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Original Article

# The Outcome of 69 Recemented Hip Femoral Prostheses Performed by One Surgeon 22-40 Years Ago

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ABSTRACT

*Background:* There is a lack of long-term data on cement-in-cement technique in revision of failed hip femoral stem.
*Methods:* We present the outcome of 69 consecutive recemented femoral prostheses, performed by one surgeon (GH) 22-40 years ago. Four patients (4 hips) were lost to follow-up. Sixty-three patients (65 hips) were followed for their lifetime or until the time of the preparation of the study. The study population consisted of 18 failed hemiarthroplasties and 47 failed total hip arthroplasties.
*Results:* The 23-year probability of survival for the recemented femoral components, with re-revision for any reason and resection arthroplasty as the end point, was 73.6% (61.8%-85.4%) and, with re-revision for aseptic loosening as the end point, was 82.2% (71.4%-93%).
*Conclusion:* Our follow-up study at 22-40 years, after recemented hip femoral prostheses, shows that recementing works well in selected cases.



The optimal method of fixation for the revision of a femoral component in a failed cemented hip arthroplasty remains controversial. Although most orthopedic surgeons are currently using long uncemented stems in cemented stem revisions, there are short-term and midterm clinical studies presenting decent results with the use of recementing revision, also called the cement in cement (CiC) technique [1-4]. The incidence of re-revision was limited in these case series. Certain in vitro biomechanical studies have demonstrated the efficacy of the method [5]. There is, however, lack of long-term clinical studies supporting this method of fixation.

The purpose of our study was to present the long-term data for 65 recemented femoral prostheses, performed by the same surgeon (GH) 22-40 years ago, to be used as a benchmark with which to compare other methods of revision of failed cemented femoral components. Part of the material has been previously published with a midterm follow-up [6].

## Materials and Methods

The present study was approved by the institutional review board of our hospital. Between 1976 and 1994, a consecutive series of 67 patients underwent 69 recemented aseptic revisions of femoral prostheses. Four patients (4 hips, 6%) were lost to follow-up and thus excluded from the analysis. The remaining 65 recementing procedures were performed in 63 patients (46 women and 17 men). The mean age of patients at the time of the index operation was 60 years (range, 27-78 years).

The reason for primary operation was idiopathic osteoarthritis in 8 hips, secondary osteoarthritis due to congenital hip disease [7,8] in 21 (6 dysplastic, 8 with low dislocation, and 7 with high dislocation), inflammatory arthritis in 4, avascular necrosis of the femoral head in 2, femoral neck fracture in 29, and acetabular fracture in 1. Out of 65 recemented revisions, 18 were failed

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**Table 1**
The Types of the Failed Cemented Hip Femoral Prostheses.

| Type of Primary Prosthesis | Number |
|---|---|
| Charnley low-friction arthroplasty | 29 |
| Thompson (hemiarthroplasty) | 16 |
| Mueller | 10 |
| Bousquet | 4 |
| Mc Kee | 3 |
| Monk (hemiarthroplasty) | 2 |
| Lettin | 1 |

cemented hemiarthroplasties and 47 failed cemented THAs (7 with broken stems; Table 1).

Only aseptic revisions were included in our study. Infected cases were excluded by clinical examination, preoperative biochemistry, and 3-phase technetium-99m bone scan, also confirmed by intraoperative tissue sampling. Bone loss was classified according to the Estok and Harris system [9] using preoperative radiographs confirmed intraoperatively after implant and loose cement removal. There was little or no cortical bone loss in 37 cases (grade I), moderate cortical bone loss in 20 (grade II), and major bone loss in 8 (grade III; Table 2).

All revised cases were routinely followed up clinically and radiologically, at 3 and 12 months after surgery and at 1- to 3-year intervals thereafter by the senior surgeon. A small number of aged patients were contacted by telephone. Clinical evaluation was performed with the Merle d'Aubigné and Postel score, as modified by Charnley [10]. The most recent radiographs were evaluated by 2 independent observers (KLA, GH) with 95% interobserver and intraobserver agreement. Any osteolysis around the femoral component was assessed on the latest radiograph. Linear osteolysis at most 1 mm at the cement–bone surface $\leq$50% around the component was considered as "well fixed", at least 1 mm at the cement–bone surface >50% and <100% around the component was considered as "possibly loose," whereas a continuous linear osteolysis without migration as "probably loose" [11].

### *Surgical Technique*

Chemoprophylaxis and thromboprophylaxis was used in all procedures, according to the best practices of that time. Revision procedures were performed through a transtrochanteric lateral approach. After hip dislocation, bone cement in the upper third of the femur was removed using special revision chisels. Then the loose implants were easily extracted. Well-fixed parts of cement in the distal two thirds of the mantle were left in place.

For the 12 first recementing procedures between 1976 and 1981, the new cement (Simplex P; Howmedica, Rutherford, NJ) was introduced and finger-packed. A second-generation cementing technique was used from 1982 onward in the other 53 cases thus injecting cement retrograde with a gun in a more liquid form to fill the gaps or cracks of the old mantle and thereafter, while polymerizing, to turn into a "single-body" mantle [11]. The new femoral prosthesis was then introduced earlier than usual to achieve the expected position in the novel cement mantle. Stems with long-neck were used in cases with metaphyseal bone loss, and long stems were used to bypass diaphyseal defects by approximately 2 femoral diameters (Table 2). Charnley polished stems (Thackray; now DePuy, Leeds, United Kingdom) were used in most of the cases (54 hips).

**Table 2**
The Femoral Hip Prostheses Selected for the Recemented Revision According to the Bone Stock Loss.

| Revision Stem Type | Osteolysis | | | |
|---|---|---|---|---|
| | Type I (%) | Type II (%) | Type III (%) | Total (%) |
| Charnley | | | | |
| Extra heavy flanged | 14 (37) | 1 (5) | 1 (13) | 16 (25) |
| Long neck–long stem | 3 (8) | 6 (32) | 3 (38) | 12 (18) |
| Long neck–extra heavy | 4 (11) | 6 (32) | 1 (13) | 11 (17) |
| Long neck | 4 (11) | 2 (10.5) | 0 (0) | 6 (9) |
| Standard flanged | 6 (16) | 2 (11) | 0 (0) | 8 (12) |
| CDH extra small | 0 (0) | 0 (0) | 1 (13) | 1 (2) |
| Harris CDH extra small | 2 (5) | 0 (0) | 0 (0) | 2 (3) |
| Harris–Galante (hybrid) | 4 (11) | 2 (11) | 2 (25) | 8 (12) |
| Opti-Fix (hybrid) | 1 (3) | 0 (0) | 0 (0) | 1 (2) |
| Total | 38 | 19 | 8 | 65 |

### *Statistical Analysis*

Kaplan–Meier survival curves with 95% CIs were generated (1) with re-revision or resection arthroplasty (Girdlestone procedure) for any reason and (2) with re-revision for aseptic loosening as the end point. The statistical tests were performed using SPSS 20 statistical software (SPSS Inc, Chicago, IL).

## Results

At the time of the preparation of the study, from the 65 recemented femoral prostheses, 11 (17%) failed again because of aseptic loosening at a mean of 12 years (range, 3-25 years) from the index recementing operation. Four hips (5.8%) were infected and converted to resection arthroplasty at a mean of 7 years (range, 4-10 years) postoperatively. Other complications were 2 dislocations (one occurred postoperatively and converted to resection arthroplasty, and the other one the first year after surgery that reduced under general anesthesia), 3 periprosthetic fractures occurred at 4 months, 7 and 13 years postoperatively (2 fractures treated with open reduction and internal fixation and 1 with revision of the stem), and 1 peroneal palsy treated by a posterior tibialis tendon transfer 2 years later.

Thirty-three patients (34 hips) died at a mean of 15 years (range, 2-32 years) after the index operation with the recemented prosthesis in place. The mean age of these patients at the time of death was 79 years (range, 64-91 years). At the most recent follow-up, 14 patients (14 hips) were alive retaining the recemented implant for a mean of 25 years (range, 21-35 years) after the index operation. Their mean age was 76 years (range, 50-95 years; Fig. 1).

Clinical rating, according to the modified Charnley score system, was obtained from the 14 patients (14 hips) who were alive retaining the recemented femoral components. At the final follow-up, 5 patients were free of pain (6 points) and 9 had slight pain on starting to walk (5 points). Eight patients walked normally or with slight limp without the need of a stick (5 and 6 points), one patient walked long distances with a stick (4 points) and one limited distances with one stick (3 points). Four patients had limited walking ability (2 points). Twelve hips had more than 160° total range of motion (5 and 6 points) and 2 hips had 100°-160° total range of motion (4 points). Obviously, function (walking ability) had declined with age and cannot be correlated with the index operation. In addition, pre-recementing functional data were recorded at a very low range as walking was limited because of loose component or a broken stem. On the latest radiograph, 7 femoral components were "well-fixed," 5 "possibly" and 2 "probably loose."

The 23-year probability of survival for the recemented femoral components, with re-revision for any reason and resection arthroplasty as the end point, was 73.6% (61.8%-85.4%) and, with re-revision for aseptic loosening as the end point was 82.2%