AN EXTENSIVELY HYDROXYAPATITE-COATED TITANIUM HIGH OFFSET FEMORAL COMPONENT IN REVISION HIP ARTHROPLASTY

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INTRODUCTION:
Femoral stem revision presents a challenge for the orthopedic surgeon. Pre-existing poor femoral bone stock frequently coupled with multiple previous surgeries forces the surgeon to obtain stable implant fixation in often deficient proximal femoral bone. A higher offset stem offers potential advantages, including improved abductor mechanics and less tendency too leg lengthening. However it also raises theoretical concerns regarding increased load on the femoral component and a possible negative effect on fixation/aseptic loosening.

The purpose of this study is to evaluate the aseptic loosening rate and initial results of an extensively hydroxyapatite (HA) coated, titanium high offset femoral component for femoral revision arthroplasty.

METHODS:
This institutional review board-approved study is a retrospective review of data collected on an extensively HA coated cementless titanium high offset femoral stem for revision hip arthroplasty. The two senior authors performed all surgeries at a single institution using similar techniques. Thirty-nine revision total hip arthroplasties in 38 patients were performed between October 1995 and September 2001 which met institutional review board requirements for consent. Three revisions were done for periprosthetic fracture and were excluded from the study. Nine hips could not be included in this study because the patients were lost to follow-up, deceased prior to the required follow-up period, or unable to return for follow-up.

The remaining 26 patients (27 hips) included 14 males (15 hips) and 12 females (12 hips). The mean age at the time of the revision surgery was 68 years (range, 43-82 yrs), mean weight 183 lbs (range, 106-280 lbs). The mean follow-up for this patient group was 53 months (range, 24-98). The initial arthroplasty was performed for osteoarthritis (11 cases), septic arthritis (7 cases), avascular necrosis (5 cases), rheumatoid arthritis (2 cases), inflammatory arthritis (1 case), and for unknown reasons in 3 cases. The reason for femoral stem revision was aseptic loosening in 17 cases, osteolysis in 4 cases, acute femoral stem fracture in 1 case, polyethylene wear in one case and revision following a girdlestone procedure for sepsis in two cases. There were also two cases of revisions of well-fixed femoral stems. The current revision was the first femoral stem revision for 25 cases (9 prior uncemented stems, 16 prior cemented stems) and the second femoral stem revision for 2 cases.

The femoral stem used in all study cases was a cementless titanium alloy stem with a chemically etched substrate, fully coated with hydroxyapatite. Available in straight, bowed, or calcar replacement designs, it features a higher offset neck angle of 127 degrees. In this study group, there were no calcar replacement stems, 14 straight stems and 13 bowed stems. A beaded dual geometry press-fit acetabular shell design with a multi-layer titanium Microstructured porous ingrowth surface was utilized in 12 revision cases. Extended trochanteric osteotomies were necessary in 7 cases. Femoral bone grafting was required in 20 cases.

Clinical evaluation, using a modified Harris Hip Score (HHS), was completed preoperatively and at 3 months, 6 months and yearly follow-ups thereafter. Functional data for the HHS was collected by questionnaire administered by a nurse without the presence of the surgeon to decrease potential bias. Pre-revision radiographs were reviewed for femoral bone deficiency and placed into five categories according to the Mallory classification of femoral bone deficiency. There was one case of Type I bone loss, seven cases of Type II bone loss, 3 cases of Type III A bone loss, 10 cases of Type III B bone loss, and 5 cases of Type III C bone loss.

RESULTS:
The mean preoperative HHS was 52 (range, 23-79), excluding one patient who was unable to stand or walk preoperatively. The mean postoperative HHS was 80 (range, 51-98), excluding one patient who had an incomplete score. Six patients (6 hips) had excellent results with scores between 90 and 100, and six patients (7 hips) had good results (between 80 and 89). Nine patients (9 hips) had fair results (between 70 and 79) and 4 patients (4 hips) had scores less than 70. Preoperative pain was severe in 6 cases, moderate in 14 cases, mild in 2 cases, slight in 1 case and absent in 4 cases. Pain at latest follow-up was moderate in 1 case, mild in 1 case, slight in 8 cases and absent in 16 cases. No patient had severe pain at latest follow-up. Preoperatively one patient was unable to walk, 4 patients walked with a severe limp, 10 patients with a moderate limp, 11 patients with slight limp and one patient with no limp. At most recent follow-up, patients walked with a moderate limp in 6 cases, a slight limp in 8 cases and without a limp in 12 cases. Preoperatively, 7 patients did not use walking support and 19 patients required walking support (cane or crutch in 12 cases, 2 canes in 2 cases, walker or 2 crutches in 5 cases). At latest follow-up, 18 cases did not require walking support and 9 cases used one cane/crutch or two canes for support. No patients relied on a walker or two crutches.

Most recent radiographs were reviewed for bony ingrowth according to the criteria set forth by Engh. All components were classified as having bony ingrowth.

There were two cases of intra-operative fractures; both were secured with a trochanteric grip and cables. There were 3 cases of dislocation within the first year postoperative and one dislocation approximately 3.5 years postoperative treated with closed reduction. One patient underwent a reoperation one year postoperative for non-union of a trochanteric osteotomy. There was one case of Grade II-III heterotopic ossification. There were no loose femoral components and no subsequent femoral stem revisions.

DISCUSSION:
There are several approaches to femoral stem revision. Cemented stems, proximal porous-coated cementless and extensively porous-coated cementless femoral stems have all been used for femoral stem revision. The goal in each case is to achieve stable implant fixation in proximal femoral bone stock that is often deficient. Early poor results of cemented femoral stem revisions led to so-called “second generation” cementing techniques. The use of proximally porous-coated stems is one alternative to cemented femoral stem revision. Extensively porous-coated stems are another alternative, and the implant under study here is an extensively HA coated titanium high offset stem. A higher offset stem offers potential benefits of achieving desired abductor tension and range of motion with less tendency to lengthening the limb. However it also raises theoretical concerns regarding increased load on the femoral component and a possible negative effect on fixation/aseptic loosening. At a mean follow-up of 53 months (range, 24-98) in 27 femoral revisions, all stems were classified as bone ingrown. There have been no femoral stem revisions and no loose femoral stems. For intermediate follow up, this component has thus far demonstrated an excellent rate of stable bone fixation including those requiring extended trochanteric osteotomy.