Section: Orthopaedics

Original Research Article

A PROSPECTIVE STUDY TO EVALUATE THE FUNCTIONAL OUTCOME OF CALCAR BUTTRESS SCREW IN FRACTURE NECK OF FEMUR

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Abstract

Background: Hip fractures account for 20% percent of the operative workload of an orthopaedic trauma unit. Femoral neck fractures in younger population are uncommon, usually occur due to high velocity trauma and often accompany other injuries. There is no conclusive evidence of any method related to low morbidity following fracture of neck of femur. **Materials and Methods:** The prospective study was conducted in the Department of Orthopedics N.S.C.B. Medical College, Jabalpur (M.P.) from 1st September 2022 to 30th June 2024 with 25 diagnosed cases of neck of femur fracture satisfying the inclusion-exclusion criteria, and was treated by closed reduction internal fixation with locking compression screw system (Wonder Screw) using BDSF method. **Result:** Total of 25 patients, majority were male (64%) with the age group from 40 to 65 years (mean 52.5 years). The union rate was 96% and average healing time between 18-24 weeks both clinically and radiologically and a mean healing time of 21weeks (5 months) with 1 case of osteonecrosis and 1 case of non-union and 4 cases of screw backout. **Conclusion:** The use of calcar buttress screw has evolved as a cost effective, feasible and safe modality of treatment along with preservation of normal anatomy and viability of head for the management of fracture neck of femur in the age group of 40-65 years. It facilitates early rehabilitation and quick return to normal activities. Wonder screw (Locking compression screw system) has limited utility and no added advantage for management of fracture neck of femur. The calcar buttress technique (i.e. BDSF) of fixation prevents the patient from complications which have been known to occur in patients treated with other modalities for fracture neck of femur like hemiarthroplasty or total hip arthroplasty.

INTRODUCTION

Hip fractures account for 20% percent of the operative workload of an orthopaedic trauma unit. Out of which, intracapsular fracture of neck of femur is around 50 percent of all hip fractures.[1] The neck of femur fractures is an emergency and require urgent and strong fixation to avert unnecessary complications related to the same. In the older adult population who has suffered a fractured hip, the treatment of choice is mostly Hemiarthroplasty or Total hip arthroplasty. But there is no sure shot promising a good outcome with adults who need osteosynthesis.[2]

In an effort to find a treatment for patients for whom primary arthroplasty was not recommended, Orlin Filipov developed the groundbreaking Biplane Double Supported Screw Fixation (BDSF) procedure for treating non-union fractures in young adults.[3] Compression screw system (Wonder screw) is used in our study because it's a self -tapping and self-drilling with variable pitch in head and shaft to add to compression. It is used to easily counter sink in metaphysis. It is a percutaneous system. It also has site specific anatomic plate to neutralize for the forces with ease using minimally invasive principles. Some studies have already show good to excellent results of BDSF in fracture neck of femur, but none have used ―wonder screw as implant. Thereby, we underwent this study to ascertain the utility and evaluate the functional outcome as calcar buttress screw in fracture neck of femur.

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MATERIALS AND METHODS

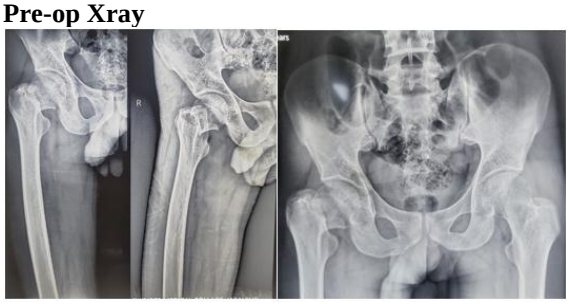
This prospective study was done in the Department of Orthopaedics of N.S.C.B. Medical College, Jabalpur, (M.P), from 1st September 2022 to 30th June 2024, with the sample size of 25 diagnosed cases satisfying the inclusion-exclusion criteria. Patients with Neck of femur fracture were treated by closed reduction internal fixation with locking compression screw system (Wonder Screw) using BDSF method.

Reduction: The Garden alignment index, which measures the angle of the compression trabeculae on the lateral view relative to the femoral shaft and the angle of the compression trabeculae on the anteroposterior view respect to the longitudinal axis of the femoral shaft, was used to assess if the reduction was acceptable. This angle should be 160 degrees on the antero-posterior view and 180 degrees on the lateral view. A reduction that is acceptable falls between 155 and 180 degrees on both viewpoints.

Indications: Fractures of the Pauwels's types I to III

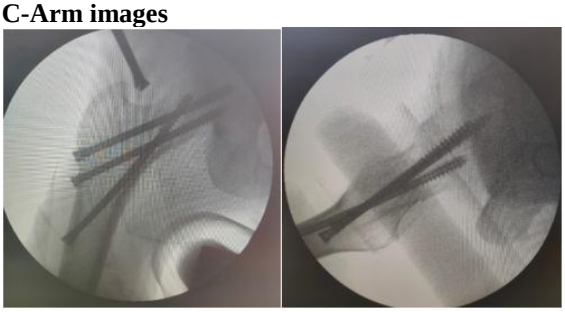
Implant: Wonder screw (compression screw system) Size-6.5/7.5 mm (Made up of Titanium)

Pre-op Xray



Approach: Under effect of anaesthesia the patient is put on fracture table and the procedure was carried out using C arm with image intensifier guidance. The periosteum of the lateral femoral diaphysis was removed after a 6-7 cm incision made at the level of the greater trochanter's lower border. The distal most screw's guide wire is first set, with an entry site 5-7 cm distal to the greater trochanter's lower border. A diaphyseal axis inclined posteriorly proximally yields an angle of 150–165 degrees, and when the wire reaches the calcar, it enters the dorsal part of the femur's head. The entry location for the middle wire is now 2-4 cm proximal to the distal wire. The diaphyseal axis and wire should be at an angle of 135 to 140 degrees, depending on the diaphyseal, caput, and column angles. The wire is angled anteriorly and proximally, hitting the calcar tangentially before entering the frontal third of the femoral head. Lastly, the entry point of the proximal most guide wire is positioned 1.5 to 2 cm in front of the centre wire. Additionally, this wire enters the femoral head's frontal third. The guide wires were positioned over a cannulated drill bit and then covered with screws of the proper size. Since the intermediate and proximal screws are perpendicular to the fracture, they were inserted using a hexagonal screw driver before the distal screws. The foot traction has now been released, the diaphysis has been hammered through the plastic impactor, and the liberated screw has been further tightened. The distalmost screw was lastly tightened, taking care not to overtighten for fear of a longitudinal fissure. Successive reviews were done at 4 weeks and 3 months, 6 months, 12 months during which rotation in flexion and extension, limb length discrepancy and hip range of motion were assessed using Harris hip score and visual analogue scale.

C-Arm images



1 Month follow-up X ray:

1 month follow up X Ray showing healing of bone without displacement.

6 months follow-up

At 6 months, bone union achieved without displacement and shortening

12 Months follow-up X ray

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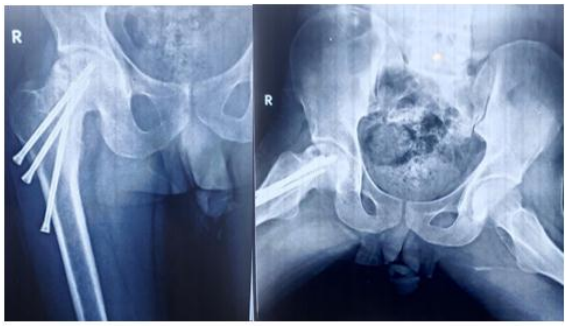

Clinical images

The analysis was done with the use of Statistical Package for Social Sciences (SPSS) software.

RESULTS

This study includes 25 patients with neck of femur fracture, in the age group of 40 to 65 years (mean age 52.5 years). We had 09 female patients and 16 males (64%). Out of 25 patients, 04 were type I, 12 were type II and 09 were type III according to Pauwel's Classification. The clinical and radiographically assessment was done in all cases at 4 weeks, 3 months, 6 months, 12 months. The union rate was 96% and average healing time between 18-24 weeks both clinically and radiologically and a mean healing time of 21weeks (5 months) with 1 case of osteonecrosis and 1 case of non-union and 4 cases of screw backout.

Operative time: Mean operative time 58.8 minutes (30-120 minutes)

Blood loss: Mean blood loss in overall series was 44ml (30-90 ml)

Table 1: Complications:

Complications	No. Of patients
Osteonecrosis	1
Infection	1
Non union	1
Broken drill bit	1
Screw backout	4

DISCUSSION

The series of cases emphasised again the advantage of BDSF (Biplane Double Supported Screw Fixation in fracture neck of femur, the operative procedure is simple, short and associated with minimal soft tissue damage and blood loss, as a results morbidity and mortality are lower than the other method like Hemiarthroplasty and Total hip arthroplasty.[4-6]

Biomechanically placement of the distal implant can be positioned farther out in order to lean onto the robust femoral neck distal cortex since three screws are positioned in two planes in this instance.[7,8]

In statistical terms, the arrangement of screws made possible by BDSF reduces the construct to a straightforward beam with an overhanging end that is loaded vertically. It permits the transfer of body weight from the head to the diaphysis, with the least amount of worry for the quality of the bones.[9]

If compared to the traditional CC screw, there was high screw backout complications seen and locking screw compression system did not show any added advantage in this aspect. Screw backout is still common with the new locking screw compression system fracture fixation.[10]

Speaking of Harris Hip Score (HHS), 14 patients (56%), showed excellent HHS, 07 patients (28%) had good HHS, 04 patients (16%) had fair HHS.[11]

Speaking of visual analogue score (VAS), 8 patients (32%) showed mild pain that is pain present presents occasionally while at work whereas rest 17 patients (68%) showed moderate pain that is pain present but can continue with work.

Speaking in terms of Pauwels angle comparison, Type-1 fractures show 100% union, Type-2 fractures show 75% union and Type-3 fractures shows 44.4% union rate over 12 month follow up.

Table 2: Comparison between our study and Orlin Filipov

Criteria	Our study	Filipov O. Study
Number of Patients	25	88
Sex	Male: 16, Female: 09	Male: 26, Female: 61
Average Age	52.5 years old	76.9 years old
Average follow up	12 months	8 months
Classification	Pauwel's classification	Garden classification
Mean operative time	58.8 minutes	39 minutes
Union rate	United: 96%, Non united: 4%	United: 98.86%, Non united: 1.13%

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CONCLUSION

Taking into consideration, the results observed in our study, we can conclude that the use of calcar buttress screw has evolved as a cost effective, feasible and safe modality of treatment along with preservation of normal anatomy and viability of head for the management of fracture neck of femur in the age group of 40-65 years. It facilitates early rehabilitation and quick return to normal activities.

Wonder screw (Locking compression screw system) has limited utility and no added advantage for management of fracture neck of femur. The calcar buttress technique (i.e. BDSF) of fixation prevents the patient from complications which have been known to occur in patients treated with other modalities for fracture neck of femur like hemiarthroplasty or total hip arthroplasty.

A long-term follow-up with increased number of cases is required to evaluate the absolute functional and clinical outcomes.

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