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## A prospective study of surgical and functional outcomes of revision hip arthroplasty

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### Abstract

**Background:** Increased use of Hip Arthroplasty has resulted in a high incidence of Failed Hip Arthroplasty with progressive groin pain and prosthetic failures which need revision arthroplasty. This study evaluates the surgical and functional outcome, along with the associated complication rates in patients undergoing Revision Hip Arthroplasty.

**Material and Method:** We studied 20 patients who underwent revision Total Hip Arthroplasty for Failed Hip Arthroplasty. All patients were operated under hypotensive spinal-epidural anesthesia in lateral position. Patients were evaluated at pre-op and post-op follow-up periods with serial radiography, Harris Hip Score (HHS) for pain and disability scoring, Oxford Hip Score (OHS) for pain, and functional scoring.

**Result:** The post-operative VAS score has decreased to  $2.5 \pm 1.01$ , from a pre-operative score of  $8.02 \pm 1.28$ ,  $p < 0.001$ . The average Harris Hip Score has improved from  $44.85 \pm 9.32$  pre-operatively to  $84.60 \pm 10.98$  post-operatively at 6 months,  $p < 0.001$  and average modified Oxford Hip Score has improved from  $11.45 \pm 1.77$  pre-operatively to  $38.85 \pm 3.82$  post-operatively at 6 months,  $p < 0.001$ . At 6 month follow-up, we had 50% excellent results, 30% good results, 15% fair results, and 5% poor results based on Harris Hip Score.

**Conclusion:** Conversion of symptomatic Failed Hip Arthroplasty to Revision Total hip replacement has good functional outcomes and significant pain relief leading to improved quality of life with marginally increased risk of intra-operative complications.

**Keywords:** Failed primary hip arthroplasty, revision total hip replacement, hemiarthroplasty, surgical outcomes, functional outcomes

### Introduction

Partial Hip Replacement and Total Hip Replacement are highly successful procedures that have been performed to improve the quality of life of patients with hip pathology [1]. Partial Hip Replacement in older patients with intra-capsular femur fracture has excellent short-term results with regard to pain relief, return to activity, morbidity, and mortality [2, 3, 4]. Long-term problems associated with partial hip replacement include progressive acetabular cartilage degeneration, groin pain, protrusio acetabuli, stem loosening, and subsidence [5].

Total hip replacement (THR) has proved to be an excellent and reliable treatment procedure for the end stages of hip pathology, with satisfactory clinical outcomes at 15- to 20-year follow-up. The burden of hip arthritis is on the rise and it is estimated that more than 950,000 primary and revision THAs were performed globally in 2010 [6]. The profile of the patients having their hips replaced is changing as well, from the elderly to the young adult who wishes to have a maximum function from their hip. Despite successful outcomes, Total Hip Replacement revision rates have grown steadily in recent years. In an immortal cohort, all hip replacements will eventually fail because of infection, fracture, or a combination of normal tribological and biological processes (aseptic loosening 69%, infection 17%, and recurrent dislocation 12%) [7].

Unlike primary Hip Arthroplasty, Revision requires more operative time and blood loss, and the incidences of infection, thrombo-embolism, dislocation, nerve palsy and femoral fractures are higher [8].

Femoral stems relying on proximal fixation have historically provided disappointing results due to insufficient proximal bone stock, which is inadequate to provide structural support and osteogenic potential for bone in-growth or cement interdigitation<sup>[9]</sup>. The preoperative assessment of acetabular bone stock before revision surgery is critical for acetabular reconstruction because the amount and location of pelvic osteolysis will determine the type and success of revision surgery<sup>[10]</sup>.

The purpose of the present study is to evaluate the surgical and functional outcome, along with the associated complication rates in patients undergoing revision hip arthroplasty.

### Materials and methods

The study was conducted on 20 patients who were clinically and radiologically diagnosed with Failed Hip Arthroplasty in the Department of Orthopaedics, Mahadevappa Rampure Medical College, Kalaburgi and other private hospitals in Kalaburgi. It was conducted between October 2019 to March 2021. Patients were evaluated at pre-op and post-op follow-up period with serial radiography, Harris Hip Score (HHS) for pain and disability scoring, Oxford Hip Score (OHS) for pain, and functional scoring.

### Inclusion Criteria

1. Patients with infected hip Arthroplasty.
2. Mechanical failure of the implant.
3. Periprosthetic fracture.
4. Painful aseptic loosening.
5. Stem subsidence.

6. Erosion of acetabular cartilage.
7. Protrusion acetabuli.

### Exclusion Criteria

1. Patients having co-morbidities categorized as grade 4 or grade 5 patients as per ASA grading.
2. Any Primary or Secondary Malignancy leading to revision surgery.

### Results

We had 20 patients (9 males; 11 females), with a mean age of  $66.85 \pm 7.53$  years at the time of revision surgery with a maximum number of failed hip arthroplasty cases 11 (55.0%) were between 61-70 years. 13 patients were operated on the right hip whereas 7 were operated on left hip. 12 (60.0%) cases were revision Total Hip Arthroplasty and 8 (40.0%) cases were the conversion of Hemiarthroplasty to Total Hip Replacement. The reason for the revision was periprosthetic fractures in 6 patients(30%), 4 (20.0%) cases of periprosthetic joint infection, 3 (15.0%) cases of subluxation/dislocation, 3 (15.0%) cases of protrusion acetabula, 2(10.0%) cases of aseptic loosening, 1 case of cantilevel breakage of femoral component and 1 case of erosion of acetabular cartilage.

In this study, the post-operative VAS score has decreased to  $2.5 \pm 1.01$ , from pre-operative score of  $8.02 \pm 1.28$ ,  $p < 0.001$ . The Average modified Oxford Hip Score has improved from  $11.45 \pm 1.77$  pre-operatively to  $38.85 \pm 3.82$  post-operatively at 6 months,  $p < 0.001$ . The average Harris Hip Score has improved from  $44.85 \pm 9.32$  pre-operatively to  $84.60 \pm 10.98$  post-operatively at 6 months,  $p < 0.001$ . (Table 1)

**Table 1:** Functional outcome of Revision Hip Arthroplasty

Variables	Pre-OP scores	Post-OP scores	Paired t-test value	P-value & significance
	Mean $\pm$ SD	Mean $\pm$ SD		
VAS	$8.02 \pm 1.28$	$2.5 \pm 1.01$	$t = 20.09$	$P = 0.000$ , VHS
HHS	$44.85 \pm 9.32$	$84.60 \pm 10.98$	$t = 20.35$	$P = 0.000$ , VHS
OHS	$11.45 \pm 1.77$	$38.85 \pm 3.82$	$t = 10.45$	$P = 0.000$ , VHS

NS= not significant, S=significant, HS=highly significant, VHS=very highly significant, VAS=Visual Analog scale, HHS= Harris Hip Score, OHS= Oxford Hip Score

At 6 month follow-up, we had 50% excellent results and 30% good results, 15% fair results, and 5% poor results based on Harris Hip Score. (Table 2)

**Table 2:** Classification of assessment of Harris Hip scores at 6 month post-operative period

Classification based on Harris Hip Score	Number (%)
Excellent (90-100)	10 (50.0%)
Good (80-90)	6 (30.0%)
Fair (70-80)	3 (15.0%)
Poor (< 70)	1 (5.0%)
Total	20 (100.0%)

7 complications were observed in this study, 2 cases had superficial skin Infection, 3 cases of intra-operative femoral fracture, 1 case of post-operative periprosthetic femoral fracture and 1 case of Deep Venous Thrombosis.

### Discussion

Partial hip replacement is the preferred treatment for displaced neck femur fractures in the elderly, with the aim to return the patients to their pre-injury mobility status immediately and minimize the risk of further immobilization<sup>[11]</sup>. With increasing demands being placed on the prosthesis

by fitter and more physically demanding patients, a group of these patients would develop early-onset groin and thigh pain leading to a marked decrease in their quality of life<sup>[12]</sup>.

Total Hip replacement has transformed the lives of hundreds of thousands of people with arthritis of the hip regardless of the underlying etiology. Surgeons should select their patients for surgery carefully, use implants with long-term follow up, and apply surgical techniques that have been shown to decrease implant failure rates<sup>[13]</sup>.

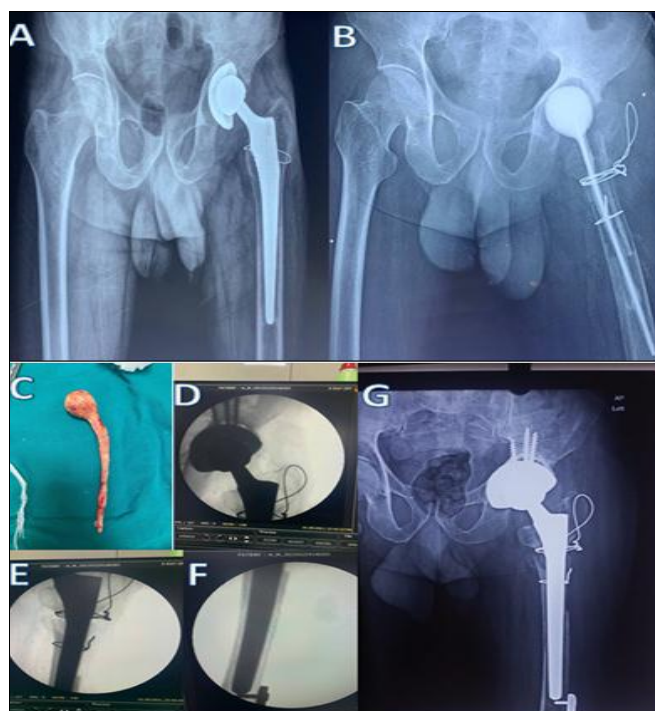
Pankaj *et al.* observed that the reason for the revision was acetabular erosion and protrusion in 32%, aseptic femoral loosening in 34%, septic loosening in 12%, implant breakage in 9%, dislocation in 7%, and periprosthetic fractures in 5% of hips. It comes to 66% of aseptic loosening / osteolysis and 21% of fractures/dislocations. The rest of the hips were revised due to infection<sup>[14]</sup>. Nerurkar *et al.* had 12 patients (63.16%) with osteolysis / loosening of the prosthesis as the cause for revision and 7 patients (36.84%) had a periprosthetic fracture or a fracture/broken implant, or hip joint dislocation<sup>[15]</sup>. ISHKS newsletter 2018 shows, Numbers of revisions THA has gradually increased year on year. The reason for revision is primarily aseptic loosening (69%), infection 17%, and recurrent dislocation 12%<sup>[16]</sup>. The reason for revision in our study were periprosthetic fractures in 6 patients (30%), 4 (20.0%) cases of periprosthetic joint

infection, 3 (15.0%) cases of subluxation/dislocation, 3 (15.0%) cases of protrusion acetabuli, 2 (10.0%) cases of aseptic loosening, 1 case of cantilevel breakage and 1 case of erosion of acetabular cartilage.

Cho - Choi *et al.* in their study have observed that the mean Harris Hip Score (HHS) and Visual Analogue Scale (VAS) score for THA has been 82.1 and 0.9 retrospectively, whereas the mean HHS and VAS score were 68.6 and 3.1 respectively in the bipolar hemiarthroplasty [17]. In a study conducted by Nerurker *et al.*, the postoperative VAS score has decreased to a mean score of  $2.26 \pm 0.99$ , from a mean pre-operative score of  $7.47 \pm 1.17$  [15]. In another study Harris Hip Scores (HHS) improved from 38 (range 15- 62) preoperatively to 92 (range 42 to 100) assessed six months postoperatively, whereas at the final follow-up (mean 6.4 years), the average HHS was 86 (range 38 to 100) [14]. Diwanji *et al.* followed up 25 patients of conversion total hip replacements for 7.2 years and observed improvement in the average HHS from 41 (34 to 67) pre-operatively to 85 (65 to 95) at final follow-up [18]. The outcomes of HHS have been classified as excellent (91-100%), good (81-90%), fair (71-80%), and poor ( $\leq 70\%$ ) [19]. Squires *et al.* have shown post-operative HHS to be excellent in 40% of patients, good in 30%, fair in 10%, and poor in 20% in patients undergoing conversion hip replacement [20]. In a study conducted by nerurker *et al.*, the average Harris Hip Score has improved from  $46.47 \pm 8.16$  (range, 32 - 66) pre-operatively to  $81.68 \pm 10.38$  (range, 59 - 98) post-operatively [15]. In our study, the post-operative VAS score has decreased to  $2.5 \pm 1.01$ , from a pre-operative score of  $8.02 \pm 1.28$ ,  $p < 0.001$ . The Average modified Oxford Hip Score has improved from  $11.45 \pm 1.77$  pre-operatively to  $38.85 \pm 3.82$  post-operatively at 6 months,  $p < 0.001$ . The average Harris Hip Score has improved from  $44.85 \pm 9.32$  pre-operatively to  $84.60 \pm 10.98$  post-operatively at 6 months,  $p < 0.001$ . At 6 month follow-up, we had 50% excellent results and 30% good results, 15% fair results, and 5% poor result based on Harris Hip Score.

Amstutz and Smith, have noted a high incidence of complications in 41 patients with conversion THA. They had five intra-operative proximal femoral fractures, two perforations of the medial cortex with stem protrusion, two cases with instability, two cases with infection, three patients with deep venous thrombosis, and six patients with progressive loosening [21]. Sierra and Cabanela in a series of 132 hemiarthroplasties converted to THA, reported 10% loosening after a mean follow-up of 7.1 years and major complications in 45%, including 12 intra-operative femoral fractures (9%) and 13 dislocations (9.8%).<sup>22</sup> Pankaj *et al.* have observed a high rate of intra-operative complications with iatrogenic femoral fractures in two, femoral perforation in two, partial trochanteric avulsion in two, and fracture of the acetabular floor in three hips. The rate of loosening was 2.3% after a mean follow-up of 6.4 years [14]. 7 complications were observed in this study, 2 cases had superficial skin Infection which was treated with appropriate antibiotics, 3 cases had intra-operative fracture which were managed with long stem and coxa femoral bypass, One patient had post-operative periprosthetic fracture following fall at home immediately after discharge from hospital, which was fixed with plating (as the implant was stable) and 1 case of Deep Venous Thrombosis which was managed medically.

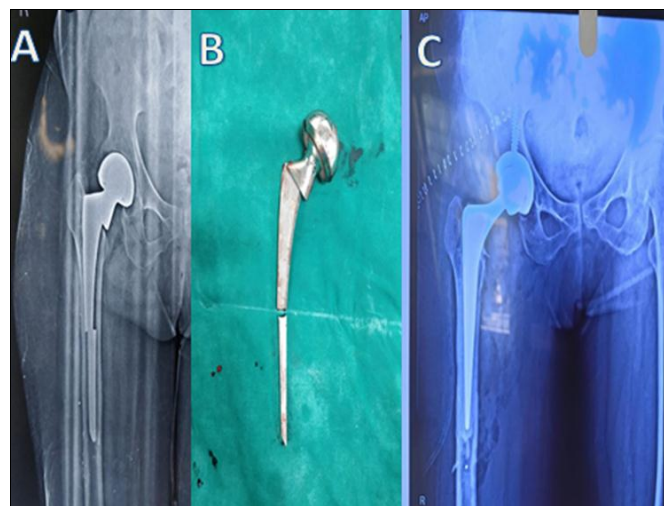
Revision total hip arthroplasty is a reasonably safe and effective procedure for failed hip replacement. Based on this exploratory analysis revision hip procedures seem to have comparable longevity to a primary hip replacement but appear to have slightly lower functional outcomes (as measured by global hip scores), and slightly higher morbidity and mortality rates than primary procedures.<sup>23</sup> The primary objective of this study was to assess surgical and functional results after Revision Hip Replacement, which is well fulfilled. However, prospective randomized studies of larger strength and longer follow-up duration would be helpful to establish long term-survival and functional outcomes of Revision Hip Arthroplasty.



**Fig 1:** A case of 2-staged Revision of Infected Total Hip Replacement. A. Pre-operative radiograph. B. post-operative radiography following debridement and antibiotic spacer insertion. C. Intra operative picture of the spacer. D, E, F. Intraoperative C-arm Images. G. Post-operative radiography following revision Total Hip Replacement.



**Fig 2:** A case of Painful Aseptic loosening converted to Total Hip Replacement. Patient sustained Periprosthetic fracture in the post-operative period, ORIF with locking plate was done. A. Pre-operative radiograph. B. post-operative radiography following Total Hip Replacement. C. Radiography showing periprosthetic fracture. D, E, F. Intraoperative C-arm Images of plating for periprosthetic fracture.



**Fig 3:** A case of cantilever breakage of femoral stem converted to Total Hip Replacement. A. Pre-operative radiograph. B. Intra operative picture of the Prosthesis extracted. C. post-operative radiography following Total Hip Replacement.

### Conclusion

The conversion of Failed Hip Arthroplasty to Total Hip Arthroplasty in symptomatic patients has good surgical as well as functional outcomes in terms of significant pain relief, increase in range of motion at the affected Hip joint, Harris Hip scores, and Oxford Hip Score with improved quality of life after surgery with marginally increased risk of intra-operative complications.

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