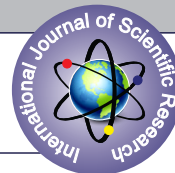


EVALUATION OF FUNCTIONAL OUTCOMES OF FRACTURE NECK OF FEMUR TREATED BY BIPLANE DOUBLE SUPPORTED SCREW FIXATION (BDSF) AT OUR TERTIARY CARE CENTER



Orthopaedics

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ABSTRACT

Aim & Objective: To evaluate & analyse the functional outcomes of Fracture Neck of Femur treated by biplaner double supported screw fixation, Viz efficacy of fixation of fracture neck of femur & time taking to union of fracture neck of femur. **Material and Method:** The present study was conducted at department Of Orthopaedics, S.N.M.C, AGRA, on patients admitted in the department of orthopaedics between September 2019 to March 2021, mostly during covid pandemic. Patients were followed up regularly every month till 8-10 months and then every two months. The minimum follow up in our study was 6 months and the maximum follow up was 12 months for functional outcome assessment using Harris hip score after radiological union, ambulation, walking distance, ability to climb stairs, ability to trim nails, ability to sit on chairs for long times. Later after 6 weeks active hip mobilisation exercises and partial weight bearing was allowed after reviewing follow up x rays of the patient. Later full weight bearing allowed after radiological union was seen. **Conclusion:** The study conducted above concludes that by providing additional cortical support, the novel BDSF method enhances femoral neck fracture fixation strength, reveals excellent clinical outcomes and is a valid alternative to other treatment methods.

KEYWORDS

INTRODUCTION

Fracture of neck of femur is a very common injury in patients more than 50 years of age. According to the present scenario, arthroplasty should be reserved for patients more than 80 years, while in patients age less than 65 sustaining fracture neck of femur, hip preservation should be attempted.

A number of controversies exist in relation to the cannulated screw fixation for fracture neck of femur like number of screws to be used, position of screws in the head and neck and the configuration of screws to be used. The most commonly used methods by surgeons worldwide to fix fracture neck of femur is three parallel screws inserted in inverted triangle configuration. The initial inter-fragmentary compression of these constructs is frequently insufficient and therefore unable to ensure stability in osteoporotic bone. When cannulated screws are used to fix a femoral neck fracture with osteoporosis, intraoperative inter-fragmentary compression alone may not ensure adequate stability during the healing process because it could soon be lost on fracture impaction.

To overcome this problem of osteoporosis and for those patients in which arthroplasty is contraindicated, Filipov devised a method of Biplane Double Supported Screw Fixation (BDSF) in which the two screws are laid in two planes, which makes it possible for the entry points of middle and distal screws to be placed in distal solid cortex of proximal diaphysis, the distal screw is placed in the dorsal oblique plane while the middle and proximal screws are inserted in ventral oblique plane.

METHOD

This prospective study was conducted at Department Of Orthopaedics, S.N.M.C, AGRA, on patients admitted in the department of orthopaedics between September 2019 to March 2021, mostly during

covid pandemic.

Inclusion Criteria

- 1) Fracture neck of femur
- 2) AGE 18-60 YEARS
- 3) Both sex
- 4) Fresh fracture (≤ 3 weeks)

Exclusion Criteria

- 1) Old fracture neck of femur (> 3 weeks)
- 2) Pathological fracture
- 3) Open or infected fracture
- 4) Fracture with malignant changes
- 5) Fracture NOF with open epiphysis
- 6) I/L Shaft femur & I/T fracture

Assessment Of Functional Outcome Based On:

Modified Harris Hip Score- It Has The Following Components:

1. Pain- 44 points maximum
2. Gait (walking maximum distance) (33 points maximum)
3. Functional activity (14 points maximum)
4. Range of motion (5 points maximum)
5. Absence of deformity (4 point maximum) Total – 100 points :-
<70 poor, 70-79 fair, 80-89 good, 90-100 excellent

Preoperative Protocol

All study patients were put on either derotation boot or non adhesive skin traction. Adequate medical management of associated co-morbid conditions like Diabetes Mellitus, Systemic Hypertension, Chronic Obstructive Pulmonary Disease and Heart Diseases were initialized to optimize patient's fitness for anesthesia. Preoperatively CT scan were taken for all patients to find out posterior wall comminution.

Approach

A straight lateral incision, starting at the level of lower border of greater trochanter, with distal length of 6 to 10 cm. First, we lay the guide wire for the distal cannulated screw. Its entry point is at 5-7 cm distally from the lower border of the greater trochanter, directed at an angle of 150 – 165°, with inclination to posterior, proximal, so that after it touches the “calcar” tangentially, the wire goes into the posterior third of femoral head. The middle guiding wire is placed second with entry point 2 to 4 cm proximally from the distal wire at an angle of 135-140° and is inclined to anteriorproximal, so that after it touches onto the calcar tangentially, the wire goes into the anterior onethird of the femoral head. Then we place the proximal guiding wire, with its entry point at 1.5-2 cm proximally from the middle wire and parallel to it. Then reaming was done and then cannulated cancellous screws application was done. The middle and proximal screws are placed first because they are perpendicular to the fracture surface. Finally, the distal screw is placed. Later wound closure was done in layers and followed by sterile dressing.

Postoperative Protocol

Passive knee mobilisation exercises and quadriceps strengthening exercises were advised immediately on first post op day. Non weight bearing for period was advised for 6 weeks from the day of surgery. Later after 6 weeks active hip mobilisation exercises and partial weight bearing was allowed after reviewing follow up x rays of the patient. Later full weight bearing allowed after radiological union was seen.

Follow Up

Out of 27 patients, 14 patients were followed up regularly every month till 8-10 months and then every two months. The minimum follow up in our study was 6 months and the maximum follow up was 12 months. During the follow up period, functional outcome were assessed using Harris hip score after radiological union, ambulation, walking distance, ability to climb stairs, ability to trim nails, ability to sit on chairs for long times.

RESULTS

Table 1: Age distribution of patients studied

Age	Number	%
11–20	4	14.8
21–30	3	11.1
31–40	1	3.7
41–50	7	25.9
51–60	9	33.3
61–70	3	11.1
TOTAL	27	100.0

The above table shows that majority of the patients were in the limit of 51-60 yrs (33.3%) with mean age of 56.5 yrs. The youngest was 14 yrs and the oldest was 66 years.

Table 2:- Distribution Of Cases According To Mode Of Injury

MODE OF INJURY	NUMBER	%
Fall on ground	6	22.2
RTA	11	40.7
Fall from height	7	25.9
Fall from stairs	3	11.1
TOTAL	27	100.0

The above table shows that mode of injury for majority of cases was RTA 11 (40.7%) followed by fall from height 7 (25.9%), fall on ground 6 (22.2%) and fall from stairs 3 (11.1%).

Table 3:- Distribution Of Cases According To Type Of Fracture

Type of Fracture	Number	%
Transcervical	16	59.3
Subcapital	10	37.0
Basicervical	1	3.7
TOTAL	27	100.0

The above table shows that majority of cases were transcervical type 16 (59.3%) following by subcapital 10 (37%) and basicervical 1 (3.7%).

Table 4:- Distribution Of Cases According To Timing Of Presentation

Time of Presentation	Number	%
<1DAY	7	25.9
1–5DAYS	11	40.7
6–10DAYS	8	29.6
>10DAYS	1	3.7

TOTAL	27	100.0
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In our study 11 patients (40.7%) present with 1-5 days, 8 patients presented within 6-10 days (29.6%), 7 patients presented within 24 hrs (25.9%) and 1 patient presented after 10 days (3.7%) of injury.

Table 5:- Distribution Of Cases According To Pain On Walking

Pain	Number	%
Pain free	22	81.48
Mild	5	18.5
Moderate/Severe	2	7.4

In our study out of 27 patients, 22 (81.48%) were pain free, 5 (18.5%) patients had mild pain, and 2 (7.4%) patient had moderate pain.

Table 6:- Distribution Of Cases According To Ambulation

Ambulation	Number	%
Without Help	20	74.07
With Support of Cane Walker	3	11.1

20 patients (74.07%) were found to be ambulating without the help of any support and the remaining 3 patients (11.1%) needed some support in the form of a cane or walker for long walks.

Table 7:- Distribution Of Cases According To Distance Walked

Distance	Number	%
Unlimited	20	74.07
<1 KM	2	7.4
<500 M	2	3.7

20 (74.07%) of the study patients could walk an unlimited distance at .Any given point of time while 2 patients (7.4%) could walk no more than 1000 meters at a time and 1 patients (3.7%) could only manage 500 meters at a time.

Table 8:- Distribution Of Cases According To Ability To Climb

Climbing	Number	%
Able to climb	19	75
Support of railing	2	15
Not able to climb	1	10

On evaluation of the patients ability to climb stairs, it was found that 19 patients (75%) were able to climb stairs without the use of any support or railing while the remaining 2 patients (15%) were able to do so with the support of the railing, 1 patients (10%) not able to climb.

Table 9:- Distribution Of Cases According To Ability To Trim Nails

Ability to Trim Nails	Number	%
Able to trim	19	75
Difficult to trim	2	15
Not able to trim	1	10

Our patients did not have the habit of using shoes and socks, their ability to trim their toe nails was used as a parameter for evaluation. It was found that 19 patients (85%) were able to trim their toe nails without any difficulty while 2 patients (10%) found it difficult to do so, 1 patient (5%) not able to do.

Table 10:- Distribution Of Cases According To Ability Tosit On Chair For Long Time

Duration	Number	%
<1/2 hr	3	20
>1 hr	18	80

With regards to the ability to sit for a long duration it was found that 18 (80%) of the study patients were able to sit comfortably on a chair for upto one hour while 3 patients (20%) were not able to sit on a chair for more than half an hour at a stretch.

Table 11:- Funtional Outcome Grade According To Modified Harris Hip Score

Grade	HHS	Number	%
Excellent	90-100	19	70.4
Good	80-89	2	7.4
Fair	70-79	1	3.7
Poor	<70	5	18.5

Harris Hip Score evaluated at maximum follow-up of our patients averaged 90.13 with the maximum score being 96 and the minimum score being 66. Overall, 19 patients (45%) achieved excellent result, 2 patients (30%) achieved good result, 1 patients (15%) achieved fair result and 5 patients (10%) achieved poor result. 75% of the patients achieved either excellent or good result.

Table 12:- :- Distribution Of Cases According To Complication

Complication	Number	%
NONUNION	4	14.8
NIL	22	81.5
SURGICAL SITE INFECTION	1	3.7
TOTAL	27	100.0

In our study we had 4 cases of non union, 1 case of surgical site infection.

DISCUSSION

Our study is focused on the clinical and radiological outcomes in neck of femur fracture fixation using the biplane double-supported screw fixation method described by Orlin Filipov which states that in respect of the fixation strength, the most original and effective is the distal screw—placed at obtuse angle and supported on a large area along the distal and posterior cortex of the femoral neck.

The period defined in the literature for occurrence of bone union after osteosynthesis of femoral neck fractures is usually within 3 months post operation, and all complications related to mechanical and/or biological deficiencies, called with the collective term non -union, occur within 6 months, including failure of fixation and pseudoarthrosis. Therefore, we assumed a minimal follow-up period of 12 months as sufficient to demonstrate occurrence of bone union and other associated complications.

In our study, we analysed the following parameters especially: age, fracture type according to Garden and Pauwel, time of presentation, timing of surgery and degree of posterior wall comminution with functional outcome of the patient.

In a study by Karl Stoffel et al., in addition to evaluation of clinical results by HHS, important parameters namely: age, gender, relief of pain (good, poor), mobility (good, poor) and putting on socks and shoes skills (easy, difficult), degree of fracture displacement, incidence of AVN were analysed. He concluded that among all 207 patients, the Harris hip score was 86.2 ± 18.9 (range 10– 100), with no significant difference between genders. In Karl Stoffel et al study, Harris hip score for patients aged below 65 years was similar to the age group 66–70 years, but significantly higher than in all other age groups.

In our study we found that patient in younger age group preferably below 60 yrs had good functional outcome compared to patients above 60 years. With regarding to time of presentation and functional outcome, 7 patients who presented within 24 hrs of injury and operated earlier had good functional outcome with average Harris hip score of 89.5 Our study shows that patients with Pauwels type 3 (22.72%), and garden type 4 (36%) had low Harris hip score in comparison to other types. Moreover among 3 patients (15%) with posterior wall comminution, 2 patient had good functional outcome, while 1 patient had poor functional outcome.

Karl Stoffel et al., highlighted that 88.4% were pain free, 83.6% had good mobility, 80.7% of patient were able to put shoes and socks with ease. 37 In our study out of 27 patients, 81.4% were pain free, 74.07% had good mobility, 85% of patients were able to trim nails with ease. Incidence of non-union in operated patients in Orlin Filipov study was 6 out of 83 patients (7.2%).

In our study the incidence of non union was 4 out of 27 cases (14.8%). The rate of AVN seems to be similar worldwide and is slightly influenced by the applied fixation method and type of fracture pattern, rating about 9% (range 6–19%) for undisplaced and about 16% (range 9–32%) for displaced fractures. Orlin Filipov stated that the incidence of AVN in their study using this BDSF method is less (12.07%) when compared to conventional method of fixation (10–45%) quoted in the literature. In our follow up period of 1 yr there were no AVN in our patients.

All the patients with the time of union of 3 months achieved excellent functional outcome. Other patients with longer union time achieved either good or fair functional outcome.

CONCLUSION

BDSF method was devised mainly to address that group of patients who have contraindications for arthroplasty and we have found this as an excellent method in terms of fracture consolidation and functional

outcome. By providing additional cortical support, the novel BDSF method enhances femoral neck fracture fixation strength, reveals excellent clinical outcomes and is a valid alternative to other treatment methods.

Limitation

Due to covid-19 pandemic situation, only 27 patients were included in the study for given time period. Therefore, a more generalised study is needed for an accurate comparison of outcome.

Conflicts of Interest: There are no conflicts of interest.

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