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Evaluation of Short Term Results of Conversion Total Hip Arthroplasty after Failed Hemiarthroplasty and Failed Osteosynthesis.

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Conflicts of Interest: Nil.

Abstract

Background: Conversion total hip replacement (THR) has been defined as a THR done for failed prior hip surgery either hemiarthroplasty or failed osteosynthesis. One of the most common conversions done is a conversion from a prior hemiarthroplasty to THR.[1,8,10,66] Despite continued discussion regarding the treatment of neck femur fractures, controversies continue regarding their optimal treatment, including choice of implant and fixation method.[8, 10,35,49,67]

Objective: To evaluate the short term results of conversion total hip arthroplasty after failed hemiarthroplasty and failed osteosynthesis.

Material and Methods: A total of 20 patients who met the inclusion criteria were taken up for study. Only failed hemiarthroplasty and failed osteosynthesis were included, which were primarily done for fracture neck of femur. The majority of patients in both groups were males.

Average age was 60 years in failed hemiarthroplasty and 58.8 years in failed osteosynthesis patients.

After conversion THR Each patient was allowed to do full weight bearing on an average of 4th postoperative day

Results: Average time to conversion total hip arthroplasty in failed hemiarthroplasty patients was more in comparison to failed osteosynthesis patients

In hemiarthroplasty group range of motion improved from an average of 121.5^0 preoperatively to 192.5^0 at final follows up of 1 year. In osteosynthesis group range of motion improved from an average of 114^0 preoperatively to 189^0 at one year follow up.

At final follow up 90% of patients in both groups were having none or slight pain and were satisfied with the procedure

Conclusion: Conversion of symptomatic hemiarthroplasty and failed osteosynthesis patients to total hip replacement is a safe option that gives excellent results in terms of pain relief and restoration of function and mobility as near as pre-injury level.

Keywords: Conversion THR, failed osteosynthesis, failed hemiarthroplasty

Introduction

Conversion total hip replacement (THR) has been defined as a THR done for failed prior surgery and includes failed hemiarthroplasty, failed hip pinning, failed hip fractures treated with screw and side plates, failed hip arthrodesis,

failed osteotomies and failed surface hip arthroplasties. One of the most common conversions done is a conversion from a prior hemiarthroplasty to THR.[1,8,10,66]

Hip fractures including intracapsular fracture of proximal femur are common in geriatric age group. Despite continued discussion regarding the treatment of these fractures, controversies continue regarding their optimal treatment, including choice of implant and fixation method.[8, 10,35,49,67]

For more than 100 years the optimal treatment of femoral neck fractures has been sought. Internal fixation (osteosynthesis), hemiarthroplasty or total hip replacement can be used to manage displaced fractures of neck of femur in active, 65 to 80 years old individuals.[2,18, 22]

Hemiarthroplasty (HAP), unipolar or bipolar has been widely used for the treatment of displaced intracapsular fractures of femoral neck in elderly patients, because of high incidence of non-union & avascular necrosis for open reduction & internal fixation.[79] Among hemiarthroplasty, Austin Moore's hemiarthroplasty is one of the commonly used methods in the treatment of displaced intracapsular fracture neck of femur in geriatric age group.[77] It allows patient to start early weight bearing and walking in a relatively pain free condition.[3,20,2,63,74]

The indications for conversion of hemiarthroplasty to total hip arthroplasty include acetabular erosion, protrusion, femoral loosening and subsidence, dislocation, breakage of implant, periprosthetic fracture and infection.[4]

Another modality of treatment for femoral neck fracture is reduction and internal fixation which is also not without failure and complication rates range from 2% to 42%.[19,30,52,75] The most common indications for conversion in this group include non-union and avascular necrosis.[75]

Current evidence is emerging that total hip arthroplasty (THA) may be a better choice for patients of intra-capsular fractures of neck of femur in elderly age group (60-75 years) who are mentally competent, relatively healthy, active and capable of living independently.[45,72]

The purpose of the present study was to evaluate the functional outcome, survivorship at short to mid-term follow up and complication rates of total hip arthroplasty after failed hemiarthroplasty or failed osteosynthesis done for femoral neck fractures.

Material and methods

This study was prospective case control series which was conducted by postgraduate department of orthopaedics Bone and joint hospital Srinagar which is a tertiary care hospital. The present hospital based prospective study was done in 20 cases of failed hemiarthroplasty (HAP) / failed osteosynthesis. The study was done between July 2106 to June 2017.

All patients who met the inclusion criteria gave their consent to be part of study.

Inclusion Criteria

- Age (55-80 years).
- Sex (males / females)
- Patients whose indication of osteosynthesis /Hemiarthroplasty (HAP) was fracture of neck of femur.

Exclusion Criteria

- Patients with infected osteosynthesis / HAP.
- Patients whose primary indication of HAP was other than fracture neck of femur.
- Patients having other medical co-morbidities which were contraindication for surgery.
- Progressive neurological disorders.

Preoperative Planning

All patients planned for conversion surgery were evaluated as under:

- Detailed history, duration of pain, time since index surgery , dislocation in post operative period if any was recorded.
- Thorough general physical examination was done to rule out any systemic disorder.
- Any limb length discrepancy, range of motion (ROM) of the affected hip and any deformity if present was recorded and hip function was assessed as per Modified Harris Hip Scoring (HHS).[82]
- Routine investigations including complete haemogram, blood sugar (Fasting & Postprandial), KFT, ECG, urine examination and chest x-ray was done in all cases. ESR and CRP was assessed twice with an interval of three weeks to rule out infection.[4] If elevated i.e; ESR greater than 30mm/h and CRP greater than 10mg/L, presumptive diagnosis of infection was made.
- All previous radiographs were evaluated in chronological order up to the latest one. Radiograph of the pelvis AP view with both hip and femur in addition to lateral view were done and studied for presence or absence of calcar, extent of osteolysis, acetabular erosion, loosening, cortical perforation, position of implant, protrusio acetabuli and/or subsidence among hemiarthroplasty patients. Non union and avascular necrosis were also confimed by radiographs.
- In our whole study cemented collarless polished double tapered (CPT) stems with 28mm modular head and cemented ultra high molecular weight polyethylene (UHMWPE) cup was used.
- Templating was done to assess proper size on both AP and lateral views by following method:

Pre-Operative Regime

- Patients were shaved of all hair from umbilicus to toes both anteriorly and posteriorly. Prior to surgery the operative area was scrubbed carefully and covered with sterile cloth in patients planned for total hip arthroplasty. Both finger and toe nails were clipped and nail polish removed.
- All patients were given preoperative prophylactic antibiotic inj. Cefazolin 1 g 8 hourly started 24 hours before surgery.
- Two units of whole blood were kept ready on the day of surgery.
- Urinary catheter was introduced in all patients undergoing total hip arthroplasty just prior to surgery.

Operative Procedure for total hip arthroplasty

All procedures were carried out under combined spinal epidural anaesthesia.

All procedures were performed through posterolateral approach (Gibson) using the previous incision with minor variations as and when required.

Preparation of the acetabulam followed by placement of acetabular component (image 1). femur was done after acetabular component placement (image 2) .

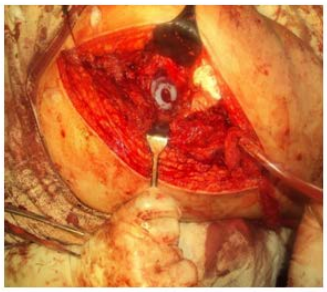

Image 1 and 2

PLACEMENT OF ACETABULAR COMPONENT

PLACEMENT OF FEMORAL COMPONENT

After Treatment

- Patients Were Then Shifted To Postoperative Ward, With An Abduction Bar Between The Thighs And Were Instructed Not To Flex, Adduct And Internally Rotate The Operated Limb. Patient's Vital Signs Were Monitored in Immediate Postoperative Period.
- Patient Were Put On Parental I.V. Antibiotics (Cefazoline 1g Thrice A Day And Amikacin 500mg

Twice A Day) For Five To Seven Days Followed By Oral Antibiotics.

- Deep Vein Thrombosis (DVT) Prophylaxis Using Inj. Heparin 5000 I.U. Twice A Day Starting On The Day After Surgery Was Given To All Patients For 7 To 10 Days. Oral Aspirin (150mg Once Daily) Was Given For 3 To 4 Weeks after Discontinuation Of Heparin.[4]
- Patients Were Shifted To General Ward On First Postoperative Day And Check X Rays Including AP View Of Pelvis With Both Hips And Femur, Lateral View Of The Operated Hip With Femur Were Taken.
- Postoperative Radiographs Were Evaluated For Component Orientation, Adequacy Of Fixation Including Cement Mantle Thickness And Presence Of Lucent Lines Around Each Component. Progressions Of Lucent Lines In Serial Follow Up Were Classified According To Zones Of Guern Et Al[36] For Femur And Delee And Charnley [26] For Acetabulum.
- Suction Drain Was Removed On Second Post Operative Day And Antiseptic Dressing Applied Which Was Changed After Every Two Days. Stitches Were Removed On The 10th Or 12th Postoperative Day. Physical Therapy Program Consisting Of Deep Breathing, Coughing And Bilateral Active Ankle Exercise And Isometric Contraction Of The Quadriceps Muscles Were Started From First Postoperative Day.
- Prophylaxis Against Heterotropic Ossification Was Given With Indomethacin 25mg Thrice A Day For 10 Days.[39]
- Patients Were Made Ambulatory With Walker And Touchdown Weight Bearing Was Started On 2nd Day Followed By Weight Bearing As Tolerated By Patient. Most Of The Patients Were Discharged From The Ward On 7th Postoperative Day With The Special Instructions:
  - To Prevent Flexion, Adduction And Internal Rotation Of The Hip Joint.
  - Not To Squat.
  - To Use Western Type Latrine For Defecation.
  - Avoid Sleeping With Affected Hip Up.
  - To Keep Pillow Between The Thighs At Night.
  - Strict Use Of Walker While Walking.
- To Have An Attendant While Walking.
- Don't Sit On A Low Chair Or Sofa For Six Weeks.
- Regular Quadriceps, Hamstring And Abduction Exercise Of Hip Were Advised To Keep Up The Muscle Power And Movement Around The Hip Joint.
- Post Operative Follow Up Were Done At 2 Weeks, 4 Weeks, 8 Weeks, 12 Weeks, 6 Months And Final Follow Up At 1 Year, Both Clinically And Radiologically.
- Special Attention Was Given To Use Of Walking Aid, Pain And Any Complication Arising From The Conversion THR.

Results

Final Assessment of All Patients Treated By Total Hip Arthroplasty Was Done By Modified Harris Hip Scoring System (William H Harris 1969)[82]

Results Assessed By Modified Harris Hip Score Are Graded As Follows:

Excellent	**90-100**
Good	**80-89**
Fair	**70-79**
Poor	**< 70**

Table-1: Age Distribution

Age (Years)	HAP Group		Osteosynthesis Group	
	No. of patients	Percentage	No. of patients	Percentage
55-60	7	70	7	70
61-65	1	10	1	10
66-70	2	20	2	20
Total	**10**	**100**	**10**	**100**

HAP = Hemiarthroplasty

Mean age in hemiarthroplasty (HAP) group was 60 years (range 55-70 years) and in osteosynthesis group mean age was 58.8 years (range 55-70 years) (table 1).

Majority of cases in both groups were males (80%) in hemiarthroplasty group and (60%) in osteosynthesis group.

70% of our patients in HAP group were having left side involvement where as 60% of patients in osteosynthesis group was having right side involvement.

Table – 2 :Implant in Previous Surgery		
Implant in Previous Surgery	**No. of patients**	**Percentage**
Austin Moores prosthesis	7	35
Bipolar prosthesis	3	15
Cannulated Cancellous screws	10	50
Total	**20**	**100**

Cannulated cancellous screws were removed in majority of cases i.e. 50%. Austin Moore's prosthesis was removed on 35% of cases and bipolar prosthesis in 15% of cases (table2).

Image 3. Radiograph of patient who developed AVN after 18 months post op. CRIF with cannulated cancellous screw fixation for fracture neck of femur.

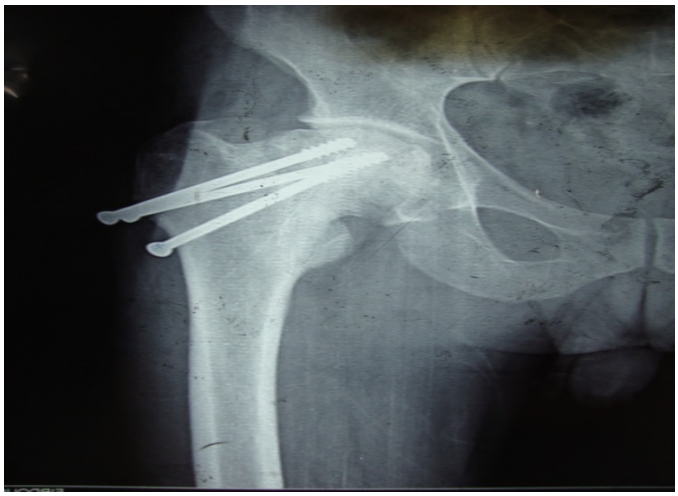

Image 3 A case of 47 year old male operated CRIF with cannulated cancellous screw fixation for fracture neck of femur later on developed AVN (23 months after primary surgery).

Image :4

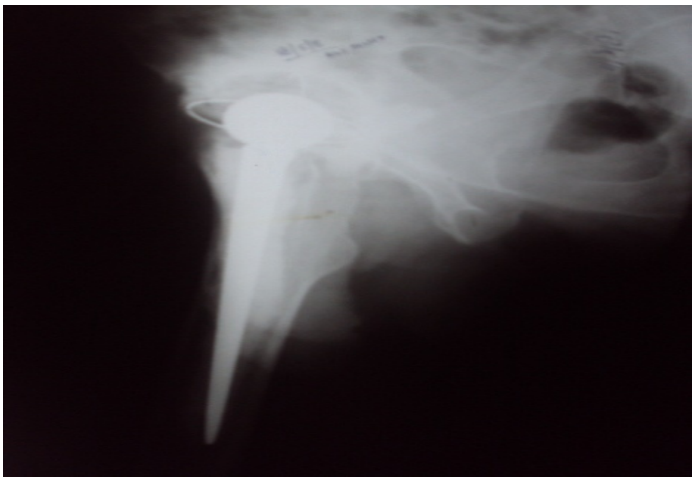

Image 5

Image 4 and 5: Immediate postoperative AP and LAT view of THR in a case of AVN of hip following failed osteosynthesis.

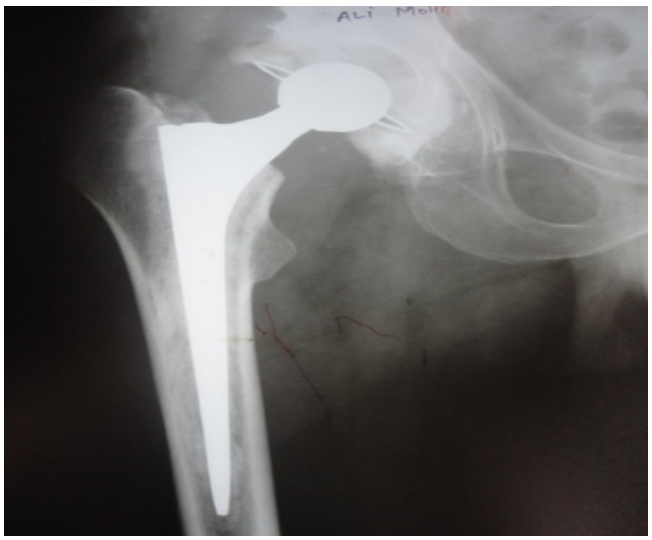

Image 6

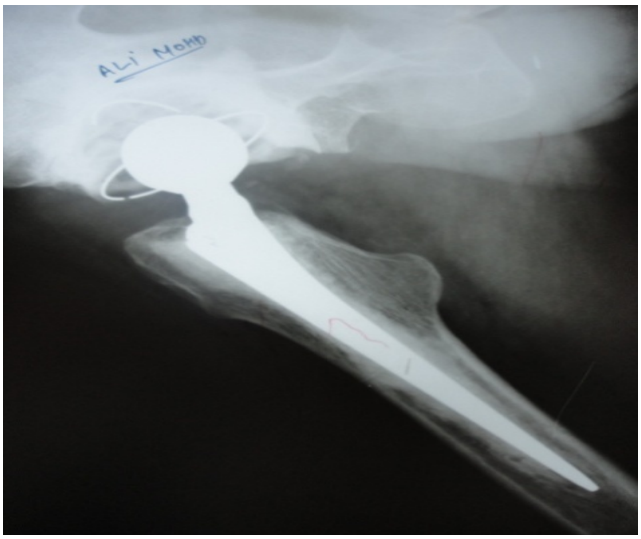

Image 7

Image 6 and 7: One year post op THR (total hip replacement) of same patient with no complaints.

Table – 3: Mode of Failure in HAP Group		
Mode of Failure	**No. of Patients**	**Percentage**
Acetabular erosion	6	60
Femoral loosening	3	30
Femoral loosening and subsidence	1	10
Total	**10**	**100**

HAP = Hemiarthroplasty

In majority of patients, cause of failure was acetabular erosion (60%). In others femoral loosening (30%) and subsidence (10%) was the cause of failure (table 3).

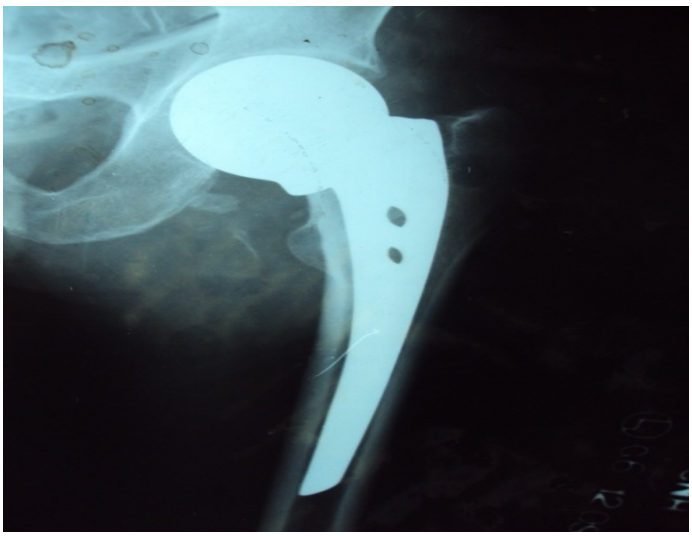

Image 8

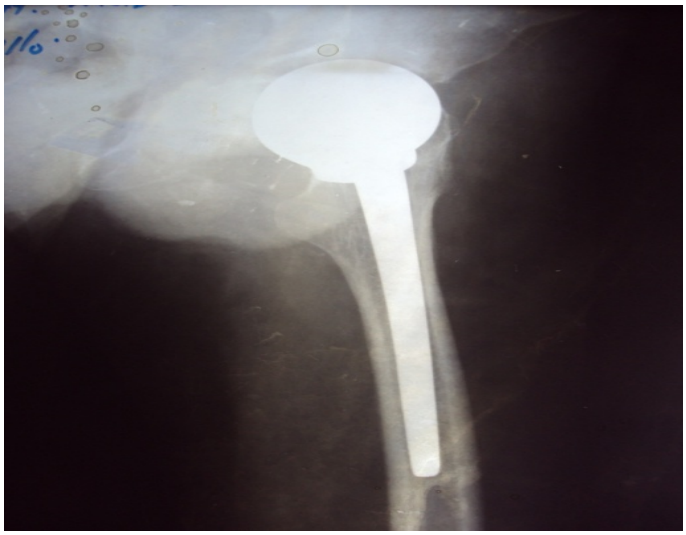

Image 9

Image 8 and 9: Pre operative AP and Lateral view in a case of hemiarthroplasty o complaining of persistent pain in hip and not able to walk.

Image 10

Image 11

Image 10 and 11 One year post op AP and lateral view with no fresh complaints.

Final follow-up clinical images images 12(a – f).

Image **12(a)** standing

12(b) sitting on chair

12(c) sitting cross legged

12(d) limbs in abduction **12(e)** external rotation and abduction **12(f)** adduction and internal rotation

Table – 4: Mode of Failure in Osteosynthesis Group		
Mode of Failure	**No. of patients**	**Percentage**
Avascular necrosis	6	60
Non-union	3	30
Non-union with broken screws	1	10
Total	**10**	**100**

Major cause of failed osteosynthesis was due to avascular necrosis (60%) and in remaining (40%) cases non-union was found to be mode of failure.

In our study majority of patients with failed hemiarthroplasty were complaining of groin pain (50%) and in remaining cases thigh pain and limb length discrepancy were chief complaints. Pain in all patients was present only during walking.

Table – 5: Patients Complaints in Osteosynthesis Group		
Complaints	**No. of patients**	**Percentage**
Hip pain	8	80
Hip pain + LLD	2	20
Total	**10**	**100**

HAP = Hemiarthroplasty; LLD = Limb Length Discrepancy

Hip pain (Anteriorly/ laterally/posteriorly) alone was the major complaint in failed osteosynthesis group i.e. 80% (table 5).

The mean interval between hemiarthroplasty and total hip replacement was 38.1 months (Range 6 months to 98 months), while in case of osteosynthesis group it was 25.2 months (Range 10 months to 48 months). Majority of patients in both groups were operated between 11-30 months.

The average surgical time for conversion total hip arthroplasty was 170 minutes (2 hours and 50 minutes) in failed hemiarthroplasty group (range 1 hour and 40 minutes to 3 hours) and in osteosynthesis group it was 129 minutes (2 hours and 9 minutes) with range between 1 hour and 50 minutes to 2 hours and 30 minutes.

Hospital stay after conversion total hip replacement averaged 9.9 days (range 7 days to 13 days) in hemiarthroplasty group and in osteosynthesis group it averaged 10.1 days (range 7 days to 15 days).

The average time for full weight bearing after conversion surgery was 4 days (range 3-5 days) in both failed hemiarthroplasty and failed osteosynthesis patient.

Preoperatively in both groups, majority (60%) of patients were having range of motion between 101^0 to 160^0. Average range of motion in hemiarthroplasty group was 121.5^0 and in osteosynthesis group it was $114^{0.}$

At one year follow up of conversion total hip arthroplasty, majority of patients i.e. 80% in both groups were having range of motion between 161^0 to 210^0. Average range of motion after conversion was 192.5^0 in hemiarthroplasty group and 189^0 in osteosynthesis group.

In both groups all patients were having moderate or marked pain preoperatively with an average pain score of 14 in hemiarthroplasty group and 12 in osteosynthesis group

After one year follow up of conversion surgery, majority of patients (90%) in hemiarthroplasty group were having none or slight pain with an average pain score of 41.4. In osteosynthesis group majority of patients i.e. 90% were having none to mild pain with an average pain score of 33.8 at final follow up.

After one year follow up of conversion total hip replacement 80% of cases in hemiarthroplasty group were walking without support or were using cane for long walks only, with an average score being 8.2. In osteosynthesis group 60% of cases were

walking without support or were using cane for long walks, with an average score of 6.6.

At one year follow up of conversion total hip replacement, 80% of patients in hemiarthroplasty group were walking unlimited or were able to walk six blocks with an average walking score 8.3 (range 5-11). In osteosynthesis group 90% of patients were able to walk unlimited or six blocks with an average walking score of 8.6 (range 5-11).

The average limb length discrepancy in failed hemiarthroplasty group was 1.7cm (range -6cm to 0cm) and in failed osteosynthesis group average limb length discrepancy was 1.4cm (range -2.5cm to 0cm).

The average limb length discrepancy after one year of conversion total hip arthroplasty in failed hemiarthroplasty group was 0.5cm (range -2cm to 0.5cm) and in osteosynthesis group it was 0.3cm (range -1cm to 0.5cm).

Among all 20 cases, majority of patients (85%) were having neutral alignment of stem in postoperative x-ray. Normal cement mantle (i.e. whiteout) was found in all except 4 patients, where cement mantle was found defective in zone 3, 4 and 5 of femoral component. Cement mantle of femoral component was graded according to the criteria of Barrak, Mulroy and Harris.[9]

Postoperatively majority of patients (60%) were having acetabular inclination angle between 35^0 to 40^0.Average inclination angle was found to be 41.5^0 with range between 35^0 to 60^0.

At 1 year follow up only two patients were having radiolucent lines in zone 1 of acetabular components, both of which were from hemiarthroplasty group. Radiolucent zones of acetabulum were classified according to De Lee and Charnley and were considered insignificant in both patients as they were less than 2mm.[26] Radiolucencies in femoral cement mantle due to defective cementization was found to be non progressive at final follow up.

We reported three complications in our whole study. One patient among failed osteosynthesis developed posterior dislocation in 3rd week after conversion surgery (image 13). Dislocation was believed to be as a result of increased abduction angle of acetabular component. Patient was managed conservatively by closed reduction under general anaesthesia followed by skeletal traction for 6 weeks with satisfactory outcome (image 14).

Image 13 posterior dislocation of hip

Image 14 hip reduced by close reduction

One patient in failed hemiarthroplasty group developed external rotation deformity postoperatively which was also thought to be due to malalignment of both acetabular and femoral component. Another patient among failed hemiarthroplasty group got intrusion of cement in to pelvis but did not develop any complication related to pelvic viscera or neurovascular structures and was managed without any treatment.

In failed hemiarthroplasty cases, Modified Harris Hip Score ranged from 35 to 57 with an average of 40.1 whereas in failed osteosynthesis cases it ranged from 30 to

69 with an average of 44.8 preoperatively. HAP = Hemiarthroplasty

At final follow up of 1 year after conversion surgery, average modified Harris Hip Score in failed hemiarthroplasty patients was 92.7 (range 79 to 99) and In failed osteosynthesis group modified Harris Hip Score averaged 90.7 (range 79 to 98).

At final follow up 90% of patients in both groups were having to good to excellent results and 10% were having fair results.

Discussion

Hip fractures including intracapsular fracture of proximal femur are common in geriatric age group. From last 10 decades the optimal treatment of femoral neck fractures has been sought. Internal fixation (osteosynthesis) or hemiarthroplasty are widely used for the treatment of femoral neck fracture in active old individuals. Because of high incidence of complications, majority of symptomatic hemiarthroplasty and osteosynthesis patients needs conversion total hip arthroplasty for relief of pain and improvement in functional outcome.

The age in our study of 20 cases ranged from 55 to 70 years with a mean of 60 years in hemiarthroplasty patients and 58.8 years in osteosynthesis patients. Amite Pankaj et al in their study of 54 hemiarthroplasties found mean age of 62 years (range 42-75 years). Akram Hammad et al found mean age group of 64.3 years (range 54-83 years).

Thomas Mehlhoff et al studied 27 cases of failed osteosynthesis converted to total hip arthroplasty found mean age of 65 years (range 35-90 years). Jorirs C.T et al found mean age of 74 years (range 59-92 years).

Mean age of our study was consistent with the study of Augusto Sarmiento et al, Akram Hammad et al and Amite Pankaj et al.

Although mean age of our failed osteosynthesis patients was not compatible with the study of Herbet Franzen et al and Joris C.T et al where mean age was higher, our study is consistent with study of Thomas Mehlhoff et al.

In our study male patients were 80% in failed hemiarthroplasty and 60% in failed osteosynthesis group. In a study conducted by Augusto Sarmiento et al on failed hemiarthroplasty only 23.75% patients were males. Akram Hammad et al in his similar study found 32% males. Amite Pankaj et al while studying results of failed hemiarthroplasty by total hip replacement found 68.18% males.

Our study is compatible with a study of Amite Pankaj et al having male preponderance of 68.18%.

In our study on 20 cases of failed previous hip surgeries, Austin Moore's prosthesis was removed in 35%, bipolar prosthesis in 15% and Cannulated cancellous screws were removed in remaining 50% of cases. Mode of failure was due to acetabular erosion (60%) and femoral stem loosening (30%), femoral stem loosening and subsidence in 10% of patients with hemiarthroplasty.

Sierra R J et al reported acetabular erosion in 28.87% and femoral loosening in 16.61% as a cause of failure in hemiarthroplasties. Akram Hammad et al found acetabular erosion in 38.21% and femoral loosening in 23.41% of patients.

Our study is in accordance with the above mentioned studies showing acetabular erosion as the main cause of failed endoprosthesis. The reason for higher percentage of acetabular erosion in our study could be due to small sample size.

In our study avascular necrosis of femoral head was found as a major cause of failed osteosynthesis i.e. 60%. Non union was found in 40% of cases in which one patient was having broken screws near the fracture site.

In a study, Thomas Mehlhoff et al reported avasular necrosis in 37% and non-union in 22.22%, as a cause of

failed osteosynthesis. Joris C.T et al found avasular necrosis and non-union in 29% and 3.22 respectively.

Our study is comparable with the study of Thomas Mehlhoff et al in which ratio of avasular necrosis to non-union is 1.66:1 as is in our study i.e.1.5:1.

Among failed hemiarthroplasty patients 60% were having groin pain including one patient who was also complaining of limb length discrepancy, remaining 40% were complaining of thigh pain. All failed osteosynthesis patients were complaining of hip pain including two patients whose concern was limb length discrepancy in addition to pain.

Our study is in consistent with the study of Amite Pankaj et al, in when they found groin pain in majority of patients (40%) and thigh pain in 28% of patients as a chief complaint. Hammad et al in their study found pain as a chief complaint in 61.7%, pain and limb length discrepancy was found in 37.1% of patients with failed hemiarthroplasty.

In our study, time interval from previous surgery of hemiarthroplasty to conversion total hip replacement ranged from 6 months to 98 months with an average of 38.1 months. Our study is comparable to the study of Akram Hammad et al in which mean interval was 33 months, although it does not correlate with the studies of Amite Pankaj et al and Sierre R.J et al , in which it was more than that of our study.

In our study, failed osteosynthesis patients were operated after a mean interval of 25.2 months (range 10 months to 48 months). Among other studies as shown in table below, our study is compatible with the study of Thomas Mehlhoff et al, in which mean interval for conversion of failed osteosynthesis to total hip replacement was 20 months.

In our study all patients were operated through posterolateral approach (Gibson's approach). Additional procedure like adductor tenotomy was done in 4 patients of hemiarthroplasty and 2 cases of osteosynthesis. The duration of surgical procedure in our study ranges from 1 hour and 40 minutes to 3 hours with an average of 2 hours and 50 minutes. Our duration of surgery in compatible with the study of Augusto Sarmiento et al 2hour 50 min as shown below in table:

In the osteosynthesis group our mean duration of surgery was 2 hours and 9 minutes with a range from 1 hour and 50 minutes to 2 hour and 30 minutes. This is in accordance with studies of Thomas Mehlhoff et al (1991)[75] and Shekhar et al (2008)[65] 2 hour 23 min and 2 hour 5 minutes.

Duration of hospital stay in our study averaged 9.9 days (range 7-13 days) in hemiarthroplasty patients and 10.1 days in (range 7-15 days) in osteosynthesis patients. Hospital stay of osteosynthesis patients as compared to hemiarthroplasty was due to the fact that majority of osteosynthesis patients belonged to rural area. For proper wound care and rehabilitation they were allowed to remain in hospital for longer duration as compared to hemiarthroplasty patients converted to total hip replacement.

Early weight bearing was an important step to prevent deep venous thrombosis and hasten the functional recovery.

In our study majority of patients (60%) in each failed hemiarthroplasty and failed osteosynthesis were having preoperative range of motion between 101^{o} to 160^{o} with an average of 121.5^{o} in hemiarthroplasty group and 114^{o} in osteosynthesis group. At final follow-up of 1 year after conversion, 80% of patients in both groups achieved 161^{o} to 210^{o} of range of motion at hip with the sum of flexion, adduction, abduction, internal rotation and external rotation. 10% of patients in each group achieved range of motion between 211^{o} and average range of motion was

better i.e.192.5^{o} in hemiarthroplasty group as compared to osteosynthesis group (average 189^{o}) operated for conversion total hip replacement, this may be related to better preservation of range of motion in hemiarthroplasty patients due to early mobilization after primary procedure as compared to internal fixation.

Preoperatively all 20 patients in our study were having moderate to marked pain with an average pain score of 41.4 and 33.8 in hemiarthroplasty and osteosynthesis group respectively. Pain grading was scored as per modified Harris hip scoring system. At final follow-up majority of patients (90%) operated for failed hemiarthroplasty were having none or slight pain with an average pain score of 41.4%. 90% of converted patients among failed osteosynthesis were having non or mild pain after 1 year of total hip replacement with an average Pain score of 33.8.

Although final follow-up of Amite Pankaj et al and Augusto Sarmiento et al were larger, our study is compatible with the study of Sierra R.J et al in which pain status was studied at 1 year follow-up.

All patients in our study including both hemiarthroplasty and osteosynthesis group were using support for walking except two patients in latter group, who were walking without support. At final follow-up, 40% of patients operated for failed endoprosthesis were walking without any support and 40% of patients were using cane for long walks only, our study is in accordance with the below mentioned studies in table:

At final follow-up of 1 year after conversion in failed osteosynthesis patients, 60% were walking without any support or were using cane for long walks only. Our study correlates well with the study of Shekhar et al in which 61.84% of patients operated for failed osteosynthesis were walking without support or were using cane for ambulation.

Before conversion total hip replacement, 90% of patients with failed hemiarthroplasty and 70% of patients with failed osteosynthesis were restricted to bed and chair or were doing only indoor activities. At our final follow-up of 1 year after conversion, 30% of patients in both groups were able to walk unlimited distance and remaining 70% of patients could walk a distance from 2 to 6 blocks. We have compared our study with the below mentioned similar study of Rafael et al

Difference in above table can be explained by the fact that Sierra R.J et al have studied walking distance in their patients after a mean follow-up of 5.3 years with large sample size including 132 conversion total hip replacements. So at our short follow-up of 1 year, improved walking score of our studied patients is justifiable.

The average limb length discrepancy in all failed hemiarthroplasty patients was 1.7 cm (range 6cm shortening to no limb length discrepancy). At final follow-up of 1 year after conversion, limb discrepancy averaged 0.5cm with range between 2cm shortening to 0.5cm lengthening. Akram Hammad et al in their study found average limb length discrepancy of 1.2cm. Our study is compatible with the study of Amite Pankaj et al as shown below:

In our study of failed osteosynthesis group, average preoperative limb length discrepancy was 1.4cm with a range from 2.5cm shortening to no limb length discrepancy. After 1 year of follow-up average limb length discrepancy was 0.3cm with a range from 1cm shortening to 0.5cm lengthening. Our study is similar to the study of Thomas Mehlhoff et al with respect to correction of limb length discrepancy as shown in below mentioned table;

In our whole study of 20 conversion total hip arthroplasties done in 20 patients including 10 cases of

failed osteosynthesis and 10 of failed hemiarthroplasty, we reported only three complications namely posterior dislocation in conversion of one patient with failed osteosynthesis, external rotation deformity and cement intrusion into pelvis in two cases of failed hemiarthroplasty. We believe that all complications were due to technical errors. Posterior dislocation was found in third week after conversion surgery in one patient that constitutes incidence of 10% dislocation in failed osteosynthesis group. We believe that dislocation in one patient was due to malalignment of acetabular component, where increased abduction inclination was found on postoperative radiograph. Patient was managed conservatively with closed reduction under general anaesthesia. Stability of arthroplastic joint was found satisfactory and was put on complete bed rest and skeletal traction for 6 weeks. Subsequent follow-up of the patient was satisfactory. Dislocation rate after conversion total hip replacement in our failed osteosynthesis patients is compatible with the study of Joris C.T et al [47] and Shekhar et al [65] who reported incidence of dislocation 5% and 14.3% in their conversion total hip replacement respectively. No patient in hemiarthroplasty group developed dislocation that is compatible with the study of Akram Hammad et al [3] in which 0% of dislocation was found. In hemiarthroplasty group one patient developed external rotation deformity of 40^0 that has not been mentioned in studied literature. We believe that external rotation deformity was due to technical error in orientation of the components. No treatment has been done for the deformity as patient was able to manage his routine activities without any difficulty. Third complication was the intrusion of cement into the pelvis in one patient of failed hemiarthroplasty (i.e. 10%). Intrusion of cement was thought to be through the medial margin of acetabulum where Hoffman retractor was placed intraoperatively. Postoperatively patient neither developed any complication related to pelvic structures nor was symptomatic in relation to pain and range of motion around the hip joint. Joris C.T et al [47] in their study found that 3% of patients developed complication like extrusion of cement from the femoral medullar canal into soft tissue, removal of cement was done only in symptomatic patients in their study.

We have compared our study with other published studies in relation to modified Harris hip score as shown in below table:

Our preoperative study of Harris hip scoring was comparable to the study of Amite Pankaj et al and Akram Hammad etal.

Preoperative modified Harris hip scoring of our study is in accordance with the study of Thomas Mehlhoff et al and Shekhar et al although mean in their studies is lower than that of our study; it may be because of large sample size in their study as compared to ours.

In our study of 10 cases of conversion total hip replacement done for failed hemiarthroplasty, we found an average modified Harris hip score of 92.7 (Range 79 to 99) at final follow up of 1 year and this compares well with the studies of Akram Hammad et al and Amite Pankaj et al with mean score of 86 and 92 respectively.

After conversion of failed osteosynthesis, we found an average modified Harris Hip Score of 90.7 (Range 79 to 98) .Our results were higher than that of above mentioned study that may be because of large sample size and long follow up in their studies.

The results in our study were found good to excellent in 90% of patients in each group converted to total hip replacement. Our study was comparable to other respective studies of failed hemiarthroplasty and failed osteosynthesis as shown in above tables. This illustrates

the high rate of success possible even in less established centres.

Conclusion

- Conversion of symptomatic hemiarthroplasty and failed osteosynthesis patients to total hip replacement is a safe option that gives excellent results in terms of pain relief and restoration of function and mobility as near as possible to pre-injury level.
- Hip replacement performed after failed previous surgeries is more difficult than routine primary total hip replacement due to multiple factors like scar tissue, osteoporotic bone, proximal migration of greater trochanter, difficulty in dislocation of joint with prosthesis.
- The intraoperative complications may be more than a primary total hip arthroplasty but the clinical relief that benefits a predominantly geriatric population with this final solution justify its use and we strongly recommend conversion total hip arthroplasty in failed fracture neck of femur .

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