

Research Article

Treatment Outcome of Sub-Trochanteric Fractures of Femur Fixed with Dynamic Condylar Screw

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Abstract |

Objective: To find out clinical and radiological union, implant failure and mobility at adjacent hip joint for sub-trochanteric fracture treated with dynamic condylar screw fixation.

Method: This case series was conducted in the Department of Orthopedics Surgery and Traumatology Unit I (DOST-I), Mayo Hospital, Lahore from January 2013 to January 2015. A total of 26 patients with closed sub-trochanteric fracture fixed with dynamic condylar screw were assessed radiologically between 20 to 60 years of age after acute trauma within two weeks. We followed all patients at two weeks' interval for 1st month and after one month till nine months post-operatively at four weeks interval. We assessed all patients till last follow up for radiological union, implant failure and range of motion of hip joint using Modified Harris Hip score.

Results: Out of 26 patients, 18 (69.23%) were males and 08 (30.8%) were females. Median age was 37.5-year and inter-quartile range was 16.50. At the end of the study, were 25 (96.15%) fracture united but 01 (3.85%) developed non-union. These non-union was associated with implant failure. The implant failure was observed between 3rd to 5th months.

Conclusion: We concluded that fixation of sub-trochanteric fractures of femur with dynamic condylar screw can be treated efficiently in terms of fracture union.

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Introduction

Sub-trochanteric fractures of femur occur below lesser trochanter to 5cm distal in shaft.¹ These fractures are difficult to treat due to compressive, tensile, torsional forces and decreased blood supply in the region.² Medial cortex has greater stress and muscles forces exert shears at fracture site.³ These fractures can pose various problems included non-union, implant failure, and iatrogenic devascularization of the operative site.⁴

These injuries can occur from high energy trauma either by road traffic accident (RTA) and fall from height. In elderly these fractures occur from fall.⁵ Open reduction and internal fixation (ORIF) of these fractures is necessary for early recovery of a patient.⁶ There is no single implant recommended for the fixation of sub-trochanteric fractures. These are intra-medullary implants include intramedullary nail, proximal femoral nail, Russel Tylor nail, gamma nail, and extra-medullary implants like plate and screw.

Intra-medullary implants required less exposure have better outcome but in sub-trochanteric fracture with extension into piriformis fossa has technical difficulties included nail entry and problem with proximal locking.⁷ Sliding or dynamic hip screw has technical difficulty, including anchoring in proximal fragment with supplement of screw and on weight bearing the outward drift may result into construct failure and non-union.

Dynamic condylar screw exerts vertical forces and provides good stability due to strong fixation in the cancellous bone of neck and head with good rotational stability. Keeping in mind all these aspects we planned to fix sub-trochanteric fractures with dynamic condylar screw (DCS) to find out rate of fracture union, implant failure and hip range of motion of the hip joint.

Methodology

This case series was done in the Department of Orthopedics Surgery and Traumatology Unit-I (DOST-I), Mayo Hospital, Lahore from January 2013 to December 2015. A total of 26 patients with closed sub-trochanteric fracture between 20 to 60 years of age with history of acute trauma within last two weeks later confirmed on radiograph. Patients with segmental fracture, pathological fracture and poly trauma were excluded from the study. We assessed all patients till last follow up for radiological union, implant failure and range of motion of hip joint.

After permission from ethical board of the hospital, we obtained verbal and written consent from all the patients. Patients were admitted in the hospital and temporarily immobilized with proximal tibial skeletal traction by Steinmann-pin under local anesthesia and was suspended on a Bohler's splint in 45° of abduction at hip, with weight equal to 10 lbs. Fractures were classified according to AO Mueller Classification⁸ to assess the stability. All the patients were given third generation cephalosporin 30 mins prior to the surgery and 48 to 72 hours post-operatively. Quadriceps exercises were started on second post-operative day. Patients were discharged on 3rd and 4th post-operative day and continued oral antibiotics till removal of stiches. Stiches were removed 15-postoperative-day in outpatient department (OPD). We followed all patients at two weeks' interval for 1st

month and after one month till nine months post-operatively at four weeks interval. Upon every follow up, patient was taught static quadricep, knee bending and high sitting exercises and assessed clinically (operative site & range of motion, and painless weight bearing) and radiologically progression of callus on X-rays for the union. Partial weight bearing was started in stable fracture with good fixation 16 to 21 days post-operatively and delayed weight bearing in 6 to 8 weeks in unstable fractures. Patients radiological union was assessed every month with progression of callus. Range of hip motion was measured on each follow up using Modified Harris⁹ Hip Score as excellent, good, fair and poor score. Union was considered when patient was able to bear weight painless with adequate hold of callus seen on x-ray.

Data was analyzed using SPSS version 20.0. Quantitative variables of age, and union time were calculated as mean±SD. Qualitative variables gender, side of limb involved, and mode of injury were calculated as frequencies and percentages. Associations between variable were tested for statistical significance using Chi-square test and differences were regarded to be significant at the 5% level.

In supine position under spinal / epidural anesthesia, patient put on traction table and reduction of the fracture was done. Skin was prepared over hip by soap scrub and pyodine solution. Through lateral approach incision was made and extended it distally. Hemostasis was secured, and fracture site was opened. Guide wire was inserted over anterior aspect of femoral neck to determine the antiversión. Another guide wire inserted with controlled drill machine through greater trochanter with the help of guide angle 95° in lower half of femur neck. Guided pin remained 1cm below the articular surface subsequently reaming done over the guide wire. Appropriate size lag screw inserted after tapping. Side plate fixed according to required length of fracture and fixed with 4.5mm cortical screws. We did bone grafting in cases with severe posteromedial comminution, where, it was not possible to hold the posteromedial area in spite of anatomical alignment. Our focus was to obtain length, mechanical and rotational alignment. Wound closed with suction drain and aseptic dressing was done.

Results

Out of 26 patients, there were 18 (69.22%) were males and 08 (30.8%) were females. Median age with inter-quartile range, side of limb involved, mode of injury, side of the affected limb, outcomes of fractures, AO classification, femoral neck shaft angle, mean union time (Mean $\pm$ SD) is given in table 01. The non-union was observed due to implant failure. The implant failure was observed between 3rd to 5th month. The mean degree hip flexion at nine months was $115.7^{\circ}\pm 7.9$. Majority 21 (80.76%) has stable, and only 04 (19.23%) patients had unstable sub-trochanteric fractures. Out of 25 patients with union, the modified Harris hips score was excellent in 16 (64%) patients, good in 06 (24%) patients and fair in 02 (8%) patients and one patient poor range of motion (Table 02). We used bone graft in three cases. Chi square test was applied to determine if there was statistically significant difference between mode of injury and union of the fracture in months. The result was non-significant for union of the fracture with mode of injury (p-value=0.619) (Table 03).

Table 1: Demographic Data, Union, and Implant Failure

Variables	Frequency (N=26)	Percentage (%) (p-value)
Gender of the patients		
ξ Male	18	69.23%
ξ Female	08	30.8%
Mode of Injury	21	80.77%
ξ RTA	05	19.23%
ξ Fall from Height		
Side of the affected limb	16	61.53%
ξ Right	10	38.47%
ξ Left		
Median Age of the (years)		37.5
Inter-quartile range		16.5
Outcomes of Fractures		96.15%
ξ Primary Union	25	3.85%
ξ Non-union	01	
AO Classification	09	34.61%
ξ Type A	14	53.84%
ξ Type B	03	11.54%
ξ Type C		
Femoral Neck Shaft Angle	23	88.46%
ξ 120-135°	03	11.53%
ξ 110-119°		
Mean Union Time (Mean $\pm$ SD)		17.807 $\pm$ 4.647

Table 2: Modified Harris Hips Score for Functional Outcome

Modified Harris Hip Score	N=25	Percentage (%)
ξ Excellent	16	64%
ξ Good	06	24%
ξ Fair	02	08%
ξ Poor	01	04%

Table 3: Cross Tabulation of the Mode of Injury with Union of the Fracture

Variables	Union of the fracture			p-value
	Primary union (N=25)	Secondary Union (N=01)	Total N=26)	
Mode of the injury				
ξ Road traffic accident	20	01	21	= 0.619
ξ Fall from the height	05	00	05	

Discussion

Sub-trochanteric fractures of the femur demand special attention of Orthopedic trauma due to the high complications associated with their management biomechanically. There is high stress concentration in this region and fractures with comminution are difficult to reduce and fix anatomically. Loss of anatomical reduction and in-adequate implant choice is associated with high complications rate.¹⁰ Dynamic condylar screw (DCS) is implant of choice for fixation of sub-trochanteric fracture. There are minimum chances of stress failure, less operative time, easy to insert and higher union rate.

In our study the primary union was observed in (96.15%) cases which was similar to the results of Halwai et al.¹¹ who had 96.6% primary union. Rohilla et al.¹² and Sherma et al.¹³ who presented 40 and 25 cases respectively. They found union 100% in patients with sub-trochanteric fractures treated with DCS. As compared to the study of Sahin et al.¹⁴ in which union rate fracture was 70.2% which was low when compared to the result of our study. They had acceptable functional result as 16.5% and poor outcomes in 13.5% patients treated with DCS. Their difference may be result of patient factor, surgeon technique and sample size. These fractures required anatomical reduction and adequate fixation. The mean time of union was 17 weeks in our study which is comparable with other studies.¹⁵

In our study there were 18 (69.22%) were males and

08 (30.8%) were females, while Vashisht et al.¹⁶ had 73.3% males and 25.7% females which are similar to our reported data. The mean age of the patients in our study was 37.45 ± 4.29 -year with minimum age 30 and maximum age 48-year and El-Desouky et al.¹⁷ had mean age of the patient 44.3-year in his study population. The lower mean age in our study was the reason of inclusion of age group of patients between 20 to 60-year while El-Desouky et al. had patients included between 18 to 74-year in his study.

Hip range of motion (ROM) was measured in every follow up using Modified Harris Hip Score. In our study, Modified Harris Hip Score was excellent in 16 (64%) patients, good in 06 (24%) patients and fair in 02 (8%) patients and one patient poor range of motion. Vashisht et al.¹⁶ in which he reported excellent score in 50%, good in 30%, fair in 15% and poor in 5% patients.

When we compared the implant failure, it was minimal in our study which was only one (3.84%) case of implant failure, while Kulkarni et al.¹⁸ reported 04 (10%) cases of implant failure in his study. The data has reported the implant failure due to the mechanical shearing load effect.¹⁹ The implant failure in our study was associated with early weight bearing. According to AO classification, 09 (34.61%) were Type A, 14 (53.84%) were type B and 03 (11.54%) were type C fractures while Mahmood et al.²⁰ type A fracture was noted in 17 (18.1%) patients followed by type B 46 (48.9%) and type C in 31 (33%) patients.

There were 16 (61.53%) fractures were on right and 10 (38.47%) were on left sided. Majority 21 (80.77%) of the patients had fractures due to RTA and 05 (19.23%) sustained injury due to fall from height. These fractures result due to high energy trauma. The mean time of union was 17.807 ± 4.647 -week. The advantage of this study was good union rate 96.15% and excellent to good functional outcome in 84% patients. There are certain limitations in our study. The sample size of the study was small. Compared with close fixation in which hematoma is preserved, it was done through open reduction. The better evidence can be obtained with addition of control group in this population to consolidate the treatment of one type over the other for such fractures in our population.

Conclusion

Dynamic condylar screw has good clinical and radiological outcomes in management of subtrochanteric fractures femur. We also find it biomechanically stable with minimum rate of implant failure and early union is effective for good range of motion at affected hip joint. We recommend further studies to confirm our observations.

Ethical Approval: Given

Conflict of Interest: None

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References

1. Joglekar SB, Lindvall EM, Martirosian A. Contemporary management of subtrochanteric fractures. *Orthop Clin North Am.* 2015;46(1):21-35.
2. Vashisht D, Sreen S, Daroch MS, Alawadhi K. Dynamic condylar screws versus 95° angle blade plate fixation of subtrochanteric fractures of femur. *Int J Res Med Sci.* 2017;5(5):2040-5.
3. Mishra SK, Deepak CE, Goari K, Shukla S. Study internal fixation of subtrochanteric fracture of femur with dynamic hip screw, dynamic condylar screw and proximal femoral nail-a retro-prospective study. *Int J Res Med Sci.* 2018; 6(3):1011-16.
4. Akhtar MS, Gillani HUR, Khan KR. Comparison between proximal femoral nail antirotation (PFNA) and dynamic condylar screw (DCS) in the management of unstable proximal femur fractures in term of mean union time. *Pak J Med Health Sci.* 2016. 10(2):555-58.
5. Hak DJ, Wu H, Dou C, Mauffrey C, Stahel PF. Challenges in Subtrochanteric Femur Fracture Management. *Orthopedics.* 2015; 38(8):498-502.
6. Mousa SS. Results of biological fixation for subtrochanteric femoral fractures with a beveled dynamic condylar screw. *Egypt Orthop J.* 2014;49(2): 140-5.
7. Khandelwal RCS, Bhaladhare S, Sanghvi U, Koshire S, Agrawal AK. Three point contouring of 95 degree DCS plate & its advantages for fixation of sub trochanteric femur fracture. *Int. J. orthop. sci.* 2018; 4(2): 158-60.
8. Müller M E, Nazarian S, Koch P, Schatzker J. *The Comprehensive Classification of Fractures of Long Bones.* Berlin: Springer-Verlag; 1990.
9. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg Am.* 1969;51(4):737-55.
10. Shah SN, Maniar PP, Moradiya NP, Patel KC, Gawatre PR. Outcome evaluation of dynamic condylar screw fixation for subtrochanteric femur fracture. *Int J Orthop Sci* 2017;3(1):351-5.

11. Boopalan PR, Jepegnanam TS, Nithyananth M, Venkatesh K, Cherian VM. Functional outcome of biological condylar blade plating of subtrochanteric fractures. *J Orthop Sci.* 2012;17(5):567-73.
12. Godghate NA, Godghate NN, Saindane KA, Yemul S, Suryawanshi S. Biological dynamic condylar screw fixation for management of Peritrochanteric hip fractures. *Trauma International* 2018;4(2):25-8.
13. Vijay N, Vignesh R, Karthik R, Chander VS. A Comparison between Treatment Outcome of DHS and DCS Fixation in Hip Fracture and its Associated Medical Complications; An Observational Study. *Intern J Contemp Med Res.* 2017; 4(11): 2294-6.
14. Sahin EK, Imerci A, Kınık H, Karapınar L, Canbek U, Savran A. Comparison of proximal femoral nail antirotation (PFNA) with AO dynamic condylar screws (DCS) for the treatment for unstable peritrochanteric femoral fractures. *Eur J Orthop Surg Traumatol.* 2014; 24:347-52.
15. Patil SV, Rajale S. Subtrochanteric femoral fractures treated by fixation with dynamic condylar screw. *Arch. Appl. Sci. Res.* 2014; 6 (3):94-101.
16. Vashisht D, Sreen S, Daroch MS, Alawadhi K. Dynamic condylar screws versus 95o angle blade plate fixation of subtrochantric fractures of femur. 2017;5(5):2040-5.
17. El-Desouky II, Mohamed MM, Kandil AE. Clinical outcome of conventional versus biological fixation of subtrochanteric fractures by proximal femoral locked plate. *Injury.* 2016;47(6):1309-17.
18. Kulkarni SG, Sekhri A, Malve SP, Kulkarni MG, Kulkarni V, Prajapati N. Intramedullary Nailing Versus Dynamic Condylar Screw for Subtrochanteric Femur Fractures. 2015;10(4):10-5.
19. Yu J, Zhang C, Ling Li L, Kwong JSW, Xue L, Zeng X et al. Internal fixation treatments for intertrochanteric fracture: a systematic review and meta-analysis of randomized evidence. *Sci Rep.* 2015; 5: 1-11.
20. Mahmood S, Ali Z, Mustafa MI. Frequency of union in cases of subtrochanteric femoral fractures treated by fixation with dynamic condylar screw system. *Pakistan J Med Heal Sci.* 2017;11(1):482-5.