Surgical and Functional Outcomes of Conversion Total Hip Replacement after a Partial Hip Replacement

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Abstract:

Background: Incresed use of bipolar hemiarthroplasty has resulted in high incidence of failed hip hemiarthroplasty with progressive groin pain and prosthetic failures which need conversion to total hip arthroplasty (THA). This study evaluates the outcomes of such failed hips which required conversion hip replacements.

Material and Method: We studied 19 patients with failed hip hemiarthroplasty converted to THA. All patients were operated under hypotensive spinal-epidural anesthesia in lateral position. Patients were evaluated with serial radiographs, Harris Hip Score (HHS), range of motion at hip joint and visual analogue scale (VAS) for pain evaluation. The functional analysis was done by SF 36 scoring at final follow up.

Result: The post-operative VAS score has decreased to 2.26 ± 0.99, from pre-operative score of 7.47 ± 1.17, $p<0.001$. The average Harris Hip Score has improved from 46.47 ± 8.16 pre-operatively to 81.68 ± 10.38 post-operatively, $p<0.001$. At final follow-up, the average total SF-36 score was 69.99 ± 11.58, whereas the physical and mental component scale were 66.51 ± 13.44 and 75.47 ± 9.41 respectively.

Conclusion: Conversion of symptomatic failed bipolar to THA has good functional outcomes and significant pain relief leading to improved quality of life. Primary THA is a better option than hemiarthroplasty in young and active patients with neck femur fractures.

Keywords: Conversion Total Hip Arthroplasty, Failed Bipolar Hemiarthroplasty, Revision Total Hip Replacement, Surgical and functional outcomes.

Thesis Question: What are the surgical and functional outcomes of conversion of Partial Hip Replacement to Total Hip Replacement?

Thesis Answer: The conversion of Partial Hip Replacement to Total Hip Replacement in symptomatic patients has good surgical as well as functional outcomes in terms of significant pain relief, statistically significant increase in range of motion at the affected hip joint and Harris Hip scores, and improved quality of life.

THESIS SUMMARY

Introduction

Total hip replacement, partial hip replacement, and revision hip replacement are among the most successful surgical procedures that have been performed to improve quality of life[1] of patients with hip pathology. Hip Hemiarthroplasty in elderly patients with intracapsular displaced neck femur fractures has good short-term results with regard to pain relief, return to activity, morbidity and mortality[2,3,4]. Although the immediate results are excellent, patients experience progressive groin pain with time and restoration of mobility. Erosion of acetabular cartilage, stem loosening and acetabular protrusion are

recognised as a cause for the pain[5]. The appearance of symptoms is dependent on the level of activity of the patient and duration since surgery[6].

Long-term problems associated with hemiarthroplasty include progressive acetabular cartilage degeneration and concomitant groin pain, protrusion acetabuli, stem loosening and subsidence[7]. Poor results have been reported in active patients[7]. This has resulted in a huge demand for revision of Hip Arthroplasty; In 2002, 17.5% of all hip arthroplasties performed in the United States were revision procedures[8].

Unlike primary Hip Arthroplasty, revision is not a simple procedure and not many surgeons have expertise in revising a hip. Revision requires more operative time and blood loss, and the incidences of infection, thrombo-embolism, dislocation, nerve palsy, and femoral fractures are higher[9]. Femoral component revision is often complicated by insufficient proximal bone stock, which is inadequate to provide structural support and osteogenic potential for bone in-growth or cement interdigitation. Hence femoral stems relying on proximal fixation have historically provided disappointing results[10].

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. Traditionally, plain radiographs and Judet views are used to assess integrity of the anterior and posterior columns; CT scans are only indicated in selected patients[11].

Current evidence suggests that THA is a better choice for intracapsular neck femur fractures in elderly individuals who are relatively healthy, active and have a long life expectancy[12,13].

The purpose of the present study is to evaluate the relief of pain, structural and functional outcome, along with the associated complication rates in patients undergoing conversion of Hemiarthroplasty to Total Hip Arthroplasty.

Materials And Methods

All patients who required a conversion of hemiarthroplasty to THA were screened using the following inclusion and exclusion criteria:

Inclusion criteria

1. Mechanical failure of the implant.
2. Dislocation of hip joint.
3. Periprosthetic fracture.
4. Painful aseptic loosening.
5. Stem subsidence.
6. Erosion of acetabular cartilage.
7. Protrusio acetabuli.

Exclusion criteria

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

All patients were then regularly assessed using the Harris Hip Score (HHS) and range of motion evaluation. SF-36 scoring and VAS scale were documented at final follow up to assess functional outcome and pain respectively.

Digital radiographs were taken for each patient- Pelvis with both hips (AP) view with 100 mm rod and lateral view of the affected hip. The radiographs were marked with horizontal and vertical offsets on both the sides. Two lines joining lesser trochanteric point and both the tear drops were drawn on radiograph. The limb length discrepancy was measured with respect to convergence of these two lines drawn from bony fixed points.

Surgery was performed in theatres equipped with laminar flow and controlled room temperature under Hypotensive Spinal- Epidural Anaesthesia. All surgeries were performed in lateral position with modified Southern Moore's approach. Post-operatively drain was kept for <48 hours post-surgery. Dressing was done on post-op day 2 and day 5.

Results

We had 19 patients (9 males; 10 females), with mean age of 63.73 ± 13.73 years at the time of revision surgery. 7 patients were operated on the right hip whereas 12 were operated on left hip. The reason for revision was osteolysis/ loosening of prosthesis in 12 patients (63.16%), and fractures/ dislocations in 7 patients (36.84%).

On evaluation of range of motion at the affected hip joint, the post-operative fixed flexion deformity decreased from 5.83 ± 6.87 pre-operatively to 2.08 ± 4.98 post-operatively, p=0.066. The post-operative flexion increased from 52.05 ± 20.05 pre-operatively to 110 ± 19.54 post-operatively, p=0.002. The post-operative abduction increased from 21.25 ± 5.69 pre-operatively to 31.25 ± 4.33 post-operatively, p=0.003. The post-operative adduction increased from 11.25 ± 6.78 pre-operatively to 17.05 ± 5.83 post-operatively, p=0.059. The post-operative internal rotation increased from 7.91 ± 6.55 pre-operatively to 23.33 ± 9.84 post-operatively, p=0.003. The post-operative external rotation increased from 21.25 ± 8.01 pre-operatively to 32.08 ± 8.10 post-operatively, p=0.007.

In this study, the post-operative VAS score has decreased to a mean score of 2.26 ± 0.99, from a mean pre-operative score of 7.47 ± 1.17, p<0.001 (Wilcoxon Sign Rank test). The average Harris Hip Score improved from 46.47 ± 8.16 pre-operatively to 81.68 ± 10.38 post-operatively, p<0.001 by using (Paired T – test). The average total SF-36 score was 69.99 ± 11.58, whereas the physical component scale and mental component scale was 66.51 ± 13.44 and 75.47 ± 9.41 respectively.

Only 3 complications were observed in this study, 1 (5.26%) each of dislocation of prosthetic head, peri-prosthetic fracture and sciatic nerve palsy, 2 of which required revision procedure.

Discussion

Hemiarthroplasty is preferred treatment for displaced neck femur fractures in elderly, with the aim to return the patients to their pre-injury mobility status immediately and minimize the risk of further immobilisation[50].

AMP and Thompson prostheses have been associated with poor quality of life in the long run with a very high incidence of groin and thigh pain in physically active patients, largely a consequence of acetabular cartilage degeneration and stem loosening respectively[12,51,52].

Recent studies comparing bipolar to unipolar hemiarthroplasty show little difference between the two with regard to morbidity, mortality, or functional outcome in long term follow-ups[53,54].

Pankaj et al[7] observed that the reason for 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.

We had 12 patients (63.16%) with osteolysis / loosening of prosthesis as the cause for revision and 7 patients (36.84%) had periprosthetic fracture or a fracture/broken implant, or hip joint dislocation.

Coleman et al[29] have observed that average time to failure of the primary hip replacement was 38 months; 56% cases showed radiographic evidence of osteolysis around the stem. Warwick et al[55] observed that median time to the onset of symptoms was 12 months and to revision 33 months. Suominen et al[23] have observed that interval between hemiarthroplasty to revision hip replacement was 83 months. This is comparative to the interval in this study.

Our mean duration of interval between the hemiarthroplasty and revision surgery was 7.09±4.80 years, (range; 6 months to 15 years), 5 revisions (26.32%) were done within the first year of hemiarthroplasty, whereas 14 hips (73.68%) were revised after an interval of more than 5 years, with no revision surgery between 1 and 5 years.

Pain following hemiarthroplasty is either due to articular cartilage degeneration in the acetabulum or loosening of the prosthesis. These pathological processes are exacerbated by many factors including incongruence between the femoral head and the acetabulum, excessive neck length, impaction at the time of injury, cementation of the prosthesis, physiologically young active patients and shear forces between the prosthesis and the cartilage[51,56,57].

Cho - Choi et al in their study have observed that 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(48). In this study, the post-operative VAS score has decreased to a mean score of 2.26 ± 0.99, (range; 1 - 5) from a mean pre-operative score of 7.47 ± 1.17 (range; 5 - 9), p value of < 0.001.

In another study[7] 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). Diwanji et al[45] 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.

The outcomes of HHS has been classified as excellent (91-100%), good (81-90%), fair (71-80%) and poor (≤70%)[58]. Suominen et al[23] have observed that the final results were excellent in nine, good in ten, fair in five and poor in thirteen cases in complicated subcapital femoral fractures treated by Hemiarthroplasty, and the final result after THR was excellent or good in four, fair in three and poor in seven cases. Author recommends THR as preferred modality of treatment for the complicated subcapital femoral fractures[23].

Squires et al[12] 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. However, the results are excellent in 63%, good in 23%, fair in 3% and poor in 10% of primary total hip replacements, thus recommending primary THR as the surgery of choice.

In our study, the average Harris Hip Score has improved from 46.47 ± 8.16 (range, 32 - 66) pre-operatively to 81.68 ± 10.38 (range, 59 - 98) post-operatively, p value of <0.001. The average total SF-36 score was 69.99 ± 11.58 (range,40 - 87.9), whereas the physical and mental component scale was 66.51 ± 13.44 and 75.47 ± 9.41 respectively.

Enocson et al[44] have shown that age, sex, indication for surgery, and type of HA had no statistically significant effect on the outcomes of revision hip replacement.

Squires et al[12] observed that hemiarthroplasty in mobile and independent patients frequently requires conversion to THR, the results of which are inferior to a primary procedure.

Amstutz and Smith[18], have noted 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. Sierra and Cabanela[31] 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%).

Pankaj et al[7] 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.

Hammad et al[39] reported no loosening in their series of conversion arthroplasty in 47 patients after an average follow-up of 44 months. The cause for failure on the femoral side may be attributed to extensive resorption of the endosteal bone in a loose stem, or due to damage of the endosteal bone during revision[59].

Furthermore, toggling of the stem may produce a thick fibrous membrane that is adherent and might not be completely removed at revision, with its remnants compromising the subsequent cemented

fixation. It has been suggested that fragments of such a fibrous membrane are metabolically very active, producing Prostaglandin E2, collagenase and Interleukin 1b, all of which may contribute to resorption of adjacent bone[60,61].

Bush JB et al in their study[41] observed that (2.3%) dislocations occurred in the study population, and all were in the posterior group (4.5%) in 375 hemiarthroplasty patients with 6 months follow-up. Unwin AJ et al[25], in their study have shown that the overall dislocation rate for the posterior approach was 9.0%, whereas that for the direct lateral approach was 3.3%.

However, in this study, posterolateral approach was used for all the surgeries and there was only 1 (5.26%) dislocation observed. This is probably due to acquaintance of the surgeon to a particular approach. The dislocation occured due to increased inclination, and acetabular cup was revised. The HHS was 68 and SF-36 score was 59.58 at final follow up.

One patient had post-traumatic peri-prosthetic fracture in third post-operative week. Revision of femoral component with long stem femoral prosthesis was performed and tension band wiring was done to secure the femoral stem. At final follow up, the HHS was 94 and total SF-36 score was 80.83 respectively.

One patient had sciatic nerve palsy, which was treated conservatively with neurotrophic medications, nerve stimulation, proprioceptine neuro-muscular facilitation and foot drop splint. Sciatic nerve palsy recovered completely on one year follow up.

The primary objective of this study was to assess surgical and functional results after conversion 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 conversion of partial to total hip replacements.

Conclusion

The conversion of Hip Hemiarthroplasty to THA in symptomatic patients has good surgical as well as functional outcomes in terms of significant pain relief, statistically significant increase in range of motion at the affected Hip joint and Harris Hip scores. Patients after conversion THA demonstrated excellent SF 36 scores and had improved quality of life after the surgery. Primary THA is a better option than hemiarthroplasty in young and active patients with neck femur fractures.

Clinical Message

Patients with hip Hemiarthroplasty often suffer from regional groin pain, prosthetic failures, hip dislocations, periprosthetic fractures, protrusion acetabuli, aseptic loosening or subsidence. All such symptomatic patients when converted to Total Hip Replacement have excellent surgical and functional outcomes.

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