

Study of Supracondylar Fractures of Femur by Various Modalities of Treatment

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I. Introduction

Over the centuries from ancient ages to the present age of advanced technology there have been many changes in the life style of mankind. Industrialization and the fast pace of life have brought both comforts and catastrophic road traffic accidents, crippling many young lives. Supracondylar and intercondylar fractures of femur are very often difficult to treat and they are notorious for many complications.

In the past they tried to treat the complications and disabling fractures and achieved mixed results. Before AO group revolutionized internal fixation methods, conservative management was treatment of choice. This is due to lack of proper instrumentation and lack of implants as well as antibiotics. But in 1960's AO has introduced condylar blade plate for treatment of supracondylar and intercondylar fractures of femur. Later extensive studies on open reduction and internal fixation with blade plate, dynamic condylar screw have achieved best results in comparison with conservatively managed cases.

In the supra and intercondylar fractures of femur particularly with intra articular extension, patient may develop stiffness of knee, shorting, rotational deformities, internal derangement of knee with instability, varus and valgus deformities which affect patient's routine life style. If such fractures are not properly treated the individual becomes crippled, thus affecting the country's working class and nation's economy. This study includes behaviour of supracondylar and intercondylar fractures of femur after internal fixation and an attempt is made to manage these fractures with early ambulation and least disability.

Aims And Objectives

1. To study the role of open reduction and internal fixation by various modalities like dynamic condylar screw, GSH intramedullary supracondylar nail and locking compression plate in supracondylar and intercondylar fractures of femur.
2. To assess range of motion of knee and functional status of patients after union of fracture.
3. To compare the results of other studies which were done previously in these fractures.
4. To follow up the patients and note the complications and analyze them.

II. Materials And Methods

In this study we have included consecutive 25 supra condylar and inter condylar fractures of femur (both muller's type 'A' and type 'C' fractures) and treated with open reduction and internal fixation by dynamic condylar screw, closed reduction, internal fixation with GSH retrograde supracondylar nail and locking condylar plate in the department of orthopaedics, government general hospital, Vijayawada from June 2012 to July 2015.

Among them 5 patients were lost for follow up due to various reasons and leaving 20 fractures from 20 patients.

There are 18 males and 2 females age ranging from 20 years to 65 years with an average 40 years. Average age for males is 28.9 years and average age for females is 25 years.

17 fractures were due to road traffic accidents and 3 cases due to fall from varying heights. Among 20 cases there are 3 compound fractures 15% and in them 2 cases were type 1 66% 1 case was type 2 33%. For classification of open fractures we have used Gustilo Anderson classification. Fractures included in this study were muller's type A and C fractures. Sub groups are type A 1-3 cases, A2-2 cases, type A 3-5 cases, type C 1-4 cases, type C 2-3 cases and type C3-1 cases. Muller's type B fractures were not included.

The average time between admission and operation was 7.3 days (range 5 days to 16 days), more than one week was attributable to multiple trauma and poor general condition of patient. In case of compound fractures grading was given according to Gustilo's classification and wound was debrided thoroughly and wash was given with saline, hydrogen peroxide, betadine and if wound was smaller, primary closure was done. All compound fractures were covered with TT injection, combination of antibiotics consisting of cephalosporins, aminoglycosides and metronidazole and this regimen effectively prevented infection. For simple fractures antibiotic regimen was started 12 hours before surgery parenterally and continued till 3rd post operative

day, from then till 10th to 15th post operative day oral antibiotics were given. The implants used were dynamic condylar screw, GSH retrograde intramedullary supracondylar nail and locking condylar plates. Patient was kept in post operated ward for first 48 hours and then shifted to respective general ward. On second post operative day wound was dressed and drain was removed. Post operative check x ray was taken.

During the follow up patients were received in out patient department once in every 3 weeks and fracture union was clinically and radiologically. Full weight bearing was allowed at the end of 3rd or 4th month after confirming the clinical and radiological union of fracture.

For functional evaluation of the results we have taken criteria of 2 functional scoring systems which were used by previous workers.

1. Neer's functional scoring system

2. Sander scoring system.

The scoring system described by Neer's et al. gives points for pain, functional capability for work, gross anatomy and radiographic appearance. This system was developed specifically for the evaluation of fractures of the femur. The Sander's evaluation scale assessed ROM, pain, walking ability, return to work, previous level of activity and lengthening and shortening as measured on radiographs. A malunion was defined as greater than 5 degrees varus, valgus, recurvatum, procurvatum or shortening greater than 2cm.

III. Observations And Results

Total number of cases treated in the department of orthopaedics, government general hospital, Vijayawada from June 2012 to July 2015 were 25. Among them 20 fractures were followed up till union occurred. All cases were unilateral.

Type of injury: 17 fractures were due to road traffic accidents, 3 cases were due to fall from various heights like tree and steps.

Type of fractures: According to Muller's classification there were 3 cases of A1 type, 5 cases were A2 type, 4 cases of A3 type cases, 4 cases were C1 type, 2 cases were C2, C3 type was 1 case. In brief type A 65%, type C 35%.

Among 20 cases 12 cases were right femur, 8 cases were left femur.

Age incidence: 10 cases were in 20-30 age group, among them 2 were females and 8 were males. In 31-45 years age group 7 cases involved, 3 cases involved in 40-60 years age group were males.

Time of healing:

All cases showed radiological and clinical union between 12 weeks to 18 weeks. Muller's A1 type fractures took an average time of 14 weeks, maximum of 16 weeks and minimum of 12 weeks, A2 type fractures took an average of 15.2 weeks maximum of 18 weeks and minimum of 16 weeks for healing. C2 type fractures took average time of 15 weeks maximum of 16 weeks and minimum of 14 weeks and for C3 type fractures have taken average time of 18 weeks.

According to age group 20-30 age group took 15.2 weeks for average healing, maximum of 18 weeks and minimum of 12 weeks, 31-45 age group took 15 weeks maximum 16 weeks and minimum 12 weeks, 40-60 age group took 16.28 weeks maximum 18 weeks and minimum 14 weeks for radiological union.

Infection

In one case of Muller's C2 fracture fixed with DCS superficial infection was noticed, longest follow up case was 18 months and least follow up was 5 months. There were no deaths in our series.

Among total 12 fractures of Muller's A type, 5 cases were treated with dynamic condylar screw (41.5%), 4 cases were treated with GSH retrograde (33.33%) and 3 cases were treated with LCP (25%).

Among 8 fractures of Muller's type C fractures, 7 cases were treated with dynamic condylar screw (87.5%) and 1 case with LCP (12.5%).

According to fracture type and knee ROM: 12 cases of type A fractures average knee ROM achieved was 98.46 degrees and 8 cases of C type fracture average ROM was 71.41 degrees and total average for this study was 74.28 degrees.

Average time of partial weight bearing was 6.8 weeks and full weight bearing was 15.5 weeks. There were no cases of implant failures and non unions.

Out of 20 patients, 16 returned to their pre injury job, 3 patients had returned to their job with mild difficulty. 1 patient lost his employment. Regarding stair climbing 16 patients had free stair climbing and 3 patients hold the side rails while climbing and one patient can climb the steps with one step with each attempt. Total hospital stay was 18.5 days with minimum of 15 days and maximum of 27 days. For 20 cases average full weight bearing has taken 15.5 weeks.

According to Neer's excellent to good results were achieved in 80% and fair to poor results were 20%. According to Sander's excellent to good results were 75% and fair to poor results were 25%.

In gross

Neer's :excellent 65%,good 15%,fair 15%,poor 5%.
 Sander's :excellent 65%,good 20%,fair 10%,poor 5%.

IV. Discussion

We report our experience with 20 distal femoral fractures in 20 patients treated with closed /open reduction and internal fixation with implants like dynamic condylar screw ,GSH retrograde intramedullary supracondylar nail and locking condylar plates their behaviour results and functional outcome. There are 18 males and 2 females in this study.there are 3 compound fractures including 2 grade 1 grade 2 type fractures.3 patients had associated fractures like fracture of both bone leg,fracture humerus and fracture both bone forearm.

In previous study at Rancho,the following complications were observed with internal fixation of supracondylar and intercondylar fractures of femur.Firstly supracondylar fracture tends to collapse in varus.during applications condylar screw the shaft of the femur pulled often laterally,displacing the line of weight bearing lateral to anatomic axis of condyles.this creates rotational movement at the fracture site that causes the distal fragment to displace into varus by either pulling off the blade plate or condylar screw or leading to fatigue fracture of the plate. Secondly ,the presence of osteoporotic bone in the distal femur which is very common in elderly population especially in females who suffer this fracture frequently leads to fixation failure with screws and plates cutting out a soft bone. The obvious advantage of an intramedullary device is that it aligns the femoral shaft with the condyles, reducing the tendency to place a varus movement at fracture site.there is less or nil periosteal stripping and less soft tissue dissection around fracture site.these features help in preservation of blood supply at the fracture site.

All fractures in the study united by 18 weeks,average of 15.5 weeks.the cases treated with dynamic condylar screw have united on an average in 15.6weeks ,those treated with GSH retrograde intramedullary nailing united on an average 15.2 weeks,and those treated with locking condylar plates united on an average in 15.5 weeks. In our series there are a total of 20 cases with 16 males and 4 females.there are 4 muller's A 1 type ,3 cases A2 type,8 cases A3 type ,4 cases C2 type,4 cases C3 type.among them 3 were compound fractures. In our series of present study of 20 fractures,12 cases were treated with dynamic condylar screws,4 cases were treated with retrograde intramedullary nailing,and in 4 cases with locking compression plate. Average ROM in our study in 74.28 degrees and type A fractures 98.46 degrees and type C fractures 71.41 degrees.this indicates knee ROM is better in extraarticular fractures than intra articular fractures.in 8 cases there is shortening less than 1.5 cm and in 1 case there is 5 degrees of varus angulation.

In our study average knee ROM is 74.28 degrees and range is 30 to 120 degrees.ROM with dynamic condylar screw 90 degrees,with GSH retrograde nailing is 85 degrees and locking compression plate was 100 degrees. Results of this study suggest that the implant like dynamic condylar screw and GSH retrograde supracondylar nailing are optimal tools for many supracondylar fractures of femur. Despite many changes and refinements in the surgical treatment of the supracondylar and intercondylar fractures of femur since the introduction of the condylar blade plate to present retrograde supracondylar nailing and locking condylar plates,these fractures particularly if open and associated with severe fragmentation of the articular cartilage and in the elderly with severe osteoporosis continue to be major unsolved surgical challenge.

Age And Sex Incidence Of Fractures

Age (in years)	males	percentage	Females	percentage	Total no. Of cases	percentage
20-30	8	40	2	10	10	50
31-45	7	35	-	-	7	35
46-60	3	15	-	-	3	15
total	18	90	2	10	20	100

Fracture Treatment And Outcome

Type of surgery	excellent		Good		fair		Poor	
	Neer's	Sander's	Neer's	Sander's	Neer's	Sander's	Neer's	Sander's
Dynamic condylar screw	6	6	3	2	2	3	1	1
Retrograde supracondylar nail	2	2	1	-	1	2	-	-
Locking condylar plate	3	2	-	-	2	-	-	-

V. Conclusions

1. To give appropriate and optimum treatment for supracondylar and intercondylar fracture of femur is a challenge to every orthopaedic surgeon and it needs careful planning and skills to obtain best results.
2. Soft tissue injuries and intra articular comminution (C3 types) greatly compromise the outcome of the patient.

3. Regarding functional assessment both neer's and sander's functional scoring system are found to be useful in adequately evaluating the results.
4. Our study has shown the use of prophylactic antibiotics to decrease the incidence of infection after internal fixation of fractures. we therefore advocate the routine use of antibiotics as a prophylactic measure against infection.
5. We attribute the favourable results due to adherence to the principles of stabilization with rigid internal fixation and early functional rehabilitation.
6. Despite many changes and refinements in the surgical treatment of the supracondylar fractures since the introduction of the condylar blade plate to the present days of retrograde intramedullary supracondylar nailing and locking condylar plate these fractures particularly if open and associated with severe fragmentation of the articular cartilage and in the elderly with severe osteoporosis continue to be a major unsolved surgical challenge.

VI. Summary

In our study of 20 cases of supracondylar and intercondylar fractures of the femur 12 were treated with open reduction and internal fixation by dynamic condylar screw ,4 cases with closed reduction and internal fixation with GSH retrograde intramedullary supracondylar nailing and 4 cases with open reduction and internal fixation with locking condylar plates and followed them up till union occurred both clinically and radiologically. these results were analysed with neer's and sander's scoring system.

Out of 20 fractures 3 are muller's A1 type, 5 are muller's A2 type, 4 are muller's A3 type, 4 are muller's type C1, 3 are muller's C2 type and 1 was C3 type. All 20 cases united well and there were no non unions. Out of 20 cases only one case had superficial infection, treated effectively with good wound care and antibiotics.

As per neer's according to implant wise dynamic condylar screw has got 6 excellent results (60%), 3 good results (25%), 2 fair 1 poor result (5%). As per sander's ,dynamic condylar screw has got 6 excellent results (60%), 2 good results (10%), and 3 fair results (25%) and poor result (5%). With GSH retrograde supracondylar nail ,according to neer's there were 2 excellent results (50%), 1 good result (25%), 1 fair result (25%) and no poor result, according to sander's there were 2 excellent (50%), 2 fair results (50%) and no poor result. With LCP according to neer's there were 3 excellent results (75%), 1 fair result (25%), according to sanders there were 2 excellent (50%) and 2 poor (50%) results. In gross, according to neer's ,there were 13 excellent, 3 good, 3 fair, and 1 poor results out of 20 cases. According to sander's there were 13 excellent, 4 good, 2 fair and 1 poor results out of 20 cases.

Neer's: Excellent-65%, good-15%, fair-15%, poor-5%.

Sander's: Excellent-65%, good -20%, fair-10%, poor-5%.

The excellent and good results were attributed to the stable internal fixation and achievement of anatomical congruity in case of intra articular fractures, which permitted early post operative functional mobilization.

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