
Original Article

A study of communitated intra articular supracondylar and inter condylar fractures of femur treated with Condylar Buttress Plating

P Sukarna Reddy¹, V. P. Raman²

¹ Associate Professor of Orthopedics, Malla Reddy Medical College for Women, Hyderabad

² Professor of Orthopedics, Malla Reddy Institute of Medical Sciences, Hyderabad

Corresponding Author

Dr. V. P. Raman

Email: vpraman04@gmail.com

Abstract:

Fractures of the distal femur have been reported to account for between 4% and 7% of all femoral fractures. If fractures of the hip are excluded, 31% of femoral fractures involve the distal femur. With the modern trends of high-energy lifestyles combined with increased longevity, this incidence is probably increasing. The patients included in this study were those with communitated Supracondylar fractures of the femur with intra articular involvement and disruption of the joint surface. No pathological fractures or fractures in the children were included in the study. All the patients were treated in the Department of Orthopedics, Nizam's Institute of Medical Sciences, Hyderabad during the period between January 2008 and October 2012. Men and younger age group are more commonly involved by Road traffic accident. To give appropriate and optimum treatment for Supracondylar fractures with communitation and intra articular extension is a challenge to every orthopedic surgeon and it needs careful preoperative planning, per operative skills and postoperative attention to obtain best results.

Key words: articular, supracondylar, inter condylar fractures, femur

INTRODUCTION:

Fractures of the distal femur have been reported to account for between 4% and 7% of all femoral fractures. If fractures of the hip are excluded, 31% of femoral fractures involve the distal femur. With the modern trends of high-energy lifestyles combined with increased longevity, this incidence is probably increasing. Distal femur fractures occur predominantly in two patient populations: young persons, especially young men, after high-energy trauma, and elderly persons, especially elderly women, after low- energy injuries. In the older group, most of the injuries occur after moderate trauma, such as a fall on the flexed knee. Two thirds of the fractures caused by moderate trauma were "preceded by prior age-related problems (hip, proximal humerus, distal forearm, pelvis or vertebra) or with roentgen graphic evidence of generalized osteopenia".¹

In the younger group, distal femur fractures occur after high-energy trauma. These fractures are open, communitated, and most probably the result of direct application of load to the flexed knee. Most are caused by vehicular accidents, including motorcycle accidents, but they can also be caused by industrial accidents or falls from heights. Most of these patients are younger than 35 years of age, and there is a definite male predominance. Surprisingly, there is often

equivalent communitation in the supracondylar region in both these groups. However, younger patients experiencing high energy trauma have a greater incidence of additional intra articular disruption or segmental or more proximal shaft communitation. Fractures of the distal femur present considerable challenges in management. Severe soft tissue damage, communitation, fracture extension into knee joint, and injury to the quadriceps mechanism lead to unsatisfactory results, regardless of treatment.²

As technology and implants have improved most traumatologists have advocated some form of internal fixation in the management of distal femoral fractures. However, osteo synthesis of Supracondylar region of the femur can be difficult for several reasons. Thin cortices, communitation, osteopenia, wide medullary canal, made secure internal fixation difficult to achieve even for experienced surgeons. Although better methods of fixation have improved clinical results, the operative management of these difficult fractures is far from uniformly successful. If such fractures are not treated properly results are unsatisfactory.³

MATERIAL AND METHODS

The patients included in this study were those with communitated Supracondylar fractures of the femur with intra

articular involvement and disruption of the joint surface. No pathological fractures or fractures in the children were included in the study. All the patients were treated in the Department of Orthopedics, Nizam's Institute of Medical Sciences, Hyderabad during the period between January 2008 and October 2012. For the purpose of evaluating the results 30 cases with communited intra articular Supracondylar fractures of femur treated with Condylar Buttress Plating were followed up. The average follow up period was 13.81 months varying from 5 months to 36 months. All the patients were immediately admitted and in detail general examination done for complete assessment of status of all body systems like head injuries, spine, chest, abdomen, pelvis and limbs. If patients have severe blood loss and in hypovolemic shock it was corrected with intravenous fluids and blood. In cases of head and chest injuries and blunt injury abdomen present we have taken help of Neurosurgery and Cardiothoracic surgery doctors and General surgery doctors and treated in standard guidelines.

After resuscitation period has over, and patient was hemodynamically stable patient was shifted to X-ray department and taken proper AP and LATERAL views of affected limb. With the help of radiographs diagnosis was made and classified according to Muller's classification.⁴ After confirming the diagnosis limb was placed in above knee pop slab support or Bohler-Braun Splint and upper tibial pin traction was given 5-8 kg weight till surgery was planned. In case of compound fracture grading was given according to GUSTILO classification⁵, wounds are debrided thoroughly and wash given with saline, hydrogen peroxide, betadine and primary closure was done. Sutures are removed on 10th to 12th day and then surgery was planned along with bone grafting if necessary. All compound fractures are covered with injection TT and combination of antibiotics consisting of cephalosporin, aminoglycosides and metronidazole and this regimen effectively prevented infection. For simple fractures antibiotic regimen was started 12 hours before surgery and continued for 10th postoperative day. Other fractures and injuries are attended depending upon the priority order and treated on standard principles and guidelines. All patients are taken up for surgery when patient general condition is stable and when fit for general anesthesia or spinal anesthesia. If patient is more than 35 years old preoperatively we have evaluated the patient for cardiac status with ECG, Chest X-ray and 2D Echo, if necessary with Dobutamine 2D Echo and if patient is hypertensive we controlled with antihypertensive drugs, if patient is diabetic we have treated with insulin by monitoring fasting blood sugar / random blood sugar, throughout the hospital stay of the patient.

Anesthesia:-

The anesthesia employed in all the patients was regional anesthesia i.e. spinal or epidural anesthesia. The recovery is smooth and uneventful in all the patients.

Position:-

Supine with the flexed knee over a roll 60 degrees to 90 degrees to relax the gastrocnemius muscle. Hip and knee are draped free. Use of a tourniquet may be indicated.

Incision:-

Incision in the distal part of thigh along a line joining the greater trochanter, the lateral condyle and the tibial tuberosity

Post Operative Management:-

Postoperatively patient was kept in postoperative ward for first 24 hours and then shifted to respective general ward. On second postoperative day wound was dressed and drain was removed. Post operative radiograph was taken. Assisted quadriceps exercises were started from 1st postoperative day. Suture removal was done on 10th postoperative day and patient was discharged with advice of strict non-weight bearing and active quadriceps exercises and asked to come to the hospital after 4 weeks. We had given knee brace support for some patients for 4 weeks for severely communited intra articular fractures at 4 weeks.

Follow up:-

During the follow up patients are received in the outpatient department once in every four weeks and assessed fracture union clinically and radiologically. The range of motion of knee and power of quadriceps was assessed. At the end of 12 weeks partial weight bearing was allowed with the help of walker and full weight bearing was allowed at the end of 4th month after confirming the clinical and radiological union of the fracture. For functional results evaluation we have taken the criteria of two functional scoring systems which were used by previous workers:

- 1) Neer's functional scoring system⁶
- 2) Sanders scoring system⁷

The scoring system described by Neer et al⁶ gives points for pain, function, capability for work, gross anatomy, and radiographic appearance. This system was developed specifically for evaluation of fractures of the distal part of the femur. The Sanders evaluation scale⁷ assesses ROM, pain, walking ability, return to work, previous level of activity, and alignment and shortening as measured on radiographs. A mal-union was defined as greater than 5 degrees varus or valgus or recurvatum or procurvatum or shortening greater than 2 cm.

RESULTS

27(90%) fractures occurred due to high velocity road traffic accidents in the form of direct collision of vehicles or fall from moving vehicles or hit by a moving vehicle. 3 cases (10%) were due to trivial fall like slip and fall from small height. 9 cases are of C 1 type (30%), 7 cases of C 2 type (23.3%), 14 cases of C 3 type (46.7%). Among 30 cases 21 cases are of compound type (70%) and 9 cases are closed type fractures (30%). Among open fractures 2 cases are Gustilo's type I (6.6%), 8 cases are type II (26.7%), 11 cases are type III (36.7%). In our study right side fractures are more common than left side. Most of the patients sustained

injury due to motor cycle accidents where impact is more on right side. 26 cases occurred in right femur (86.7%) and 4 fractures occurred on left side (13.3%). 2 fractures occurred in less than 20 years age group (6.6%). 12 cases are involved in 20-40 years of age group and all are males (40.0%). 13 cases are involved in 41-60 years of age group (43.3%) in which group males are 12 (92.3%) and females are 1 (7.3%). 3 cases involved in 61- 85 year age group (10%) in one female. Average age of study is 42.83 years and range 19-85. In our study we had male preponderance, 27 (90%) of 30 patients we had operated were males and 3 female patients (10%). This is probably males are engaged in more strenuous activity compared to females who have contained life. Hence males are more prone to trauma.

Table 1: Fracture type vs. time of healing:

FRACTURE TYPE	NO OF CASES	Avg TIME OF HEALING (WEEKS)	MINIMUM	MAXIMUM
C 1	9	15.33	12	16
C 2	7	16	14	18
C 3	14	16.16	14	19

All cases were shown radiological healing and clinical union between 12 weeks and 16 weeks. Muller C 1 type fractures had taken average time of healing is 15.33 weeks (minimum 12 weeks and maximum 16 weeks), C 2 type fracture had taken 16 weeks and C 3 type fracture had taken average time of 17.22 weeks (minimum 14 weeks and maximum 19 weeks). An average total C 1 type fractures has taken 14.18 weeks for healing and for Muller C 2 type has taken 15.34 weeks average time and for C 3 type has taken 16.16 and total 30 cases have taken average time of 15.04 weeks for healing, range is 14 weeks to 20 weeks. In our series of 30 cases, there were 16 patients who had associated fractures. 10 patients (%) are in 21 to 40 years age group and 4 patients (19%) are in 41- 60 years age group. All these patients sustained injuries in high velocity trauma. There were no patients with vascular injuries.

Table 2: Fracture type vs. knee range of motion:

TYPE	NO OF CASES	AVG R.O.M	MINIMUM	MAXIMUM
C 1	9	80.73	70	110
C 2	7	78.25	60	100
C 3	14	76.3	50	100

Of 9 cases of type C 1, average knee ROM achieved is 80.73 degrees (minimum 70 degrees and maximum 110 degrees) and for 7 cases of C 2 type fracture average ROM is 78.25 degrees (minimum 60 degrees and maximum 100 degrees) and for 14 cases of C 3 type average ROM is 76.30

(minimum 50 degrees and maximum 100 degrees). Total average for study is 78.4 degrees.

Table 3: Fracture type vs. average weight bearing period:

FRACTURE TYPE	NO OF CASES	PARTIAL WEIGHT BEARING (weeks)	FULL WEIGHT BEARING (weeks)
C 1	9	12.6	15.3
C 2	7	13.2	16
C 3	14	14.6	17.4

Average time for partial weight bearing is 13.88 weeks and average time for full weight bearing is 16.57 weeks. Type C 1 fractures has taken average partial weight bearing of 12.6 weeks and 15.3 weeks for full weight bearing, Type C 2 has taken average partial weight bearing of 13.2 weeks and full weight bearing of 16 weeks, type C 3 fractures has taken average partial weight bearing of 14.6 weeks and full weight bearing of 17.4 weeks.

Table 4: Complications

COMPLICATIONS	NO OF CASES
PRESSURE SORES	1
C.V.A	0
P.T.E	1
ASPIRATION PNEUMONIA	0
D.V.T	1
U.T.I	0
INFECTION	0

During hospital stay one patient developed pulmonary thrombo-embolism and one patient developed deep venous thrombosis and one patient developed bed sores

Table 5: functional evaluation of patients

RESULT	NEER'S	SANDER'S
EXCELLENT	8	8
GOOD	16	18
FAIR	5	3
POOR	1	1

For functional evaluation we have followed both NEERS'S and SANDERS'S scoring system. In gross , according to NEER'S there were 8 excellent , 16 good, 5 fair and 1 poor results out of 30 cases. According to SANDER'S there were 8 excellent, 18 good fair and 1 poor results out of 30 cases.

DISCUSSION:

This study consists of 30 patients with communitated supracondylar intra articular femoral fractures, treated with Condylar Buttress Plating. None of the patients were having bilateral fractures. There were males 27 and 3 females. 12 patients had associated fractures. There were 21 compound fractures (two cases were grade 1, 8 cases were grade 2 and 11 cases were grade 3). Supracondylar fractures of the femur are always regarded with great concern because they are difficult to treat, cause a long absence from work. These facts have encouraged surgeons to resort to operative treatment with internal fixation. Successful treatment of intra articular fractures, especially in weight bearing joint, requires restoration and maintenance of the congruence of the two articular surfaces. Non operative management can hardly guarantee restoration of such congruence. In principle, therefore all intra articular distal femoral fractures should be treated surgically. The degree of functional loss is often the result of articular cartilage and bone damage, soft-tissue injury, or a combination thereof.

Before the introduction of stable fixation by the AO, Supracondylar fractures of the femur most often were treated in skeletal traction because the techniques of open reduction and internal fixation and the implants available for fixation at the time were very limited. As a result, open reduction and internal fixation rarely was attempted and was condemned as a method of treatment. This was well borne out in the two major publications on this subject of the mid 1960s by Stewart et al ⁸ in 1966 and by Neer et al ⁶ in 1967. These authors reported that only slightly more than 50% of patients treated by open means obtained a satisfactory result, whereas closed methods were said to yield satisfactory results in 90% of patients.

The Condylar Blade Plate, a fixed angled plating device for the treatment of fractures of the distal femur was introduced by the AO group ⁹ in the early 1960. In 1970 the AO group ⁹ published its first review of 112 patients with Supracondylar fractures who were treated according to the principles of accurate anatomic reduction, absolutely stable internal fixation, and early function, which meant full unrestricted movement of the involved joint without the protection of splints or plaster. The results achieved by this method were revolutionary. Of the patients treated surgically, 73.5% achieved good to excellent results. For the AO an excellent result meant a normal knee and a good result meant a knee with only a minor compromise. These results compared with those achieved by Stewart et al ⁸ and Neer et al ⁶ and their contemporaries show the tremendous progress made by the AO group and the superlative results made possible by the AO methods of treatment.

In 1974 Schatzker and colleagues ¹⁰ published the Toronto experience with the Supracondylar fracture between the years 1967 and 1972. This study was the first critical review of the results of treatment of Supracondylar fractures achieved with the AO methods ⁹ by surgeons who were not the innovators of the technique. The 75% of good to excellent results achieved in patients who had surgery was in stark contrast to

the 32% of good to excellent results achieved by the same surgeons in patients who they treated non-operatively. The outcome criteria for the surgically treated and non-surgically treated patients were the same. The 32% of acceptable results for non operative treatment showed realistically what could be achieved non-operatively.

Since the "Toronto review" ¹⁰ there have been many publications dealing with the surgical treatment of Supracondylar fractures. All have echoed the superlative results that can be achieved with the AO method ⁹. This technique, which at one time was considered innovative, revolutionary, and by some as experimental, has become the standard of care. The years of experience with the AO principles and methods ⁹ have resulted in numerous innovations and changes. These changes are reflected in the present day approach to the Supracondylar fracture. As this the apex institute in our state we get most of the cases with communitated fractures. If there is more than 2/3rd communitation there is every chance for the need of bone grafting. The complications involved are association with floating knee injuries, intra articular bone loss, and other associated injuries like patellar fractures. These patellar fractures form a rent in Condylar area and are associated with quadriceps injury.

CONCLUSION:

Open reduction and rigid internal fixation gives best results. Soft tissue injuries and intra articular communitation (C 3 type) greatly compromise the outcome of the patient. The Muller's classification of Supracondylar-inter condylar fractures is simple to use and accurate in predicting the outcome of the fracture and can indicate surgical techniques that are needed for adequate stabilization. Regarding functional assessment both Neers et al and Sanders et al scoring systems are found to be useful in adequately evaluating the results.

RECOMMENDATIONS:

We suggest delayed reconstruction of ligament injuries. Protected motion in conjunction with knee brace together with vigorous rehabilitation may obviate the need for late reconstructive surgery in some patients. 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. Good operation theatre facilities and good image intensifier are essential for obtaining good results. We attribute the favorable results in this series to adherence to the principles of stabilization with rigid internal fixation and early functional rehabilitation. Hinged knee brace is useful for early mobilization of patients. Our study shown Condylar buttress plate is a better alternative to locking plate provided medial pillar reconstruction is good. Fully threaded cancellous screws will have a better pull out strength and in conjunction with a Condylar buttress plate they will prevent varus/valgus collapse. Gentle and aggressive, early mobilization of knee joint gives the better results. Despite many changes and refinements in the surgical management of the Supracondylar fractures since the introduction of the Condylar blade plate, these fractures are

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.

REFERENCES:

1. Canale TS, Beaty JH. In: Canale TS, Beaty JH, editors. Campbell's Operative Orthopaedics, 11th ed. Vol 3. Saunders. Elsevier 2008.
2. Shewering DJ, Meggitt BF. Fractures of the distal femur treated with the AC dynamic condylar screw. *J Bone Joint Surg* 1992;74(1):122-5.
3. Chivsovitsinos JP, Xenakis T, Popakostides KG. Bridge plating osterosynthesis of 20 comm. Fracture of the femur. *Acta Othop Scand suppl* 1997;275:72-6.
4. Müller AO Classification of Fractures—Long Bones. Available from: https://www.aofoundation.org/Documents/mueller_ao_class.pdf
5. Aiyer A, Taylor B. Gustilo Classification. Available from: <http://www.orthobullets.com/trauma/1003/gustilo-classification>
6. Neer CS Grantham SA, Shelton ML. Supracondylar fracture of the adult femur. *J Bone Joint Surg Am* 1967; 49:591–613.
7. Sanders: Double Plating of Comminuted unstable fractures of the distal part of femur. *J Bone Joint Surg* 1991;73:341-6.
8. Stewart MJ, Sisk TD, Wallace SC, fracture of the distal third of the femur a comparison of methods of treatment. *J Bone Joint Surg* 1966;48:784.
9. AO/ASIF instrument and implants: A technical manual, 2nd edition.
10. Schatzker T, Home G, Waddell J. The Toronto experience with the supracondylar fracture of the femur. *Injury* 1974;6:113

Source of Support: Nil. **Conflict of Interest:** None.

Cite this article as: Sukarna Reddy P, Raman VP. A study of communitied intra articular supracondylar and inter condylar fractures of femur treated with Condylar Buttress Plating. *MRIMS J Health Sciences* 2016;4(2):129-133.