PROSPECTIVE STUDY OF AUSTIN-MOORE'S ARTHROPLASTY WITH BONE CEMENT IN FRACTURE NECK OF FEMUR IN ELDERLY

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ABSTRACT

BACKGROUND

Objectives - This is a prospective study of 40 consecutive cases of fracture neck of femur in patients older than 60 years who were managed by cemented hemiarthroplasty with Austin-Moore's prosthesis. The patients were followed up and the results were analysed with the objectives of studying the outcome of management of fracture neck of femur by cemented Austin-Moore's Hemiarthroplasty and to compare the results with standard studies using non-cemented Austin-Moore's prosthesis and to assess if cementing the prosthesis improves clinical outcome.

MATERIALS AND METHODS

40 patients aged more than 60 years, who sustained fracture neck of femur were treated by hemiarthroplasty using Austin-Moore's prosthesis and polymethyl methacrylate bone cement for stem fixation in Shadan Institute of Medical Sciences, Hyderabad, TS between December 2013 and November 2015; 40 patients who were followed up for a minimum of one year have been included in this study. Functional outcome was analysed using the Harris hip scoring system.

RESULTS

All the 40 patients were available for follow-up at the end of study period. The patients were in the age group of 68 to 85 years with the mean age of 74.7 years, 63.3% of patients were female with 90.9% of male. All cases sustaining the fracture following a trivial trauma. The functional outcome using the Harris hip score was excellent in 18%, good in 50%, fair in 13.6% and poor in 9% of the cases.

CONCLUSION

Hemiarthroplasty with Austin-Moore's prosthesis is a good option in elderly patients with limited physical demands and mobility. Cementing the prosthesis can achieve better control of thigh pain, improve mobility, allow early mobilisation and lesser use of walking aids. Cementing of Austin-Moore's prosthesis can be safely undertaken in patients to achieve better functional outcome.

KEYWORDS

Fracture Neck of Femur, Austin-Moore's Prosthesis, Bone Cement.

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BACKGROUND

Femoral Neck fractures are one of the most common in the elderly. The prevalence of these fractures has increased with improvement in life expectancy. The prevalence of the fracture neck of femur doubles for each decade of life after the fifth decade.[1]

With our society becoming more and more geriatric society, the burden of this fracture and its sequelae continues to be on the rise.[2] The goal of treatment of femoral neck fractures is restoration of pre-fracture function without associated morbidity.[3] Open reduction and internal fixation of these fractures in elderly has poor outcome including high rate of non-union and avascular necrosis.

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The introduction of single piece unipolar metal prosthesis by Thompson in 1954 and Austin-Moore's in 1957 to replace the femoral head ushered in the era of hemiarthroplasty of the hip as a treatment of these fractures. Experience of the last four decades has shown that hip Arthroplasty is the best treatment for intracapsular fracture of neck of femur in elderly in terms of both short-term and long-term results.[4] Currently, surgeons can choose between unipolar and bipolar hemiarthroplasty and total hip arthroplasty in the treatment of intracapsular fracture of the neck of femur in the elderly.[5]

The problems encountered with unipolar prosthesis were acetabular erosion and loosening of stem giving rise to pain. Bateman in 1974 introduced the bipolar prosthesis, which had mobile head element and had additional head surface to allow movement within the acetabulum, this led to reduction of acetabular surface and hence reduce incidence of pain and acetabular protrusion, because motion is present between the metal head and the polyethylene socket (inner bearing) as well as between the metal head and acetabulum (outer bearing).[6]

Bipolar prosthesis is slowly replacing the conventional unipolar prosthesis, because of its superior benefits as higher percentage of satisfactory results, less post-operative pain, greater range of movement, more rapid return to unassisted activity and reduced incidence of acetabular erosion.[7,8]

We have taken up this study to gain deeper understanding of the results and problems associated with this procedure and to evaluate if using bone cement with the Austin-Moore's Prosthesis offers any distinct advantages in reducing the complications of thigh pain, stem loosening and periprosthetic fractures.

Objectives

1. To study the management of intracapsular fracture of the neck of femur with Austin-Moore's prosthesis used with polymethyl methacrylate bone cement.
2. To compare the results with standard studies and draw conclusions.

Review of Literature

Ambroise Pare, a French surgeon was the first person to describe fracture of proximal femur in 1564[9] Emil Theodor Kocher suggested 2 mechanisms of injury in femoral neck fractures. The first was a fall producing a direct blow over the greater trochanter of femur.

The second mechanism is external rotation of the extremity.[10] Sir Jacob Astley Cooper in 1882 was the first to distinguish between intra- and extra-capsular fractures.[11] Union rate for close reduction and spica casting from the 1930s recorded at only 23%.[12]

Attempts at internal fixation date back to isolated cases as early as 1850. In 1950s saw the advent of hemiarthroplasty as a means to prophylactically address non-union and avascular necrosis, the primary complications following femoral neck fracture fixation.

The Austin-Moore's[13] and Thompson prosthesis[14] were successful metallic implants designed to replace the femoral head and neck secured with an intramedullary stem in the femoral shaft.

The Evolution of Hip Arthroplasty

The first reported hemiarthroplasty was by Delbet who used reinforced rubber as a replacement for the femoral head in 1919. In 1950, Thomson developed a short stemmed metal prosthesis.[15] At about the same time, the Austin-Moore's prosthesis was described. This prosthesis had a femoral stem, which was fenestrated and also has a shoulder to enable stabilisation within the greater trochanter and to prevent rotation within femoral canal. It became apparent that the long-stemmed devices generally were superior to the shorter stemmed devices, which they soon replaced.

Beginning in 1973 and working independently, Giliberty and Bateman developed the prototypes of the current bipolar endoprosthesis, which used metallic cups lined with high-density polyethylene that were locked securely on to the head of femoral component.[16] Sir John Charnley began the development of various types of total hip replacement arthroplasties between 1958 and 1963.[17] He has ushered in the era of modern joint replacement surgery.[18]

Figure 1. Austin-Moore's Prosthesis

Figure 2. Thompson's Prosthesis

Figure 3. Bipolar Prosthesis

Figure 4. Total Hip Replacement

Use of Cement with Austin-Moore's Prosthesis

The Austin-Moore's prosthesis is traditionally used without bone cement in contrast to Thompson's prosthesis, which is usually cemented in place. Charnley showed that the cement increases the weight bearing capacity by 200 fold.[19] The use of cement enables a secure primary fixation to be achieved at the time of surgery between the prosthetic stem and proximal femur. True fixation of an uncemented femoral component is less likely to develop with a hemiarthroplasty in a hip fracture patient than with a total hip arthroplasty in the arthritic patient. The intramedullary canal of the osteoporotic patient is likely to be wide and thin walled.[20]

Figure 5. Powder and Liquid Components of Bone Cement

Advantages of using Cement with AMP

Follacci and Charnley (1969) reported a comparative study of a selected group of 40 patients. Half the patients were treated for complications of internal fixation of an intracapsular fracture by means of a Cemented Thompson prosthesis and half for a fresh fracture with uncemented Thompson prosthesis. The cemented group patients had less residual pain and improved gait.[21]

Lausten and Vedel (1982) found a slightly increased tendency towards loosening in uncemented prosthesis compared with cemented prosthesis at two years from injury in a group of 73 patients.[22]

Sonne-Holm et al (1982) compared Austin-Moore's arthroplasty with and without cement and found that the patients with cemented arthroplasties had a superior hip function during first 6 months of followup.

In this study, the Merle D'Aubigne total hip index was significantly higher for patients with cemented hemiarthroplasty, due mainly to less pain and better gait function. The authors attributed this to better primary anchorage. They also noted a higher number of settings in the uncemented group.[23]

Safety of Cemented Hemiarthroplasty

Although, there are number of advantages with using cement, it is associated with some serious disadvantages. These include cement-induced hypotension and cardiovascular collapse, excessive acetabular wear, difficult revision and retained cement within the acetabulum.

Sevitt (1972) reported a 7% incidence of fat embolism in a series of 88 patients treated with cemented Thompson prosthesis for fracture neck of femur and none in those who underwent uncemented arthroplasty.

This was the sole cause of death in all patients within 1 week of injury.[24]

MATERIALS AND METHODS

Source of Data

40 consecutive patients with intracapsular fracture neck of femur satisfying inclusion criteria were admitted in Shadan Institute of Medical Sciences, Hyderabad - TS during the study period of December 2013 to November 2015 were included in this study.

Inclusion Criteria

1. Intracapsular fracture neck of femur.
2. Patients aged above 60 years.

Exclusion Criteria

1. Patients below 60 years.
2. Patients with arthritic changes involving acetabulum.
3. Pathological fractures.
4. Patients medically unfit for surgery.

Preoperative Protocol

All study patients were put on high tibial skeletal traction. Adequate medical management of comorbid conditions, informed written consent for the surgical procedure and inclusion for the present study was taken, standard surgical preparation was done.

Surgical Procedure

Cases were done under spinal or epidural anaesthesia. Moore's posterior approach was taken.[25]

Standard surgical procedure was followed. The prosthesis of stainless steel AIS 316 L of 135 degrees and stem length of 127 mm and stem thickness of 10 mm was used; 40 gram of bone cement of Simplex P, Stryker Howmedica Osteonics Corp. NJ, USA was used.

Postoperative Protocol

All the patients were advised to sit with back rest from 2nd postoperative day. Mobilisation with walker was started between 3rd and 5th postoperative day. Patients were initially advised toe-touch weight bearing and later advised progress to full weight bearing as tolerated. The study patients were discharged on an average of 40 days. Regular followup of all cases was done at 6 weeks, 3rd, 6th, 9th month and one year. At each followup, patients were evaluated clinically using the Harris hip score and Radiologically.

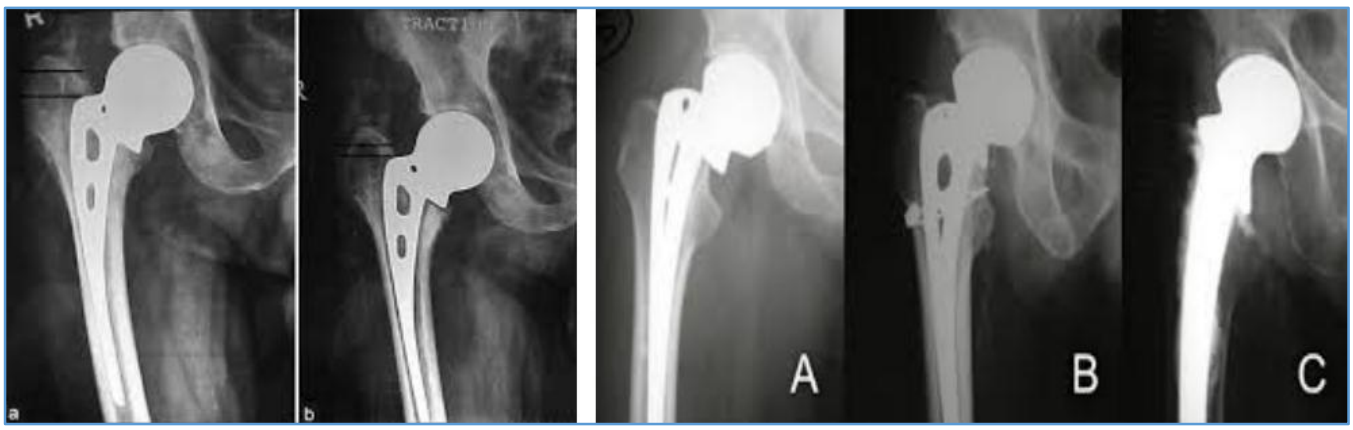

Figure 6 & 7. X-Rays of Austin-Moore's and Thompson's Prosthesis In-Situ

Figure 8. Bipolar Prosthesis In-Situ

RESULTS

Age in Years	No. of Patients	Percentage
60 - 70	6	15
71 - 80	29	72.5
> 81	5	12.5
Table 1. Age Distribution		

Sex	No. of Patients	Percentage
Males	15	37.5%
Females	25	62.5%
Table 2. Sex Distribution		

Mode of Injury	No. of Patients	Percentage
Tripping	36	90%
RTA	4	10%
Table 3. Mode of Injury		

Time of Presentation	No. of Patients	Percentage
< 24 hours	11	27.5
24 - 72 hours	11	27.5
72 hours - 1 week	6	15
> 1 week	12	30
Table 4. Time to Presentation after Injury		

Radiological Type	No. of Patients	Percentage
Trans-cervical	36	90
Basi-cervical	2	5
Sub-capital	2	5
Table 5. Radiological Type of Fracture		

Grade	Harris Hip Score	No. of Patients	Percentage
Excellent	90 - 100	8	20
Good	80 - 89	24	60
Fair	70 - 79	5	12.5
Poor	< 70	3	7.5
Table 6. Final Harris Hip Score			

Grade	Our Study	Moore's	Jensen[26]	Noor[27]
Excellent	20%	31.6%	30%	38%
Good	60%	43.3%	29.6%	21%
Fair	12.5%	16.6%	43.3%	24%
Poor	7.5%	8.3%	5%	17%
Table 7. Comparison with Standard Studies of Austin-Moore's Arthroplasty				

DISCUSSION

The aim of replacement surgery in fracture neck of femur is early return to daily activities. This is particularly applicable to the elderly age group where complications related to prolonged immobilisation need to be prevented.

40 patients aged more than 60 years who sustained fracture neck of femur and treated by Austin-Moore's arthroplasty with bone cementing consecutively treated between Dec. 2013 and Nov. 2015 were included in the study at Shadan Institute of Medical Sciences, Hyderabad, TS.

The mean age of patients in the present study was 74.77 years. Present study also had a higher number of females; majority of our patients (90.9) sustained the injury due to trivial trauma. All study patients had a displaced fracture neck of femur. Majority had a transcervical fracture (90.90%). When choosing hemiarthroplasty for management of fracture neck of femur, the age of the patient and time since injury is considered.[28]

A little more than half of our study patients were brought to the hospital within 3 days of sustaining the injury. All the study patients were taken for the surgical procedure between 3rd and 5th day of trauma. Most of our study patients were mobilised in bed on day 1 of surgery and with weight bearing as tolerated using a walker within the 72 hours of postoperative period.

There was no case of any cement related complications like hypotension, pulmonary embolism or cardiac arrest.

The average duration of hospital stay among the study patients was 40 days. There were no postoperative complications like loosening, dislocation, erosion, subsidence, protrusio acetabuli or periprosthetic fracture.

In our study, the final Harris Hip score as evaluated in 1 year followup averaged 84.53.

There is only one study in literature by Sonne-Holm et al comparing Moore's arthroplasty with and without cement. The authors found that the patient with cemented Moore's arthroplasties had a superior hip function during the first six months of followup. In this study, the Merle D'Aubigne total hip index was significantly higher for patients with cemented hemiarthroplasty due mainly to less pain and better gait function.

CONCLUSION

Hemiarthroplasty using cemented Austin-Moore's prosthesis for fracture neck of femur provides freedom from pain, better range of movement and more rapid return to unassisted activity with an acceptable complication rate.

Providing a good primary anchorage in the osteoporotic femur is of paramount importance. This can be done by cementing the prosthesis without any significant increase in cement related complications. Our experience with Austin-Moore's prosthesis has been better than that with an uncemented Austin-Moore's hemiarthroplasty. Considering the good result achieved in the short term, it seems reasonable to use bone cement for all Austin-Moore's hemiarthroplasties.

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