

SURGICAL OUTCOME OF SUPRACONDYLAR AND INTERCONDYLAR FRACTURES FEMUR IN ADULTS TREATED WITH DYNAMIC CONDYLAR SCREW

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ABSTRACT

Objective: To evaluate the surgical outcome of supracondylar and intercondylar fractures of femur in adults treated with dynamic condylar screw.

Methodology: This descriptive study was carried out in department of Orthopedics, Lady Reading Hospital Peshawar from October 2006 to October 2007. Thirty-five consecutive adult patients with supracondylar and intercondylar femur fractures fulfilling the inclusion criteria were managed with dynamic condylar screw and were followed for a minimum of six months post-operatively. Relevant data like time to union, knee range of movement and complications associated with these fractures treated with dynamic condylar screw was recorded.

Results: In 45.71% cases road traffic accident was responsible for the fracture followed by 28.57% cases due to fall from height, and 25.71% cases due to firearm injury. 74.28% fractures were closed fractures and 25.71% fractures were open. Average time of union was 15 weeks. Two patients (5.71%) had delayed union while two patients (5.71%) had non-union. There were six patients with knee stiffness and two with limb shortening of up to 1.5 cm. Infection was noted in two patients, treated successfully with debridement and I.V. antibiotics. Two patients developed wound hematoma. The overall outcome were good to excellent in 26 patients (74.28%). Moderate outcome were obtained in three patients (8.57%) and poor in six patients (17.14%).

Conclusion: The dynamic condylar screw is an easy, less technically demanding and rewarding method of treatment for supracondylar and intercondylar fracture of femur in adults.

Key Words: Supracondylar fracture of femur, Dynamic condylar screw, Time of union, Surgical outcome.

INTRODUCTION

Supracondylar fractures of the femur are seen (a) in young adults, usually as a result of high-energy trauma and (b) in elderly individuals with osteoporotic bones. Direct violence is the usual cause. The fracture line is just above the condyles, but may extend between them. In the worst cases the fracture is severely comminuted¹. These fractures are relatively uncommon and account for only 7% of all femoral fractures². There has been a changing philosophy towards surgical treatment of supracondylar fractures of femur^{3, 4}. Early surgical stabilization can facilitate care of the soft tissues, permit early mobility and reduces the complexity of nursing care⁵. Open reduction and internal fixation has been advocated,

using implants including Angled blade plate, Zickle devices, Rush rods, Ender nails and Interlocking nails. These implants can be used in various circumstances like simple fractures and complicated cases e.g. fracture after total knee arthroplasty⁶. But these devices are technically demanding and none of them can provide inter-fragmentary compression with good purchase in osteoporotic bones.

Dynamic Condylar Screw is easier to insert, provide more inter-fragmentary compression across an intercondylar fracture and correct sagittal plane malalignment^{7, 8}. The purpose of our study was therefore to evaluate the surgical outcome of dynamic condylar screw in supracondylar fractures of femur in adults in our hospital.

METHODOLOGY

This one year study was conducted at the Department of Orthopedics and Traumatology, Post Graduate Medical Institute, Lady Reading Hospital Peshawar from October 04, 2006 to October 04, 2007 including a minimum of six months follow up. The study was conducted on 35 consecutive adult patients of both sexes with AO type A and type C1, C2 supracondylar and intercondylar femur fractures presented to orthopedic unit of Lady Reading Hospital Peshawar.

Patients with lower diaphyseal fractures of femur, pathological fractures, active infection anywhere in the body, and medically unfit patients were excluded from the study.

All patients were received through accident and emergency department. Patients were evaluated for life threatening conditions as per Advance Trauma Life Support protocol and initial resuscitation performed. Detailed history about the mechanism and type of injury was obtained. Thorough physical examination of the patients performed. In terms of the management of open fractures, initial irrigation, debridement, intravenous antibiotic, proximal tibial pin traction and delayed wound closures were done routinely. Radiological examination of fracture site obtaining A/P and lateral views with joint above and below the fracture was performed. From the initial radiographs, the fractures were classified according to Orthopedic Trauma Association (OTA) while Gustillo and Anderson classification was used for open fractures due to fire arm injuries. The patients were put in supine position on orthopedic table. The average time between the injury and fracture fixation was 9 days. A conventional lateral incision was made in all cases.

The patients were made sit in the bed on the 1st postoperative day. Passive range-of motion exercises of knee joint were started on 2nd-3rd postoperative day. Patients were mobilized with Crutches or Zimmer frame with only touchdown weight bearing in the first week.

After discharge from the hospital, these patients were called for follow up at two, four, six and twelve weeks and then at six month. During these visits clinical and radiological union was assessed. Clinical union was considered satisfactory if progressively increasing stiffness and strength provided by the mineralization process made the fracture site stable and pain-free. Roentgenographic union was considered satisfactory when plain x-rays showed bone trabeculae or cortical bone crossing the fracture site. Full weight bearing was allowed when radiological signs of union were present. Schatzker and Lambert criteria (Table 1) were used to grade the results. All the information regarding patients age, sex, type of fracture, mechanism of injury,

associated injuries, per-operative and postoperative complications, union time of fracture, partial weight bearing, hospital stay were recorded on a Proforma specifically design for this purpose.

All the study variables were analyzed for descriptive statistics that is frequency and percentages. The quantitative data like age, time of union, infection, non-union, pain in the knee, limb shortening, knee range of movement, hospital stay were calculated for mean, ± standard deviation. Male to female ratio was calculated for sex. All the data was analyzed for descriptive statistics by using computer program SPSS for windows version 11.

RESULTS

Average age of patients was 40.37±11.87 years. Male to female ratio was 1.92: 1. All fractures were at location 33 according to the OTA classification. Twenty six (74.28%) fractures were closed and nine (25.71%) were open fractures due to fire arm injuries. There were ten (28.57%) patients having injuries to other limbs, two (5.71%) patients of abdominal and chest injury, and 23(62.86%) patients with isolated femur fracture. No patients of head injury or spinal injury. The details are given in Table 2.

PRE-OPERATIVE HOSPITAL STAY: Average time between injury and arrival in hospital was 8

Table 1: Schatzker and Lambert Criteria³

Excellent --full extension:
Flexion loss less than 10 degree
No varus, valgus or rotatory deformity
No pain
Perfect joint congruency
Good ---not more than one of the following:
Loss of length not more than 1.2 cm
Less than 10 degree varus or valgus
Flexion loss not more than 20 degree
Minimal pain
Moderate --- any two of the criteria in good category
Poor ---any of the following:
Flexion to 90 degree or less
Varus or valgus deformity exceeding 15 degree
Joint incongruency
Disabling pain no matter how perfect the x-ray

Table 2: Classification, time of radiological healing and the outcome of fractures

Classification			
Fracture Type (Closed) n = 26			
OTA Classification	No. of Patients	Percentage	
A1	4	11.43%	
A2	8	22.86%	
C1	7	20%	
C2	7	20%	
Fracture Type (Open) n = 9			
OTA Classification	Gustillo and Anderson	No. of Patients	Percentage
A3	11A	6	17.14%
C2	11A	3	8.57%
Time of radiological healing			
Closed Fractures, n = 26			
Time of Radiological Union (weeks)	No. of Patients	Percentage	
12-----14	11	31.43%	
15-----16	15	42.86%	
Open Fractures, n= 9			
18-----20	5	14.28%	
22-----24	2	5.71%	
Surgical Outcome			
Outcome	No. of Patients	Percentage	
Excellent	20	57.145	
Good	6	17.14	
Moderate	3	8.57	
Poor	6	17.14	

hours and between injury and operation was 9 days.

TIME OF UNION: In twenty six (74.28%), patients with closed fractures union was achieved within sixteen weeks. Out of nine open fractures five (14.28%) united within 20 weeks, two with delayed union, united in 24 weeks. Two cases were labeled as non-union. Mean time of union was 15 weeks.

GRADING OF RESULTS: According to the criteria set by Schatzker and Lambert³ excellent outcome were obtained in twenty patients (57.14%), good outcome in six patients (17.14%), moderate in three patients (8.57%) and poor in six patients (17.145%) with open fractures.

PER-OPERATIVE COMPLICATIONS: No complications of anesthesia or massive bleeding that needs transfusion were noted in all thirty-five patients operated during this study.

POST-OPERATIVE COMPLICATIONS: Postoperative hematoma developed in two (5.71%)

patients. It was treated by evacuation and elastic bandage. There was one case of superficial infection. One patient developed deep infection that was treated successfully by drainage and intravenous 1st generation cephalosporin. Over all infection rate was 5.71%. Six (17.14%) patients developed stiffness with less than 90 degree of flexion at the knee joint. Three of these patients were having degenerative changes due to osteoarthritis while three of them did not follow instructions regarding knee exercise and were lost to follow up for first three months. Three patients had knee pain of moderate nature at the end of six months of operation, which were treated with analgesics. The cause of pain was degenerative osteoarthritis due to old age.

There were two cases of limb shortening (5.71%) up to 1.5 cm. The shortening was intentional in both these cases, in order to get stable fixation in comminuted fractures.

Two (5.71%) cases of delayed union were observed in whom union was complete by

the end of 24 weeks. Non-union was observed in two patients who were treated by autologous bone grafting without exchange of the implant.

DISCUSSION

Supracondylar fractures of the femur are often difficult to treat. These fractures are often comminuted⁴¹. Fractures in the distal femur have posed considerable therapeutic challenges throughout the history of fracture treatment³⁴⁻³⁶. Young patients have often sustained high velocity injuries and old patients have osteoporotic bone⁴⁰. These fractures require careful management to obtain good cosmetic and functional results. The main problem is obtaining and maintaining an adequate reduction of both shaft and articular fragments while allowing function of the knee to be regained at an early stage. There are powerful muscles, which act across the knee, tending to maintain deformity of the fractured fragments. It is difficult to counterbalance these forces by closed methods, and if open reduction and internal fixation is performed the implants can be subjected to considerable stress⁹. Close methods of treatment have traditionally been used for these injuries, using tibial traction with added disadvantages of prolonged immobilization and knee stiffness. In recent years great advances have been made in the understanding and techniques of internal fixation. Over the time different types of implants have been used for the fixation of these fractures¹⁰⁻¹². The fixed angle blade plate was very popular up to 1970s. This method of fixation is technically difficult and requires accurate insertion of the blade in 3-planes simultaneously^{13, 32, 33}. Intramedullary devices provide more biological fixation than that provided by plates because they are load sharing rather than load sparing implants. But it has been shown that biomechanically they provide less rigid fixation of the distal femur fractures than plate fixation^{15, 31, 39}. A less technically demanding alternative is the "Dynamic Condylar Screw" (DCS). It is technically easier to apply than a blade plate, allow adjustment in the sagittal plane and moreover it can be used for both supracondylar and intercondylar fracture with at least 4 cm intact bone in the femoral condyles above the intercondylar notch is necessary for successful fixation^{16,17,43}.

In our study there was male preponderance between 18 to 50 years of age making 83% of the total. As most of the people in this age-range are involved in out-door activities and are therefore more prone to road traffic accidents and other injuries. Due to increasing number of automobiles on the roads, the number of femur fractures has increased over the past two decades.

Males were more affected than females,

as 66% of the patients were male, and 34% were female. This is because of the male dominated society and less active participation of females in day-to-day life activities especially out side the house in our society. A study conducted in Islamabad¹⁸ has fewer male to female ratio because of active participation of females in daily life activities in this capital city. In western studies the male to female ratio is less than that of our study^{3,19}.

Road traffic accidents were responsible for most of the cases (45.71%), followed by fall from height (28.57%). In this part of the country, as firearm injuries are common, so this type of trauma accounted for 25.71% of cases. KM Marya in India reported 92% road traffic accidents²⁰. In another study in India Sudheer U reported 77.5% RTAs²¹ and in Australian study, 82% has been reported²². Two patients had chest and abdominal injuries along with supracondylar femoral fractures and were dealt with by the concerned units and then shifted to our unit for fracture treatment. Ten patients were having other orthopedic injuries to the limbs. Twenty-three patients had isolated lower limb injuries without any other organ system injury. The figures of poly trauma patients (with involvement of other organ systems along with musculoskeletal system) in our study is less than those of other studies. In a German study there were nineteen poly trauma patients out of forty-seven patients²³. In another study it was 60%²⁴.

None of the patients were operated in the first twenty-four hours of their arrival while in the developed countries it is done early²⁵. This is because of lack of facilities in our hospital at the accident and emergency department. The other reason for the delay was the increase workload on our unit due to lack of facilities in the peripheral hospitals. In the Western world most of the patients are fixed within first 24 hours because of facilities of early fixation^{26,27, 25}.

According to Schatzker and Lambert criteria, results were graded as excellent in twenty (57.14%) patients, good in six (17.14%), moderate in three (8.57%) and poor in six (17.14%) patients.

Christodoulou et al reported excellent results in 19 (51%), good in 11(30%), moderate in 4 (11%) and poor in 3 (8%) in total of 37 patients³. In a total of 30 patients M. Ayaz et al reported excellent results in 18 (60%), good in 6 (20%), fair in 5 (17%) and poor in 1 (3%) patient⁶. Huang H. T. reported 81% excellent or good results³⁰. The reason for high percentage of poor results in our study was open comminuted fractures due to fire arm injuries.

Average time of union in our study was 15 weeks. Time of union is comparable with other national and international studies. A. Christodoulou et al reported an average time of union of 20 weeks³. In another study at Addenbrook's Hospital Cambridge, the average time of union was 11.3 weeks²⁸. In a local study it is 12 weeks⁶. Huang HT et al reported average time of union of 18.5, weeks³⁰. Fu HD et al reported an average union time of 18.6 weeks²⁹. In some studies the time of union is quite early²⁸ and in some it is very late³. This might be due to differences in post-operative mobilization protocol and criteria for union.

In twenty-seven patients (77.14%) complete weight bearing was allowed between twelve to sixteen weeks, in five cases between 17 to 20 weeks while in rest of three patients complete weight bearing was allowed after twenty weeks. A study in Addenbrook's Hospital Cambridge England shows better results by early weight bearing in the third week of operation²⁸.

The overall rate of union was 94% which is comparable with other national and international studies^{2, 3, 6, 29, 30}.

Two cases (5.71%) of non-union were observed in our study. In study by Ayaz M, et al no case of nonunion was observed⁶. Huang Dong Fu, et al in China reported a nonunion rate of 6.94%²⁹. A. Christodoulou, et al in Greece reported 5.55% nonunion rate³. D.J.Shewring and B.F.Meggitt in England reported 5.26% non-union rate²⁸. Huang H.T. et al observed no nonunion in their study³⁰. Sudheer U et al reported 8% nonunion rate²¹. The rate of infection in our study was 5.71%. The reported rate of infection is zero to eight percent in other studies^{3, 6, 21, 28-30}. One patient who had multiple fractures, developed signs and symptoms of fat embolism, so the reason of fat embolism was probably not the surgery. Moreover mortality and morbidity in such cases is high as compared to patients with unilateral fractures⁴⁵. A study conducted in Netherland⁴⁴ reported five out of one hundred and twenty two cases (4.098%). Another study conducted in USA shows 14.6% lung complications³⁸.

CONCLUSION

So in conclusion the dynamic condylar screw is an easy, less technically demanding and rewarding method of treatment for supracondylar and intercondylar fractures of femur in adults.

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