

# A Comparative Study of Functional Outcome of Three Methods of Internal Fixation in a Comminuted Supracondylar Fracture Femur in Post Menopausal Women

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**Abstract:** Objectives: To compare the 3 methods of internal fixation (a. Condylar buttress plating, b. Dynamic condylar screw & plate fixation, c. Distal Femoral plating.) in comminuted supracondylar fracture femur in post menopausal women treated in the department of orthopedics, MCH Kozhikode during the period of 2010-2012. Materials and Methods: This is a prospective and comparative study conducted in MCH Kozhikode, Kerala, India.. The study was carried out in the period of November 2010 to September 2012 and 30 patients were included in the study. The detailed history, clinical examination, all the relevant laboratory investigations and treatment were done. In the present study, the conditions were defined according to standard practice and based on relevant literature. We have analyzed 3 methods of internal fixation a. Condylar buttress plating, b. Dynamic condylar screw & plate fixation, c. Distal Femoral plating.) in comminuted supracondylar fracture femur in post menopausal women. The ideal method should provide restoration of anatomy, stability, preservation of blood supply, early mobilization of joints with good functional outcome, but it's quite difficult to attain in an osteoporotic bone which may not often allow stable fracture fixation. Results: In this study, the mean menopausal age considered was 50 years & the patients in the age group of 50-80 years being included in the study. The peak incidence was in the age group of 60-70 followed by above 70 years. Out of 30 female patients, 14 (46.7%) were treated with Distal femoral plate, 12 (40%) were treated with Condylar buttress plate, 4 (13.4%) were treated with Dynamic condylar screw. This shows that results were relatively better with DFLP & least effective with DCS & this observation statistically insignificant 0.067 (P value). Conclusion: Locking plates are effective treatment option for supracondylar fractures of femur. DCS was the initial treatment modality. The present study Distal femoral locking plates gives better results in comparison to condylar buttress plate and DCS. Results are better in young patients in whom fixation was done early.

**Keywords:** DFLP; DCS; supracondylar fracture femur

## 1. Background

“Few injuries present more difficult problems than those associated with comminuted supracondylar fractures of the femur.”

Sir Reginold Watson – Jones

The above statement by one of the greatest Orthopaedician himself aptly describes the complexity in treating these fractures. It is one of the major challenges to a surgeon to not only treat the fracture with the aim of attaining union but also to help the patient to achieve maximum pain free, stable movement at the knee.

Of all the hip fractures excluded, distal femoral fractures includes 31%. Distal third of femur in particular is 6% of all the femoral fractures.

In these fractures there are 2 different patient groups involved. One less than 50 yrs old with high velocity trauma & the other more than 50 yrs with low velocity trauma due to poor quality of bone.

The changing trends in the management of supracondylar fractures of the femur can be said to reflect the evolution of modern Orthopaedics over the decades. The supracondylar fractures of the distal femur are defined as those which occur in the articular & non-articular metaphyseal region of

the distal femur which comprises distal 9-15 cm of the femur.

Severe soft tissue damage, comminution, Intraarticular extension, injury to Quadriceps, and extra articular adhesions are some of the challenges faced by the surgeon.

Before the advent of reliable surgical techniques, the traditional management of displaced fractures of distal femur was essentially non-operative comprising skeletal traction supplemented by manual manipulation of the fracture fragments followed by maintenance of the reduction with some form of external immobilization. The fracture must be first reduced and traction only used to maintain that reduction.

Neer et al, Stewart et al reported better results with non-operative treatment like skeletal traction & cast brace treatment. Closed reduction described by Watson-Jones (1955), John Charnley (1966) may produce knee stiffness & deformity in the form of angulation or shortening.

Dissatisfaction with anatomical reduction and prolonged confinement to bed and poor function of knee, commonly encountered with traditional treatment with traction, lead to the development of open reduction & internal fixation, which may be complicated by a surgeon with limited expertise, by inadequate fixation as well as increased incidence of infection and non union.

With the advent of various newer generation of antibiotics, newer design of implants, more extensive surgical experience, improved Surgical incisions & improved understanding of the basic principles of operative fracture treatment, surgical treatment of these fracture are coming up with good results.

The nature of the fracture may play & role in decision making whether the patient will receive maximum benefit by surgical or closed treatment. Certain variables such as intra-articular fracture, ipsilateral injuries of the lower limb (eg : floating knee) & the soft tissue status (open fracture or vascular injury) may dictate the need for surgical treatment. The surgeon should demonstrate sound judgment in interpreting the fracture pattern and must possess a basic understanding of the principles of operative fracture treatment as well as knowledge of the mechanics of the implants.

Finally he should have a clear understanding of post-operative fracture rehabilitation. If the surgeon is found deficient in any of these pre-requisites, closed fracture management should be considered (Johnson et al 1987).

## 2. Aim of the Study

- 1) "Our aim should be to help nature's normal healing process rather than to hinder them".  
E. G. St. Clair Strauge (1963)
- 2) There are different methods of fixation of supracondylar fracture femur like plate & screw fixation (first done by AO group of Switzerland), Dynamic condylar fixation (ostrum & geel), condylar buttress plate (Less Invasive Stabilization Technique), Intramedullary nailing, External fixation.

The ideal method should provide restoration of anatomy, stability, preservation of blood supply, early mobilization of joints with good functional outcome, but it's quite difficult to attain in an osteoporotic bone which may not often allow stable fracture fixation.

The three methods included in the study are

- 1) Condylar buttress plating
- 2) Dynamic condylar screw & plate fixation
- 3) Distal Femoral plating.

To compare the 3 methods of internal fixation in comminuted supracondylar fracture femur in post menopausal women treated in the department of orthopedics, MCH kozhikode during the period of 2010-2012.

It is hoped that the results of this study will be of help in more careful selection of patients and implants, thereby avoiding a long number of complications which are actually the result of inadequate pre-operative planning and case selection.

## 3. Materials and Methods

For a fracture to be included in this series, part of the fractures line had to extend distal to a horizontal line drawn on the AP roentgenogram 9 cm above the distal articular surface of femoral condyles with comminution. Patients whose

records were available from october 1<sup>st</sup> 2010 onwards and those who presented till December 31<sup>st</sup> 2012 were taken up for the study. The proforma was made. The age, sex, mechanisms of injury, type of fracture were noted from the records available. Patients treated outside are not included.

**Study design:** Cohort study

**Study group:** Patients with comminuted supracondylar femoral fractures of post menopausal age presented to ortho casualty during 2010-2012.

No of patients included for the study-30

### Inclusion Criteria

- 1) Patients between the ages of 50-80 females.
- 2) Post menopausal women

### Exclusion Criteria:

- 1) Type 3 Open Fractures
- 2) Pan compartmental osteoarthritis knee
- 3) Polytrauma/other fractures in the same limb
- 4) pathological fractures

On arrival of the patient in the casualty room, Primary emergency management was carried out. A thorough examination was done to rule out life threatening injuries vis, head, chest, abdomen, pelvis and spine. The extremities were examined to locate any associated injuries. Once the patient was hemodynamically stable, the fractured extremity was immobilized temporarily in a Thomas Splint with sufficient soft padding beneath the knee and the distal fragment of the femur. The distal neurocirculatory status of the limb was carefully assessed both before and after application of the splint.

After applying the splint, a radiological examination of the affected limb to assess the fracture type was done.

The patient was shifted hereafter to the operating theatre where as upper tibial (steinmann pin / Denham pin) was applied and skeletal traction given over a Bohler's frame in the ward.

(In few cases of polytrauma, where the associated injuries were life threatening, priority was given to the management of these while the limb was simply immobilized in the splint.)

Under non-Operative methods the patients were treated either by

- 1) Skeletal traction and functional cast bracing or
- 2) Closed reduction and cast application.

When in traction, satisfactory alignment in both Anterior Posterior and lateral views of roentgenograms is usually attained with 15-20<sup>0</sup> of knee flexion. If posterior angulation persists at the fracture site after several adjustments of the longitudinal traction, a second steinmann pin is inserted in the distal femoral fragment for vertical pull as suggested by Stewart.

Active Quadriceps exercise are initiated the day following injury. Once X-Rays shows early callus formation and clinically there is no tenderness at the fracture site, the extremity is removed from skeletal traction and placed in a cast brace.

**Pre-Operative Management**

On Admission, relevant investigation were performed for each patient, eg. Hemogram, ECG, Chest-X-Ray, Blood Sugar, Renal function tests, Liver function tests etc. for the purpose of anaesthetic fitness. Medical disorders like hypertension, diabetes mellitus, Bronchial Asthma etc. were brought under control before surgery. The fracture was assessed using radiographs and proper implants were selected and the implants were autoclaved and kept ready for surgery. Twenty four hours prior to the surgery i.v. antibiotics were started (usually cephalosporin) and a single i.v dose repeated one hour prior to the surgery.

**Operative Technique**

Anaesthesia: Spinal / Epidural / G.A.

- **Position** : Supine on the table with the ipsilateral hip elevated to allow slight internal rotation of the leg.
- **Preparation** : A pneumatic tourniquet was applied to the upper thigh. The tibial pin was removed and the site dressed. The limb was prepared using savlon and povidone iodine, and draped adequately (entire leg and iliac crest).
- **Approach** : Skin incision was made through a line connecting greater trochanter to the lateral femoral condyle over the distal half of the thigh extending distal to the patella. Passing across the knee joint and ending just lateral to tibial tubercle, always remaining anterior to lateral collateral ligament. The vastus lateralis muscle was elevated from the lateral Intermuscular septum and retracted anteriorly and medially, exposing the distal femur. This exposure was extended by lateral parapatellar arthrotomy after which the patella could be dislocated medially, if necessary, for better visualization of the femoral condyles.

The condyles were reduced and stabilized temporarily by k-wires, to be fixed with various implants later. The extracondylar portion was reduced next.

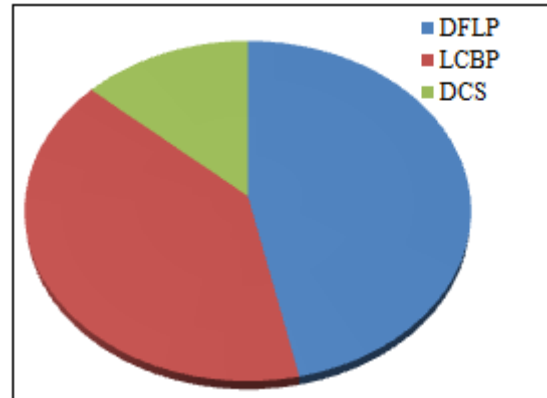
Cancellous bone graft was used to fill supracondylar defects. The source of the graft was iliac crest. After copious irrigation of the wound, incision was closed over a suction drain. Post operatively the limb was kept in Bohler Braun splint to prevent contracture of the Quadriceps. The suction drain was removed on the 2<sup>nd</sup> post operative day and intensive physical therapy was begun immediately. After Quadriceps and hamstrings setting exercises, active and active assisted range of motion exercises of the knee were initiated.

All patients were personally examined at follow up. We considered a fracture to be united if there was no pain on palpation or attempted motion at the fracture site, no discomfort on full weight bearing and serial roentgenograms demonstrated bone trabeculae crossing the fracture site. The functional and radiographic results were recorded according to Neer’s Criteria. Functional grading was made depending on pain, walking capacity, mobility and work. Radiological grading was made depending in varus or valgus deformity, shortening, signs of Osteoarthritis and Union of fracture.

**4. Results**

**Patients and fracture characteristics**

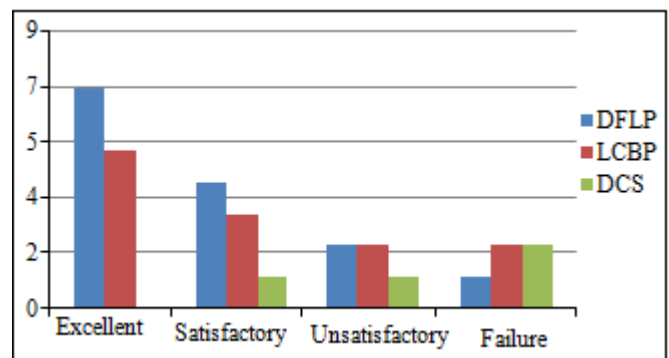
Out of 30 female patients, 14 (46.7%) were treated with Distal femoral plate, 12 (40%) were treated with Condylar buttress plate, 4 (13.4%) were treated with Dynamic condylar screw.



Implant	Frequency	Percentage
DFLP	14	46.6
LCBP	12	40
DCS	4	13.4

**(2) Outcome**

Result	DFLP	LCBP	DCS
Excellent	7	5	0
Satisfactory	4	3	1
Unsatisfactory	2	2	1
Failure	1	2	2

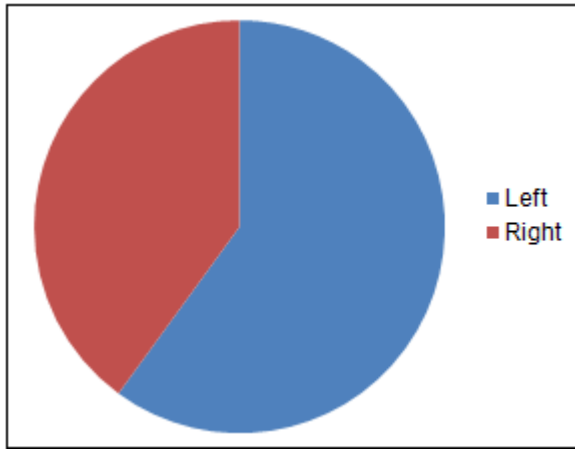


This shows that results were relatively better with DFLP & least effective with DCS & this observation statistically insignificant 0.067 (P value)

**(3) Laterality:**

Out of 30 fractures, 18 (60%) fractures on the left side, 12 (40%) on the right side.

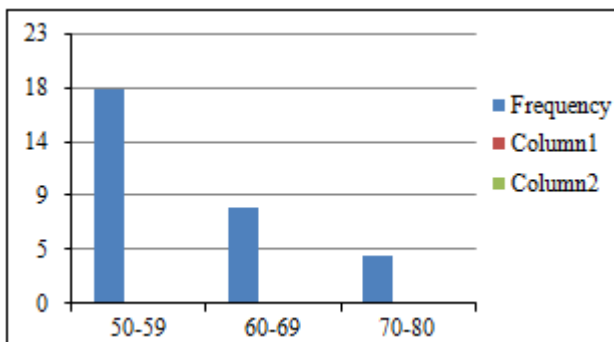
Side	Frequency	Percentage
Left	18	60
Right	12	40



**(4) Age distribution**

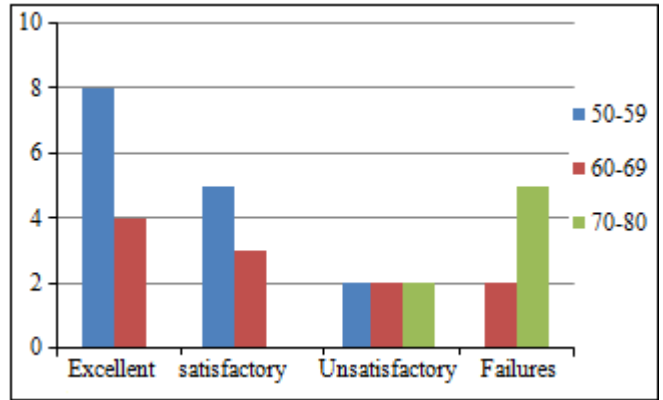
In this study, the mean menopausal age considered was 50years & the patients in the age group of 50-80years being included in the study. The peak incidence was in the age group of 60-70 followed by above 70years.

Age	Frequency	Percentage
50-59	18	60
60-69	8	26.6
70-80	4	13.4



In the final evaluation, out of 30 patients, patients in the group of 50-59years, there were 8 excellent results (6-DFLP & 2 LCBP), 5 satisfactory (3 DFLP & 2 LCBP), 2 unsatisfactory (1 DFLP & 1DCS) & zero failures. In the age group of 60-69 years, 4 excellent (1 DFLP & 3LCBP), 3 satisfactory (1DFLP, LCBP, DCS), 2 unsatisfactory (1LCBP & 1DFLP) & 2 failures (DCS).In the age group of 70-80years, there were zero excellent & satisfactory cases, 1 unsatisfactory (DFLP) & 3 failures (1DFLP & 2LCBP).

Age Group	Excellent	Satisfactory	Unsatisfactory	Failures
50-59	8	5	2	0
60-69	4	3	2	2
70-80	0	0	2	3

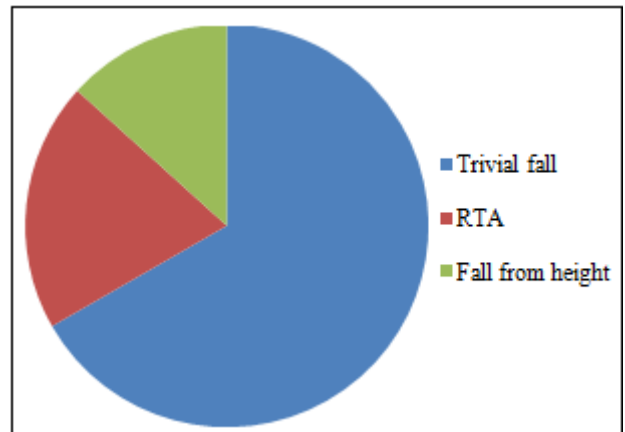


Result analysis shows outcome was better in the age group of 50-59 years treated with DFLP & the failure rates are high after 70 years more with DCS or any.

**(5) Mode of injury**

Out of 30 patients, 20 (66.7%) patients sustained just a trivial fall, 6 (20%) patients due to an RTA & 4 (13.3%) patients due to fall from height.

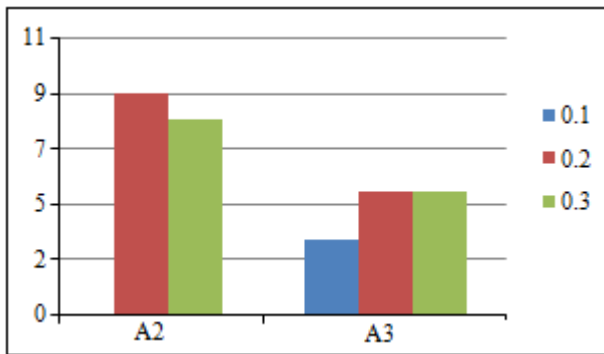
Mechanism of injury	No of patients	Percentage
Trivial fall	20	66.7
RTA	6	20
Fall from height	4	13.3
Total	30	100%



**(6) Preoperative radiological classification**

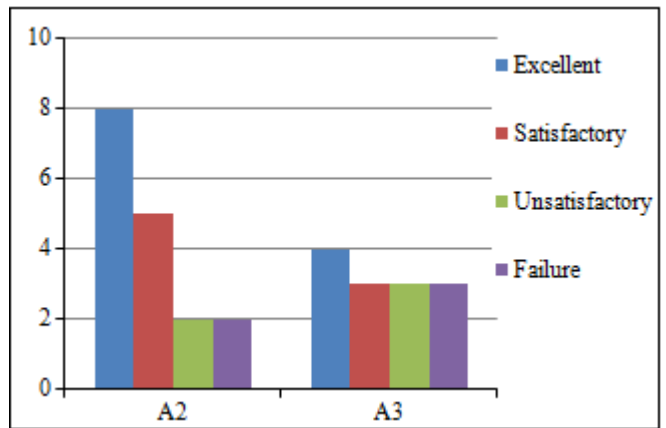
The AO classification was used to classify the fractures & only Type A included in the study for final evaluation. Out of 30 fractures in the study, 17 (56.7%) were type A2 & 13 (43.3%) were type A3.

		0.1	0.2	0.3	Total	Percentage
	1	0	0	0	0	
	2	0	9	8	17	56.7
A	3	3	5	5	13	43.3
					30	100%



Out of 17 A2 fractures, 8 had excellent (4 DFLP & 4 LCBP), 5 had satisfactory (2 DFLP & 3 LCBP), 2 (1 DFLP & 1 LCBP) were unsatisfactory results & 2 (1 DCS & 1 LCBP) had failures. Out of 13 A3 fractures, 4 had excellent (3 DFLP & 1 LCBP), 3 had satisfactory (1 DCS 1DFLP & LCBP), 3 (1 DFLP, 1DCS 1 LCBP) had unsatisfactory results & 3 (1DCS, 1DFLP & LCBP) had failures.

Type of fracture	Number	Excellent	satisfactory	Unsatisfactory	Failure
A2	17	8	5	2	2
A3	13	4	3	3	3

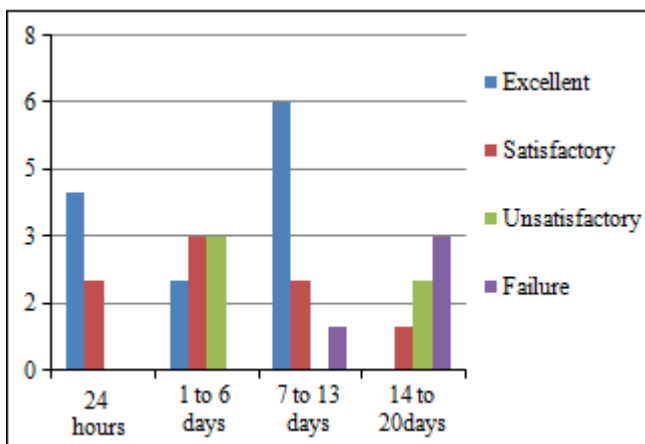


This shows that greater the comminution of the fracture, poorer is the result & this was statistically significant 0.0009 (p value)

**(7) Time delay between injury & surgery:**

The interval between the injury varied between a few hrs to 20 days with a mean of 8 days. Within 24 hrs, out of 6 cases, 4 had excellent & 2 had satisfactory results. In 1-6 days, Out of 8 cases, 2 had excellent, 3 had satisfactory & 3 unsatisfactory results. In 7-13 days, out of 9 cases, 6 had excellent, 2 had satisfactory results & 1 failure. In 14-20 days, Out of 7 cases, 1 had satisfactory, 2 unsatisfactory results & 3 failures.

Duration	No.of patients	percentage	Excellent	satisfactory	Unsatisfactory	Failure
24hours	6	20	4	2		
1-6 days	8	26.7	2	3	3	
7-13days	9	30	6	2	0	1
14-20days	7	23.3	0	1	2	3



This suggest that early surgery significantly improves the functinal outcome. (p value 0.005)

**(8) Post operative wound infection:**

There were 5 cases pin track infection which responded to antibiotics and regular dressings. There were 2 cases of deep infection among which one case went into non union.

**(9) Duration of Hospital stay**

The average duration of hospital stay was 20.64 days with a minimum of 10 days and a maximum of 38 days. The delay in discharge was due to associated injuries or infection.

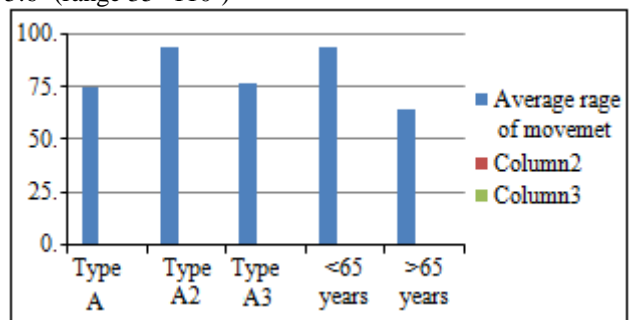
**(10) Full weight bearing:**

The average duration for full weight bearing was 156 days (range 120 – 210days)

**(11) Range of movement**

The average range of movement of Type A fractures treated by open reduction was 75.6°; Type A2 fractures had an average range of movement of 94.37°, TypeA3 had 77°.Average ROM for patients < 65 years was 93.89° and above 65 years was 65.31°.

Average range of motion of the knee during follow up was 75.6° (range 35°-110°)



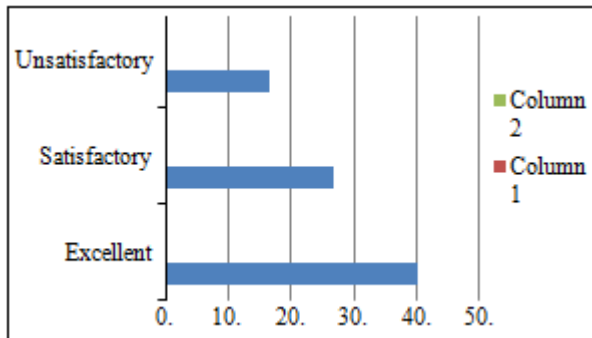
**(12) Complication:**

There were 2 cases of deep infection and 1 case of non-union, with 2 cases of internal derangement of knee.

## (13) Results

Grading	No.patients	Percentage
Excellent	12	40
Satisfactory	8	26.7
Unsatisfactory	5	16.6
Failure	5	16.7
Total	30	100

The knee society score was used to quantitate the final functional outcome of the knee. Neer's criteria were used for overall functional rating.



## 5. Interpretation and Conclusion

Locking plates are effective treatment option for supracondylar fractures of femur. DCS was the initial treatment modality. The outcome is by proper principles of plating. The present study Distal femoral locking plates gives better results in comparison to condylar buttress plate and DCS. Results are better in young patients in whom fixation was done early.

### 5.1 Conclusion

Locking plates are effective treatment option for supracondylar fractures of femur. DCS was the initial treatment modality. The present study Distal femoral locking plates gives better results in comparison to condylar buttress plate and DCS. Results are better in young patients in whom fixation was done early.

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