Original Article

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COMPARISON OF FUNCTIONAL OUTCOME OF DYNAMIC CONDYLAR SCREW AND CONDYLAR BLADE PLATE IN TYPE A FRACTURES OF DISTAL FEMUR IN SKELETALLY MATURE PATIENTS

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ABSTRACT:

BACKGROUND & OBJECTIVE: Distal femur fractures are increasingly common injuries in today's orthopedic practice. Early treatment with suitable implant brings in promising functional outcomes. Therefore, we have compared two commonly used implants to determine the functional outcomes in search of an implant that has less post-operative complications, less technically demanding and produces better results. The study objective was to compare the functional outcome of dynamic condylar screw with condylar blade plate in treatment of distal femur fractures.
METHODOLOGY: A total of 372 skeletally mature patients aging 18-60 years of both gender with fracture of distal femur (Type A, according to Orthopedic trauma association classification) presented within 3 weeks of fracture time were included. Patients meeting inclusion criteria were stratified into two groups having 186 patients each. Group A and Group B. Group A received dynamic condylar screw fixation and in group B, condylar blade plate fixation was preferred. Patients were followed for 3 years and their functional outcome was evaluated with the help of Lysholm knee score.
RESULTS: Lysholm knee score after 3 years in group A (Dynamic condylar screw) was excellent (95-100) in 173 patients (76.9%), Good in 33 (17.7 %), Fair in 8 (4.3%), poor in 2 (1.1%). However, group B had Excellent in 57(30.6%), Good in 59(31.7%), Fair in 38 (20.4%), and poor in 32 (17.2%).
CONCLUSION: Dynamic condylar screw can be used as an effective treatment with better functional outcome as compared to condylar blade plate in type A fractures of distal femur.
KEYWORDS: Distal Femur Fractures**,** Functional outcome, Lysholm Knee Score.

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INTRODUCTION:

Distal femur fractures make up to 6% of all femur fracture [1]. Femur has been defined as distal 9 cm of the femur. Young adults commonly suffer these injuries due to high energy trauma while elderly may get it due to osteoporotic bones after a fall [2]. Classification for this fracture is not universally accepted, however, we preferred OTA (Orthopedic Trauma Association) classification system as it is widely accepted and applicable to various parts of skeletally mature bones. It distinguishes among extra-articular (Type A), partial articular (Type B) and complete articular (Type C) injuries and accounts for fracture complexity [3].

Most of the supracondylar fractures before 1970s were treated nonoperatively [4]. However, it was revealed that surgical treatment may result in early surgical stabilization to facilitate the soft tissue, reduces complex nursing and allows early mobility [5]. Controversies between the proponents of different implants and operative techniques have occupied the attention of most of the reports [6]. Superior results could be attained using the Ender nail and screw, retrograde intramedullary nail and least invasive stabilization system using locking compression plate. Excellent, good, fair and poor functional outcome have been reported to be 70%, 26%, 2% and 2% in dynamic condylar screw and 33%, 38%, 17% and 13% in condylar blade plate respectively [7]. Recently, there has been a paradigm shift towards minimally invasive plate osteosynthesis (MIPO technique) to avoid much soft tissue trauma to the surrounding tissues with promising outcomes and minimal complications.

In our settings, we use both dynamic condylar screws, a relatively newer implant which is gaining popularity among surgeons worldwide and condylar blade plate, a traditional implant, to treat these fractures. Dynamic condylar screw is easier to insert and corrects sagittal plane malalignment while condylar blade plate is a single piece implant which is technically demanding and does not allow much correction in coronal plane. We evaluated the long term survival of both implants by evaluating functional outcomes of operated knees with the help of functional knee score (Lysholm Knee Score) and analyze the results of open reduction and rigid internal fixation with them in type A fractures of distal femur[8]. So, our study may help select the implant that is cost effective and bring about better functional outcome at our institution.

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METHODOLOGY:

This comparative study was carried out at Allied/DHQ Hospitals, Faisalabad for 3 years during July 2016 Till June 2019. A permission from Institutional Ethical Review Committee was granted to make sure there were no ethical concerns regarding the study (letter: 3467/ierc,23/07/2016). A total of 372 cases (186 in each group) between 18-60 years (mean age 43.9 $\pm$ 5.3) of both sexes were included. Diagnosis was confirmed with the help of clinical and radiographic findings. Skeletally mature patients presented in ER and Out-patient within 3 weeks of injury, with closed fracture distal femur type A, Patients with open fractures of distal femur type A, were also included and operated after healing of the wound. Those with open fractures with infected wounds, Polytrauma patients, pathological fractures, recurrent fractures, confirmed on history were not included in this study.

Patients were stratified into two groups by using computer generated random number and labeled as group A in which dynamic condylar screw was used and group B in which condylar blade plate was applied.

All patients had to go through a preoperative workup at floor. Anesthetist was called for fitness and after the fitness was declared with relevant departments, patients were put on elective list. A broad-spectrum intravenous antibiotic was given as prophylaxis 30 minutes prior to the skin incision.

All surgeries were performed by consultant orthopedic surgeon under preferably spinal anesthesia. In supine position, limb to be operated was scrubbed, painted with pyodine solution and draped. A traction table was used

for fractures more than 10 days old and the c-arm was employed for better assessment and visualization of the fracture geometry. Incision was made over fracture parallel to the shaft of femur, extending distally through the lateral joint capsule and synovium, taking care of meniscus. Fascia lata was incised longitudinally. Vastus lateralis muscle was reflected anteriorly off the intermuscular septum. Quadriceps mechanism and patella was reflected medially to expose the entire lower end of femur. Insertion point is located 2 to 2.5 cm proximal to the distal femoral articular surface in the mid of anterior half of the lateral femoral condyle and a guide wire inserted transversely. In group-A, over the guide wire, reaming was done with triple reamer. Condylar screw of appropriate size was inserted, fracture reduced, and barrel plate was assembled to the condylar screw and fixed across the fracture with cortical screws. In group B, patients a triple guide sleeve was placed parallel to guide wire and three holes were drilled with 4.5-mm drill transversely, expanded with a router to create a window for seating chisel that was inserted into femoral condyles. Then condylar blade plate of 95 degree was inserted into the path created by chisel, fracture reduced, and plate was fixed across the fracture with screws. Wound was washed, hemostasis done, suction drain was placed, fascia lata closed with absorbable suture and skin closed with nonabsorbable suture. Aseptic dressing was done.

Intravenous antibiotic postoperative prophylaxis and analgesia was given for 3 days. Passive movement at knee joint was started at 3rd post-operative day and patients discharged on oral antibiotic prophylaxis and analgesia for 2 weeks. Removal of stitches was advised at 10th post-operative day at outdoor. Functional outcome (Excellent, good, fair and poor) was assessed in terms of limb length, range of motions, pain and valgus/ varus and rotator deformity after 6 months of treatment. Follow up was made sure by keeping a complete record of patient's profile and following them over the 3 years in outpatient setting with the relevant author and contributors in this study.

For variables like age, limb shortening, pain, normal anatomical angles and ranges of motion after 6 months mean, and standard deviation was calculated. Whereas we calculated frequency (%) for gender and functional outcome (excellent, good, fair, poor). Chi-square test applied to compare functional outcome of both groups. Probability value ≤ 0.05 was taken as significant.

RESULTS:

Out of 372 patients, 65 (17.5%) had age between 18-27 years, 101 (27.2%) patients had age between 28-37 years, 75 (20.2%) patients had age between 38-47 years and 131 (35.2%) patients had age between 48-57 years. (Table - I)

Out of 372 patients, 213 (57.3%) were male patient and 159 (42.7%) were female patients. In dynamic condylar screw group, out of 186 patients, 103 (55.4%) were male patients and 83 (44.6%) were female patients. In condylar blade plate, out of 186 participants, 110 (59.1%) were male patients and 76 (40.9%) were female patients. (Table-II). The age distribution and gender difference between the two groups was not statistically significant (p-value = 0.49 and p-value = 0.463 respectively).

Functional outcome was significantly different between the two groups (p-value < 0.001) (table-III).

Majority of the patients of this trial belong to age of 48-57 years (35.2%). There are mostly male patients (57.3%). Overall excellent functional outcome was noted in 200 (53.8%) patients, good result was observed in 92 (24.7%) patients, moderate outcome was found in 46 (12.4%) patients and poor outcome was assessed in 34 (9.1%) patients.

In dynamic condylar screw group, it was noted that excellent functional outcome was in 143 (76.9%) patients, good result was in 33 (17.7%) patients, moderate outcome was in 8 (4.3%) patients and poor outcome was in 2 (1.1%) patients. In condylar blade plate group, it was observed that excellent functional outcome was in 57 (30.6%) patients, good result was in 59 (31.7%) patients, moderate outcome was in 38 (20.4%) patients and poor outcome was in 32 (17.2%) patients.

Table-I: Age distribution.

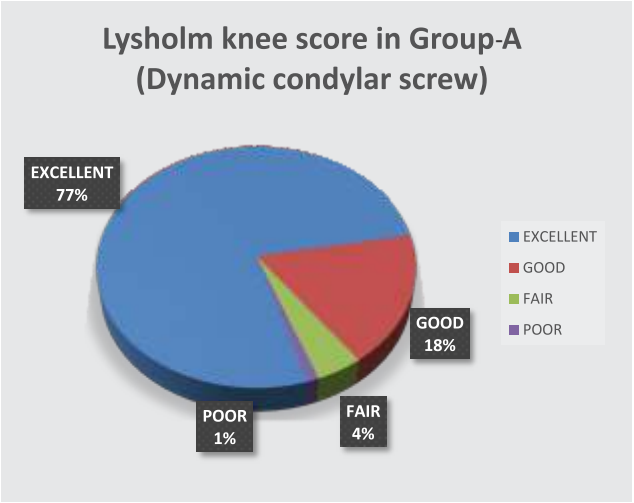
Age distribution	Group-A Dynamic Condylar Screw	Group-B Condylar Buttress Plate	Total
18-27 years	29	36	65
	15.6%	19.4%	17.5%
28-37 years	52	49	101
	28.0%	26.3%	27.2%
38-47 years	34	41	75
	18.3%	22.0%	20.2%
48-57 years	71	60	131
	38.2 %	32.3%	35.2%
Total	**186**	**186**	**372**
Chi-square value = 2.42 p-value = 0.49			

Table-II: Table of association among the gender and both groups.

Gender	Group-A Dynamic Condylar Screw	Group-B Condylar Buttress Plate	Total
Male	103	110	213
	55.4%	59.1%	57.3%
Female	83	76	159
	44.6%	40.9%	42.7%
Total	**186**	**186**	**372**
Chi-square value = 0.538 p-value = 0.463			

Table-III: Functional outcome in both groups.

FUNCTIONAL OUTCOME (LYSHOLM KNEE SCORE)	Group-A Dynamic Condylar Screw	Group-B Condylar Buttress Plate	Total
EXCELLENT	143	57	200
	76.9%	30.6%	53.8%
GOOD	33	59	92
	17.7 %	31.7%	24.7 %
FAIR	8	38	46
	4.3%	20.4%	12.4%
POOR	2	32	34
	1.1%	17.2%	9.1%
Total	**186**	**186**	**372**
Chi-square value = 90.364		**p-value < 0.001**	



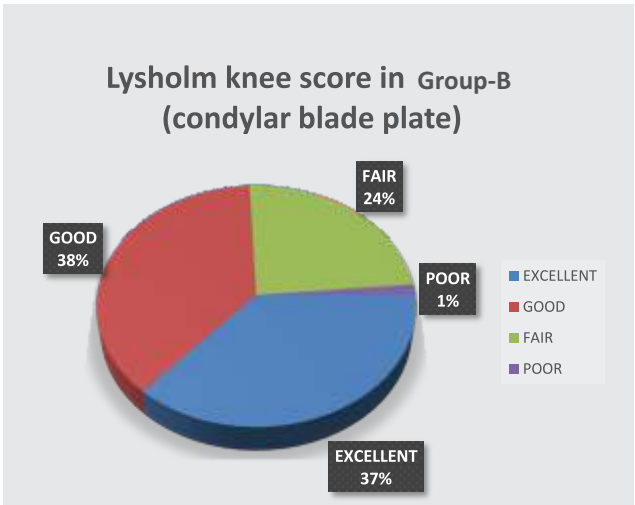
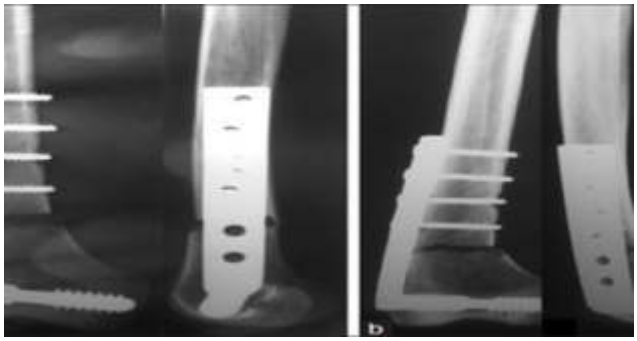
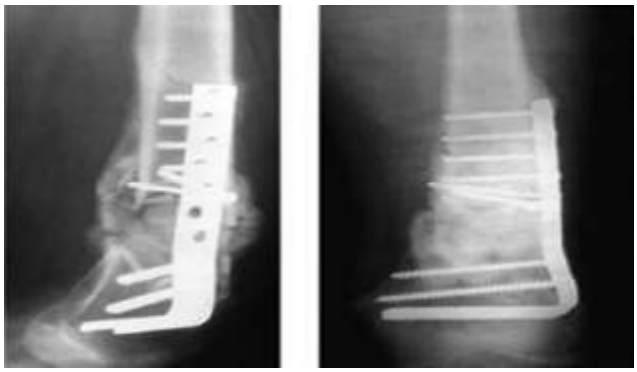


Figure-II: Functional outcome in patients with condylar blade plate.

A: DISTAL FEMUR FRACTURE (TYPE A ,OTA)



B: DYNAMIC CONDYLAR SCREW (IN SITU)



C: CONDYLAR BLADE PLATE

DISCUSSION:

There has been a constant debate over the implants type and variety for the treatment of distal femur fractures. Various studies conducted around the globe determined the similar outcomes following these implants. Choice of implant remains the matter of surgeon's preference and technical expertise the operating surgeon has. It is quite possible to have been good at one implant and lack the knowledge of the others at the same institute. By keeping the guidelines and following the principles of fracture fixation, any implant that serves the purpose can be utilized provided it has the relevant stability, long term survival and necessary conformity to the fracture surface with minimal complication rate. A couple of studies that are quite similar to the results of our study are being mentioned here. Petsatodis G et al., conducted a study in Greece on condylar buttress plate versus fixed angle condylar blade plate versus dynamic condylar screw for supracondylar intra-articular distal femoral fractures [9]. They assessed 108 patients in which male patients are dominant

(54.63%). Average age was 47 years. Functional outcome was excellent in 70% of the fractures, good was in 26%, both moderate and poor was in 2% fractures with DCS while excellent functional outcome was in 33%, good in 38%, moderate in 17% and poor in 13% of the fractures with condylar blade plate. They concluded that dynamic condylar screw fixation for distal femoral fractures achieves better functional outcome and low complication rate which favors the results of our study.

Ali I et al., In their study there are more male patients than females (male: female ratio was 1.92:1) with mean age 40.37 years [10]. They observed excellent outcome in 57.145% fractures, good in 17.14%, fair in 8.57% and poor in 17.14% fractures. They concluded that dynamic condylar screw is an easy, less technically demanding and rewarding method of treatment for supracondylar and intercondylar fractures of femur which is similar to results of our study.

Christodoulou et al., noted excellent results in 51%, good in 30%, moderate in 11% and poor in 8% fractures[11]. Muhammad Ayaz et al observed excellent results in 60% of the cases, good in 20% of the cases, moderate in 17% of the cases and poor in 3% of the cases. Huang[7] found 81% excellent to good results [12]. They concluded that dynamic condylar screw is one of the best devices to treat supracondylar fractures of the femur which favors the results of our study. Reddy & kakar et al., displayed similar results with dynamic condylar screws fixation and recommended it to be a better implant as compared to condylar buttress plate [13,14]. Kumar et al., proved this to be a cost-effective implant that bears an additional advantage of allowing correction of the deformity in sagittal and coronal planes. Meena et al., evaluated different implants for distal femur fractures and came up with the conclusion that dynamic condylar screw provides excellent long-term results [15,16].

CONCLUSION:

Dynamic condylar screw is effective and durable implant for the treatment of fracture of distal femur with better functional outcome as compared to condylar blade plate. Dynamic condylar screw can be used as a first line of treatment in type A fractures of distal femur.

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Author's Contribution

Muhammad Javaid Iqbal Awan: Study design, Manuscript writing & Proof reading.
Dilshad Gill: Over all supervision of data collection, Analysis and manuscript writing.
Osama Bin Saeed: Help in data collection & final draft of study.
Basharat Manzoor: Data analysis & Manuscript writing.

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