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Short and midterm functional and radiological outcomes of revision total hip arthroplasty with uncemented extensively porous coated monoblock cylindrical femoral stems

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ABSTRACT

Background: This retrospective cohort study examines clinical and radiological outcomes of revision total hip arthroplasty (THA) using uncemented extensively porous coated mono block femoral stems.
Methods: Patients who were operated for revision THA at medical college Baroda, between January 2008 to December 2018, and who had at least 36 months follow up were included in the study. Details were retrieved from hospital records. Harris hip score (HHS) was used for functional outcome and Paprosky classification was used for femoral bone defects.
Results: Mean age of patients was 60.1 year (range 35-86 years), mean follow up was 84 months (range 40-126 months), Paprosky type 1 defect was found in 4 hips, type 2 was found in 20 hips and type 3a defect was found in 21 hips. Mean HHS improved from pre-operative 30 to post-operative 78 (p=0.0104). Expected survival at 5 and 10 years was more than 95%. No stem was loose at the end of follow up. Thigh pain and proximal osteolysis were most common complications.
Conclusions: Extensively porous coated cylindrical stems give good functional and radiological outcomes at short and midterm follow up.

Keywords: Revision THA, Revision total hip replacement, Fully porous coated femoral stems, Solution stem

INTRODUCTION

Choice of femoral implant in revision THA depends on the available bone stock.[1] To achieve stability in the scenario of extensive bone loss, distal fitting stems are the only viable option.[2] Extensively porous coated cobalt chromium (Co-Cr) cylindrical stems are commonly used in our institute to address femoral bone defects in revision THA. Co-Cr mono block extensively porous coated stems provide good implant and diaphyseal bone integration in cases with metaphyseal bone loss.[3] Worldwide recent literature is showing preference of using titanium fluted tapered long stems in revision THA.[4,5] In this study we are describing functional and radiological outcomes of revision THA patients treated by extensively porous coated cylindrical mono block femoral stem at short and midterm follow up.

METHODS

This retrospective cohort study was conducted at the medical college Baroda, Baroda, Gujarat. All the patients who were operated for revision THA using extensively porous coated cylindrical mono block CoCr stem at our hospital between January 2008 to December 2018 were included. Patients who were lost to follow up, had less than 36 months of follow up, or missing data were excluded from the study. This study was approved by the institutional ethical committee.

Details of the patients were retrieved from the hospital registers. Case records were reviewed for patient demographic details, surgery details and details of implants used. Indication for THA, cause of failure of THA, date of revision surgery, duration of survival of

implant were noted. Pre and post operative radiographs were analyzed for classification of defects. Paprosky classification was used for the defects.[6,7]Any complications during or after surgery were noted. Sequential follow up radiographs were analyzed to check for subsidence. Follow up details were retrieved from patients' records.

Surgical technique of revision THA

Routinely all patients were checked for signs of peri prosthetic hip joint infection before revision surgery. Hip aspiration and synovial fluid analysis and culture were done. In the case of infection, 2 stage revision was done. All patients were operated through either posterolateral or direct lateral approach for index and revision THA. All patients were operated under general anesthesia. Implant removal was done with or without extended trochanteric osteotomy. Thorough debridement was done. Type of bone loss was assessed and the decision to use an extensively porous coated cylindrical stem was made during surgery by the operating surgeon. Sequential reaming of the femoral canal was done, followed by trial implantation. scratch fit of the stem was aimed for good fixation. Extended trochanteric osteotomy was closed with encircle wires. Allografts were used for larger defects of lateral femoral cortex. The wound was closed in layers.

Rehabilitation and follow up

All patients were given thromboprophylaxis according to hospital protocol. Patients were discharged home after adequate mobilization. All patients were kept non-weight bearing for 2 weeks, and toe touch weight bearing was started after that. Partial weight bearing was allowed after 4 weeks. Physical therapy was carried on up to 12 weeks at patients' home. Routinely, patients come for follow up 6 weeks, 12 weeks, 6 months and 1 year after the surgery, and yearly once thereafter. Functional outcomes were recorded and X-rays were taken on each visit. HHS was used to document the functional outcome.

Statistical analysis

Descriptive data was described using mean. Paired t-test and chi squared test were applied to find a correlation. All data was managed by Microsoft excel (Microsoft corporation, US) software.

RESULTS

Three patients had less than 36 months of follow up, and in 7 patients details of final follow up or X rays were missing, and hence a total 10 patients (11 hips) were excluded. Forty-five hip joints from 40 patients were included in the study. There were 23 males and 20 females. Mean age of patients at the time of surgery was 60.1 year (range 35-86 years). Mean follow up period was 84 months (range 40-126 months). All patients received “Solution” stem (Depuy Orthopaedics, Inc; Warsaw, IN, USA). Causes of failure of primary THA were aseptic loosening in 26 hips, periprosthetic joint infection in 8 hips, periprosthetic fracture in 6 hips, recurrent instability in 3 hips and stem fracture in 2 hips.

Femoral defects were classified according to Paprosky classification of femoral bone defects. Paprosky type 1 defect was found in 4 hips, type 2 was found in 20 hips and type 3a defect was found in 21 hips. All THA failures due to periprosthetic joint infection were operated in 2 stage revision method. In the first stage, cement spacer was implanted, and bone defects were classified after removal of the cement spacer. Osteolysis in the final follow-up x ray was compared with the immediate post op x ray in all the patients. HHS was retrieved for each patient through records of the last follow up.

Mean HHS before the revision THA was 30 (range 11-45), which improved to 78 (range 48-98). The improvement in the HHS is statistically significant as measured by the paired t test (p=0.0104). Sub group analysis according to causes of failure of THA did not reveal any correlation by chi squared test.

Table 1: Demographic details of the patients.

Variables	N
Total number of patients	40
Total number of hips	45
Female patients	20
Mean age (Years)	60.1 (range 35-86)
Side of surgery (Right: left)	24:21
Follow up (months)	84 (range 40-126)
Indications for revision	
Aseptic loosening	26
Periprosthetic joint infection	8
Periprosthetic fracture	6
Instability	3
Stem fracture	2
Paprosky class of femoral defect	
Paprosky type 1	4
Paprosky type 2	20
Paprosky type 3a	21
Stem length (mm)	
152	9
200	25
254	11
Mean stem diameter	13.5
Head size mm	
22	4
28	18
32	19
36	4
Bowed stem	6

Out of 45 hips, 35 were operated by posterolateral (modified Gibson’s) approach and 10 were operated by direct lateral (Hardinge) approach. Extended trochanteric

osteotomy was done in 14 patients. All extended trochanteric osteotomies were stabilized by encirclage wires or cables. All osteotomies were spanned with appropriate length of stem. Post operative toe touch weight bearing was allowed from post op day 1. Strut allograft made from tibia was used in 6 patients to augment the lateral cortex.

We found complications as mentioned in table 2. No stem was revised till the time of last follow up. One cortical perforation happened during surgery which was addressed by using bowed stem at the time of surgery. Two hips got dislocated, each 2 times, one of them was revised for dual mobility head and acetabular shell revision after 45 weeks of revision THA. Proximal stress shielding was evident in 4 hips, but none of them showed any sign of stem loosening. One superficial infection was cured by superficial debridement, while 2 non infective wound gaping required re suturing of wound. Abductor weakness and lurch was found in 4 patients, all were old age (mean age 68.5 year) and all were operated for two stage revision for peri prosthetic joint infection. Significant thigh pain was found in 5 hips. Out of 40 patients, 31 were not using any assistive device for ambulation, while 3 used stick support and 6 used walker support for walking.

Table 2: Complications of revision THA until last follow up.

Complication	Number of hips (%)
Cortical perforation	1 (2.2)
Aseptic loosening	0
Periprosthetic fracture	0
Periprosthetic joint infection	1 (2.2)
Wound gaping	2 (4.4)
Abductor weakness	4 (8.8)
Instability	2 (4.4)
Thigh pain	5 (11.1)
Proximal osteolysis	4 (8.8)

DISCUSSION

Selection of femoral implant in revision THA is guided by the amount of bone loss. Paprosky classification of femoral bone loss is most commonly used because it classifies the bone loss and guides treatment and implant selection.[6] Studies have shown that for cylindrical stems to osteointegrate, 4 cm length of intact diaphyseal bone is needed.[8,9] So, for Paprosky type 1, 2 and 3a defects, long cylindrical stems can be used, while for Paprosky type 3b and 4 defects, proximal femoral replacement should be considered.[10] Some unique complications seen with use of mono block Co-Cr extensively coated cylindrical stems are stem fracture, thigh pain, proximal stress shielding.[11] As these stems directly fit into the diaphysis, gives rise to all these complications.[12] Recent studies have shown superior performance of conical tapered titanium mono block and modular stems in revision THA, but rate of subsidence is slightly higher than cylindrical stems.[13] Modular stems need preparation of proximal and distal bone parts carefully to prevent complications like stem fracture and early failure.[14]

Survival studies for long term results of extensively porous coated stems have consistently shown 10-year survival rates above 95%.[15] We have found only 1 failure due to recurrent dislocation, and the stem was well fixed in that patient. All cause revision set as an end point. Kaplan Meier analysis gives 5- and 10-year survival above 95%. Studies have found the incidence of thigh pain in up to 16% of patients, and that increases with use of larger diameter stem due to the high specific strength of Co-Cr alloy.[16,17] Abductor weakness was found in 4 patients, that was due to multiple surgery due to periprosthetic joint infection in 2 patients, and old age (mean 70 years) in two patients. Extensile approaches in revision surgeries are responsible for weakness of abductors.

Limitations

The major limitation of this study was its retrospective nature. The sample size is small and there is no comparison group. Patients were at various stages of time duration from the revision THA surgery. The follow up period is short, so as long-term complications like difficulty in repeat revision after using this stem due to proximal stress shielding is not assessed, which may be important in younger patients undergoing revision THA.

CONCLUSION

Use of extensively porous coated long cylindrical stems for revision THA gives excellent mid- and short-term results with improvement in function with good survival and low complication rate.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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