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Research Article

7 - 14 year Results of a Modular, Distal Fixation, Revision Femoral Component

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Abstract

Performing revision THR (Total Hip Replacement) presents many challenges to restore joint kinematics whilst ensuring a stable and durable component fixation. This uncemented modular, distal fixation revision femoral component allows the surgical team to overcome the challenges of revision hip surgery by compensating for varying degrees of bone loss and soft tissue compromise. Previous follow up studies of this femoral stem have demonstrated survivorship of 93 - 98% in the short to mid-term with significant improvement in functional outcome. There are no published studies reporting the survivorship for the ZMR® beyond 10 years.

We present our consecutive case series of ZMR® femoral components in the mid to long term.

Between 2002 and 2006 31 hips in 31 patients mean age 66 were followed up radiologically and clinically using Oxford Hip Score. No patients were lost to follow up in this study. Mean follow up both clinically and radiologically was 9.7 years (7 - 14).

Survivorship with revision for any reason being defined as a failure was 97%. One patient required revision of whole construct, one painful neuroma, one dislocation and four deep vein thromboses. No stems subsided more than 2mm, mean Oxford Hip score 30.4 (6 - 48).

The ZMR® femoral stem continues to show good survivorship in the longer term and remains a valid, reproducible technique for revision arthroplasty with proximal femoral bone loss.

Keywords: *Revision Arthroplasty; Revision Hip Replacement; Uncemented Revision Stem; Distal Fixation Revision Hip Arthroplasty*

Abbreviations

THR: Total Hip Replacement; PACS: Patient Archive and Communication System; TO: Trochanteric Osteotomy; ETO: Extended Trochanteric Osteotomy

Introduction

Performing revision THR (Total Hip Replacement) presents many challenges to restore joint kinematics whilst ensuring a stable and durable component fixation. In cemented revision, femoral stems the shear interface strength has been shown to reduce to approximately 20% of that for a primary stem [1] and poor survivorship is reported which makes them less favourable than uncemented femoral components [2-4]. Proximal porous coated stems do not achieve a stable fixation due to osteolysis from aseptic loosening producing significant metaphyseal femoral bone defects and survivorship is poor [5,6]. Uncemented stems that rely on a distal fixation of at least 4 - 7 cm for stability have had consistently low failure rates [7-9]. The ZMR® Hip System (Zimmer, Inc, Warsaw, Indiana) is a modular revision system. The femoral component of this system has an uncemented, distal fixation design and offers several options to the surgeon. There are porous, slotted porous, spline and taper stems available in a variety of diameters and lengths. A metaphyseal fill is achieved with a choice of cone, calcar or spout body which can be decided upon intraoperatively. The system allows the surgical team to overcome the challenges of revision hip surgery by compensating for varying degrees of bone loss and soft tissue compromise. Previous follow up studies of the ZMR®

femoral stem have demonstrated survivorship of 93 - 98% in the short to mid-term with significant improvement in functional outcome [10-12]. There are no published studies reporting the survivorship for the ZMR® beyond 10 years.

We present our consecutive case series of ZMR® femoral components in the mid to long term.

Patients and Methods

We retrospectively reviewed our clinical and radiological results of patients who has a first-time revision total hip arthroplasty using the ZMR® system.

Between March 2002 and February 2006, we identified 31 patients who had undergone this procedure performed by a Consultant Arthroplasty Surgeon in our unit. Five of these cases were second stage revision procedures for infection. There were 9 female and 22 males in this cohort. The mean age of the patients was 66 (50-83).

The surgeons preferred approach was performed and an extended trochanteric osteotomy was required in 3 cases in order to remove the previous implant. After this the femoral canal was prepared with sequential conical reamers until there was tight cortical contact. The surgeon then assessed bone stock and quality before choosing an appropriate stem. The proximal body was then chosen based on leg length, offset and version required as well as proximal fill.

Patients were followed up clinically with post-operative Oxford Hip Scores and patient satisfaction score (0 - 4, 0 being unsatisfied and 4 being very satisfied). All patients had been followed up radiographically annually to assess for evidence of subsidence or signs of failure and these images were reviewed by the primary author using our PACS system and assessed measuring the distance from the tip of the greater trochanter to the top of the femoral implant on sequential images. The radiographs were also reviewed for osseointegration of the femoral component.

No patients were lost to follow up in this study. Mean follow up both clinically and radiologically was 9.7 years (7 - 14).

Indications for revision are outlined in table 1 below. Surgical details and specifics of the implants are shown in table 2.

Indication for revision	Patient numbers
Infection	6
Aseptic loosening	23
Conversion of excision arthroplasty	1
Periprosthetic fracture	1

Table 1: *Indications for revision.*

Patient	Approach	Stem type	Stem sizes (mm)	Body type
1	Posterior	Porous	170 x 12	Spout A 40 x 35
2	Trochanteric Osteotomy (TO)	Porous	115 x 13.5	Spout B 46 x 45
3	Posterior	Porous	115 x 15	Spout B 46 x 45
4	Posterior	Tapered	185 x 19	Spout A 46 x 35
5	TO	Tapered	70 x 18	Spout D 46 x 45
6	Anterolateral	Tapered	185 x 19	Cone AA 36x35
7	TO	Porous	115 x 15	Cone C 46x55
8	Posterior	Spline	115 x 12	Spout A 46X35

9	TO	Tapered	185 x 20	XL 78X40
10	Posterior, Extended TO (ETO)	Tapered	135 x 14	Cone A 46x55
11	TO	Spline	115 x 13.5	Spout A 40x35
12	TO	Tapered	14 x 185	Spout A 46x35
13	Posterior, ETO	Porous	115 x 13.5	Cone A 36x45
14	TO	Porous	170 x 19	Spout E 46x45
15	TO	Tapered	135 x 17	Cone A 40x35
16	TO	Tapered	135 x 17	Cone A 40x35
17	ETO	Tapered	135 x 16	Cone B 46x35
18	Posterior	Tapered	135 x 15	Cone B 40x35
19	TO	Porous	185 x 16	Calcar A 40x35
20	Posterior	Porous	185 x 85	Spout A 4x35
21	Posterior	Spline	115 x 16.5	Spout B 45x35
22	TO	Spline	135 x 13.5	Cone A 46x55
23	Anterolateral	Tapered	135 x 15	Cone A 40x35
24	Posterior	Tapered	135 x 19	Spout D 46x35
25	Posterior	Porous	115 x 16.5	Spout D 46x45
26	TO	Tapered	235 x 19	XL 93 extended offset
27	TO	Tapered	185 x 21	Cone B 40x35
28	Posterior	Tapered	185 x 18	Spout B 40x35
29	Posterior	Tapered	235 x 17	Cone C 46x45
30	TO	Tapered	235 x 19	Cone C 46x45
31	TO	Porous	170 x 16.5	

Table 2: *Surgical and Implant details.*

Results

One patient required revision of the entire construct for infection and one hip was extensively investigated for post op pain around the scar for neuroma. One hip dislocated and required closed reduction only. Other complications included 4 deep vein thromboses.

Other than the one revised stem, all of the femoral components achieved osseointegration. None of the stems subsided greater than 2 mm, accepting the limitations of the measuring tool of our PACS system with a mean subsidence of 1.6 mm.

Average post-operative Oxford Scores are 30.4 (6 - 48) at a mean of 9.7 years (7 - 14) and patient satisfaction scores had a mean of 3.2 (0 - 4).

Survival of the femoral component with revision for any reason being defined as a failure was 97%.

Discussion

Revision hip arthroplasty is often complex and challenging. A surgeon may face poorer quality soft tissues and bony defects and cemented revision implants have been shown to be poor with failure rates of between 17 and 60% at 2 - 8 years follow up [2-4]. Conversely uncemented distal fixation femoral devices have been reported to be successful [8,13].

The ZMR® femoral component allows surgeons modularity in its design to cope with these problems and aid in reconstruction. It provides a distal fixation concept but combines that with modularity proximally. It comes in a number of designs including extensively porous, tapered and splines.

Good short to midterm results for the ZMR® have been described by several authors [10-12].

Kang., *et al*. [10] reported their series of 39 hips at 2-5 years which showed significant improvements in functional scores but 5 hips showing significant subsidence greater than 5mm. Ovesen., *et al*. [11] showed a 94% survival between 2 and 7 years. Similarly, Lakstein., et al. [12] showed a 93.4% survival at 5 - 10 years follow up. Summaries of the published literature on the subject are outlined in table 3 below.

Primary Author	Number of hips	Mean age	F/U (years)	Implants	Survival
Kang	39	67	2 - 5	Porous/Tapered	98%
Ovesen	125	68	2 - 7	Tapered	94%
Lakstein	72	70	5 - 10	Porous	93.8%
Banks	31	66	7 - 14	Porous/Tapered/Spline	97%

Reported complications in these studies include femoral perforations, dislocations, peroneal palsy, infection and trochanter escape. All studies report subsidence, with significant subsidence reported in a small proportion in each study.

Our cohort shows excellent survival in the midterm using the stem with no increase in the complication rate in comparison to previous studies. Our survivorship is similar to other cementless femoral revisions in the midterm [4,8,9,13].

None of our stems had subsided significantly which is in contrast to previous work. We put this down to meticulous attention to proximal and distal fill within the medullary cavity.

Other studies of the ZMR® system reported on Harris Hip scores with post-operative scores of 72 - 85, a significant increase on pre-operative scores [10-12]. In our study Oxford Hip scores were recorded, so direct comparison is not possible. However, in this study the oxford hip scores demonstrated good post-operative function and high patient satisfaction scores indicate the stem continues to perform well after initial reported positive results.

Conclusion

This case series showed that the ZMR® femoral stem continues to show good survivorship in the longer term and remains a valid, reproducible technique for revision arthroplasty with proximal femoral bone loss. Further evaluation with longer term follow up with larger series are required to show demonstrate any superiority over other systems.

Conflict of Interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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