International Journal of Research in Orthopaedics
Kapila R et al. Int J Res Orthop. 2019 May;5(3):449-453
http://www.ijoro.org

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20191782

Original Research Article

Functional outcome of total hip replacement using a short stem implant

Rajiv Kapila[1]*, Mukand Lal[2], Preeti Takkar Kapila[3]

[1]Department of Orthopedics, [3]Department of Radiodiagnosis, Dr. Rajendra Prasad Government Medical College, Tanda, Kangra, Himachal Pradesh, India
[2]Department of Orthopedics, Surgery and Rehabilitation, Indira Gandhi Medical College, Shimla, Himachal Pradesh, India

Received: 10 November 2018
Revised: 11 February 2019
Accepted: 16 February 2019

***Correspondence:**
Dr. Rajiv Kapila,
E-mail: drrajivkapila@yahoo.co.in

ABSTRACT

Background: Conventional cementless THA is associated with stress shielding of the proximal femur and thigh pain. Short femoral stem can conserve bone, reduce stress shielding in the femur and reduce thigh pain. The present study aims to describe the functional outcomes associated with short stem metaphyseal implant in THA in our department.
Methods: This prospective study was conducted in the Department of Orthopaedic Surgery, Indira Gandhi Medical College, Shimla among patients who needed THA for painful disabling hip. Modified Harris hip scores (HHS) were assessed for all patients pre-operatively and at their final follow up.
Results: During the study period, a total of 20 patients were included in the study, 20% of them were females. The most common indication for THA was avascular necrosis head of femur with secondary osteomyelitis (n=14), of which 12 cases had excellent Hip Harris Score while two were in good category. Modified Harris hip score was excellent in patients where early partial and full weight bearing was started. Per-operatively, there was only one complication of fracture greater trochanter which was fixed with cerclage wire. In early post-operative period, two cases of superficial infection were noted and one case of varus malposition was present. In late post operative period, there were three cases of varus malposition and one case of deep infection as sinus.
Conclusions: Total hip replacement with short anatomical metaphyseal loading stem improved the modified Harris Hip score significantly, with very few complications. Future multicentric studies are needed to evaluate the efficacy of short stem implants over a long follow up period.

Keywords: Anatomic short stem, Cementless stem, Total hip arthroplasty

INTRODUCTION

Total hip arthroplasty (THA) is a common orthopaedic procedure. For patients with hip pain due to a variety of conditions, THA can relieve pain, can restore function, and can improve quality of life. Despite the documented success of THA implants, uncemented stems present specific challenges, like the presence of proximal metaphyseal-distal diaphyseal mismatch in patients with excessively bowed femurs and large cancellous metaphyses, the ease of removal for revision surgery and the facilitation of minimally invasive approaches, such as the direct anterior approach.[1] Moreover, conventional cementless THA is associated with stress shielding of the proximal femur and thigh pain.[2,3] THA using a short femoral stem is particularly popular among younger patients in whom hip resurfacing is not appropriate, as it is associated with adverse reactions secondary to metal-on-metal articulation. The first concept of the short stem was designed by Judet and Judet, though the long term results were not satisfactory.[4] However, short femoral stem can conserve bone, reduce stress shielding in the

femur and reduce thigh pain.[5,6] The present study aims to describe the functional outcomes associated with short stem metaphyseal implant in THA in our department.

METHODS

This prospective study was conducted in the Department of Orthopaedic Surgery, Indira Gandhi Medical College, Shimla from February 2007 till February 2009. Patients with good bone stock, longer life expectancy and those who needed THA for painful disabling hip were included in the study. We excluded patients with life expectancy less than 15 years, soft osteoporotic bones, those needing a revision or conversion surgery, those who had fracture neck femur beyond sub-capital region, active infection of hip joint, insufficiency of abductor mechanism and with hips unsuitable for short anatomical metaphyseal loading stem on templating. The study was approved by the institutional ethics committee. Patients were explained the purpose of the study and a separate informed consent was obtained from all patients before being included in the study.

All patients underwent routine and specific laboratory and radiological investigations. Pre-anesthestic assessment was obtained and an informed consent for surgery was taken from the patient or their first degree relative. A short anatomical metaphyseal loading stem femoral implant (Hip Proxima, Johnson and Johnson) was used for uncemented THA with bone conservation principle. Appropriate implants were chosen by templating and anticipating unusual needs during surgery. Acetabular template that corresponded most closely to subchondral bone plate with adequate lateral coverage was placed in appropriate position, and hip's new center of rotation was marked. Femoral template that most closely matched proximal and distal size and contour of femoral metaphysis was placed in correct orientation. Femoral size was confirmed on Lowenstein lateral view. Prophylactic intravenous antibiotics were used post-operatively, followed by oral antibiotics. Suction drains were removed a day after surgery. Physiotherapy in the postoperative period involved static exercises in bed on the first postoperative day. Partial weight bearing with walker was started from the second post-operative day and was continued for the next six weeks. Progression to full weight bearing was done gradually after six weeks following a clinical and radiological examination. Active hip mobilization, muscle strengthening exercises were continued. All patients were followed up at six week interval for at least 6 months post-operatively.

A pre-tested semi-structured questionnaire was used to note patient related data. Baseline demographic and clinical data were obtained from the patient or their hospital clinical records. Indication for surgery was noted for all patients and its relation to intra-operative findings like type of anesthesia, additional soft tissue release and suction drainage were analysed. Modified Harris Hip Score (HHS) has demonstrated validity and responsiveness in cohort of patients with proximal femur fracture and was assessed for all patients pre-operatively and at their final follow up in the present study. Quantitative variables were described as mean and standard deviation and qualitative variables as frequency and percentages. All analysis were performed in Epi Info.[7]

RESULTS

During the study period, a total of 20 patients were included in the study, 20% of them were females. Right leg was affected in eleven patients (Table 1). The most common indication for THA was avascular necrosis head of femur with secondary osteomyelitis (n=14). Other common indications were polyarticular rheumatoid (n=4), fracture neck femur with ankylosing spondylitis (n=1) and Perthes' disease (n=1). Intraoperative change of plan was done in three cases, in two cases because of soft osteoporotic bony status found preoperatively and in one case due to smaller diameter of metaphysis than smallest size of proxima implant available. In patients with avascular necrosis (n=14), 12 cases had excellent Hip Harris Score while two were in good category. In polyarticular rheumatoid, out of four cases three were in excellent category and one in good category. Further, we found that the Modified Harris hip score was excellent in 12 cases where duration of surgery was 136-160 minutes and in four cases where duration of surgery was 161-185 minutes. Modified Harris hip score was excellent in patients where partial and full weight bearing was started at 1 to 2 weeks and 5 to 6 weeks respectively (Table 2).

Table 1: Baseline demographic and clinical information of the patients included in the study.

Variables	N (%)
Age distribution (in years)	
20 to 30	02 (10)
31 to 40	02 (10)
41 to 50	13 (65)
51 to 60	03 (15)
Gender distribution	
Males	16 (80)
Females	04 (20)
Side affected	
Right	11 (58)
Left	07 (37)
Bilateral	01 (05)
Indication of surgery	
Fracture neck femur with ankylosing spondylitis	01 (05)
Polyarticular rheumatoid	04 (20)
Avascular necrosis head of femur with secondary osteoarthritis	14 (70)
Perthes' disease	01 (05)

Table 2: Comparing Harris hip score in relation to different patient related variables.

	Modified Harris hip sore			
	90-100 (Excellent)	**80-89 (Good)**	**70-79 (Fair)**	**<70 (Poor)**
Indications for surgery				
Fracture neck femur with Ankylosing spondylitis	1	0	0	0
Avascular necrosis head of femur	12	2	0	0
Polyarticular rheumatoid	3	1	0	0
Perthes disease	0	1	0	0
Duration of surgery (in minutes)				
110 to 135	0	2	0	0
136 to 160	12	0	0	0
161 to 185	4	2	0	0
More than 186	0	0	0	0
Total	16	4	0	0
Partial weight bearing (in weeks)				
1 to 2	16	0	0	0
3 to 4	0	2	0	0
5 to 6	0	2	0	0
7 to 8	0	0	0	0
Full weight bearing (in weeks)				
5 to 6	16	0	0	0
7 to 8	0	2	0	0
More than 8	0	2	0	0
Follow up periods				
Preoperative	0	0	0	20
Postoperative	0	0	0	20
Sixth week	0	14	6	0
Last follow up	16	4	0	0

Table 3: Complications reported in the patients included in the study.

Type of complication	Per-operative	Early post- operative	Late post- operative
Nil	19	17	16
Varus mal position	0	1	3
Fracture proximal shaft femur	0	0	0
Fracture greater trochanter	1	0	0
Superficial infection	0	2	0
Hypotension	0	0	0
Deep infection	0	0	1
Shortening	0	0	0
Irritation of sciatic nerve	0	0	0

Pre-operatively, the modified Harris Hip score was poor in all patients, which continued in the early post-operative period as well. When assessed at sixth week post-operatively, the modified Harris Hip score was good in 14 patients and fair in 6 patients. At the last follow up, 16 patients had an excellent assessment according to the modified Harris Hips score and 4 had a good score. Per-operatively, there was only one complication of fracture greater trochanter which was fixed with cerclage wire. In early post-operative period, two cases of superficial infection were noted and one case of varus malposition was present. In late post operative period, there were three cases of varus malposition and one case of deep infection as sinus. At about one year and nine months follow-up, endosteal weld spots were seen in one patient in Zone 2.

DISCUSSION

The present study describes our experience of managing patients with short anatomical metaphyseal loading stem femoral implant (Hip Proxima, Johnson and Johnson) for uncemented THA with bone conservation principle. In this study we analysed functional outcome of 20 hips operated at our centre during the study period. During the follow up period, average modified Harris hip score

improved from 32 to 91. With the use of a similar implant, Choi et al demonstrated a significant improvement from 45 preoperatively to 98 at the last follow-up.[8] Ghera and Pavan, similarly, reported improvement in modified Harris Hip score from 51 pre-operatively to 91 at the last follow up.[9] Kim et al followed their patients for a mean duration of 4.5 years and demonstrated no discernible sites of resorption or only slight rounding off of osteomized neck.[10]

Avascular necrosis of femoral head was the most common indication and out of 14 cases, 12 had a final modified Harris Hip score of more than 90 and remaining two had a score of 86. There is a lack of consensus in the literature about the most appropriate arthroplasty method for patients with progressive avascular necrosis of femoral head. Due to the frequent young age of patients with avascular necrosis, the THA would ideally preserve bone mass as well to allow more options if revision is needed in the future. Recently, the number of cementless, short-stem THAs has increased. The implantation of short-stem THAs enables further options for revision with implantation of a standard THA in the event of loosening due to a higher resection height and a different fixation pattern. Furthermore, in our study, there were a total of 16 patients with excellent modified Harris Hip score, of which 12 had a duration of surgery as 136 to 160 minutes. However, the score was not observed to depend on the duration, as the duration was more in cases requiring extensive tissue release. Early partial weight bearing was done in 16 patients as stem was supposed to take some time for osteo-integration. In four cases partial weight bearing was delayed in one case owing to fracture of the greater trochanter during surgery and others due to varus malposition. Similarly, modified Harris Hip score was excellent in patients who underwent full weight bearing early (5 to 6 weeks).

It has been noted that stem position is linked to implant survival. Learning curve and prosthesis design are known variables for proper prosthesis placement. Per-operatively, one patient had a fracture of the greater trochanter. In the early post-operative period, two patients had superficial infection and one had a varus mal position. In the late post-operative period, one patient had a deep infection and three had varus mal position. Varus malalignment, especially in cemented implants, has been shown to impact negatively on implant survival.[11] However, many studies evaluating cementless implants have failed to show any difference.[12]

There are a few limitations in this study. First, this is a non-comparative study. Without comparing the results with another surgical technique or implant, the results might not be be helpful in guiding a surgeon's practice. Second, the follow up duration was relatively short. Choi et al commented in their study that a minimum period of 10 years is necessary to assess the functional outcomes of THA using short stem.**Error! Bookmark not defined.** Lastly, unless a standard surgical technique is employed when using this implant, the results of our study cannot be compared with the results of studies done at other centres.

CONCLUSION

Total hip replacement with short anatomical metaphyseal loading stem improved the modified Harris Hip score significantly, with very few complications. Patients who had an early full weight bearing were found to have excellent modified Harris Hip scores. Additionally, our results show that use of short stem implant result in favourable functional outcomes in young population. Future multicentric studies are needed to evaluate the efficacy of short stem implants over a long follow up period.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Chimento GF, Pavone V, Sharrock N, Kahn B, Cahill J, Sculco TP. Minimally invasive total hip arthroplasty:a prospective randomized study. The Journal of arthroplasty. 2005;20(2):139-44.
2. Engh CA Jr, Young AM, Engh CA Sr, Hopper RH Jr. Clinical consequences of stress shielding after porous-coated total hip arthroplasty. Clin Orthop Relat Res 2003;417:157–63.
3. Fumero S, Dettoni A, Gallinaro M, Crova M. Thigh pain in cementless hip replacement. Clinical and radiographic correlations. Ital J Orthop Traumatol 1992;18:167–72.
4. Judet J, Judet R. The use of an artificial femoral head for arthroplasty of the hip joint. J Bone Joint Surg Br. 1950;32:166-73.
5. Renkawitz T, Santori FS, Grifka J, Valverde C, Morlock MM, Learmonth ID. A new short uncemented, proximally fixed anatomic femoral implant with a prominent lateral are: design rationals and study design of an international clinical trial. BMC Musculoskelet Disord 2008;9:147.
6. Kulkarni M, Wylde V, Aspros D, Learmonth ID. Early clinical experience with a metaphyseal loading implant: Why have a stem? Hip Int 2006;16(Suppl 3):3–8.
7. Dean AG, Sullivan KM, Soe MM. OpenEpi: Open Source Epidemiologic Statistics for Public Health. Available at: http://www.openepi.com. Accessed on 22 October 2018.
8. Choi YW, Kim SG. The short-term clinical outcome of total hip arthroplasty using short metaphyseal loading femoral stem. Hip Pelvis. 2016;28(2):82-9.
9. Ghera S, Pavan L. The DePuy Proxima hip:a short stem for total hip arthroplasty. Early experience and technical considerations. Hip Int. 2009;19:215-20.

10. Kim YH, Kim JS, Oh SH, Kim JM. Comparison of porous-coated titanium femoral stems with and without hydroxyapatite coating. J Bone Joint Surg Am. 2003;85:1682-8.
11. Kobayashi S, Takaoka K, Saito N, Hisa K. Factors affecting aseptic failure of fixation after primary Charnley total hip arthroplasty: multivariate survival analysis. JBJS. 1997;79(11):1618-27.
12. Berend KR, Mallory TH, Lombardi Jr AV, Dodds KL, Adams JB. Tapered cementless femoral stem: difficult to place in varus but performs well in those rare cases. Orthopedics. 2007;30(4):295-7.

Cite this article as: Kapila R, Lal M, Kapila PT. Functional outcome of total hip replacement using a short stem implant. Int J Res Orthop 2019;5:449-53.