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ORIGINAL ARTICLE

De-escalation exchange of loosened locked revision stems to a primary stem design: Complications, stem fixation and bone reconstruction in 15 cases

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KEYWORDS
Total hip arthroplasty revision;
Femoral bone loss;
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Summary
Introduction: Femoral stem revision with a locked stem after total hip arthroplasties treats severe bone defects by favoring spontaneous bone reconstruction. Initially, once reconstruction was obtained, the temporary implant was to be replaced by a standard primary component. The use of locked stems has increased, but repeat revision with a short stem which is also called ''de-escalation'' has not been extensively studied.
Hypothesis: Repeat revision of a locked stem with a short stem is not associated with any specific morbidity and does not affect the quality of reconstruction obtained, or fixation of the subsequent standard length primary design stem.
Patients and methods: Fifteen patients whose locked femoral stem was exchanged due to thigh pain and/or radiographic images showing failed osteointegration were analyzed. These 15 patients were all followed-up and evaluated by the Postel Merle d'Aubigné score. Progression of bone defects was evaluated using the Hofmann cortical index.
Results: There were no difficulties extracting the locked stem and a standard length primary stem was inserted with no associated procedures or bone complications in any of the cases. At a mean follow-up of 55 months (36—84 months), thigh pain had disappeared and the Postel Merle d'Aubigné score had increased from 12.6 ± 2.9 (7—16) to 16.5 ± 0.9 (15—18) ($P = 0.0001$). The use of a locked femoral stem resulted in bone reconstruction in all cases, the Hofmann index increased from 30.5% ± 17.9% (12—71%) before insertion of the locked stem to 43.6% ± 25.6% (19—90%) at exchange ($P < 0.05$). Bone reconstruction was durable after the exchange with a stable Hofmann index 43.7% ± 26.2% (17—92%) at the final follow-up ($P = 0.9$). No recurrent loosening occurred.

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Discussion: Revision of a loosened locked femoral stem with a standard design primary stem does not result in any specific increased morbidity, or modify bone reconstruction obtained with the locked stem and results in stable fixation of a new standard length stem.
Level of evidence: : IV: retrospective or historical series.

Introduction

Revision total hip arthroplasties (RTHA) and the severity of bone defects which are the indication for these revisions are increasingly frequent [1,2]. The use of locked femoral stems, developed by Pierre Vives in 1987 [3], has been widespread in France. The initial concept was to implant a temporary revision locked femoral stem to obtain bone reconstruction in order to then implant a standard primary femoral stem [3—5]. Thus the idea of ''exchange'' or ''de-escalation'' was developed which involved changing a long revision stem by a standard length primary stem.

In fact, this idea of exchange has not been consistently applied, because locked stems have produced satisfactory and long lasting results [6—10] with regular bone reconstruction methods [7—9]. The notion of a temporary implant has evolved into a definitive implant as implant designs and surface treatments have improved. For all these reasons, there are very few studies on these exchanges in the literature. We began using locked stems in 1994, and according to Pierre Vives we performed exchanges in the presence of clinical symptoms of failed osteointegration or symptomatic implant breakage (stem or screws). The aims of this study were:

- to evaluate the clinical results of locked stem revision by a shorter stem;
- to evaluate the technical difficulty of this type of exchange;
- to describe the outcome of fixation of the short stem and the durability of bone reconstruction obtained with the locked stem.

Materials and methods

Patients

We performed a retrospective analysis of a monocentric series of repeat revisions of locked stems with standard length primary stems, according to the ''de-escalation'' technique. Two hundred and fifty-nine locked stems (101 Ultime™ et 158 Linea™) were implanted between 1994 and 2007 in our institution. Etiologies for RTHA with a locked stem were: aseptic loosening in 120 cases (46.3%), septic loosening in 46 cases (17.6%) and peri-prosthetic fractures in 71 (27.4%) cases, while there were specific indications in 22 cases (after tumor resection of the proximal femur, broken implants, fracture of the femur associated with osteoarthritis of the hip). Bone defects were severe: 101 (39%) stage III and IV on the Société française de chirurgie orthopédique et traumatologique (SoFCOT) score [11]. Between 2001 and 2008, 15 patients (15 stems) (9 men, 6 women) underwent de-escalation exchange or 5.7%. Mean age at exchange was 60.8 years (41—83 years), the mean delay between insertion of the locked revision stem and de-escalation exchange was 71.8 months (30—148 months). The minimum follow-up for evaluation of the repeated exchange stem was 36 months.

The indication for de-escalation exchange was based on thigh pain ($n = 11$) and/or radiological features of stem loosening (progressive radiolucent lines ($n = 15$), stem breakage ($n = 1$), or severe facing the locking screws ($n = 11$)).

Surgical technique

Two types of locked stems were revised:

- Ultime™ stem (Cremascoli-Wright, Créteil, France) in 10 cases;
- Linea™ revision stem (Tornier, St.-Ismier, France) in five cases (Figs. 1 and 2).

All surgical interventions were performed by a posterolateral approach. An additional lateral incision was made in the thigh in 14 cases to remove locking screws. The standard primary stem used for de-escalation exchange was a straight cementless Alloclassic™-SL (Zimmer, Étupes, France) in 10 cases and a cemented stem in five cases including three straight self-locking Müller™ implants (Zimmer, Étupes, France) and two Charnley Kerboull™ implants (Stryker, Pusignan, France). Postoperative full weight bearing was allowed in all cases. The choice of the stem for exchange was left up to the surgeon, however cemented stems were used in the first cases, then cementless stems were systematically used thereafter.

Methods of evaluation

Patients were evaluated by the Harris (HHS) [12] and Postel Merle d'Aubigné (PMA) scores [13] before revision surgery, at final follow-up and for intermediary follow-up visits (at 1 and 6 months, then annually). Thigh pain was investigated. Patient satisfaction was evaluated at follow-up using a 4-point scale: very satisfied, satisfied, disappointed, and dissatisfied. The etiology of failure of the locked stem, and the condition of bone, the presence of implant breakage and union of the femorotomy were investigated on anteroposterior (AP) and profile pelvic X-rays [11] (Table 1), while signs of bone regeneration were determined with the Hofmann cortical index measured 1 cm below the lesser trochanter [14] (Table 1).