interest statement

The authors declare no conflict of interest.

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Author contributions

AP: writing – original draft, writing – review & editing, study selection, data collection and extraction, risk of study bias assessment; GT, GV: writing – original draft, study selection, data collection; GDN, GG: writing – study selection, data collection; GC: writing – original draft, writing – review & editing, final approval. All authors: final approval.

Ethical consideration

This study was approved by the Institutional Ethics Committee (ASL SALERNO, P.O. Oliveto Citra) The research was conducted ethically, with all study procedures being performed in accordance with the requirements of the World Medical Association's Declaration of Helsinki. Written informed consent was obtained from each participant/patient for study participation and data publication.

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