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Clinico-radiological and functional outcome of intertrochanteric fractures by dynamic hip screw

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Abstract
Background: Fractures of proximal femur are amongst the most often encountered fractures by orthopedic surgeon. Intertrochanteric fractures were one of the most common fractures of the hip especially in the osteoporotic bones and high velocity trauma. Many treatment techniques are described in literature but internal fixation with Dynamic Hip Screw is the versatile treatment of choice.
Objective: To analyze the clinico-radiological and functional outcome of intertrochanteric fractures by dynamic hip screw.
Materials and Methods: A retrospective study with 64 adult patients with intertrochanteric fractures according to Boyd & Griffin classification were treated with dynamic hip screw (DHS) in School of Medical Sciences & Research from January 2014 and December 2018. All the cases were followed at regular intervals as per our study protocol. The functional outcome were assessed with Modified Harris Hip Score.
Results: In the present study, 64 intertrochanteric fractures underwent surgical fixation with dynamic hip screw (DHS). The functional results assessed by Modified Harris Hip score showed excellent in 37 cases (57.81%), good in 13 cases (20.31%), fair in 9 cases (14.06%) and poor in 5 cases (7.81%).
Conclusion: We conclude that the dynamic hip screw (DHS) is an ideal and versatile implant of choice for intertrochanteric fractures, leading to high rate of bone union restoring the postero-medial wall, reducing the chances of implant failure and decreasing the post-operative morbidity by improving the functional quality of life.

Keywords: intertrochanteric fractures, boyd & griffin, dynamic hip screw

Introduction

In geriatric population, fall is the leading cause of nonfatal injuries and hospital admissions. Proximal femur fractures are divided into three categories: femoral neck and inter-trochanteric fractures account for 90%, sub-trochanteric fractures occurring in 5 – 10% of the population [1].
Intertrochanteric fracture is the fracture of the proximal femur, in which the fracture line extends from the greater trochanter to lesser trochanter. A total of 9 out of 10 intertrochanteric fractures occur in elderly, the female to male ratio is 3:1 [1]. Intertrochanteric fractures unite readily due to broad fracture surfaces, adequate blood supply and they rarely lead to non-unions. If proper precautions are not taken fractures unite in malposition resulting in shortening, limp and restricted movements. Treatment must also consider effective internal fixation to help early mobilisation and to reduce morbidity [2].
A combination of surgical fixation, early postoperative physiotherapy and ambulation is usually the best approach. The overall goal in the treatment of hip fractures is to return the patient to pre-morbid level of function. Among the various internal fixation devices used for trochanteric fractures the dynamic hip screw with sliding plate is one of the versatile implant which permits the proximal fragments to collapse or settle, seeking its own position of stability. Dynamic Hip Screw (DHS) works with the principle of controlled dynamic sliding of the femoral head and used to fix both the femoral head and the device to the shaft of the femur. The dynamic compression allows the weight-bearing stresses to stabilize the femur so that it may undergo remodelling and proper fracture healing. After 6 to 8 months of surgery, 75% of the patients had their normal function restored [3].

In our study period of four years 64 cases according to the inclusion criteria were radio logically classified and treated surgically as early as possible. These fractures were treated with dynamic hip screws and plate system. A study was undertaken to study the effectiveness of the DHS and Tip Apex distance, stability, reduction and the functional outcome with Modified Harris Hip score.

Materials and Methods

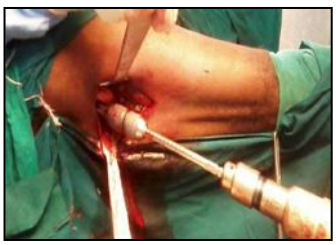
With a level IV evidence, a retrospective study was carried out from January 2014 and December 2018 in department of Orthopaedics, School of Medical Sciences & Research. A total of 64 patients with intertrochanteric fractures were treated surgically by dynamic hip screw and were followed up at the immediate post op period and at the end of 1, 3, 6 and 9 months and evaluated for clinic-functional outcome using Modified Harris Hip score.

Patients who were in the age group from 21 – 90 years of age, patients with clinically and radiologically diagnosed intertrochanteric fractures as per Boyd and Griffin classification were included in the study. Patients who were below 20 and above 90 years of age, patients with clinically and radiologically diagnosed subtrochanteric fractures, patients with fracture dislocation of hip, patients with compound fractures, pathological fractures and fractures over ipsilateral lower limb and patients with neck of femur and shaft of femur fractures were excluded from the study.

After getting IEC and informed & written consent from the patients and attenders, the patients enrolled in the study were subjected for thorough clinical examination. The baseline investigations and radiographic analysis such as plain x ray of the affected hip with proximal femur were analysed. All the cases were posted for surgical management with closed or open reduction with DHS and followed up according to our study protocol.



Guide pin insertion through Angle guide



Reaming with triple reamer



Insertion of dynamic hip screw



Placement of barrel plate along the Lateral aspect of proximal femur

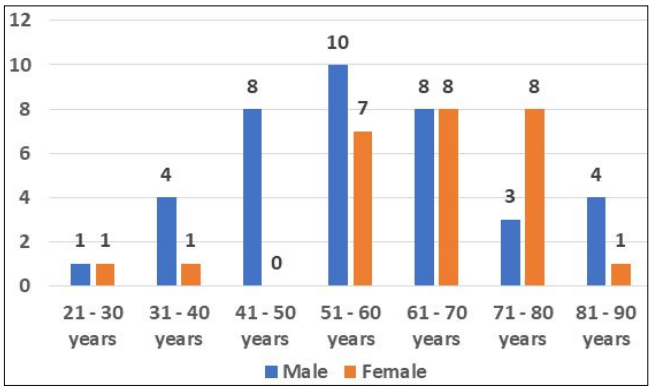
Fig 1: Intra-operative images of dynamic hip screw surgery

All cases were initiated with active and passive exercises within 48 hours of surgery. All the patients were advised to completely weight bearing after 10 – 12 weeks of post-operative period. All patients were followed up at the end of 1, 3, 6 and 9 months. The functional results were calculated according to Modified Harris hip score.

Results

A total of 64 cases of intertrochanteric fractures underwent surgical management with dynamic hip screw (DHS) as per our study protocol. The descriptive statistics were reported as mean (SD) for continuous variables, frequencies (percentage) for categorical variables. Data were statistically evaluated with IBM SPSS Statistics for Windows, Version 24.0, IBM Corp, Chicago, IL.

Among 64 cases, 38 cases (59.37%) were males and 26 cases (40.62%) were females. All the patients belong to age between 51 to 60 years of age (as shown in graph 1). The maximum age limit in the study was 86 years and minimum age was 27 years. The mean (±SD) age of the patients were 56.73±7.91 years. A total of 29 cases (45.31%) sustained injury due to road traffic accident, 16 cases (25.00%) fall from height and 19 cases (29.68%) due to trivial fall.



Graph 1: Demographic distribution

According to Boyd and Griffin classification, out of 64 cases of unstable intertrochanteric fractures, the pattern of fractures were type 1 in 13 cases (20.31%), type 2 in 27 cases (42.18%), type 3 in 17 cases (26.56%) and type 4 in 7 cases (10.93%). All cases were operated with an average of 3.92 ± 0.75 days ranging from 2.86 – 6.97 days of admission. Among 64 cases, 56 cases (87.50%) were operated with CRIF with DHS and 8 cases (12.50%) underwent ORIF with DHS. Out of 64 cases, 2 cases (3.12%) needed additional bone grafting since there were postero-medial comminution.

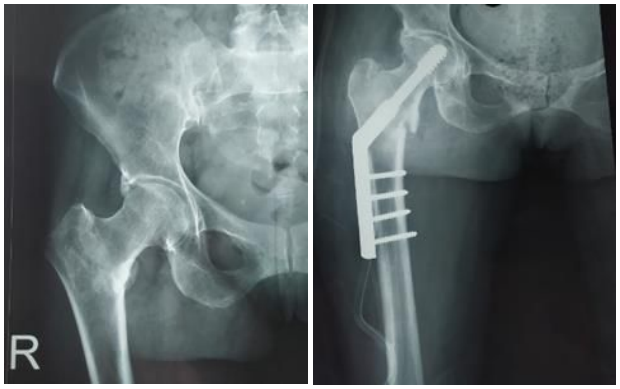
We used tip apex distance (TAD) to evaluate and compare the quality of the fixation. In our study, the difference in the TAD score among study population was not statistically significant (as shown in table 1).

Table 1: Tip Apex Distance (TAD)

Age (years)	TAD < 2.5 cm	TAD > 2.5 cm
21 – 30	2	0
31 – 40	3	2
41 – 50	8	0
51 – 60	16	1
61 – 70	15	1
71 – 80	10	1
81 – 90	5	0
$X^2 = 4.8$; df = 4; p = 0.30 not significant		

The mean radiological union of intertrochanteric fractures were 11.17 ± 4.82 weeks. A total of 2 cases (3.12%) showed signs of established non-union after 9 months of post procedure with DHS. These non-union cases were counselled for total hip

arthroplasty. The complications associated in our study were pain 13 cases (20.31%), non-union 2 cases (3.12%), varus angulation 2 cases (3.12%) and screw cut-out 1 case (1.56%).



Pre-op – AP Immediate post op



6th month follow up

Fig 2: Radiographs of intertrochanteric fracture fixed with DHS





Fig 3: Clinical outcome in patient with of intertrochanteric fracture fixed with DHS

According to Modified Harris Hip scores, out of 64 cases, the functional outcome were excellent in 37 cases (57.81%), good in 13 cases (20.31%), fair in 9 cases (14.06%) and poor in 5 cases (7.81%). The poor range of movements (n=5) were due to non-union 2 cases, varus collapse 2 cases and screw cut-out 1 case.



Fig 4: Screw cut in DHS plate

Discussion

The management of intertrochanteric fractures pose a significant challenge to the orthopaedic surgeon. These fractures represent a technical difficulty in reduction of fractures and implication of surgical implant may lead to failure of primary fixation of fracture. The medial and posteromedial fracture fragments were the most important elements in determining the severity of intertrochanteric fracture [4, 5].

Lakho *et al*. observed acceptable outcomes in 81.1% (86) patients at the end of three months treated with DHS for unstable intertrochanteric fractures in 106 patients [6]. Mardani *et al*. reported despite the complications of fixation with the DHS device, it remains the most successful for treatment of intertrochanteric fractures over LCP [7]. Nordin *et al*. reported 16.7% of DHS implant failure on intertrochanteric fractures.[8] Various studies reported varus collapse and failure of femoral head screw were the most frequent complications reported with DHS for intertrochanteric fractures [9, 10].

Various authors suggested that Tip Apex Distance (TAD) is the most important predictive factor for DHS failure, followed by lag screw position, fracture pattern and reduction, patient's age and presence of osteoporosis. Therefore, they recommended proper training of surgeons, as well as attention to detail while performing DHS for intertrochanteric fracture of femur [11 14].

Sedighi *et al*. assessed assess the positive predictive value of tip-to-apex distance (TAD) index in the prognosis of patients treated with DHS. They showed a statistically significant correlation between TAD index and cut-off rate in patients with intertrochanteric fractures of femoral bone treated by DHS. Screw failure was the most common complication in the remaining 16% of patients [15]. Some reports suggest that fixation with the DHS device is preferable; the placement of screw near the subchondral bone can improve fixation [16] and the associated compression to weight bearing aids in the healing of the fracture [17].

Qidwai *et al* compared the functional outcome of DHS and PFN in intertrochanteric fractures. They found out improved Modified Harris Hip score after 6 month in PFN group (83.50±0.96) than in DHS group (73.73±3.30). They concluded that cephalo-medullary femoral reconstruction nails with a trochanteric entry point (PFN) are biomechanically stronger than extramedullary implants (DHS) [18].

In our study, dynamic hip screws were used. These implants provides dynamic and controlled collapse of fracture site. The dynamic hip screw increases the biomechanical stability of the fracture fixation. According to Modified Harris Hip scores, out

of 64 cases, the functional outcome were excellent in 37 cases (57.81%), good in 13 cases (20.31%), fair in 9 cases (14.06%) and poor in 5 cases (7.81%). DHS have the biological advantages in terms of restoration of abductor-lever-arm mechanism, decreased tensile strain on the implant and maintenance of controlled fracture impaction.

Limitations of the study were smaller sample size, limited duration of post-operative follow up to comment on biomechanical stability of the implant and no control group for comparison.

Conclusion

Intertrochanteric fractures pose a great challenge for orthopaedic surgeons to manage surgically. We conclude that the dynamic hip screw (DHS) is the versatile implant of choice for intertrochanteric fractures, leading to high rate of bone union restoring the postero-medial wall, reducing the chances of implant failure and decreasing the post-operative morbidity by improving the functional quality of life.

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