AUSTIN MOORE PROSTHESIS IN THE MANAGEMENT OF FRACTURE NECK OF FEMUR IN AN ELDERLY POPULATION.

Orthopaedics

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ABSTRACT

Introduction: Intracapsular fractures of the proximal femur form a major share of fractures in the 77 elderly. Hip replacement arthroplasty (partial or total) is emerging as a most viable treatment option, and in that, hemiarthroplasty with the Austin Moore Prosthesis is among the most commonly employed. In our study, we have made an attempt to assess the functional status at long term follow up after hemiarthroplasty with the AMP, used in the treatment of fracture neck of femur in the elderly population, and to substantiate the use of the prosthesis in modern day orthopaedic practice.

Materials and : A retrospective study was carried out in patients above the age of 60 years, who had been diagnosed with non-pathological fracture neck of femur, treated operatively with hemiarthroplasty using the Austin Moore prosthesis in a tertiary care centre. A minimum follow up period of two years was considered. All the patients were evaluated clinically, and wherever possible, radiologically. Functional outcome was assessed based on the Harris Hip scoring system, and the results were analysed. Radiologically, an attempt was made to assess, among others, the amount of protrusio acetabuli at follow up, and femoral offset changes following hemiarthroplasty with the AMP. **Results:** In our study, we observed a positive functional outcome (excellent or good) in 9(45%) patients, with fair result in 6(30%) and poor in 5(25%). However, when pain alone was taken as criteria for assessment, upto 14(75%) patients had none to slight pain at follow up, and only 1(5%) patient had marked pain. Walking distance was significantly reduced in 6(30%) patients, who were either confined indoors or bedridden, but in only 1(5%) of them, the cause for the decreased ambulatory status was implant or procedure related (pain). Among the complications, 1 patient had a post-operative periprosthetic fracture that healed subsequently, 2 patients had marked osteolysis around the stem of the prosthesis, and only 1 patient had a radiological evidence of protrusio acetabuli. **Discussion:** Hemiarthroplasty with Austin Moore Prosthesis for fracture neck of femur remains a fairly good treatment option in elderly patients.

KEYWORDS

Hemiarthroplasty, Austin Moore Prosthesis, AMP, Fracture neck of femur

Introduction:

Intracapsular fractures of the proximal femur form a major share of fractures in the elderly. The treatment goal is to return the patient to his or her pre-morbid status of function. Management of femoral neck fractures in elderly patients has been controversial. Presently, there are multiple surgical treatment options available. Intracapsular extent of the fracture, tenuous blood supply to the femoral head going through the neck and difficulty in maintaining fracture reduction have been cited as reasons for failure of fixation. Although treatment methods have been refined over the years, a consensus on the ideal treatment remains elusive.

Important factors to consider in choosing any treatment modality are intrinsic, namely patient age, general medical condition, type of fracture; and extrinsic, viz. availability of facilities and socioeconomic status of the patient.

Surgical treatment has been established as the gold standard; however, the surgical option remains a dilemma. Hip replacement arthroplasty (partial or total) is emerging as a most viable treatment option, as it allows immediate weight bearing to return elderly patients to activity, eliminates osteonecrosis and nonunion as complications of femoral neck fractures, and reduces the incidence of reoperation compared with internal fixation in the elderly.

Even with the development of the bipolar endoprotheses, the Austin Moore prosthesis (AMP) remains one of the commonly used hip prosthesis in India. The AMP produces excellent results, however, thigh pain and protrusio acetabuli in younger patients have been associated with this device (1). Revision to a total hip arthroplasty following the use of AMP is associated with acetabular erosion. However, in the elderly population, when the cost of treatment and potential complications of modern hip prostheses are considered, it appears wise to limit the use of bipolar and total-hip arthroplasties to patients who are most likely to benefit from them. In fact, many patients will not survive long enough after their hip fracture to justify procedures with higher risk and higher cost. Moreover, studies on the functional outcomes of AMP vs bipolar prosthesis have shown the end result to be the same (2).

Thus we need a study which can help to assess the functional outcome following the use of AMP in the elderly population, and to substantiate

the use of AMP in modern day orthopaedic practice. Aim of the study was to assess the functional outcome following the use of AMP in the treatment of fracture neck of femur in the elderly population and substantiate the use of AMP in modern day orthopaedic practice.

Methodology: Patients with Fracture neck of femur admitted and operated with Austin Moore Hemiarthroplasty in a single tertiary care government hospital and who fit into the inclusion criteria were the subject of this study.

This was a retrospective study conducted on individuals admitted with fracture neck of femur and fitting into the inclusion criteria. The study patients were followed up with a subjective assessment of their post-operative quality of life using standardized questionnaire, and an objective evaluation of their clinical status and its documentation via a hip scoring system.

The study was carried out to evaluate the functional end results of Austin Moore Hemiarthroplasty for fracture neck of femur in the elderly

Inclusion criteria were: Patients with fracture neck of femur above 60 years treated by hemi-replacement arthroplasty with AMP who were able to walk before the fracture occurred and without any major hip pathology prior to the fracture. Exclusion criteria were: Patients with fracture neck of femur treated by any other technique and patients with pathological fracture of the neck of femur.

At follow up, after a subjective assessment of quality of life and functional status, a detailed clinical examination was done systematically. Patients were evaluated according to Harris hip scoring system. Wherever possible, a follow up radiograph of the pelvis was obtained to assess the status of the prosthesis in situ.

The following points were looked for while assessing the immediate post op: - Initial alignment of the prosthesis (Varus/Neutral/Valgus) and Periprosthetic fractures and related complications.

At follow up X-ray migration of the prosthesis, calcar resorption, osteolysis along the stem of the prosthesis, protrusio acetabula, other complications including dislocation of the prosthesis, implant breakage etc.

An attempt was also made to measure the medial femoral offset in the hips where an AMP had been implanted, and an assessment of variation of such offset measurements compared to the uninvolved hip was done in our study population. Such measurements could be carried out for only those patients in whom radiographs, obtained either immediately after surgery or at follow up showed comparable hip position and alignment of both hips.

Observation and results: In our series the maximum age was 86 years in case of males and 88 years in case of females. There were 8 patients in the age group 70-79 years and 8 were 80 years or above. The mean age was 75.50 for males and 75.75 for females. In all there were 12 female patients and 8 male patients.

12 of our cases sustained trivial injuries like slipping on the floor and in bathroom. 5 patients had sustained fall from height such as from bed, 2 patients got the fracture from being involved in Road traffic accidents, and in 1 patient, a stress fracture resulted from severe osteoporosis. Thus in only 2 patients was the trauma significant.

In our study population, out of 20 patients, 18 were able to walk without the need for walking support prior to the injury, while only 2 needed some sort of walking aid. Fourteen patients in our series had various medical and surgical problems. Hypertension, Diabetes mellitus, Stroke and Heart disease were the most commonly encountered (Table 1).

Associated co-morbidity	No.	%
Hypertension	3	15
Diabetes mellitus	5	25
Heart disease (CAD, LVF)	2	10
CVA	2	10
Others	2	10
None	6	30
Total	20	100

The longest follow up was of 6 years 1 month and 2 days, and the shortest follow up was of 2 years and 23 days. In general, 6 patients had a follow up period of 2-3 years, 10 patients were within follow up of 3-4 years, 2 patients were within follow up of 4-5 years, and 2 patients were followed up at more than 5 years after surgery.

Assessment of functional results based on the Harris Hip scoring system: The patients were given a score according to amount of pain and its relation to activities of daily living. Of the sample population, 16 had none or minimal pain quantifiable as slight or mild. 3 patients had moderate pain affecting daily activities, and in 1 patient, pain was marked. Pain was predominantly localised to the thigh, but 3 patients also complained of groin pain.

In our series 25% of patients did not require any support while walking, 30% of patients used cane for long walks only and only 25% of the patients used cane most of the time. 10% of the patients used crutches and another 10% were unable to walk.

40% of the patients were able to walk for considerable distance (6 Blocks and beyond). 30% could walk upto 2-3 blocks, while the rest 30% were confined indoors.

In our series the following observations were made regarding the range of movements of the hip. Majority (55%) of the patients had good range of hip motion (>160 degrees).

The functional outcome for our study was graded as excellent, good, fair and poor after adding the scores given for each criterion for assessment of the hip. The Harris hip scores at the end of our study ranged from 27 to 97. 3 (15%) patients had hip scores from 91 to 100 (excellent). 6 (30%) had hip scores 81 to 90 (good). 6 hips (30%) were rated 71 to 80 (fair) and 5 (25%) were rated <70 (poor). Thus 45% of the hips were classified as having a good to excellent results, 30% of patients had satisfactory result and 25% of the patients had a poor result.

A total of 10 follow up X rays could be obtained and evaluated. A periprosthetic fracture was noted in the immediate post-operative X ray of 1 patient and 1 prosthesis stem breakage noted in the follow up X ray of another. Otherwise, valgus/varus malpositioning of the stem was the most common radiological finding in our study, seen in 5

patients (50%). 2 patients (20%) had severe osteolysis noted along the stem of the prosthesis at follow up, and 1 patient (10%) had definite protrusio acetabuli.

Only 1 patient in our follow up series showed evidence of definite protrusio acetabuli radiologically. This amounted to 10% of the sample size.

Horizontal femoral offset measurements were taken in 10 patient radiographs, in which comparable views of both the hip joints were obtained. This included 3 immediate post op and 7 follow up X rays. Both the operated hip and uninvolved hip were assessed. Offset values were found to be 8.07% greater for the hips operated with Austin Moore hemiarthroplasty. **Discussion:** Most of the patients in our series were in the age group of 65-79 years. The mean age of our sample was 75.63 years. 60% of the patients in our series were females. Hormonal factors have a major role to play in the pathogenesis of femoral neck fractures. A high incidence of such fractures will always be seen in post-menopausal females with osteoporotic bones.

In 60 percent of our patients, the fracture neck of femur resulted from trivial trauma. In only 10 percent cases, a high energy mechanism like RTA was involved. A trivial fall resulting in such injuries is common in the elderly, as noted in a majority of other series like Evarts (3), Fielding (4), and Ingallhalikar (5). Stevens et al. (6) and several other authorities believe that the intracapsular fractures of femoral neck are stress fractures through pathological bone secondary to osteoporosis or osteomalacia. In our study, one such osteoporotic stress fracture was also noted.

The presence of major medical co-morbidities can contribute to a delayed surgical rehabilitation. While assessing long term functional outcome, ambulatory status may be limited due to generalized debilitation. A sick patient may experience greater subjective pain in the operated hip.

In our study, the longest follow up was of 6 years 1 month and 2 days, and the shortest follow up was of 2 years and 23 days. Maximum patients fell within the 3-4 years follow up group.

Norrish et al. (1) published a case series including 500 patients of fracture neck femur treated with Austin Moore hemiarthroplasty with a follow up ranging from 5-12 years. This series remains the longest follow up of patients with AMP in situ till date.

Pain following hemiarthroplasty is a major concern. Hinchey and Day (7) in their series of 294 patients found pain in 22 patients, following hemiarthroplasty, in the early post operative period. They could not find any definitive cause in them. They suspected poor muscle control as the probable cause of pain. The pain was mild to moderate and required treatment. Lanceford (8) felt that the pain following hemiarthroplasty should not be the cause for condemning the procedure. He listed the following causes for pain: Infection, improper prosthetic seating, metallic corrosion and tissue reaction, improper sized femoral head, contractures, periarticular ossification, acetabular protrusion and a redundant ligamentum teres.

Definite protrusio acetabuli was noticed in only one follow up X ray in our study population. Incidentally, the same patient was the one who fell in the category of marked pain on follow up.

Another clinico-radiological correlation that we found was the occurrence of pain in the presence of osteolysis around the stem of the prosthesis. Two such cases were noted; one patient had moderate pain and the other had marked pain. Incidentally, the latter also had protrusio acetabuli on the operated hip.

Rotational instability of the prosthetic stem within the proximal femur has been documented as a frequent mode of failure in unipolar as well as total hip arthroplasties. Sarmiento (9) studied a number of post-operative specimens following Austin Moore hemiarthroplasty and found that motion between the prosthesis and the bone takes place primarily in a rotary plane.

Majority (55%) of the patients had good range of hip motion (>160 degrees). 40% of the patients were able to walk for considerable distance (6 Blocks and beyond); 30% could walk beyond 2-3 blocks. However, 30% patients were confined indoors.

Our results with regard to the use of cane post-operatively were similar to as various studies published. Stinchfield et al. (10) reported 14% of their patients using cane regularly. 16% of Ban and Donovan (11) series were using the cane always, 34% were using occasionally and 20% discarded it.

The outcomes following various similar studies in the International literature assessing functional outcome following AMP hemiarthroplasty for fracture neck of femur in geriatric population is listed in Table 2.

Authors	No. of patients	Excellent/ Good	Fair	Poor
Austin T. Moore (12)	55	39 (70%)	10 (18%)	6 (12%)
Andersson et al. (13)	77	28 (36%)	29 (38%)	20 (26%)
Jensen et al. (14)	60	31 (52%)	26 (43%)	3 (5%)
Saxena et al. (15)	78	71 (93%)	5 (6.5%)	2 (2.5%)
Nipatasaj et al. (16)	62	77.42%	11.29%	11.29%
OUR STUDY	20	9 (45%)	6 (30%)	5 (25%)

The one major finding at the end of our study deserving attention is the relatively high incidence of Poor functional outcome (25% cases). In similar studies mentioned above, the causes for poor functional outcome have been discussed.

Hinchey and Day (7) observed that the poor results were due to preexisting medical conditions and pain following arthroplasty. Saraf and Saxena (15), Bavadekar and Manelkar (17) and Arwade (18) attributed the poor results to complications during or following surgery.

Interestingly, in our series, we have found that the poor results have predominantly resulted from a decreased ambulatory status of the patients. Pain as a determinant for poor outcome is less significant in our study. Among those patients with poor ambulatory levels, a generalised debilitation resulting from a CVA that occurred in the post operative period could be held accountable in two cases. We believe this is significant and consider it one of the fallacies of the Harris Hip scoring system that it doesn't consider non hip-related causes of pain or decreased mobility while assessing functional status.

The correlation between osteolysis noted on radiography and pain on assessing functional status has already been highlighted. Significant osteolysis as a cause of pain, aseptic loosening and early failure of hip prosthesis is well documented (19).

A periprosthetic fracture was noted in the immediate post-operative X-ray of 1 patient. It was treated conservatively at that time, with delayed weight bearing. The fracture was seen to have healed at the time of follow up, without any symptoms.

Risk factors for intraoperative periprosthetic fractures include the use of minimally invasive techniques; the use of press-fit cementless stems; revision operations, especially when a long cementless stem is used or when a short stem with impaction allografting is used; female sex; metabolic bone disease; bone diseases leading to altered morphology such as Paget disease; and technical errors at the time of the operation (20).

Anderson and colleagues (13), and Hinchey and Day (7) have emphasized that most periprosthetic fractures occur when the surgeon attempts to reduce the prosthesis head onto the acetabular socket.

1 prosthesis stem breakage was noted in another patient at 3 years follow up. The break was at the level of the distal 1/3rd of the prosthesis stem. There was no periprosthetic femur fracture. Increased radiodensity was noted in the femur surrounding the breakage site. The break itself produced no symptoms or deterioration of functional status.

Definite protrusio acetabuli was seen in 1 of the 10 follow up X rays that we could obtain in our patient population. The same patient also had evidence of osteolysis around the tip of the prosthetic stem, and

complained of marked groin pain. Ambulation was reduced to being confined indoors because of the pain.

Protrusio acetabuli as a complication of hemiarthroplasty with unipolar prosthesis is well documented (21).

In the 10 pelvis radiographs where horizontal femoral offsets were measured, offset values were found to be 8.07% greater in the hips operated with Austin Moore hemiarthroplasty. A low femoral offset can lead to wearing of the acetabular cup which is the primary cause of aseptic loosening, abnormal gait, joint instability and dislocation (22). Hence, in theory, the higher post operative femoral offset values obtained in our study in those hips with AMP imply a biomechanical advantage for the patient

Conclusion: Hemiarthroplasty with AMP for fracture neck of femur gives fairly good long term functional outcome in elderly patients. Patients are, for the most part, without pain. Satisfactory functional results, minimal incidence of major radiological complications and the biomechanical advantage that comes with providing a greater horizontal femoral offset makes the AMP a reliable endoprosthesis in orthopaedic practice.

CONFLICTS OF INTEREST: There are no conflicts of interest.

FUNDING ACKNOWLEDGEMENTS: The author(s) received no financial support for the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENTS: The authors confirm that the data supporting the findings of this study are available within the article.

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