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Original Research Article

Dynamic condylar screws versus 95º angle blade plate fixation of subtrochantric fractures of femur

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ABSTRACT

Background: The purpose of this prospective randomized study was to evaluate the results of dynamic condylar screw (DCS) system and 95º angle blade plate fixation in the management of sub-trochanteric femoral fractures, regarding stability, union time, complication rate and functional out come.
Methods: Total 30 consecutive patients with sub-trochanteric fracture were studied. The inclusion criteria were closed sub-trochanteric fractures in adults of both gender aged 18 years or above. Pathological fractures and open fractures were excluded from the study. After fixation of fractures with dynamic condylar screw system and 95º angle blade plate patients were followed up in OPD at an interval of 2 weeks till full weight bearing was started and then after at an interval of 4 weeks. Results of treatment were assessed by the Harris hip score for clinical and radiological assessment at the end of 6 months.
Results: Among 30 studied cases, males were 22 (73.30%) and female 8 (26.70%). Most common mode of injury was road traffic accidents that occurred in 17 patients (56.70%) and the rest 13 patients had a history of fall. Patients were divided into two random groups (A &B) of 15 cases each. Group A was treated with DCS and Group B was treated with Angle Blade Plate 95º implants. Radiological union in most of the patients (13 out of 15 cases) treated with 95°angle blade plate occurred between 14-18 weeks, while in cases treated with dynamic condylar screw radiological union in most of the patients (14 out of 15) occurred between 12-16 weeks. According to Harris hip score, good to excellent results were achieved in 10 cases (66.66%) of 95°angle blade plate group and 14 cases (93.33%) of dynamic condylar screw group.
Conclusions: Patients with sub-trochanteric fractures treated with dynamic condylar screw had earlier radiological union, better functional outcome, less complications and earlier weight bearing.

Keywords: Blade, DCS, Femur, Plate, Subtrochantric

INTRODUCTION

Sub-trochanteric fractures comprise of 10-34% of all hip fractures.[1] Although different implants are available to internally fix this fracture, due to anatomical and biomechanical reasons, the sub-trochanteric femoral fracture is still a challenge for Orthopaedic Surgeons. The forces in this area are up to 1,200 pounds/square inch on the medial cortex leading to immense stresses in the area. Besides this the orientation of muscle forces in this area causes shear at the fracture site.[2] Biomechanical studies have shown that femoral cortex in the postero-medial sub-trochanteric region is subjected to highest stresses in the body and thus internal fixation is difficult and has a high failure rate.[3] Considering the biomechanical forces which lead displacement, open reduction and internal fixation is necessary. Conservative treatment gives only satisfactory results in 56% of patients as compared to70-

80% for operative methods.[4] There are two main types of devices to fix sub-trochanteric fractures, intra-medullary devices and extra-medullary devices. Intramedullary devices require less surgical exposure, enable early weight bearing, achieve better proximal fixation and exert less biomechanical stresses. How-ever they are not suitable for sub-trochanteric fractures with inter-trochanteric extension and are associated with technical difficulties in 63% of cases.[5] The sliding screw is technically straightforward to use, but because of its 135-degree screw plate angle, it may not be possible to supplement the sliding screw with additional cortical screws in the proximal fragment of a sub-trochanteric fracture however when we use DCS additional screws can be used.[6] The angled blade plate has been the historical standard in sub-trochanteric femur fracture fixation, but it requires an extensive lateral approach to the femur. DCS are preferred to fix sub-trochanteric fractures, probably it has the advantage of easy insertion, firm fixation, increase strength, and resistance to stress failure, less operative time and short hospital stay.[7]

METHODS

The prospective study was conducted at Rajindra Hospital and Medical College, Patiala, in patients of sub-trochanteric fractures attending out-patient department and emergency of orthopaedics at Rajindra Hospital. Total number of 30 patients were taken. All patients were randomly divided in two groups of 15 cases each. Group A was treated with DCS and Group B was treated with Angle Blade Plate 95^0 implants.

The patients of more than 18 years of age with isolated closed sub-trochanteric fracture of less than 2week duration willing to participate in the study were included. Pre-Operatively evaluation of the patient was done and pre-operative AP and lateral X-Ray were obtained. X-rays of other body parts and other radiological investigation if needed was done to rule out any associated injury. Preoperative planning was done to assess the size of implant and placements of screws. The fracture fragments were manipulated on the fracture table and reduced under image intensifier.

The fracture was approached through a lateral approach. Under image intensifier control, the implant, of suitable length, was inserted over guide wire which was put into the neck and head of femur at 95degrees angle to the shaft of the femur with the help of the angle guide. Cancellous bone grafts for medial cortex deficiency was used when encountered with deficit or comminution. The wound was closed over a suction drain which was usually removed at 24 to 48 hours. Patients were given post-op antibiotics for adequate duration. First post-op dressing was done on 3rd day to assess wound condition and range of motion exercises at hip and knee were started on the same day. Discharge of patient from hospital done after satisfactory stich removal, wound condition and physiotherapy achieved.

All patients were regularly followed up in OPD at an interval of 2 weeks till full weight bearing was started and then after at an interval of 4 weeks. In patients with stable sub-trochanteric fractures, either treated with angle blade plate or DCS, partial weight bearing was started at 4 weeks as per callus formation. Unstable sub-trochanteric fracture cases treated with angle blade plate, partial weight bearing was started between 6-10 weeks while those treated with DCS partial weight bearing was started at 6 weeks depending upon reduction and stability of fracture. Full weight bearing was started as per radiological union seen on follow up x-ray.

Clinico-radiological assessment of the patient was done and comparison was made in terms of duration of surgery, total amount of blood loss (during surgery + drain output), duration of hospital stay, timing of early mobilization and full weight bearing, mobility at the end of 3 months and 6 months (Wheel chair bound/walking frame/ stick/ no aid), radiological assessment for callus formation and bony union, complications with technique and implant failure

Harris hip score for clinical and radiological assessment was applied at the end of 6 months.8 The result of the study was compared using standardized statistical test for different variables. P value <0.05 was considered significant.

RESULTS

Maximum number of patients were in the age group less than 40 years (36.7%). The age distribution was found to be statistically insignificant. Majority of patients were males (73.3%). The difference was found to be statistically insignificant. Mean duration of surgery for 95°angle blade plate was 104.47 minutes (Range 95-115) mean duration of surgery for dynamic condylar screw was 82.2 minutes (Range 72-90). The difference was found to be statistically significant in favour of DCS. Average amount of blood loss was 380.33 ml (Range 320-420) in cases treated with 95°angle blade plate and 342.67 ml (Range 320-380) in cases treated with dynamic condylar screw. The difference was found to be statistically significant in favour of DCS. Limb length was found to be equal in 11 (73.33%) cases of 95°angle blade plate group and 13 (86.67%) in dynamic condylar plate group, while limb length was found to be decreased in 4 (26.67%) cases of 95°angle blade plate group and 2 (13.33%) in dynamic condylar screw group. The difference was found to be statistically insignificant. The mean duration of hospital stay for 95°angle blade plate group was 15.8 (14-18) days and for dynamic condylar screw group was 14.46 (12-17) days. The difference was found to be statistically insignificant.

Partial weight bearing was started at 8-12 weeks in most of the patients (13 out of 15 cases) treated with 95°angle blade plate, while in cases treated with dynamic condylar screw partial weight bearing was started at 6-10 weeks in

most of the patients (14 out of 15). The mean was 10.53 weeks for 95°angle blade plate group and 8 weeks for dynamic condylar screw group. The difference was found to be statistically significant in favour of DCS. Full weight bearing was started at 14-20 weeks in most of the patients (13 out of 15 cases) treated with 95°angle blade plate, while in cases treated with dynamic condylar screw full weight bearing was started at 12-18 weeks in most of the patients (14 out of 15).

The mean was 17.69 weeks for 95°angle blade plate group and 14.71 weeks for dynamic condylar screw group. 2 out of 15 patients (13.33%) had non-union in the 95°angle blade plate group while 1 out of 15 patients (6.67%) had non-union in the dynamic condylar screw group. The difference was found to be statistically significant in favour of DCS. Radiological union in most of the patients (13 out of 15 cases) treated with 95°angle blade plate occurred between 14-18 weeks, while in cases treated with dynamic condylar screw radiological union in most of the patients (14 out of 15) occurred between 12-16 weeks. The mean was 16.62 weeks for 95°angle blade plate group and 13.71 weeks for dynamic condylar screw group. 2 out of 15 patients (13.33%) had non-union in the 95°angle blade plate group while 1 out of 15 patients (6.67%) had non-union in the dynamic condylar screw group.

The difference was found to be statistically significant in favour of DCS. 2 (13.33%) patients treated with 95°angle blade plate were using no aid, 11 (73.33%) patients were using sticks and 2 (13.33%) patients were using walking frame; while 7 (46.67%) patients out of 15 patients treated with dynamic condylar screw were using no aid, 7 (46.67%) patients were using sticks for mobility at the end of 3 months after surgery and 1 (6.67%) patient was using walking frame. The difference was found to be statistically insignificant. All patients treated with 95°angle blade plate and dynamic condylar screw were using no aid, except for two (13.33%) patients with 95°angle blade plate one (6.67%) patient with dynamic condylar screw were using walking frame for mobility at the end of 6 months after surgery. The difference was found to be statistically insignificant.

Non-union occurred in 2 (13.33%) patients treated with 95°angle blade plate and in 1 (6.67%) treated with dynamic condylar screw. The difference was found to be statistically insignificant. Non-union occurred in 2 (13.33%) cases of 95°angle blade plate group and in 1 (6.67%) case of dynamic condylar screw group. Shortening occurred in 4 (26.67%) cases of 95°angle blade plate group and in 2 (13.33%) cases of dynamic condylar screw group. Infection occurred in 1 (6.67%) case of 95°angle blade plate group while none occurred in dynamic condylar screw group. Loss of ROM at hip occurred in 6 (40%) cases of 95°angle blade plate group and in 4 (26.67%) cases of dynamic condylar screw group. 2 (13.3%) cases of 95°angle blade plate group had hip pain during walking while 1 (6.67%) case of dynamic condylar screw group had pain during walking.

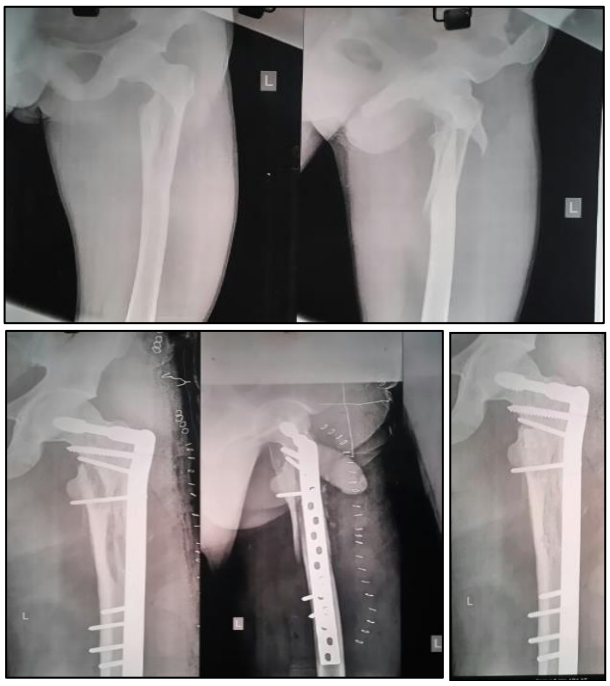

Figure 1: Pre-op and post-op X-rays treated with DCS (case 1).

Figure 2: Follow-up range of motion (case 1).

Excellent results were seen in 3 (20%) cases of 95°angle blade plate group and 5 (33.33%) cases of dynamic condylar screw group. Results were good in 7 (46.66%) cases of 95°angle blade plate group and 9 (60%) cases of dynamic condylar screw group. 3 (20%) patients had fair result in the 95°angle blade plate group. While poor results were seen in 2 (13.33%) cases of 95°angle blade plate group, 1 (6.67%) patient had poor result in the dynamic condylar screw group. The difference was found to be statistically insignificant (Table 1).

Table 1: Results.

Results	95°Angle Blade Plate		Dynamic Condylar Screw		Total	
	No. of patients	%	No. of patients	%	No. of patients	%
Excellent	3	20%	5	33.33%	8	26.67%
Good	7	46.66%	9	60%	16	53.33%
Fair	3	20%	0	0%	3	10%
Poor	2	13.33%	1	6.67%	3	10%
Total	15	100%	15	100%	30	100%
Statistical Analysis						
			Value	Df		p value
Pearson Chi-Square			4.083	3		0.253

Figure 3: Pre-op and post-op X-rays treated with ABP (case 2).

Figure 4: Follow up X-ray and range of motion (case 2).

DISCUSSION

Sub trochanteric femoral fractures are most difficult to treat due to high stress concentration zone. Sub trochanteric fractures occurs in a region of the cortical bone, where vascularity is less as a result, healing is delayed. Other factor is high biomechanical stress present in the sub trochanteric area leading to failure of fixation devices.[9] Approximately 15% of proximal femoral fractures are sub trochanteric fractures. Mechanism of injury is different in old aged peoples and young aged patients. In old patients fractures result because of weak osteoporotic bones, which are easily broken by minor injuries, while, young aged patient sustain fracture due to high injury.[10]

Recommended treatment of sub trochanteric fractures is operative, by open reduction and internal fixation. Main objective of treatment is to maintain, length, stability, alignment that is only possible by surgical treatment. Non-operative treatment is recommended in those patients in which open reduction and internal fixation is not feasible as result of co-morbid conditions. Main problems associated with treatment of sub trochanteric fractures have been non-union, mal union, delayed union and implant failure.[11] Various implant devices have been used to internally fix the sub-trochanteric fractures. These devices may be extramedullary devices or intramedullary devices. Intramedullary devices are bio mechanically stronger than the extra medullary devices, but sub-trochanteric fractures are too proximal to allow the use of a standard locking intramedullary nails.[12] In the present study of 30 patients with sub trochanteric fractures of femur, open/ biological reduction and internal fixation was done by using dynamic condylar screw and 95°angle blade plate, randomly in 15 cases each.

The present study showed 82.2 min duration of surgery with dynamic condylar screw which was comparable to Halwai MA et al who reported 80 min duration of surgery with dynamic condylar screw, while Sharma V et al reported 92.2 min.[13,14] In our study the duration of surgery for 95°angle blade plate was 104.47 minutes which was comparable to the study of Neher C et al

which reported the duration as 108 min.[15] Increased duration of surgery in angle blade plate was attributed to a greater amount of soft tissue dissection and multiple image intensifier exposures to correctly place the blade plate.

Present study showed 380.33ml of blood loss during surgery with 95°angle blade plate while Neher C et al showed 418ml of blood loss during surgery with 95°angle blade plate.[15] In our study blood loss during surgery with dynamic condylar screw was 342.67ml while Vaidya SV et alreported 430ml and Mousa SS et al reported 250ml of blood loss during surgery with dynamic condylar screw.[5,16] Increased blood loss in angle blade plate group was attributed to the increased operative time.

Mean time to union in our study for DCS group was 13.71 weeks while Rohilla R et al reported union in 16 weeks, Neogi DS et al in 15.6 weeks, Laghari MA et al in 16.5 weeks with dynamic condylar screw.[17-19] The present study showed union in 16.62 weeks with 95°angle blade plate which was comparable to Boopalan PR et al who showed union in 16 weeks, Yoo MC et al showed union in 19 weeks and Laghari MA et al showed union occurred in 18 weeks.[20-22] Earlier union in the dynamic condylar screw group was related to less soft tissue insult during the operative procedure.

Halwai MA et al showed excellent to good results in 73.33%, Neogi DS et al in 95% cases, Laghari MA et al in 81% cases with dynamic condylar screw while the present study showed excellent to good results in 93.33% cases with dynamic condylar screw.[13,18,19] Our study showed excellent to good results in 66.67% cases with angle blade plate which was less than Laghari MA et al who showed excellent to good results in 78.56% cases with the 95°angle blade plate.[22]

CONCLUSION

We conclude that the sub trochanteric fractures need open reduction and internal fixation to avoid complications like non-union and mal-union. Proper planning and execution of the technique is required to achieve good functional outcomes and avoid complications. Preservation of the vascularity of the medial fragments leads to rapid callus formation and early union and hence avoids implant failure and the need for secondary bone grafting. Primary bone grafting may be required in selected cases where there is comminution and loss of continuity of posteromedial cortex. Dynamic condylar screw had some technical advantages over angle blade plate as it was easier to insert, providing higher stability and the possibility of corrections even after insertion. In our circumstances we achieved good results by the use of dynamic condylar screw. Patients with sub-trochanteric fractures treated with dynamic condylar screw had earlier radiological union, better functional outcome, less complications and earlier weight bearing.

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