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To Compare the end results of Surgical Management of Supracondylar Fractures of Femur using the Dynamic Condylar Screw and Retrograde Supracondylar Nail

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Abstract

Supracondylar and intercondylar fractures of the distal femur historically have been difficult to treat. These fractures often are unstable and communicated and tend to occur in elderly or multiple injured patients. The incidence is highest in women older than 75 years and in adolescent boys and men 15 to 24 years old. Because of its proximity to knee joint, regaining full knee motion and function may be difficult. As the incidence of malunion, non union and infection are relatively high ,they continue to pose a major challenge to the orthopaedic surgeon. There are significant deforming muscle forces on the fracture fragments that make conservative treatment difficult and the mechanical demands on fracture implants are high. Previously the majority of supracondylar fractures were treated nonoperatively. During the past two decades as technology and implants have improved, the concepts of treatment of these fractures have changed significantly. Here we conducted a study to compare the end results of surgical management of supracondylar fractures of femur using the Dynamic Condylar Screw and Retrograde Supracondylar Nail. 34 patients with supracondylar / intercondylar fractures were taken into the study. Muller’s classification of supracondylar fracture of femur has been followed. Time of union, functional outcome and post operative complication were assessed amongs both modalities of treatment. The average time for radiological union in cases treated by dynamic condylar screw was 13.3 weeks and by supracondylar nail was 13.8 weeks. DCS showed excellent results in 27.8% cases, good in 38.9%, fair in 16.7% and poor in 16.7% of cases. Supracondylar nailing showed excellent result in 25% of cases, good in 33.3% fair in 16.7% and poor in 25% of cases based on Schatzker and Lambert criteria. In case with DCS, Infection occurred in 1 case (3.3%) malunion in 1 case (5.6%) treated by DCS and 2 cases (16.7%) by supracondylar nail treatment. Delayed union was seen in 3 cases (16.7%) treated by DCS, in 1 case (8.3%) treated by supracondylar nail. Shortening was seen in 4 cases (22.2%) treated by DCS and in 3 cases (25%) treated by supracondylar nail. Pain was present in 3 cases treated with a supracondylar nail and in 4 cases treated with dynamic condylar screw. DCS is easier to insert, needs only two plane fixation, obtains good fixation even in osteoporotic bone and has the capacity of revising non-unions with a simple plate exchange.

Key words: Dynamic compression screw (DCS), Muller’s classification, Supracondylar nail, supracondylar fracture, Schatzker and Lambert criteria

Introduction

Historically supracondylar fractures of femur have been treated with great difficulty. They continue to pose a major challenge to the orthopaedic surgeon. There are significant deforming muscle forces on the fracture fragments that make conservative treatment difficult and the mechanical demands on fracture implants are high. Regardless of the method of treatment, severe soft tissue damage, comminution, intraarticular extension and injury to quadriceps mechanism lead to unsatisfactory results in many cases. No single method of management

has overcome all the problems associated with these fractures. Before 1970, the majority of supracondylar fractures were treated nonoperatively. Traditionally this injury has been treated by initial closed reduction, skeletal traction for a variable duration, followed by some form of external immobilization. Although closed treatment methods have improved, difficulties were often encountered, including persistent angulatory deformities, knee joint incongruity, loss of knee motion and delayed mobilization (especially in patients with multiple injuries).⁽¹⁾ During the past two decades as technology and implants have improved, the concepts of treatment of these fractures have changed significantly. Most of the traumatologists have advocated some form of internal fixation. However osteosynthesis of the supracondylar region of the femur can be difficult for reasons like thin cortices, comminution, osteopenia and a wide medullary canal. Better methods of fixation have improved clinical results and allowed immediate mobilization of the patient and extremity, sparing the cardio pulmonary and other multisystem sequelae of long immobility.

Materials and Methods

34 patients with supracondylar / intercondylar fractures were taken into the study. Muller's classification ⁽²⁾ of supracondylar fracture of femur has been followed. Four patients with Muller's type B fractures, treated with L-plate and cancellous screws were not considered for the study. 30 patients who sustained either Muller's type A or type C fracture formed the basis of the study. Of these 30 patients 5 patients were having compound fractures. 18 patients were treated by open reduction and internal fixation with a Dynamic condylar screw. 12 patients were treated by closed reduction and internal fixation with a Retrograde supracondylar nail. All five compound injuries were taken to the minor O.T. or major O.T. depending on the extent of soft tissue injury, contamination of wound or for any uncontrollable bleeding from the wound. Thorough wound debridement was done. Intravenous antibiotics were given accordingly. Bone grafting was done primarily for four severely comminuted fractures and secondarily in two patients, who showed signs of delayed union or non-union, in both modalities of operative fixation. All the patients were followed regularly at an interval of 4 weeks in the first 3 months and later at 2 months interval. Patients were examined in detail and their progress was assessed both clinically and radiologically for range of movements, pain while walking, and bony union. The functional results were assessed according to the criteria of Schatzker and Lambert.⁽²⁾ X-ray of the affected femur with knee joint was taken in AP and lateral views to look for signs of union and position of the implant.

Observation and Results

The study consists of 30 cases of supracondylar fracture of femur treated by 2 modalities. All cases were available for follow up. The mean age was 45 years in female and 36 years in male. There were 21(70%) males and 9(30%) females in the study. In this study 23(76.7%) cases were due to a road traffic accident, 3(10%) cases were due to fall from a height, 3(10%) cases due to fall from slip and 1(3.3%) case was due to fall while playing. 10 cases of type A₁, (33.3%), 5 cases of type A₂ (16.7%), 1 case of type A₃ (3.3%), 3 cases of type C₁, (10%), 7 cases of type C₂ (23.3%) and 4 cases of type C₃ (13.3%) fractures were encountered. Left femur was affected in 12 (40%) patients and right femur was affected in 18 (60%) patients. Average range of knee motion was 101° in DCS and 100° in SCN

Discussion

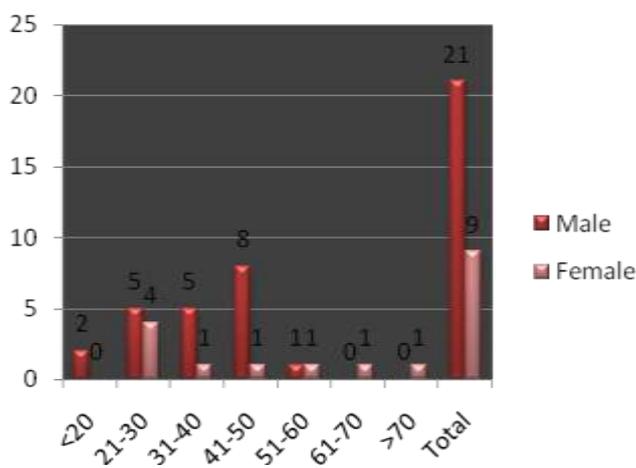
In our study 30 cases of supracondylar fractures were treated by two modalities of treatment namely open reduction and internal fixation with the dynamic condylar screw and closed reduction and internal fixation with the supracondylar nail. The purpose of the study was to evaluate the outcomes of the treatment in terms of its

union, functional outcome and to analyze the complications. In our study the average age was 38.7 years. The average age in the males were 36 years and females were 45 years similar results were found by Lucas S.E. et al⁽³⁾ where as in a study by K.S. Leung et al⁽⁴⁾ the average age was 46.5 years. In our study there were 21 males and 9 females where as in a study conducted by K.S. Leung et al⁽⁴⁾ out of the 35 patients treated, 25 patients were males and 11 were females. This suggested that the supracondylar femur fracture occurs in 3rd and 4th decades of life with male predominance. This may be due to male dominance in work involving heavy activities. In our study 23(76%) cases were due to a road traffic accident, 3 cases were due to a fall from a height, 3 cases were due to fall by a slip and 1 case due to fall while playing similar results were found by G. Papagiannopoulos⁽⁵⁾, John M Siliski⁽⁶⁾. Hence majority of the patients with supracondylar femur fractures are associated with high velocity trauma like road traffic accidents followed by fall from height. In our series of 30 patients, according to Muller's classification there were 16 cases of type A fracture patterns. Out of these, ten cases were type A₁, Five cases were type A₂ and one case was type A₃. There were 14 cases of type C fractures out of which 3 were type C₁, 7 were type C₂ and 4 Type C₃ fractures. In our study the average range of motion of knee achieved post operative by supracondylar nailing was 100^o, and by DCS was 101^o. James B. Giles⁽⁷⁾, Pritchett JW⁽⁸⁾ also had the similar observation in their studies. Type A fractures showed better range of motion than type C fractures which was due to the intraarticular comminution of the fragments causing stiffness. Few compound fractures showed less range of motion probably due to injury to the extensor mechanism causing knee stiffness. In our series the average time for radiological union in cases treated by dynamic condylar screw was 13.3 weeks and by supracondylar nail was 13.8 weeks. Type A₁ fractures took less time to union (12 weeks). Type C₃ fractures took an average of 15 weeks to heal. The average time for union in whom bone grafting was done primarily was 15 weeks and in whom done secondarily was 18 weeks. Our finding was supported by Huang HT et al⁽⁹⁾. This suggested that the fractures with high grading require more time for union. Level of comminution and articular surface involvement delays the bone healing. Primary bone grafting promotes the early union. In our study, infection occurred in 1 case (3.3%). They subsided with antibiotic therapy. There was malunion in 1 case (5.6%) treated by DCS and 2 cases (16.7%) by supracondylar nail treatment. Delayed union was seen in 3 cases (16.7%) treated by DCS, in 1 case (8.3%) treated by supracondylar nail. Non union was not seen in any case. Shortening was seen in 4 cases (22.2%) treated by DCS and in 3 cases (25%) treated by supracondylar nail. However gross shortening >2 cms was seen only in 3 cases out of the seven. Shortening was unavoidable in 2 cases of type C₃ fractures to achieve stable fixation where there was gross loss of bone. Shortening was mainly seen in type C₂ and C₃ fractures. Pain was present in 3 cases treated with a supracondylar nail and in 4 cases treated with dynamic condylar screw. The pain in patients treated with DCS has subsided within 2-3 months, persistent pain was there in patient treated with supracondylar nail but minimal pain in patients treated with supracondylar nail persisted. Our finding was consistent with Kumar A et al⁽¹⁰⁾, James B. Giles⁽⁷⁾ et al who managed all his cases with DCS, found union in all. whereas Tudor L Thomas et al⁽¹¹⁾ showed more cases of infection, delayed union and malunion with nailing so he preferred conservative cast bracing over nailing. The reason for the persistent pain may be because of the impingement of the patellar tendon and nail in the intercondylar notch. In our study DCS showed excellent results in 27.8% cases, good in 38.9%, fair in 16.7% and poor in 16.7% of cases. Supracondylar nailing showed excellent result in 25% of cases, good in 33.3% fair in 16.7% and poor in 25% of cases. In a study by Lamraski G et al⁽¹²⁾ on 47 fractures, 85% good and very good results. Malunions resulted in poor functional outcomes (50% good and very good results) especially in complex articular fractures (90%) of the cases. Huang HT et al⁽¹³⁾ achieved 81% excellent / good results using modified Schatzker rating scale in patients treated with DCS. Where as Janzing HM et al⁽¹⁴⁾ treated 26 distal femoral

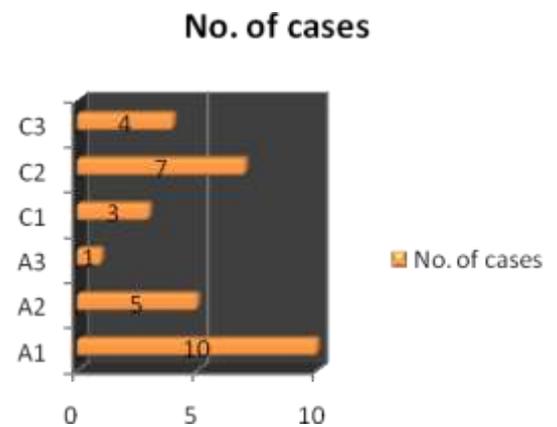
fractures with supracondylar nail and founde 72% excellent results, 20% good result, 4% fair result and 4% bad result by Neer scoring system . DCS gives good to excellent results with the dynamic condylar screw Where as Supracondylar nailing also achieved reasonably good results. Supracondylar nailing has the advantage of less soft tissue dissection, preservation of fracture haematoma, reduced operative blood loss, stabilization of fracture by a load sharing device and immediate motion with limited weight bearing in selected cases, its disadvantage is in the limitation of its use in only type A and selected type C₁ fractures. Complication such as prolonged post operative pain due to prolonged post operative pain. The procedure involves the use of complex jigs with difficult interlocking and poor hold of the distal interlocking screws. It has the problem of rotational malunion. dynamic condylar screw has the disadvantage of extensive soft tissue dissection with the risk of infection, it can be tackled by the use of proper antibiotics and with the recent advancement of minimally invasive techniques. The advantage lies in its use in all type A and type C fractures

Conclusion

We concluded that DCS is easier to insert, needs only two plane fixation, obtains good fixation even in osteoporotic bone and has the capacity of revising non-unions with a simple plate exchange. Strict adherence to the principles of internal fixation, knowledge of the mechanics of individual surgical implants, post operative fracture rehabilitation to provide early range of motion can lead to excellent results in the treatment of supracondylar-intercondylar fractures of femur with low rate of complications. The dynamic condylar screw provides a reliable, cost effective method to secure bone union, restore limb alignment, joint congruity and range of motion.



Graph 1: Age and sex wise distribution of patients.



Graph 2: Distribution of patients according to fracture type.

Table 1: Time for union in weeks

Time in weeks	Type		Total
	DCS	SCN	
10	6 (33.3%)	2 (16.7%)	8 (26.7%)
14	9 (50%)	8 (66.7%)	17 (56.7%)
16	0 (0%)	1 (8.3%)	1 (3.3%)
18	3 (16.7%)	1 (8.3%)	4 (13.3%)
Total	18 (100%)	12 (100%)	30 (100%)

Table 2: Mean duration of union in different fractures types

Type of fracture	No. of cases	Mean
A ₁	10	12.0
A ₂	5	14.0
A ₃	1	14.0
C ₁	3	14.7
C ₂	7	14.0
C ₃	4	15.0

Table 4: Functional outcome:Based on the criteria of Schatzker and Lambert (1979) ⁽²⁾

Results	Type		Total
	DCS	SCN	
Excellent	5 (27.8%)	3 (25%)	8 (26.7%)
Good	7 (38.9%)	4 (33.3%)	11 (36.7%)
Fair	3 (16.7%)	2 (16.7%)	5 (16.7%)
Poor	3 (16.7%)	3 (25%)	6 (20%)
Total	18 (100%)	12 (100%)	30 (100%)

Table 5: Postoperative Complications:

Sl.No.	Complications	No. of cases	DCS	SCN	Total%
1.	Infection	1	1(5.6%)	0(0%)	3.3
2.	Malunion	3	1(5.6%)	2(16.7%)	10
3.	Delayed union	4	3(16.7%)	1(8.3%)	13.3
4.	Nonunion	0	0	0	0
5.	Shortening	7	4(22.2%)	3(25%)	23.3
6.	Pain	7	4(22.2%)	3(25%)	23.3

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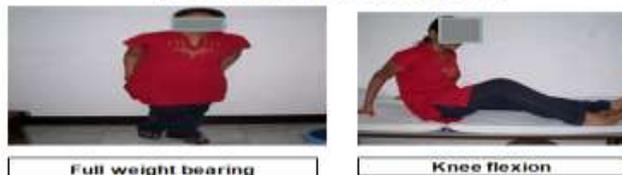
FIGURES

Treatment with Dynamic Condylar Screw

Treatment with Supracondylar Nail



POOR RESULTS WITH DCS



POOR RESULTS WITH SCN

