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### OUTCOME OF UNCEMENTED UNIPOLAR HEMIARTHROPLASTY IN FRACTURE NECK OF FEMUR, IN GERIATRIC PATIENTS IN RELATION TO BONE QUALITY

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**ABSTRACT: BACKGROUND:** Osteoporosis plays an important role in pathogenesis of fracture neck of femur in mobile elderly. Hemiarthroplasty is most common mode of management of femoral neck fractures in elderly in developing world. We report the outcome of uncemented hemiarthroplasty in elderly patients with a femoral neck fracture in relation to bone quality of patient as estimated by Dual energy x ray absorptiometry (DEXA scan). **MATERIALS AND METHODS:** 75 uncemented hemiarthroplasties for femoral neck fractures were performed in elderly patients more than 70 years of age between August 2008 and April 2012. The clinical, radiological results and bone mineral density of 65 hips in 65 patients who could be followed up were analyzed. For all cases Austin Moore prosthesis was implanted. **RESULTS:** The mean age of the patients was  $79.96 \pm 7.21$  years (71 to 96 years). 44 patients were women and 21 were men. Average duration of follow-up was  $18.59 \pm 11.53$  months (Range 4 to 44 months). The mean Harris Hip Score in patients with osteopenia was  $80.29 \pm 13.29$  and in patients with osteoporosis it was  $79.96 \pm 11.67$  at the time of the last follow-up. There was no significant difference in mean Harris hip score in osteoporotic and non-osteoporotic patient's p value 0.923. Out of 65 patients whose results were assessed in our study 48 patients (73.8%) had osteoporosis and 17 patients (26.1%) had Osteopenia. None of the patients in our study had a normal bone density. The mean T Score as measured on DEXA scan was  $-3.74 \pm 1.57$ . **CONCLUSION:** Uncemented hemiarthroplasty for elderly patients more than 70 years of age with a femoral neck fracture showed satisfactory short-term results with no relationship to the bone quality.

**KEYWORDS:** Femoral neck fracture, hemiarthroplasty, T score, osteoporosis, osteopenia, Austin Moore prosthesis.

**INTRODUCTION:** It has been estimated that 1.3 Million hip fractures occurred in 1990 worldwide, a figure that is to double by 2025 & increase to 4.5 million by 2050.<sup>1</sup> A hip fracture is associated with 20% reduction in expected survival.<sup>2</sup> Osteoporosis plays an important role in pathogenesis of fracture neck of femur.<sup>3</sup> Hip fractures are one of the most serious complications of osteoporosis, infact the measure of success or failure of treatment of osteoporosis is the proportion of patients who sustain a hip fracture.<sup>4</sup> The main diagnostic tools to predict the osteoporotic fractures is dual energy x- ray absorptiometry (DEXA) scan.<sup>5</sup> Whether fracture of femoral neck in elderly patients are treated with internal fixation, hemiarthroplasty or total hip arthroplasty should be determined by degree of fracture displacement, the patient age, functional demands and risk profile such as level of cognitive function and degree of physical fitness.<sup>6,7</sup>

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Hemiarthroplasties are associated with better functional outcome than internal fixation in elderly patients.<sup>8</sup> Considering clinical outcomes, general health and costs, it can be concluded that the choice of endoprosthesis does not pose an obstacle to a patient's recovery.<sup>9</sup>

This study was designed to evaluate clinical outcome of uncemented hemiarthroplasty in fracture neck of femur in elderly patients (age >70 years) in correlation to bone quality of patient as measured by dual energy X - Ray absorptiometry.

**MATERIAL AND METHODS:** After receiving clearance from ethical committee we performed a prospective study of 75 elderly (>70 years) patients who underwent uncemented hemiarthroplasty in our hospital within the time period between August 2008 to April 2012. Seventy five patients who underwent uncemented hemiarthroplasty and satisfied the inclusion criteria were included in the study. Patients aged more than seventy years with displaced femoral neck fracture with no pre-existing acetabular or hip diseases were included in the study. Patients with fracture neck of femur older than three weeks and pathological fractures following tumours, infection, ankylosing spondylitis etc were excluded from the study. All the patients included in the study were assessed in the emergency section of our hospital and they were provided with first aid in the form of analgesia, intravenous fluids and skin traction after radiological confirmation of fracture. All patients were subjected to thorough pre-investigational symptomology recording and clinical examination according to specific patient proforma for fracture neck of femur. Afterwards baseline investigations were done so as to assess the fitness for anaesthesia.

All patients had a plain radiograph of pelvis with both hips. A DEXA Scan of proximal femur and lumbar vertebrae was done. T-score of uninvolved hip as read on DEXA Scan was taken into consideration (Photograph 1). The treatment rationale, risk associated and frequency and projected post-operative course was discussed with the patient and an informed consent was taken.

Surgery was performed under spinal, epidural or general anaesthesia depending upon suitability and associated morbidities of the patient. The hip was approached by posterior Moore's approach and Austin Moore prosthesis was inserted.

In immediate post-operative period, the hip was positioned in approximately 15 to 20 degrees of abduction while the patient was recovering from anaesthesia (photograph 2). We used to encourage the patient to begin bed exercise and limited mobilization on the first post-operative day. Deep breathing, ankle pump, quadriceps and gluteal isometrics, and gentle rotation exercises were encouraged. Patients were instructed to exercise for a few minutes each hour they are awake. On the first or second post-operative day the patient was made to sit on the side of bed or in chair in a semi recumbant position. Gait training began on the second post-operative day. Patients were allowed partial weight bearing on the operated limb on the third postoperative day.

The patients were discharged usually on 3<sup>rd</sup> or 4<sup>th</sup> post-operative day with proper instructions, relieving home exercises and precautions to prevent dislocation. Follow – up visits were made at 2 weeks, 6 weeks, 4 months, 6 months and 1 year and periodically thereafter. After 2 weeks stitches were removed, and after 6 weeks crutches and walker were discontinued and the patients were allowed to walk with cane till pain diminished. At each visit patients were

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evaluated clinically and radiologically. The Harris hip score was calculated at 4 months and 12 months and 6 monthly thereafter and the results were interpreted in relation to T-Score (bone quality of patient).

### Results were graded according to Harris hip score into following 4 grades:

1. **Excellent:** when mean Harris hip score is between 90 to 100.
2. **Good:** When the mean Harris hip score is between 80 and 89.
3. **Fair:** When the mean Harris hip score of is between 70 to 79.
4. **Poor:** These patients have Harris hip score of less than 70.

Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables are presented as mean  $\pm$  SD, and categorical variables are presented as absolute numbers and percentage. The comparison of normally distributed continuous variables between the groups was performed using Student's t test. Nominal categorical data between the groups were compared using Chi-squared test or Fisher's exact test as appropriate. For all statistical tests, a p value less than 0.05 was taken to indicate a significant difference.

**RESULTS:** A total of 75 patients were included in the study. Fifty four (70.7%) patients were women and twenty one (29.3%) were men. Four patients died in immediate post-operative period due to medical conditions (two due to cerebrovascular accident and two due to renal failure) and 4 patients were lost to follow up. Out of remaining sixty seven patients four died after varying degree of follow up, two of them were non ambulatory (one had associated contralateral intertrochanteric fracture and another had weakness due to stroke), and were not included in final results and the results of remaining two dead patients were interpreted as per their last follow up. Thus the final results of 65 patients were interpreted in this study. Average follow-up period was  $18.59 \pm 11.53$  months (range 4 to 44 months).

The average duration of surgery and amount of blood loss was  $42.33 \pm 16.93$  min from skin to skin (Range 25 to 90 min) and  $260.13 \pm 49.77$  ml (range, 190 to 350 ml), respectively

All of sixty five patients were ambulatory at their final follow up. The toe-touch-weight-bearing walking with walker support was started at an average of  $4.42 \pm 2.06$  (3-14) post-operative day. Full weight-bearing was permitted at an average of  $6.25 \pm 0.78$  (6-10) weeks. The mean duration from injury to surgery in our patients was  $5 \pm 1.79$  days.

We had 2(3.1%) cases of superficial wound infection which were managed with dressing and antibiotics, two patients (3.1%) had dislocation within 6 weeks post operatively, one was reduced in closed manner and another required open reduction. Eight patients (12.3%) had thigh pain which started after six weeks post operatively, One patient (1.5%) had periprosthetic fracture with loosening of stem and another had implant breakage, in both total hip arthroplasty was done. There was no incidence of stem subsidence, acetabular protrusion, or heterotopic ossification in any of the patients during the study period. Acetabular erosion was seen in two patients (3.1%) but the symptoms were not severe enough to warrant revision.

In our study out of seventy five patients, fifty five patients (73.3%) had osteoporosis (T-score  $< 2.50$ ) and 20 patients (26.7%) had osteopenia (T-score between -1 and -2.5). None of the

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patients in our study had a normal bone density. The mean T Score as measured on DEXA scan was  $-3.50 \pm 1.72$  (Table 1).

	<b>N</b>	<b>Mean±S.D</b>	<b>Min – Max</b>
T-Score	75	$-3.68 \pm 1.52$	-6.5 to -1

**Table 1: Mean T-Score As Measured On Dual Energy X Ray Absorptiometry**

Out of sixty five patients available for follow up, forty nine patients (75.38%) recovered to pre-injury levels of daily activity, while sixteen patients (24.6%) used walking aids. The mean Harris Hip Score was  $80.05 \pm 12.19$  points (48-96) at the time of the final follow-up. An excellent score (90-100 points) was recorded in 19 hips (29.2%), good (80-89 points) in 23 hips (35.4%), fair (70-79 points) in 15 hips (23.1%) and poor (60-69) in 8 hips (12.3%) (Table 2). There was no significant difference in Harris hip score between the patients with osteopaenia (mean  $80.29 \pm 13.29$ ) and osteoporosis (mean  $79.96 \pm 11.67$ ), P value 0.923.(Table 3, Figure:1)

<b>Results at Final Follow up</b>	<b>Frequency</b>	<b>%</b>
Excellent	19	29.2%
Good	23	35.4%
Fair	15	23.1%
Poor	8	12.3%
Total	65	100%

**Table 2: Overall results at final follow up**

<b>Harris Hip Score</b>	<b>Osteopenia</b>			<b>Osteoporosis</b>			<b>p value</b>
	<b>N</b>	<b>Mean±S.D</b>	<b>Min–Max</b>	<b>N</b>	<b>Mean±S.D</b>	<b>Min–Max</b>	
At 4 months	17	$72.59 \pm 16.79$	40–96	48	$72.75 \pm 12.09$	35–92	0.966
At 6 months	17	$79.52 \pm 14.82$	48–98	44	$80.25 \pm 11.95$	45–96	0.844
At 12 months	14	$80.21 \pm 13.21$	52–96	34	$86.35 \pm 10.51$	54–98	0.095
More than 12 months	14	$84.07 \pm 11.63$	60–98	32	$89.59 \pm 10.03$	58–98	0.109
Mean Score	17	$80.29 \pm 13.29$	50–96	48	$79.96 \pm 11.67$	48–96	0.923

**Table 3: Harris Hip Scoring, a comparison of patients with osteopenia to those with osteoporosis**

Out of 65 patients whose results were assessed in our study 48 patients i.e., 73.8% had osteoporosis and 17 patients i.e., 26.1% had Osteopenia. Mean age of patients with osteopenia was significantly lower  $77.47 \pm 4.9$  years than those with osteoporosis  $80.85 \pm 7.71$  (p value = 0.012), furthermore osteoporosis was found to be significantly more frequent in female patients than male patients (p value = 0.048). The average T score of osteoporotic and non-osteoporotic

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patients was  $-4.45 \pm 1.14$  and  $-1.74 \pm 0.56$  respectively. There was no statistically significant difference in the mean Harris hip score in the patients with Osteopenia ( $80.29 \pm 13.29$ ) and in patients with Osteoporosis ( $79.96 \pm 11.67$ ),  $p$  value = 0.923. The mean duration of follow up was comparable in patients with osteopenia ( $21.05 \pm 11.37$  months) and in patients with osteoporosis ( $17.72 \pm 11.57$  months),  $p$  value = 0.31. There was no statistically significant difference in mean duration of surgery, intraoperative and post-operative complications and the final results in the patients with osteopaenia and the patients with osteoporosis ( $p$  value = 0.326) both clinically and radiologically.

**DISCUSSION:** Uncemented unipolar prosthesis continues to be a very important tool in the armament of Orthopaedic surgeons battling osteoporotic fractures in this part of the world. The low price, relative ease of insertion, shorter operating times and lesser blood loss, avoidance of bone cement and its complications are all alluring aspects of this prosthesis.<sup>10,11,12,13</sup> There has been some scepticism about the use of this prosthesis in Osteoporotic fractures with component instability and inadequate osteo-integration due to poor bone quality in the elderly patients being frequently cited as potential concerns.<sup>14</sup> But better understanding of the mechanism and interface has led surgeons to prefer uncemented femoral fixation even in the osteoporotic bone of the very elderly<sup>15,16,17</sup>, with 100% survival rates for the stem in large series of aged patients.<sup>18,19</sup>

This study was undertaken to establish the premise that the Austin Moore prosthesis may be a cost effective treatment in the elderly ( $>70$  years age) cohort of patients without compromising on the functional aspects. The use of Austin Moore prosthesis, in these patients who were either osteopenic or osteoporotic to begin with, had a satisfactory short term outcome. At final follow up 75% of the patients had recovered to their pre-injury levels of daily activity. Poor results were seen in only 12.3% of the cases. In our experience, we observed that a tight fit of the implant is easily achieved at the time of surgery even in osteoporotic bone and that, at final follow up, all of these osteoporotic/osteopenic patients had radiographic evidence of bone in growth with no discernible loosening. Park S.Y.; Yang I.H.; Kim S.H. and Han C.D. (2006) published a similar study on Cementless Bipolar Hemiarthroplasty for Femoral Neck Fracture in patients more than Eighty Years Old.<sup>20</sup> They also concluded that Cementless bipolar hemiarthroplasty for elderly patients more than 80 years of age with a femoral neck fracture showed satisfactory short-term results with no relationship to the severity of osteoporosis.

Osteopenia and Osteoporosis are unfortunate but inseparable consequences of aging, as demonstrated by the fact that none of the 65 patients in this study had a normal bone density. No doubt that hemiarthroplasty continues to be the most common management for displaced fracture neck of femur in elderly, especially in the developing world. We establish that this mode of treatment in the aged gives acceptable results, irrespective of the degree of osteoporosis. In this age of cost containment, we can recommend the use of uncemented unipolar prosthesis for this elderly cohort of patients, who have already exceeded the average life expectancy.

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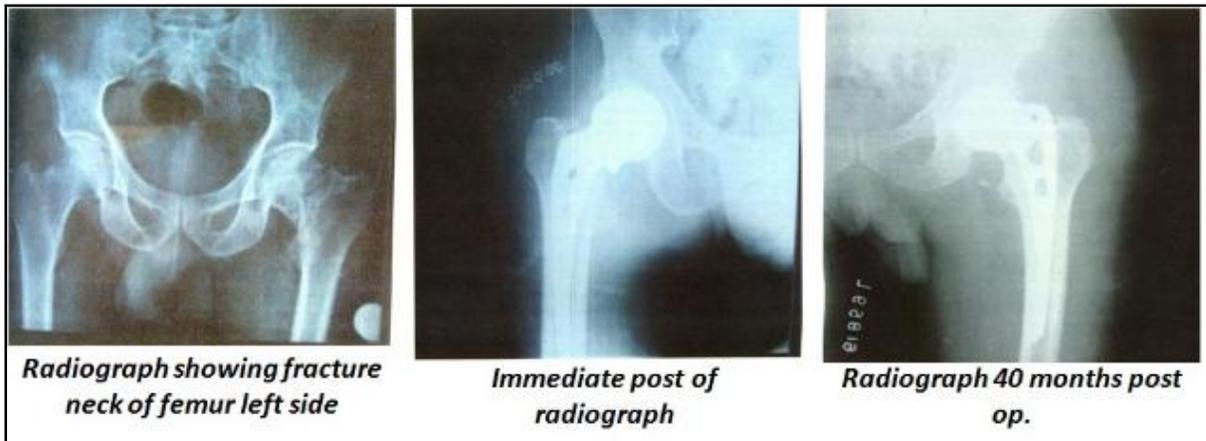
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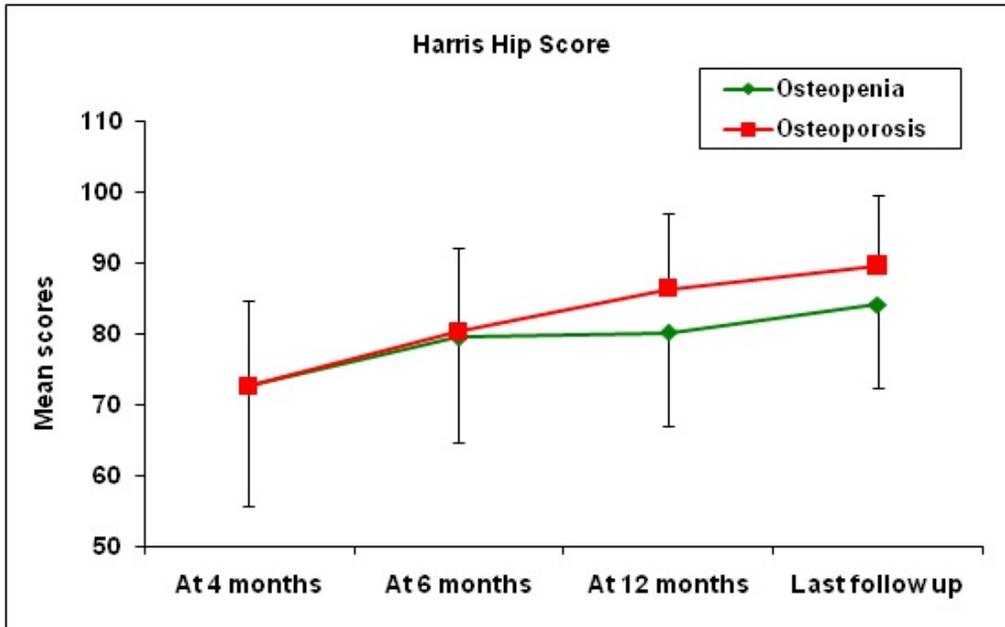
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**Photograph 2: Pre and post op. X-rays of patient with osteoporosis**



**Figure 1: Harris Hip scoring of osteopenia and osteoporosis patients**

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