

Functional and anatomical outcomes of dynamic condylar screw in unstable proximal femoral fractures

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ABSTRACT

Introduction: Fractures of the proximal femur are common, especially after falls in the elderly, further compounded by osteoporosis. As such, internal fixations offer better outcomes compared to conservative approaches to prevent non-union and/or fatality.

Objective: To determine the functional and anatomical outcomes of dynamic condylar screw in unstable proximal femoral fractures.

Materials & Methods: This was a descriptive case series which was performed at the Department of Orthopedics and Trauma at Combined Military Hospital, Peshawar, Pakistan for about 06 months. Observation and examination were done by trainee medical officer and data was recorded in predesigned proforma. SPSS 23 was used for descriptive statistics.

Results: 124 participants of unstable proximal femoral fractures in total were treated with Dynamic Condylar screw were included in the study. The male-to-female ratio was 3:2. The patients' average age was 52.54±12.69 years, with a range of 25 to 80 years. Dynamic Condylar Screw (DCS) for organization of unstable proximal femoral fractures shows that good outcome was found in majority of cases which is 36 (29%), followed by fair in 31 (25%), excellent was observed in 29 (23.4%).

Conclusions: DCS is the option for proximal femur fracture. To get good functional and anatomical outcomes and minimize difficulties, the approach must be well planned and executed.

Keywords: Osteology; Orthopedics; Femur; Femoral Fractures; Fractures, Ununited; Osteoporosis.

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INTRODUCTION

Injuries of the proximal femur are a major concern in the area of orthopedic surgery.¹ Most of these fractures occur in old age patients especially older than 60 years and the most common mechanism of injury is trivial trauma or ground level fall, during daily routine activities. On the other hand, high energy trauma is responsible for such fractures in younger population. Osteoporosis in old age is a common factor for nonunion after fixation of these fractures leading to a rise in the length of hospitalization and healthcare costs.²

Proximal femur fractures include intertrochanteric and subtrochanteric fractures, as well as a combination of the two. Because conservative techniques resulted in increased fatality rates ranging from 4.5 to 22 percent, they are currently recommended primarily for older people who are at high medical risk for anesthesia and surgery.² As a result, internal fixation surgery is the best option. The goal of the procedure is to ensure initial patient stability and early mobilization while avoiding complications including deep vein thrombosis, pulmonary embolism, urinary and lung infections, and ulcers.³

For effective treatment of stable proximal femoral fractures, conventional implants such as dynamic hip screws, angular blade plates, or cephalomedullary nails can be employed. However, AO/ASIF-classified comminuted and unstable proximal fractures, as well as mixed intracapsular and extracapsular fractures, are difficult injuries that are prone to sequelae.⁴ The angled blade plate has long been the gold standard in some unstable proximal femur fracture (sub-trochanteric) fixation, although it necessitates a lengthy lateral approach to the femur. Dynamic Condylar Screw (DCS) is used to treat all unstable proximal femoral fractures. It has the benefit of being easy to implant, firm fixation, increasing strength and resistance to stress failure, having a shorter operational time, and staying in the hospital for a shorter period of time.⁵

A descriptive study was performed in Department of Orthopedics, Bolan Teaching Hospital Quetta from January 2017 to December 2018. All adult patients with unstable proximal femoral fractures

were corrected with DCS. The functional prognosis after surgery was measured by the Harris Hip Score, and was outstanding in 46.4% of patients, good in 39.45%, fair in 8.16%, and bad in 5.44%.²

Prospective research was conducted in India to assess the effectiveness of the DCS system with 95° angle blade plate fixation in therapy of proximal femoral fractures those are unstable in terms of stability, union time, complication rate, and functional outcome. According to the Harris hip score, 93.33% of patients treated with DCS had satisfactory to outstanding outcomes.⁵ A single group quasi experimental investigation was carried out in Creek General Hospital, Karachi⁶ in which 79 patients with closed unstable proximal femoral fractures were treated with DCS. Satisfactory functional result was achieved in 82.28% (65/79) of cases. The above-mentioned studies and other similar studies clearly show that some researchers are of the opinion that DCS has an excellent functional outcome in treating unstable proximal femoral fractures while others are of the opposite opinion. This paves a route for further research in this regard. Thus, this research was aimed to estimate the functional and anatomical outcome of dynamic condylar screw in unstable proximal femoral fractures.

MATERIALS & METHODS

This was a descriptive case series which was performed at the Department of Orthopedics and Trauma at Combined Military Hospital, Peshawar, Pakistan.

This investigation was performed from 02/11/2020 to 01/05/2021, after receiving ethical permission from the Institutional Ethical Review Board (IERB) of Nowshera Medical College, Nowshera, Pakistan. The sample size of 124 was calculated using the WHO formula for sample size measurement, with the proportion of bad results set at 5.44%,² and the confidence interval (CI) at 95%, the error margin at 5%, and a p-value ≤ 0.05 indicating the significant value. The non-probability consecutive sampling technique was utilized in the investigation.

Operational definitions:

Unstable proximal femoral fractures: On antero-posterior and lateral radiograph of the hip, type 32-A3.1, type 32-B3.1 & type 32-C1.1 fractures according to AO classification⁸ were unstable proximal femoral fractures as under:

32-A3.1 Simple Transverse Subtrochanteric fracture

32-B3.1 Wedged Fragmented Subtrochanteric fracture

32-C1.1 Complex Spiral Subtrochanteric fracture

Functional outcome: It was measured in each patient at 6th months postoperatively, using Harris Hip Score.⁷

Both genders of ages 25-80 years with AO types 32-A3.1, 32-B3.1 and 32-C1 and closed fractures of less than two weeks of history were encompassed in the study whereas, those patients who had open fracture or related with any other head or abdominal damage, who were unfit for surgery, patients with non-ambulatory pre-injury status, patient who died or lost to follow up and those who had pathological fractures due to focal lesions such as tumors were not included.

The research included all patients who fulfilled the inclusion criteria. The patients who contributed in the study gave a written informed consent. Patients were recruited in the study through Accident and Emergency (A&E) and Outpatient Department (OPD) according to inclusion/exclusion criteria. Diagnosis and classification of fracture were based on x-ray findings. Fracture was reduced and fixed on fracture table in the operation theater under image intensifier guidance using 4 to 6 holes DCS and appropriately sized lag screw by a single consultant orthopedic surgeon. On the first postoperative day, an x-ray was taken to verify the quality of the osteosynthesis. All of the patients were given IV antibiotics at the start of anesthesia and subsequently three times a day for two days. Then oral broad antibiotics were started for next two weeks. All the patients were receiving IV Tramadol postoperatively for 2 days and then oral Tramadol for two weeks for pain control. Patients were kept admitted for 2 days and then discharged. All patients received Deep Venous Thrombosis (DVT) prophylaxis for 07 days postoperatively. Stiches were removed on 14th postoperative day. Patients were moved on crutches as soon as feasible following surgery, enabling toe contact to the ground on the afflicted side for the first 6 weeks and then full weight bearing thereafter. Patients were followed in OPD at the end of 1st, 3rd and 6th month. At each visit, x-ray was obtained and fracture was evaluated radiologically. The Harris Hip Score was used to assess functional outcome at the conclusion of a 6-month follow-up period. Observation and examination were done by trainee medical officer and data were collected on a predesigned Performa.

Data were entered into SPSS version 23 (IBM Corp., Armonk, NY) for descriptive statistics, including mean and standard deviation for quantitative variables such as age, BMI, and Harris Hip Score. For qualitative variables such as gender and functional and anatomical outcomes, frequencies and percentages were determined to enable categorization (excellent, good, fair, and poor). To examine the influence of modifiers, functional outcome was stratified by age, BMI, and gender. The post stratification Chi-square test was used, with a p-value ≤ 0.05 considered significant.

RESULTS

In this study of 124 individuals presenting with unstable proximal femoral fractures treated with DCS had demographic data as shown in Table 1. The male-to-female ratio was 2:1. The study involved the age range from 25 to 80 years; mean age was 52.54±12.69 years.

Table 1: Demographic data of patients (n=124).

#	Demographic Variables	Frequency	Percentage
1.	Gender		
	Male	82	66.13
	Female	42	33.87
2.	Age groups (years)		
	<40	31	25.0
	41-60	58	46.8
	>60	35	28.2
3.	BMI (kg/m²)		
	<30	78	62.9
	>30	46	37.1

Distribution of common outcome in patients with DCS for management of unstable proximal femoral fractures displays that good outcome was found in majority of cases which is 36(29%), followed by fair in 31(25%); excellent was observed in 29(23.4%) while 28(22.6%) patients had poor outcome. Age-wise distribution of outcome of DCS in unstable proximal femoral fractures indicates that old age is more disposed to poor outcome as that of younger age but statistically it was found insignificant with $p=0.125$. Excellent outcome was found in mainstream of the patients with age less than 40 years and that was 25.8% followed by individuals having more than 60 years of age 22.9% and 22.4%; excellent outcome was found in age of 41-60 years.

Gender distribution of outcomes showed that 10(23.8%) females with unstable proximal femoral fractures had excellent outcome while 19(23.2%) excellent outcomes were found in male patients. Gender shows insignificant role over the outcome of DCS in management of unstable proximal femoral fractures with $p=0.510$. Stratification of functional outcome over BMI shows that patients with BMI of less than 30kg/m^2 shows excellent results while this difference was insignificant statistically with $p=0.073$.

DISCUSSION

Many people, particularly the elderly, suffer from bone fractures. As per the International Osteoporosis Foundation's results, the lifetime danger for osteoporotic fractures in women is 30% and 13% in males.⁹⁻¹¹ For men over the age of 50, the lifetime risk of fracture is estimated to be 20%.^{10,11} Bone mineral density (BMD) has long been acknowledged as a key skeleton driver of fracture risk, but it is becoming clear that skeletal shape significantly impacts the risk. The hip axis length (HAL), femoral neck axis length (FNAL), neck shaft angle (NSA), and femoral neck width (FNW) have been studied the most comprehensively in women (FNW). The importance of all of these characteristics as self-standing predictors of hip fracture risk in both sexes is debatable, with research yielding contradictory results.^{12,13} This ambiguity may have developed as a result of variances in research design, the number of patients investigated, and broad variability in geometric characteristics among nations and races.¹⁴⁻¹⁶ Given the variability, it may be required to create data that is particular to the population under study. As suggested by our earlier study, it may also be important to produce gender-specific data.¹⁶ The average age of 124 patients in our research was 52.54 ± 12.69 years. Neogi DS et al.,¹⁷ described a series of 24 subtrochanteric fractures in patients ranging in age from 16 to 96 years old, with

an average age of 46 years. In terms of gender, there were 82(66.13%) men and 42(33.87%) females. He described a series of 20 male (58.7%) and 10 female patients (41.3%) The male-female ratio was (1.4:1) Male participants are clearly afflicted more frequently compared to females. In different studies conducted in different countries, the outcome of subtrochanteric fractures treated with DCS varies. There is a dearth of major clinical research in the medical literature that may help the orthopaedic surgeon decide which therapy to use.¹⁸ Clinical trials utilising DCS plate devices have typically shown positive outcomes (81% good or excellent results).¹⁹ A recent prospective multicenter randomised controlled study comparing the less invasive stabilisation system to the minimally invasive DCS System revealed that the locking plate design had no advantage in the treatment of proximal femoral fractures.²⁰ Määttä M et al.,²¹ did a comparative study of using DCS and Proximal Femur Nail (PFN) for the subtrochanteric fracture. They found that the delayed union, surgery time, non union and infection rate is more with DCS as compared to PFN. In young patients with high-energy injuries, good outcomes have been observed.²² Both older and younger individuals performed well in our study. This might be due to the fact that our approach required impeded weight bearing (until callus appeared on radiographs) and the elimination of pathological and open fractures. Although this operation may be conducted on older people, it is ideally suited to younger ones. The DCS is positioned closer to the higher trochanter. The plate-DCS construct offers excellent attachment in the femoral neck and head, as well as significant rotational stability. As with the angled blade plate, extra screw anchoring of the proximal pieces in the head and calcar improves construct stability.^{23,24} As a result, DCS blends the sliding screw plate's simplicity of insertion with the mechanical efficacy of the angled blade plate.²³ When utilised after open reduction, DCS has failure and non-union rates of 20-23%.²²⁻²³

CONCLUSION

Unstable proximal femoral fractures fixed with DCS result in excellent and good functional and anatomical outcome in majority of patients.

RECOMMENDATIONS

DCS is recommended as a suitable alternative to intramedullary implants to treat subtrochanteric fractures. Further randomized control trial studies are recommended to show the results for generalization and make a proper protocol to manage such patients.

REFERENCES

- Jackson C, Tanios M, Ebraheim N. Management of subtrochanteric proximal femur fractures: a review of recent literature. *Adv Orthop.* 2018;2018. [Online]. Available from: <https://doi.org/10.1155/2018/1326701>.
- Kakar H, Bukhsh K, Kakar A. Functional outcome of dynamic condylar screw (DCS) in the treatment of unstable proximal femoral fractures in adult patients. *J Pak Orthop Assoc.* 2019;31(1):20-4.
- Govindasamy R, Gnanasundaram R, Kasirajan S, Meleppuram JJ, Archit K. Proximal femur locking compression plate in complex proximal femoral fractures: a retrospective analysis. *Int J Res Orthop.* 2016;2:104-8.
- Asif N, Ahmad S, Qureshi OA, Jilani LZ, Hamesh T, Jameel T. Unstable intertrochanteric fracture fixation - is proximal femoral locked compression plate better than dynamic hip screw. *J Clin Diagn Res.* 2016;10(1):RC09-RC13.
- 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.

6. Ahmed M, Hussain G, Kumar M, Nida, Hamid R. Functional outcome of subtrochanteric fractures femur fixed with dynamic condylar screw (DCS). *Professional Med J.* 2020; 27(2):225-9.
7. Edwards PK, Queen RM, Butler RJ, Bolognesi MP, Barnes CL. Are range of motion measurements needed when calculating the Harris Hip Score? *J Arthroplasty.* 2016 Apr 1;31(4):815-9.
8. Müller ME, Nazarian S, Koch P, Schatzker J. The comprehensive classification of fractures of long bones. Springer Science & Business Media; 2012.
9. Marshall LM, Zmuda JM, Chan BK, Barrett-Connor E, Cauley JA, Ensrud KE, et al. Race and ethnic variation in proximal femur structure and BMD among older men. *J Bone Miner Res.* 2008 Jan; 23(1):121-30.
10. Van Staa TP, Dennison EM, Leufkens HGM, Cooper C. Epidemiology of fractures in England and Wales. *Bone.* 2001; 29(6):517–22.
11. US Department of Health and Human Resource. Bone Health and Osteoporosis: A Report of the Surgeon General. Rockville, Md, USA: USDHHS. 2004. Available from: <https://pubmed.ncbi.nlm.nih.gov/20945569/>.
12. Karlsson KM, Sernbo I, Obrant KJ, Redlund-Johnell I, Johnell O. Femoral neck geometry and radiographic signs of osteoporosis as predictors of hip fracture. *Bone.* 1996;18(4):327–30.
13. Gómez Alonso C, Curiel MD, Carranza FH, Cano RP, Pérez AD. Femoral bone mineral density, neck shaft angle and mean femoral neck width as predictors of hip fracture in men and women. *Osteoporosis Int.* 2000;11(8):714–20.
14. Crabtree N, Lunt M, Holt G. Hip geometry, bone mineral distribution, and bone strength in European men and women: the EPOS study. *Bone.* 2000;27(1):151–9.
15. Nelson DA, Barondess DA, Hendrix SL, Beck TJ. Cross-sectional geometry, bone strength, and bone mass in the proximal femur in black and white postmenopausal women. *J Bone Mineral Res.* 2000;15(10):1992–7.
16. Neumann DA. *Kinesiology of the Musculoskeletal System: Foundations for Rehabilitation.* 2nd ed. St. Louis, MO: Mosby Elsevier, 2010. p520-71.
17. Neogi DS, Trikha V, Mishra KK, Rohilla N, Yadav CS. Biological plate fixation of comminuted sub trochanteric fractures with the Dynamic Condylar Screw: A clinical study. *Acta Orthop Belg.* 2009;75:497-503.
18. Griffin XL, Parsons N, Zbaeda MM, McArthur J. Interventions for treating fractures of the distal femur in adults. *Cochrane Database Syst Rev.* 2015 Aug 13;(8):CD010606.
19. Kolb K, Grützner P, Koller H, Windisch C, Marx F, Kolb W. The condylar plate for treatment of distal femoral fractures: a long-term follow-up study. *Injury.* 2009 Apr;40(4):440-8.
20. Canadian Orthopaedic Trauma Society. Are locking constructs in distal femoral fractures always best? A prospective multicenter randomized controlled trial comparing the less invasive stabilization system with the minimally invasive Dynamic Condylar Screw system. *J Orthop Trauma.* 2016 Jan;30(1):e1-6.
21. Määttä M, Terho E, Jokinen H, Pulkkinen P, Korpeläinen J, Heikkinen J, Korpeläinen R. Lifestyle factors and site-specific risk of hip fracture in community dwelling older women- a 13-year prospective population-based cohort study. *BMC Musculoskeletal Disord.* 2012;13(1):173.
22. Kulkarni SS, Moran CG. Results of dynamic condylar screw for subtrochanteric fractures. *Injury.* 2003;34:117-22.
23. Nungu KS, Olerud C, Rehnberg L. Treatment of subtrochanteric fractures with the AO dynamic condylar screw. *Injury.* 1993;24:90-2.
24. Vaidya SV, Dholakia DB, Chatterjee A. The use of a dynamic condylar screw and biological reduction techniques for subtrochanteric femur fracture. *Injury.* 2003;34:123- 8.