



PROSPECTIVE FUNCTIONAL OUTCOME STUDY OF PRIMARY CEMENTED HEMIARTHROPLASTY USED IN MANAGEMENT OF UNSTABLE INTERTROCHANTERIC FRACTURES IN THE ELDERLY PATIENTS

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ABSTRACT

Introduction: Hip fractures are the most commonly occurring fracture which leads to substantial morbidity and mortality in elderly population. Conventional treatment with internal fixation devices in osteoporotic bones leads to screw cutout, implant breakage, varus collapse of femoral head and shortening on early weight bearing. Aim of this study is to assess functional outcome of cemented bipolar hemiarthroplasty in treatment of unstable intertrochanteric fracture. **Material&Method:** This study includes 20 cases of comminuted, unstable (AO/OTA type 31-A2.2 and type 31-A2.3) intertrochanteric fractures which had undergone cemented bipolar hemiarthroplasty and functional outcome was measured on sequential follow up on 3, 6 and 12 months post operatively with help of modified harris hip score. **Results:** Bipolar hemiarthroplasty can be used as an alternative to conventional internal fixation techniques as it provides stable fixation and early weight bearing mobilisation, but is a technically demanding procedure so it requires more operative time, familiarity of surgeon to the technique along with increased intraoperative blood loss. **Conclusion:** Bipolar hemiarthroplasty provides an effective alternative to internal fixation techniques for treatment of unstable intertrochanteric fractures.

KEYWORDS

Cemented bipolar hemiarthroplasty, Intertrochanteric fractures, elderly, modified harris hip score

1. INTRODUCTION:

Hip fractures are one of the commonest fractures in elderly population which leads to substantial morbidity and mortality. It is estimated that worldwide population of people in elderly age group is about to go up to 315 million by the year 2050 (1) so as to increased incidence of hip fracture which is expected to rise to 6.26 million by 2050(2-5). People in elderly age group commonly encounter episodes of fall either from standing or sitting position due to various causes like hypertension, vertigo, giddiness, generalized weakness, nutritional deficiencies, degenerative disease which ultimately leads to hip fractures in them.

Treatment methods for intertrochanteric fractures have evolved over time. Prior to introduction of fixation devices, conservative method with skeletal traction until fracture healing occurs was the treatment, for which patient has to stay in the bed for a long period of time which lead to complications like bedsores, hypostatic pneumonia, senile psychosis, deep vein thrombosis(6,7). With introduction of fixation devices, primary goal of treatment became stable fixation and early mobilization(8). J.callaghan et al in their study have stated that sliding hip screw is the implant of choice for stable type of intertrochanteric fractures and for unstable fractures which can be converted to stable variant with medial cortical buttresses restoration, (The Adult hip, 2nd edition, page number 1203)(9). But complications like loss of reduction due to excessive sliding leading to shortening, plate pullout, plate breakage, screw cutout through head were seen with sliding hip screw when it was used for unstable intertrochanteric fracture fixation in Kim WY et al's study(10). Recently, Intra medullary interlocking devices (ex. Proximal femoral nail) had shown better results in treatment of unstable fractures(11-15). But screw back out, implant breakage and varus collapse were seen with these devices also when used in osteoporotic bones and early ambulation is aimed for(16).

After introduction of bipolar prosthesis back in 1974, Tronzo(17) was the first person to use endoprosthesis for treatment of intertrochanteric fractures. After that multiple authors have published their work using bipolar prosthesis for treatment of unstable intertrochanteric fractures(7,18,19). In this study, we present our experience with use of cemented bipolar hemiarthroplasty for treatment of comminuted, unstable intertrochanteric fractures.

2. MATERIALS AND METHOD:

After getting approval from ethics committee of MMIMSR, we conducted this prospective study including 20 elderly patients who matches the inclusion criteria, coming to MMIMSR in allotted time period of october 2020 to october 2022.

Inclusion criteria:

- 1) Patient aged above 65 years
- 2) Patient who were independently ambulatory before sustaining this fracture
- 3) Unstable intertrochanteric fracture (AO/OTA type 31-A2.2 and type 31-A2.3 which coincide with Boyd and griffin type 2 and 3) in osteoporotic bones were included

Exclusion criteria:

- 1) Patient aged less than 65 years
- 2) Patient was not ambulatory before the fracture
- 3) Stable intertrochanteric fracture type
- 4) Patient with pathological fracture

Data collection:

After compiling demographic data of every patient, we took detailed history regarding mode of injury and history of any co-morbidities along with detailed clinical examination. After that every patient was gone through drill of routine investigations along with following radiographs:

- 1) x ray Pelvis with bilateral hip- AP
- 2) x ray injured hip joint with femur-AP (traction and internal rotation view)
- 3) x ray uninjured hip joint with femur- AP (for comparison)
- 4) Chest x ray -PA view for clearance in pre anesthetic checkup Pre-operative comparisons between radiographs of injured and uninjured limb were done to determine approximate size and position of the stem and approximate femoral neck offset. Every patient and their attendants were explained about the surgery and risks associated with it and an informed written consent were signed.

Operative technique:

After taking due clearance from anesthesia department, MMIMSR for every patient, patients were given pre-operative dose of antibiotic two hours before the surgery and further proceeded for local part preparation starting from iliac crest and groin region and goes up to knee joint.

Patients were putted in lateral position on unaffected side along with unaffected knee was flexed to 45 degree which was used as intra operative reference for measuring limb length. Postero-lateral approach was used to gain access to hip joint, rather than conventional posterior approach to hip following which there are more chances of posterior hip dislocation. After painting and draping of the surgical site, the incision was given from a point approximately 10 cm distal to posterior superior iliac spine and extended distally. Distally the

incision goes lateral to posterior margin of greater trochanter and continued for approximately another 10 cm over the femoral shaft. After incising fascia lata in line with the skin incision and dividing the gluteus maximus muscle over trochanteric bursa layer by layer, we could see the short external rotators of the hip. This approach prevents exposure of sciatic nerve in to the wound (as sciatic nerve was situated in posterior part of the dissection) and reduces chances of damage to the nerve. Now, external rotators of hip were dissected as near as possible to greater trochanter. After putting two sutures- one into piriformis and another one into conjoint tendon of gemelli and obturator internus and dissecting external rotators, we could see capsule of the hip joint. Capsulotomy was done in 'T' shaped manner. After that, hip joint was surgically dislocated on OT table with help of flexion, adduction and internal rotation which exposes femoral neck into area of dissection. Femoral neck osteotomy was done and femoral head was taken out of acetabulum which was measured with help of template. After that acetabulum was prepared by removing remnant of ligamentum teres and on other side, femoral canal was rasped using different sizes of rasps provided by company. Trial reductions were performed intra operatively to determine exact length which would provide the desired tension and tissue balancing of the abductor muscles and an equal leg length. Bone cementing was done by second generation cementing technique. After that appropriate size femoral stem was inserted in to the femoral canal and appropriate size femoral head was attached with stem and then reduced back once the bone cement sets in. In cases where greater trochanter was also fractured, it was fixed with help of circlage wire and putted back in place. After suturing the capsule, external rotators were sutured back to greater trochanter followed by wound closure in layers over a suction drain which was removed at first post operative dressing after 48 hours.

Post operative protocol: Post operatively patients were made to sit in bed on second day, stand up with support (walker) on third day and were allowed to bear full weight and walk with help of walker on fourth to ninth day and encouraged to walk as per his/her pain tolerance. Patients were given strict instructions to avoid squatting and sitting cross-legged. Suture removal was done on fourteenth post operative day and patients were followed up at an interval of 3 months, 6 months and 12 months. On each follow up, patient was analyzed clinically as well as radiologically. Modified harris hip score was measured at each follow up along with radiological evaluation to see for position of the prosthesis, stem loosening (if any) and periprosthetic fractures.

Case No-1:



Image 1. Image Showing Pre And Post-operative Radiographs Of Left Sided Unstable Intertrochanteric Fracture Treated With Cemented Bipolar Hemiarthroplasty

Case No-2:



Image 2. Image Showing Pre And Post-operative Radiographs Of Right Sided Unstable Intertrochanteric Fracture Treated With Cemented Bipolar Hemiarthroplasty

RESULTS:

Following observations were recorded from this study, including 20 cases of unstable intertrochanteric fracture.

Mean age of all the cases included in our study was 71.65 ± 5.11 years. Male to female ratio in our study was 3:1. 18 patients (90%) were of BOYD AND GRIFFIN type 2, while 2 patients (10%) were of BOYD AND GRIFFIN type 3 fractures. Most common co-morbidity was HTN along with DM in our patients. The mean time from injury to surgery was 5 days.

All the cases in our study were operated by same surgical team and mean operative time was 79.75 ± 7.68 mins. Intra operatively average volume of blood loss was 354.5 ± 52.96 ml. Postoperatively, most common complication is found to be abductor weakness (20%-4 patients) followed by infection and prosthesis dislocation (5% each). 9 patients had shortening of the operated limb, of which 8 had less than or equal to 2 cms of shortening so they were given a heel raise and they walked with the help of a cane. 1 patient had shortening more than 2 cm, he had a slight limp. The mean day of full weight bearing was on the 6th post operative day. The mean number of days spent by the patient in the hospital in the postoperative period was 8 days. One patient died within 3 months of surgery due to unrelated causes- so remaining 19 patients were evaluated for functional and radiological outcome at 3 month follow up. Two more patients died within 6 months of surgery due to unrelated causes.

Different Variables With Mean Values:

	N	Minimum	Maximum	Mean	SD
AGE	20	66.00	84.00	71.65	5.11
TIME FROM INJURY TO SURGERY (DAYS)	20	2.00	9.00	5.00	2.15
OPERATIVE TIME (MINS)	20	68.00	90.00	79.75	7.68
BLOOD LOSS (ML)	20	250.00	450.00	354.50	52.96
BLOOD TRANSFUSION (UNIT)	13	1.00	1.00	1.00	0.00
SHORTENING (CM)	9	0.50	3.00	1.28	0.75
TIME TO FULL WEIGHT BEAR (IN DAYS)	20	4.00	9.00	6.05	1.61
POSTOPERATIVE PERIOD IN HOSPITAL (DAYS)	20	5.00	12.00	8.00	1.89
HHS(3 months)	19	73.00	94.00	82.84	6.92
HHS(6 months)	17	68.00	94.00	84.18	7.52
HHS(12 months)	17	68.00	97.00	84.76	8.01

Modified Harris Hip Score At Follow Up:

	3 months		6 months		12 months	
HHS	No. of cases	Percentage	No. of cases	Percentage	No. of cases	Percentage
EXCELLENT	3	15.8%	5	29.4%	5	29.4%
GOOD	9	47.4%	7	41.2%	7	41.2%
FAIR	7	36.8%	4	23.5%	4	23.5%
POOR	0	0.0%	1	5.9%	1	5.9%

DISCUSSION:

Hip fractures are the most common reason for increased morbidity and mortality in elderly population. Internal fixation devices has reduced the morbidity associated with these fractures and hence became ideal implants for stable pattern fractures, but it does not allow for early weight bearing in case of unstable, comminuted fractures with poor bone quality as there is fear of fixation failure which leads to complications of prolonged recumbency (20). Primary goal is stable fixation and early weight bearing mobilisation rather than union, as most of these extracapsular fractures unites very well. Hemiarthroplasty was introduced as salvage procedure for failed pinning of hip. Tronzo (17) was the first surgeon to deviate from conventional internal fixation techniques and used straight stemmed, long prosthesis for treatment in intertrochanteric fractures. After that multiple authors have used cemented hemiarthroplasty as primary modality of treatment for intertrochanteric fractures (21,22) and found it to be successful. Here is a comparison of multiple variables of our study with available literature.

Table No. 1- Comparison Between Studies In Terms Of Age Variable

STUDIES.....	AGE VARIABLE (YEARS)
CURRENT STUDY	71.65 ± 5.11
KH SANCHETI (24) et al	77
HANTJEN (20) et al	80
ATUL PATIL (30) et al	65.5
THAKUR A (21) et al	80.7

Table No. 2- Comparison Between Studies In Terms Of Approach To Hip Joint

STUDIES.....	APPROACH TO HIP JOINT
CURRENT STUDY	POSTEROLATERAL
THAKUR A (21)	POSTEROLATERAL
KH SANCHETI (24)	POSTERIOR
LOKESH GUDDA NAIK (29)	POSTERIOR
GIRISH SAHNI (34)	POSTERIOR
CHOUDHARI PRADEEP (22)	LATERAL
REZA ZANDI (28)	LATERAL

Table No. 3- Comparison Between Studies In Terms Of Fracture Types Included

STUDIES.....	TYPES OF FRACTURE INCLUDED
CURRENT STUDY	AO/OTA TYPE 31-A2.2 AND 31-A2.3
KH SANCHETI (24)	AO/OTA TYPE 31-A2.2 AND 31-A2.3
THAKUR A (21)	AO/OTA TYPE 31-A2.2 AND 31-A2.3
ATUL PATIL (30)	AO/OTA TYPE 31-A2.2 AND 31-A2.3 AND EVANS TYPE 3&4
SA MUSTAFA (23)	AO/OTA TYPE 31-A2.3

Table No. 4- Comparison Between Studies In Terms Of Operative Time

STUDIES.....	OPERATIVE TIME (MINS)
CURRENT STUDY	79 ± 7.68
KH SANCHETI (24)	71
CHOUDHARI PRADEEP (22)	61.35
THAKUR A (21)	96
SA MUSTAFA (23)	84.9
REZA ZANDI (28)	111 ± 13.9
VARUN GOEL (25)	89.76

Table No. 5- Comparison Between Studies In Terms Of Intraoperative Blood Loss

STUDIES.....	BLOOD LOSS (ML)
CURRENT STUDY	354.5 ± 52.96
KH SANCHETI (24)	350
VARUN GOEL (25)	426.19
REZA ZANDI (28)	523
LOKESH GUDDA NAIK (29)	227.5
SA MUSTAFA (23)	204
THAKUR A (21)	125
ATUL PATIL (30)	321

Table No. 6-comparison Between Studies In Terms Of Time Taken From Injury To Surgery

STUDIES.....	TIME TAKEN FROM INJURY TO SURGERY (DAYS)
CURRENT STUDY	5
CHOUDHARI PRADEEP (22)	3.5
THAKUR A (21)	3
LOKESH GUDDA NAIK (29)	3.5 ± 1.3
BHARATHAY A (31)	21.5

Table No. 7- Comparison Between Studies In Terms Of Complications

STUDIES.....	COMPLICATIONS
CURRENT STUDY	ABDUCTOR WEAKNESS (20%), INFECTION (5%), POSTERIOR DISLOCATION(5%)
ATUL PATIL (30)	IMPLANT LOOSENING, INFECTION AND PROTRUSIO(1.58% EACH), DISLOCATION AND IMPLANT BREAKAGE(0.79% EACH)
CHOUDHARI PRADEEP (22)	INFECTION, NON UNION OF GREATER TROCHANTER AND DISLOCATION(4% EACH)
SA MUSTAFA (23)	INFECTION(6%), IMPLANT BREAKAGE AND DIFFICULTY IN REDUCTION(4% EACH), ASEPTIC LOOSENING OF IMPLANT AND HYPOTENSION(2% EACH)
ELHADI AS (27)	BEDSORE(8.3%), INFECTION AND DVT(3.3% EACH)

Table No. 8- Comparison Between Studies In Terms Of Shortening

STUDIES.....	SHORTENING (CM)
CURRENT STUDY	1.28
KH SANCHETI (24)	1.1
THAKUR A (21)	<1
LOKESH GUDDA NAIK (29)	0.5
GANTA VARAPRASAD (33)	0.5 ± 0.43

Table No. 9- Comparison Between Studies In Terms Of Days To Full Weight Bearing Mobilization

STUDIES.....	DAYS TO FULL WEIGHT BEAR
CURRENT STUDY	6
KH SANCHETI (24)	4.2
KIRAN KUMAR (26)	5.4
THAKUR A (21)	2.6
REZA ZANDI (28)	1
BHARATHY A (31)	2

Table No. 10- Comparison Between Studies In Terms Of Modified Harris Hip Score

STUDIES.....	HARRIS HIP SCORE
CURRENT STUDY	EXCELLENT TO FAIR HHS= 80%
KH SANCHETI (24)	EXCELLENT TO FAIR HHS= 91%
KIRAN KUMAR (26)	EXCELLENT TO FAIR HHS= 90%
ATUL PATIL (30)	EXCELLENT TO FAIR HHS= 97.6%
THAKUR A (21)	EXCELLENT TO FAIR HHS= 99.8%
SA MUSTAFA (23)	EXCELLENT TO FAIR HHS= 88%
REZA ZANDI (28)	MEAN HHS= 79.0 ± 11.8
ELHADI AS (27)	MEAN HHS= 77.85

Limitations:

However limitations of this study includes it's small sample size, and there was no comparison of bipolar Hemiarthroplasty with osteosynthesis surgeries like DHS and PFN. The study period was not too long and so long-term complications like hip osteoarthritis, loosening, protrusion, stem failure etc. cannot be assessed properly.

CONCLUSION:

In our study of 20 elderly patients having unstable intertrochanteric fractures of AO/OTA type 31-A2.2 and A2.3, 16 patients (80%) had excellent to fair outcomes with primary cemented bipolar hemiarthroplasty. It has an advantage of stable fixation and early full weight bearing mobilization which allows the patients to early return to pre fracture ambulatory status and decreases the chances of development of problems of prolonged recumbency like bed sores, chest infection, senile psychosis, deep vein thrombosis and ultimately improving quality of life. Cemented bipolar hemiarthroplasty decreases the duration of hospital stay overall, but it is technically demanding procedure hence has slightly more operative time and more intraoperative blood loss than the internal fixation techniques. However, smaller sample size and smaller follow up period makes our study non ideal to make any clinical recommendations, though it can serve as a critical analysis to stimulate future research.

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