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Research Article

Long-Term Follow-Up Result of Short Metaphyseal Femoral Stem in Primary Total Hip Arthroplasty: A Retrospective Study

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ISSN: 2578-0379

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Submission: September 06, 2024
Published: October 01, 2024

Volume 6 - Issue 1

How to cite this article: Manoj Kumar, Vivek P Ksheerasagar*, Akash Kumar Ghosh, Ayush Sharma and Mukund Lal. Long-Term Follow-Up Result of Short Metaphyseal Femoral Stem in Primary Total Hip Arthroplasty: A Retrospective Study. Surg Med Open Acc J. 6(1). SMOAJ.000626. 2024.
DOI: 10.31031/SMOAJ.2024.06.000626

Abstract

Introduction: Given the increasing demand for improved quality of life, there has been an uptrend in the Total Hip Arthroplasty (THA) combined with prolonged life expectancy will eventually increase the number of revision surgeries to be performed. Stress shielding is one of the major problems with regular femoral stems used in THA which makes revision surgery difficult especially in younger patients. Hence the renewed interest in investigating the safety and functional outcomes of the short metaphyseal femoral stems which can potentially mitigate this problem and can make revision surgery easier. This study was done to know the outcome of THA with short stem in long-term follow-up.

Methods: In this study we included a total of 124 hips who underwent THA using short femoral stem (TRILOCK® Depuy) between May 2006 and November 2008. Patients were followed-up for a period of 15 years. Results were assessed for pain relief, range of motion of hip joint & improvement of mobility, and functional outcome using Modified Harris hip score, OXFORD & WOMAC scores.

Results: A total of 124 hips in 98 patients were included in the study. We found significant improvement in functional outcomes on long term follow-up of 15 years and no incidence of subsidence, implant loosening or any complication requiring revision surgery till 15-year follow-up. No complications were found in any of the patients except for heterotopic ossification noted in one patient.

Conclusion: Short metaphyseal stem can be used safely in patients with adequate bone support to preserve the bony and soft tissue anatomy as it gives better functional outcomes with earlier mobilisation. Even on long-term follow-up, we found no reports of subsidence, implant loosening or bone loss due to stress shielding. This will also help in simplifying the revision by preserving bone stock especially in younger patients.

Keywords: Hip arthroplasty; Hip replacement; Metaphyseal stem; Surgery

Introduction

The need for better quality of life has led to the extension of Total Hip Arthroplasty (THA) in younger patients. However, prolonged life expectancy and improved quality of life over the recent past have led to the need for multiple revision surgeries for these younger patients. These revision surgeries are encountered with numerous technical difficulties because of the bone and soft tissue loss, distorted anatomy or other problems of multiple surgeries. In THA using a conventional femoral stem, there is more bone loss due to stress shielding which makes revision surgery difficult [1,2] mainly in younger age patients who may require more surgeries in the future. Hence a search for alternate options led to the modification of the implant, technique of the procedure and patient selection. One of the advancements is to attain more proximal femoral load transfer to reduce proximal stress shielding which helps to preserve bone stock for potential revision surgery. One way to achieve this could be the use of short-stem femoral components [3]. As most of these short stems are relatively new, there is little long-term evidence regarding their clinical and radiological outcome. Keeping this in

mind it is considered worthwhile to study the functional outcomes and complications of total hip arthroplasty with a short stem on long term.

Objective

To find out the long-term follow-up result of the short stem total hip arthroplasty.

Material and Methods

This study included retrospective cases who were operated for Total Hip Replacement using short femoral stem (TRILOCK® Depuy) in the past between May 2006 and November 2008, which were conducted in the Department of Orthopaedic Surgery, Indira Gandhi Medical College, Shimla. All of the included patients were operated on by the single orthopaedic surgeon experienced in arthroplasty surgeries. All the patients were operated by posterior approach and using the same surgical techniques.

Data collection

The institutional records were thoroughly scrutinized and relevant points pertaining to the study were noted down like demographic data, diagnosis, radiology, pre-operative functional scores (Modified Harris Hip Scoring System, OXFORD hip score & WOMAC score), pain score, complications if any etc. These patients were called for follow up through post or telephonically whichever was applicable on suitable date and follow-up data was collected for relief of pain, range of motion of hip joint & improvement in mobility, and functional outcome using Modified Harris hip score, OXFORD & WOMAC scores. We also looked for any complications and radiological outcome like subsidence, stress shielding/ proximal femoral bone loss, loosening etc. at the final follow-up.

Radiological evaluation

X-rays were taken with tube to film distance of 40 inches to get standard magnification and included both hips with upper half of Femur - Antero posterior views in neutral position and then x-rays were taken in 15° internal rotation, lateral views of both hips with upper half of thigh. Radiological features like subsidence, stress shielding/proximal femoral bone loss, loosening etc. were noted.

Result

A total of 124 hips in 98 patients were included in the study. Mean age was 44 years. 30-60 years of age was the most common age group operated, and males predominated in our study. Avascular necrosis with secondary osteoarthritis (60%) was the most common indication. Mean duration of surgery was 140mins. Average blood loss during surgery was 160ml. The demographic data, intraoperative data and diagnosis of the included patients are summarised in the Table 1. The pre- and post-operative functional outcome scores are tabulated in Table 2. We found significant improvement in modified Harris hip score in last follow-up compared to preoperative score. Mean Modified Harris Hip Score improved from pre-operative score of 19.75 to 91.66 at final follow-up. Almost 80% of the patients showed excellent modified HHS. Mean Oxford Hip Score and WOMAC score also improved from 12.04 to 40.54 and from 85.16 to 19.16 respectively at final follow-up. Radiological evaluation was also done at final follow-up. No evidence of component mispositioning, aseptic loosening except for 1 patient, significant subsidence of the implant was found in any of the patients at 15 years follow-up. Figure 1 shows sample pre and follow-up x-rays of a patient. 1 patient had prosthetic joint infection and loosening. 6 patients showed heterotopic ossification but with no significant limitation in functional activities. Figure 2 shows Xray of a patient with heterotopic ossification. 1 patient had aseptic loosening of the implant. No significant limb length discrepancy, varus malposition of the component or sciatic nerve palsy was seen. Table 3 shows the complications seen in the patients.

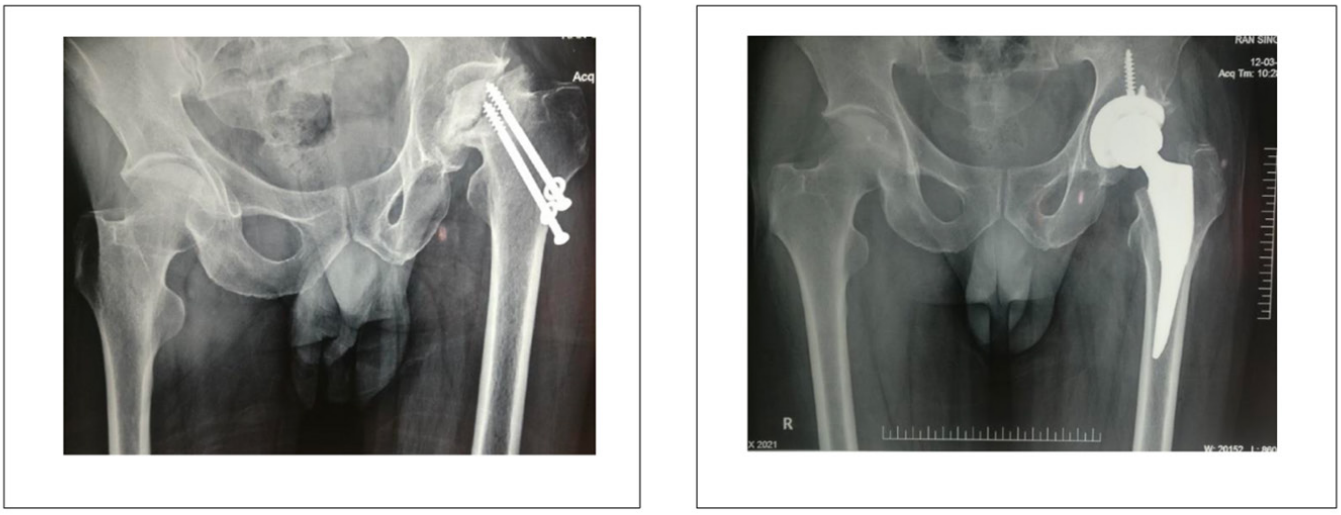

Figure 1: Shows sample pre and follow-up X-rays of a patient.

Table 1: Demographic data.

Demographic Variable	Result
Age (mean in years)	44
Side of surgery (left/right/ bilateral)	72/52/26
Indication	Avascular necrosis with secondary arthritis-65
	Fracture neck of femur-22
	Ankylosing spondylitis-13
	Psoriatic arthritis-12
	Post infection sequelae-12
Mean duration of surgery	140min
Average blood loss	160ml
Follow-up	15 years

Table 2: Pre- and post-operative functional scores at last follow-up.

Functional Score	Pre-Operative Score	Post-Operative Score at Final Follow-Up
Modified Harris Hip Score	<70(Poor)-100%, mean score-19.75	90-100(Excellent)-80% 80-89 (Good)-16% 70-79 (Fair)-4%, Mean Score-91.66
Oxford Hip Score	Mean-12.04	Mean-40.54
WOMAC Score	Mean-85.16	Mean-19.16

Table 3: Complications.

Type of Complication	Number of Patients
Heterotopic ossification	6
Varus Mal position	0
infection	1
Aseptic loosening	1
LLD>1.5cms	0
Involvement of sciatic nerve	0

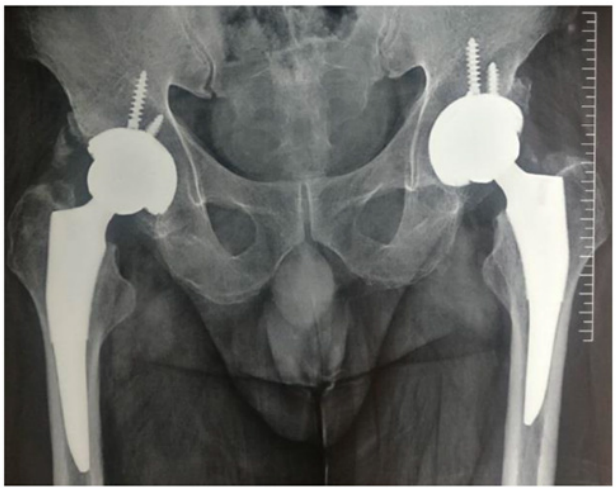

Figure 1: Shows sample pre and follow-up X-rays of a patient.

Discussion

The short-stem THA has been proposed as a bone-preserving procedure for the younger and more active population undergoing total hip arthroplasty. It was first proposed by Judet in 1940's [3]. Total hip arthroplasty using a short-stem prosthesis conserves more bone stock for any future revision, particularly in young and active patients with a longer life expectancy and higher activity levels and who are more likely to undergo revision [4]. These stems have the advantage of potentially allowing for a future revision using conventional primary stems [5]. Other advantages include lesser incidence of thigh pain [6] and ease of using minimally invasive surgery because of the more medial entry point of the stem in the femoral neck [7]. The lateral flare geometry of these short stem's rests on lateral column of the proximal femur which leads to physiological load distribution in the proximal femur and osteointegration of the implant with the metaphysis of the proximal femur avoiding the stress shielding [8,9]. Like any other operative procedure, THA with a short stem does have its limitations and complications like any other THA including increased risk of perioperative morbidity and mortality and post operative infections, dislocation/instability, heterotopic ossification and implant related problems but the benefit of THA outweighs the complications [10]. Given the advantages of these short stems in THA, it is prudent that this implant will be increasingly used in clinical practice but this needs to be backed with long term studies. The longest follow-up we could find in the literature was of 10 years [11].

In our study we found that short stem prostheses for THA was associated with improved patient-related outcomes and no significant subsidence of implant or complications were seen even after 15-year follow-up. These results align with the literature including the results of Kim et al. [12-15]. In our study we also found better patient functional outcomes can be mobilised early in line with the results of Wroblewski et al. [16]. As far as complications of the procedure are concerned at 15-year follow-up we found no radiolucent lines in any of the Gruen zones or subsidence of the implant with good osteointegration in all the cases evident on plain radiography in two orthogonal views similar to the available literature [17]. The strengths of this study include the prospective nature of the study and adequate sample size and long follow-up period. This study also gives insights into the long-term outcomes of relatively new short metaphyseal femoral stems in THA. The Limitation is that it is a single centre study.

Conclusion

THA with a short metaphyseal stem can be used safely in patients with adequate bone support to preserve the bony and soft tissue anatomy with better functional outcomes. On long-term follow-up of 15 year, we noticed minimal complications like subsidence, implant loosening or proximal femoral bone loss due to stress shielding. Short stem THR also helps in simplifying the revision surgeries by preserving bone stock if ever required. Short stem THR can be preferred in all patients with good bone stock especially in younger patients.

Ethics Approval

Ethical approval was taken from Institutional Review Board. This study has been conducted according to the guidelines in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and Institutional ethical approval taken. Ethical approval number is IRB-2257.

Authors Contribution

MK and AS-conducted the study, collected data, stats and analysis, VPK and AKG-wrote manuscript, corrections, ML-critical analysis of study.

Acknowledgement

We thank all the patients who participated and co-operated.

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