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Surgical management of fracture neck of femur in elderly adults with cemented bipolar hemiarthroplasty

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Abstract
To study the functional outcome of fracture neck of femur treated with cemented bipolar hemiarthroplasty, post operative time required for mobilization of the patient, complications related to this procedure and to study the quality of life after hemireplacement arthroplasty using cemented bipolar endoprosthesis in 20 Patients who have sustained an intracapsular femoral neck fracture and are admitted in Deccan College Of Medical Sciences (PEH) and finally evaluated by Harris Hip Score.

Keywords: Fracture neck of Femur, Elderly age people, co-morbid conditions, Cemented Bi-polar Hemirthroplasty.

Introduction
Intracapsular fractures of the proximal femur account for a major share in the community and have a tremendous effect on both the health care system and society in general. Despite the marked improvements in surgical interventions, treatment of fracture neck of femur since then remains a debate, especially in the elderly. Some studies say that osteosynthesis with open reduction and internal fixation have shown good results, but then, at the same time, has high rates of revision surgeries due to the problems of non union of the fracture, arthritis and avascular necrosis of the femoral head [1]. Prosthetic replacement of the femoral head with Austin Moore or Thompson prosthesis hemiarthroplasty has undoubtedly played an important role in the treatment of these fractures, especially in those who require immediate mobilization with full weight bearing [2-3]. However acetabular erosion is a significant long term complication of one piece hemiarthroplasty implants and is particularly common in active individuals [4]. To overcome these problems, cemented bipolar hemiarthroplasty has emerged as a good option for:

- Active elderly patients who need a stable fixation so as to return to the pre fracture level of activity and also an independent ambulation
- Patients who had developed non union of the fracture or avascular necrosis of the femoral head with osteosynthesis [5].

Initially the Bipolar prostheses were of non-modular design followed presently by the modular prostheses. The modular nature of the prosthesis allows for neck length adjustment with interchangeable stems. Future conversion to a total hip replacement is easier with a modular prosthesis because only the acetabular component needs to be added. Bipolar hemiarthroplasty thus appears to be the best option for acute fracture neck femur in the elderly in our population.

Materials and Methods
Methodology: Source of Data
20 patients who have sustained an intracapsular femoral neck fracture and were admitted in Deccan College Of Medical Sciences (PEH), Hyderabad was be taken up for this study after obtaining their consent. This is a prospective study from november 2013 to March 2015.

Inclusion Criteria

- Intracapsular fracture neck of femur in patients of age 60 years and above
- Ununited fracture neck of femur.
- Fracture neck of femur with avascular necrosis.

Exclusion Criteria

- Patients below 60 years.
- Avascular necrosis of femoral head with acetabular changes
- Pathological fractures of neck of femur
- Patients medically unfit for surgery

Results

During the period between November 2013 to March 2015, 20 patients were treated by hemiarthroplasty using cemented bipolar prosthesis, for fracture neck of femur at the DECCAN College Of Medical Sciences (Peh), Hyderabad**.**

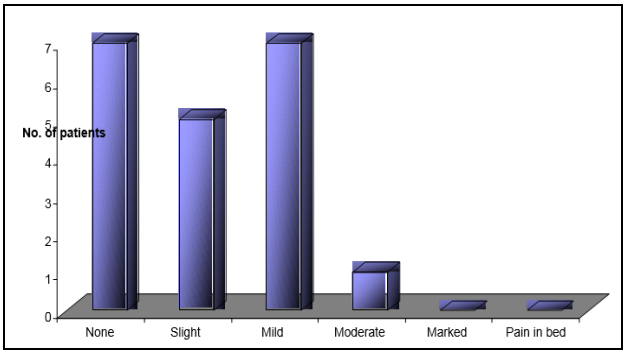
Data was collected based on detailed patient evaluation with respect to history, clinical examination and radiological examination. The postoperative evaluation was done both clinically and radiologically. Out of the 20 cases, all patients were available for follow up till six months which was taken as a basic pre-requisite for inclusion in the study. All patients were followed up regularly at 6wks, 3 months, 6 months. All patients who completed six months follow-up were included in the final analysis. Functional results of hemiarthroplasty were assessed by using the modified Harris hip scoring system under the following headings:

a. Pain
b. Limp
c. Use of support
d. Walking distance
e. Climbing up stairs
f. Ability to put on shoes and socks
g. Sitting in chair
h. Enter public transportation
i. Absence of deformities and limb length discrepancy
a. Range of movements

Table 1: Distribution of Samples by the Criteria of Pain

Criteria	Scores	Frequency	Percentage
None	44	7	35
Slight	40	5	25
Mild	30	7	35
Moderate	20	1	5
Marked	10	0	0
Pain in bed	0	0	0
TOTAL		20	100

χ^2= 17.83; P= 0.003(S)

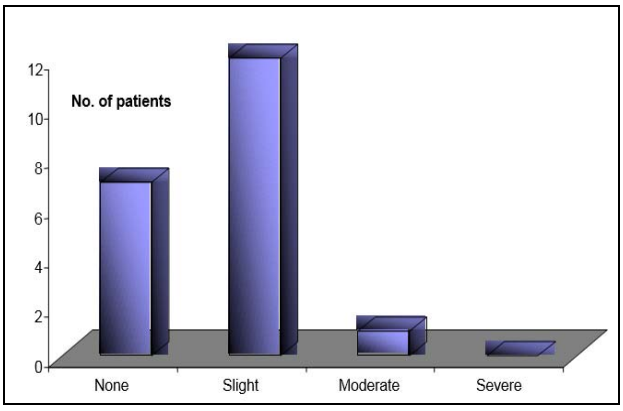


Graph 1: Distribution Of Samples Based On Criteria Of Pain

Table 2: Distribution of Samples by the Criteria of Limp

Criteria	Scores	Frequency	Percentage
None	11	7	35
Slight	8	12	60
Moderate	5	1	5
Severe	0	0	0
TOTAL		20	100

χ^2= 18.8; P= 0.0003(HS)

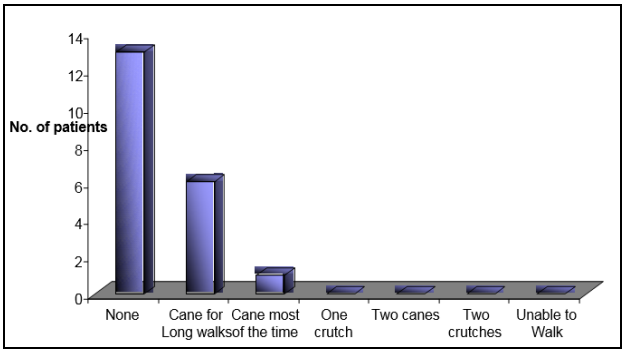


Graph 2: Distribution of Samples Based On Criteria of Limp

Table 3: Distribution of Samples by the Criteria of Use of Support

Criteria	Scores	Frequency	Percentage
None	11	13	65
Cane for long walks	7	6	30
Cane most of the time	5	1	5
One crutch	3	0	0
Two canes	2	0	0
Two crutches	0	0	0
Unable to walk	0	0	0
TOTAL		20	100

χ^2= 52.02; *P*<0.0001(HS)

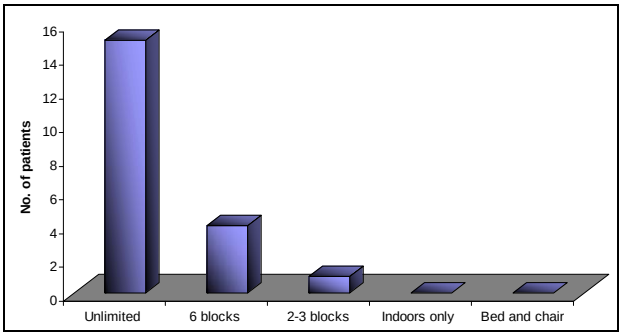


Graph 3: Distribution of Samples Based On the Criteria of Use of Support

Table 4: Distribution of Samples by the Criteria of Walking Distance

Criteria	Scores	Frequency	Percentage
Unlimited	11	15	75
6 blocks	8	4	20
2-3 blocks	5	1	5
Indoors only	2	0	0
Bed and chair	0	0	0
TOTAL		20	100

χ^2= 40.5; *P*<0.0001(HS)

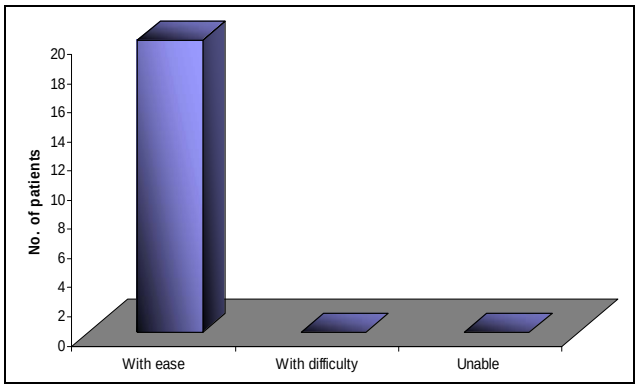


Graph 4: Distribution of samples based on the criteria of walking distance

Table 5: Distribution of Samples By The Criteria Of Ability To Put On Shoes And Socks

Criteria	Scores	Frequency	%
With ease	4	20	100
With difficulty	2	0	0
Unable	0		0
TOTAL		20	100

χ^2= 40.06; *P*<0.0001(HS)

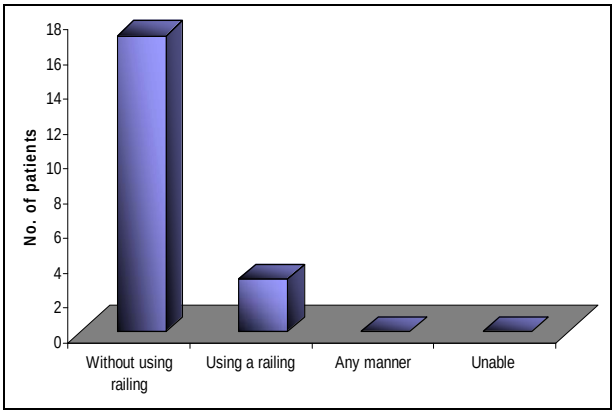


Graph 5: Distribution of samples based on the criteria of the ability to put on shoes and socks

Table 6: distribution of samples by the criteria of stair climbing

Criteria	Scores	Frequency	%
Without using railing	4	17	85
Using a railing	2	3	15
Any manner	1	0	0
Unable	0	0	0
TOTAL		20	100

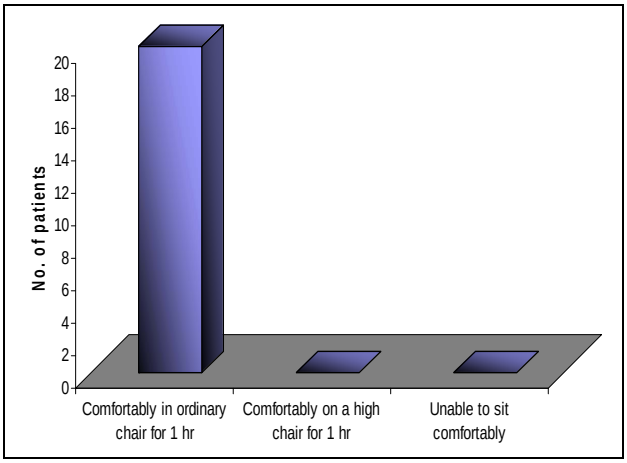
χ^2= 39.6; *P*<0.0001(HS)



Graph 6: Distribution of samples based on the criteria of staria climbing

Table 7: Distribution of Samples by the Criteria of Sitting

Criteria	Scores	Frequency	%
Comfortably in ordinary chair for 1 hr	5	20	100
Comfortably on a high chair for 1 hr	3	0	0
Unable to sit comfortably	0	0	0
TOTAL		20	100

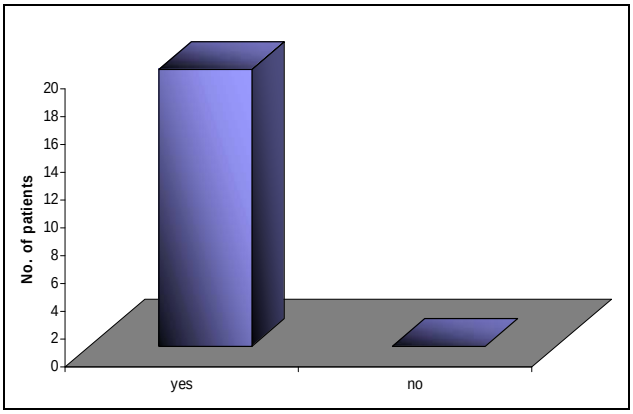


Graph 7: Distribution of samples based on the criteria of sitting

Table 8: Distribution of Samples by The Criteria Of Entering Public Transportation

Criteria	Scores	Frequency	%
Yes	1	20	100
No	0	0	0
Total		20	100

χ^2= 20; *P*<0.0001(HS)



Graph 8: Distribution of samples based on the criteria of entering public transportation

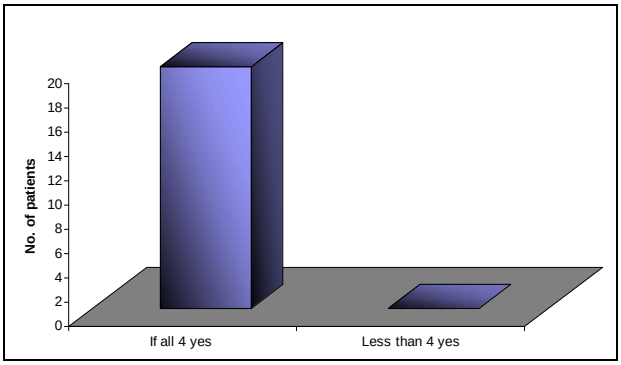
Table 9: Distribution of Samples by the Criteria of Absence of Deformity and Limb Length Discrepancy

Criteria	Results	
Less than 30° flexion contracture	Yes	No
Less than 10° fixed abduction	Yes	No
Less than 10° fixed internal rotation in extension	Yes	No
Limb length discrepancy less than 3.2 cm	Yes	No

The following observations were made

Criteria	Score	No. of patients	Percentage
If all 4 yes	4	20	100
Less than 4 yes	0	0	0

χ^2= 20; *P*<0.0001(HS)

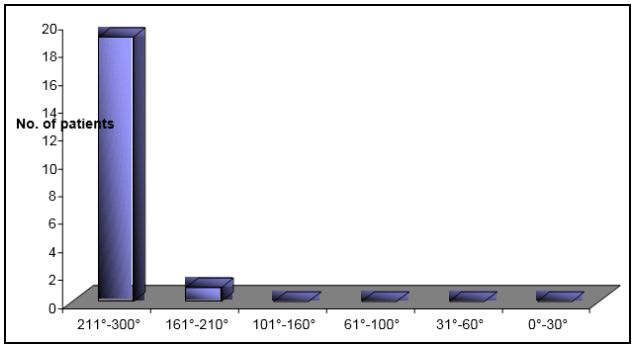


Graph 9: Distribution of samples by the criteria of absence of deformity and limb length discrepancy

Table 10: Distribution of Samples by the Criteria of Range Of Movements

ROM	Scores	Frequency	Percentage
211°-300°	5	19	95
161°-210°	4	1	5
101°-160°	3	0	0
61°-100°	2	0	0
31°-60°	1	0	0
0°-30°	0	0	0
TOTAL		20	100

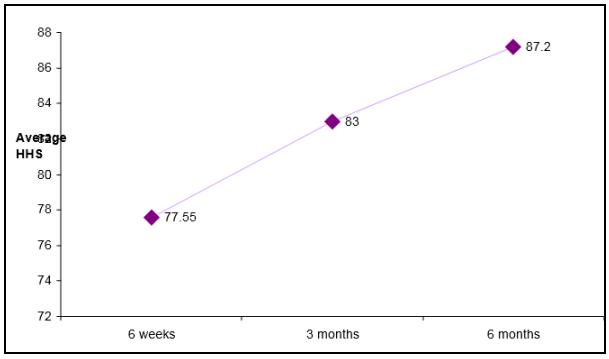
χ^2= 88.7; *P*<0.0001(HS)



Graph 10: Distribution of Samples Based On Criteria Of Range Of Movements

The Progression of the Harris Hip Score

The average Harris Hip Score at 6 weeks after surgery was 77.55 with the highest score being 91 and the lowest being 63. The average Harris Hip Score at the second follow-up of 3 months was 83 with the maximum score being 100 and the minimum 66. At the third and final follow-up at 6 months the average Harris Hip Score was 87.2 with the highest being 100 and the lowest being 55.



Graph 11: Average Hhs At Each Follow Up

Final Harris Hip Score And Clinical Result

In our study, the final Harris Hip Score as evaluated at six month follow-up averaged 87.2 with the maximum score being 100 and the minimum score being 55. Overall, 10 patients (50%) achieved Excellent result, 6 patients (30%) achieved Good result, 3 patients (15%) achieved fair result and 1 patient (5%) achieved poor result. 80% of the patients achieved an excellent or good result.

Table 11: Final Harris Hip Score and Clinical Result

Grade	Harris Hip Score	No. of patients	Percentage
Excellent	90-100	10	50
Good	80-89	6	30
Fair	70-79	3	15
Poor	<70	1	5

Table 12: Comparison of Clinical Result with Standard Studies

Grade	Our study	PS Maini[115]	Lestrange study[116]
Excellent	50	54.2	39.6
Good	30	21	31.2
Fair	15	10.7	15.3
Poor	5	3.7	13.9

Table 25 shows the comparison of the present study with standard studies. The results obtained with bipolar hemiarthroplasty in the current study are comparable with standard studies.

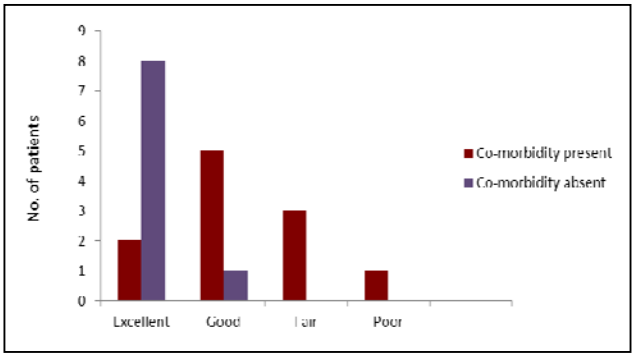
Table 13: Correlation of Age With Final Harris Hip Score

Age	Result				P-value
	Excellent	Good	Fair	Poor	
60-69	7	3	0	0	0.086
70-79	3	2	1	1	
80-89	0	1	2	0	

From the above stastical data with a P-value of 0.086, we found that there was no significant correlation between the age of the patient and the final outcome.

Table 14: Correlation of Systemic Co-Morbidities With Outcome

Co-morbidity	Result				P-value
	Excellent	Good	Fair	Poor	
Present	2	5	3	1	0.017
Absent	8	1	0	0	



From the above data with a P-value of 0.017, we inferred that there is a significant correlation between the presence of systemic co-morbidities and the final outcome of the patients.

Discussion

The aim of replacement surgery in fracture neck femur is

early return to daily activities. This is particularly applicable to the elderly age group where complications due to long periods of immoblization have to be prevented. The mean age of the patients in the present study was 75 years, the youngest being 60 years and the eldest being 82 years. Age distribution is an important factor in the management of hip fractures. The results of our study showed that age of the patient had minimal influence on the final functional outcome. As in most standard studies, the present study also had a higher number of females who sustained a fracture neck of femur as compared to the male population. Elderly females are more prone to fracture neck of femur due to osteoporosis (Choudhari & Mohite 1987) [117] Majority of our study patients (75%) sustained the injury due to a trivial trauma like tripping or slipping. This is a very common occurrence in elderly population where poor vision and lack of neuro-muscular coordination is a problem. Most of such injuries can be classified as "indirect" trauma. 10% patients sustained the injury due to a fall from a height and 15% due to a Road Traffic Accident. A little more than half of our study patients were brought to the hospital within three days of sustaining the injury. 55% of the patients were brought to the hospital within 24 hours of the injury while 30% presented for treatment within 24 hrs - 72 hrs. 10% were brought to the hospital between 72 hrs – 1 wk and the remaining 5% presented for treatment after one week. Difficulty in post-operative rehabilitation was particularly noticed in the patient who presented after 90 days following trauma, probably due to bony and soft tissue changes that would occur in this duration which finally gave a poor outcome. All of our study patients had a displaced fracture of the neck of femur. Majority of the patients (60%) had a Garden type IV fracture while seven patients (35%) had Garden type III fracture and one patient (5%) was diagnosed with a non union fracture neck of femur. Even in a comparision study by H. Krishnan, between the outcomes following Cemented and Uncemented bipolar prosthesis, 29 patients were of Garden type IV, while 5 patients sustained a Garden type III fracture type[118]. However the type of fracture and the displacement did not have any bearing on the final function. Heart disease was found to be the most common co-morbidity seen in 20% of the study patients. Two patients had Type II Diabetes and were on oral hypoglycaemic agents or Inj. human actrapid. They were shifted to insulin pre-operatively and blood sugar values optimized before taking up for surgery. 5% of the patients were hypertensives, while 10% of the patients had both heart disease and diabetes mellitus, 5% had heart disease and hypertension and another 5% of the patients were diagnosed with both hypertension and diabetes mellitus. It was observed that the post-operative rehabilitation of patients was significantly affected by the presence of the above co-morbidities [119] This also had an effect on the final functional result of the procedure [120]. Similar observations have been made by Koval *et al* [119] and Bath [120]. All the study patients were taken up for the surgical procedure between the 2nd and 4th day after the trauma, the average delay to surgery being 4 days. Delay in taking up for surgery was usually for optimizing the medical condition of the patient. DVT prophylaxis was given for all patients, using low molecular weight heparins, on admission and was stopped 12 hours before the surgery. Patients were also explained in the immediate post-operative period, about the risk of dislocation with excessive flexion or adduction of the hip. In 50% of the cases 45 mm prostheses were used which was followed by 43 mm (30%), 47 mm (15%) and 41 mm (5%) prostheses in the order of frequency. Following calcar preparation and over reaming of the medullary cavity using the rasps which were provided, manual packing of cement and insertion of the prosthesis was done. Technical difficulties encountered with the procedure, firstly was calculating the angle of the neck osteotomy required and the amount of calcar to be retained for the correct placement of the prosthesis. Secondly a difficulty in cement insertion by the technique of manual packing was also encountered. It has been reported in literature that the average blood loss with hip hemiarthroplasty is less in the anterior approach as compared to the posterior approach [120, 121]. Most of the surgeries were completed between 90-120 minutes of starting the procedure. Similar duration of the procedure has been reported by Haidukewych, *et al* [122] and Drinker, *et al*. [123]. Neither the intra-operative blood loss nor the duration of the procedure had any effect on final function. Most of our study patients were mobilized in bed on day one of surgery and with weight bearing as tolerated within the 72 hours postoperative period. Limb length discrepancies were observed in 5 patients (25%) post-operatively, of which 4 patients had a lengthening of 1 cm each, probably due to the less amount of calcar resection, while one patient had a shortening of 1.5 cm post operatively, probably due to excessive resection, during preparation of the calcar. No complications of Deep vein thrombosis was noticed in any patient due to the administration of low molecular weight heparins, pre operatively and for 5 days post operatively [115]. There were no late postoperative complications like loosening, dislocation, erosion, secondary osteoarthritis, protrusio acetabuli or periprosthetic fracture. We are unable to comment upon long term acetabular erosion due to relative short follow up. Touch down weight bearing with the help of a walker was initiated by the third to fifth day post operatively and was continued till the first follow up according to tolerance of pain. All patients were followed up regularly at 6wks, 3 months, 6 months and the functional outcomes were assessed using the Harris Hip Scoring system. Pain following hemiarthroplasty is a major concern. Lanceford stated that the causes of pain could be due to infection, improper prosthetic seating, metallic corrosion and tissue reaction, improper sized femoral head, contractures and periarticular ossification [126] In our study, 13 patients had complaints of pain on the final follow up. These patients were however adviced excercises and were reassured about the condition, along with which medications were prescribed and adviced to be consumed only when the pain was intolerable. In our study, the final Harris Hip Score as evaluated at six month follow-up averaged 87.2 with the maximum score being 100 and the minimum score being 55. Off 20 patients, 10 patients (50%) achieved Excellent result, 6 patients (30%) achieved Good result, 3 patients (15%) achieved fair result and 1 patient (5%) achieved poor result. Overall 80% of the patients achieved either an excellent or good result. Our results are comparable with standard studies of bipolar hemiarthroplasty performed for fracture neck femur. The poor result in one patient may be attained to the late presentation following trauma, which had an effect on the surgical procedure and post operative rehabilitation, probably due to soft tissue and bony changes that must have occurred.

Conclusions

In this study

- Most of the fracture neck of femur were sustained due to trivial injuries like tripping/ slip and fall.
- All cases except 1, underwent the definitive surgery

within 7 days following the trauma.

- Garden type IV fractures were the most common pattern of neck of femur fracture observed which accounted to 60%.
- In this study, the final functional outcome was affected to some extend by:
- The presence of systemic co morbidities like heart disease, diabetes mellitus and hypertension, which was seen in 11 of 20 patients.
- the slight to mild pain component present in most patients during the follow up period which could probably be due to a decrease in the intra-prosthetic motion at the inner bearing and due to inadequate cementation of the medullary cavity, during the surgical procedure.
- The final functional outcome was good to excellent in 80% of the patients.

Limitation of the study included a small sample size of 20 patients and a short follow up period of 6 months with a mean follow up of 12- 14 weeks.

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