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Original Article

Low Short-Stem Revision Rates: 1-11 Year Results From 1888 Total Hip Arthroplasties

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ABSTRACT

Background: In total hip arthroplasty, short stems were developed as a bone-conserving alternative to traditional cementless stems. So far, there have been very few recorded medium to long-term results of these comparatively new implants. The aim of our retrospective study was to report on the survival of calcar-loading short stems.

Methods: All Metha stem implantations from 2004 to 2014 were recorded from the operation protocols (n = 1888). Due to the chronological development of the stem, 3 different versions were implanted: modular titanium stems with neck adapters from titanium or cobalt-chrome and monoblock stems. Patients were questioned by post about revision, dislocation, and satisfaction.

Results: Data were complete for 93% of the procedures (1090 monoblock stems, 314 modular stems with titanium neck, and 230 modular stems with cobalt chrome neck). Mean follow-up was 6 years (1-11 years). Fifteen modular titanium implants were affected by cone fractures (4%). Therefore, monoblock, modular cobalt chrome, and modular titanium implants were analyzed separately. The 7-year revision rate for monoblock stems was 1.5%; for modular cobalt-chrome stems it was 1.8%, and for modular titanium stems it was 5.3%.

Conclusion: Our data show the midterm survival of the monoblock and modular cobalt-chrome implants equivalent to the traditional cementless stems. These might, therefore, be considered as a bone-conserving alternative for young and active patients.

In the last 50 years, total hip arthroplasty (THA) has become the gold standard procedure for the successful treatment of end-stage arthritis; some call it the "operation of the century" [1]. Meanwhile, the cementless fixation of standard shafts has become the fixation of choice not only in North America but also in many parts of Europe [2,3]. Numerous studies have confirmed the excellent long-term survival of cementless standard shafts [4-6]. Increasing acceptance of the longevity of these implants has contributed to an increasing incidence of hip arthroplasties performed in younger, heavier, and more active patients [7]. As revision is more likely in such patients, preservation of the femoral bone stock, which is used for the fixation of traditional femoral shafts, becomes more important. Besides the loss of bone stock, additional issues can occur in association with traditional cementless shafts: Distal fixation in the femoral diaphysis or distal metaphysis may cause persistent thigh pain in active patients [6,8]. The relatively long standard shafts may increase stress shielding in the metaphysis due to an anatomical proximal distal mismatch [9]. Furthermore, the shape of standard shafts often complicates their use in combination with modern minimally invasive hip approaches.

Due to these considerations, attempts have been made to improve the material and design of femoral implants, which resulted in the introduction of the short stem. Proposed improvements associated with short stems include preservation of femoral bone stock, physiological load distribution in the femur to prevent stress shielding, reduced thigh pain and easier use for

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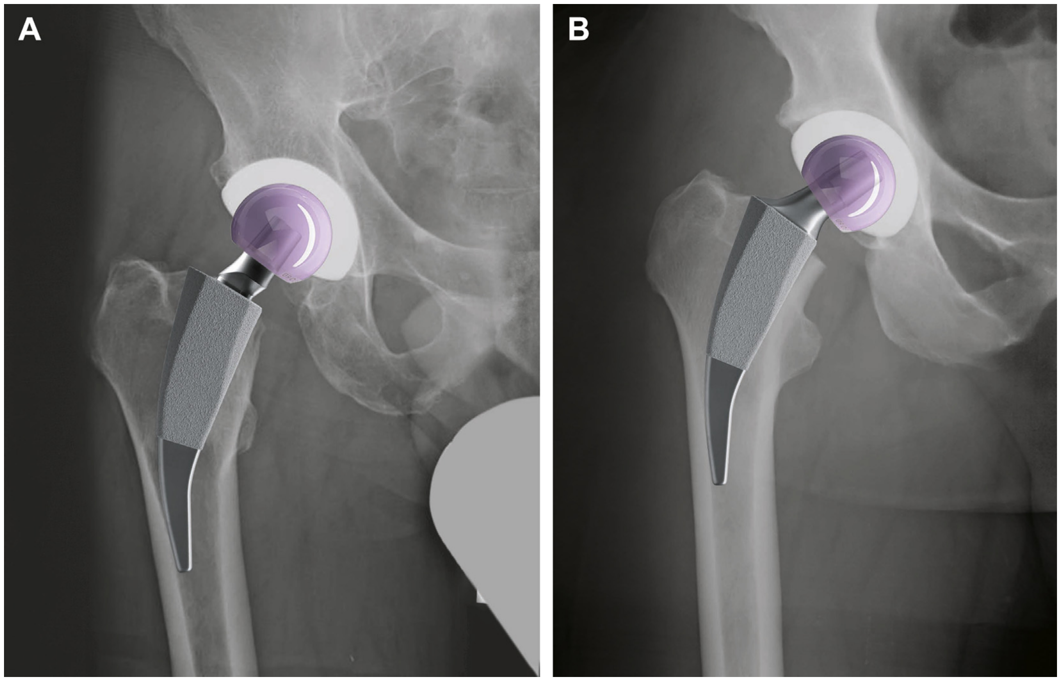

Fig. 1. Illustration of the modular (A) and monoblock stem (B).

minimally invasive approaches [2,7,10,11]. The conceptually appealing bone-conserving designs of the short stems resulted in a substantial number of implantations; for instance, short stems are implanted in 15%-20% of all THA procedures in Germany [12]. However, regardless of these theoretical benefits, new stem designs must demonstrate equivalent or improved clinical performance compared to the excellent long-term results of traditional cementless stems. Authors of current reviews report concerns for short-stem subsidence, malalignment, intraoperative fractures, and lack of intermediate to long-term data [2,10]. They, therefore, recommend further studies on the long-term results of short stems before the use of these comparatively new implants becomes routine. For this reason, our study was designed to evaluate the medium to long-term survival of the Metha short stem.

Material and Methods

At our hospital, the Metha short stem (Aesculap, Tuttlingen, Germany) has been implanted since August 2004. Indications for use of the short stem were usually age <70 years, primary arthritis, dysplastic hip arthritis, or osteonecrosis of the femoral head and a femoral anatomic situation, allowing the metaphyseal-anchoring concept of the implant. After approval by the institutional review board and ethics committee (reference number 2,015,021), we analyzed operation protocols over a 10-year period (August 2004-August 2014) to identify all implantations of the specific implant. As this study started in autumn 2015, the follow-up period averaged 1-11 years. We identified a total of 1888 implantations in 1675 patients.

Implant

The titanium implant is collarless and has a trapezoidal, double tapered shape; it is available in 8 sizes. In recent reviews, it was categorized as “partial collum” or “trapezoidal shape” [2,10]. The proximal two thirds are plasma spray coated. From 2004 until 2006, only the modular stem with 9 titanium neck adapters was available (caput-collum diaphysis [ccd] angles: 130°, 135°, 140°; version: neutral, 7.5° anteversion, 7.5° retroversion). After a series of adapter breakages, the modular titanium adapters were replaced by modular cobalt-chrome necks in December 2006 (Fig. 1A) [13]. Since 2008, in addition to the modular cobalt-chrome stems, monoblock stems have been available in 120°, 130°, and 135° (Fig. 1B). In all patients, a ceramic head and cementless acetabular cup (Plasmacup, Aesculap, Tuttlingen, Germany) were used, mainly with a ceramic liner.

Surgical Regimen

All implantations were performed through a lateral or anterolateral approach with the patient in a supine position. Intraoperatively, the bone quality of the femoral neck was confirmed, assessing whether the bone structure was strong enough to support the short-stem load transmission. Specific care was taken to ensure primary implant stability by intraoperative consideration of the following keystones: implantation through an intact cortical ring of the femoral neck, a rotationally stable filling of the femoral neck junction with the last rasp, and an alignment of the prosthesis distal third along the dorsolateral cortex of the femur. Patients were mobilized for 6 weeks with crutches.

Patients' Survey

The following data were recorded from the patients' documents: Patient's name, address, date of birth, operation date and side, implant specifications (monoblock or modular stem; in case of modular: titanium or cobalt-chrome neck adapter; size, neck-angle, and version of the cone; femoral head: size and material; type and insert of the acetabular cup), and surgeon.

The following questionnaire was sent to all patients; they were asked to mark one answer for each question: