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Prospective comparative study of different modalities of distal femoral fracture management

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Abstract

Introduction: Fractures of distal femur contribute 4 % of all femoral fractures and they present a complex problem. The mechanism of injury in most distal femoral fractures is thought to be axial loading with varus/valgus or rotational forces. The distal femoral fractures are difficult to manage. There are wide variety of choices available to treat these complex fractures which ranges from conservative management to operative management. In surgical fixation, we have variety of armamentarium available from angled blade plate to locking compression plate. However no single management has overcome all of the problems associated with this fractures.

In this study fractures of distal femur treated by various conservative and surgical methods to determine the personality of each fracture and patient and the treatment has been given accordingly.

Materials and Methods: All the patients having fractures of distal femur. who were treated and followed up in Shri.Chhatrapati Shivaji Maharaj General Hospital, Solapur in the period July 1999 to December 2000 are included. Pathological fractures and fractures in children are not included in this series. Data of the patient was collected in the form of name, age, sex, address, occupation, mechanism of injury time since injury and associated injuries.

Results: Final result were rated using Neer's Rating system, there were excellent in 61% of operative and 56% of conservatively treated distal femoral fractures. Also good, fair and poor outcome has been seen in almost similar proportion of distal femur fractures patients when compared conservative versus operative.

Conclusion: Dynamic condylar screw with plate and 95 degree condylar blade plate are effective internal fixation for treatment of fractures of distal femur. Result of intramedullary supracondylar nails are encouraging. Undisplaced unicondylar fractures can be treated satisfactory by conservative methods. The AO/ ASIF (Muller *et al*) classification is useful for planning of surgery.

Keywords: Distal femoral fractures, treatment modalities, conservative Vs operative

Introduction

In this age of trauma, due to increase in vehicular traffic and rapid industrialization the incidence of the injuries has greatly increased.

Fractures of distal femur contribute 4 % of all femoral fractures and they present a complex problem. The supracondylar area of femur comprises of distal nine centimeters of femur as measured from articular surface and is defined as zone between the femoral condyles and the junction of the metaphysis with the femoral shaft [21].

The mechanism of injury in most distal femoral fractures is thought to be axial loading with varus/valgus or rotational forces [39] In younger patients in injury typically occur after high energy related to motor cycle accidents. In the elderly with osteoporotic bone, trivial trauma on the flexed knee can cause this fractures.

The distal femoral fractures are difficult to manage because of the following reasons.

1. They are usually comminuted which is related to thinning of cortex, widening of intramedullary canal and thinner soft tissue envelop below infra isthmus area.
2. These fractures are readily deformed secondary to initial traumatic force and imbalance of the surrounding muscle pull; frequently result in posterior displacement of distal fragment.
3. Its proximity to knee joint frequently leads in intraarticular fractures and ligament injuries.
4. Associated severe injuries and medical disease usually prohibit adequate treatment.

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In the past, result were almost always associated with varying degrees of permanent disability. In the early 1960 there was great reluctance towards operative managements of this fractures. However conservative management met with problems like deformity, shortening, knee stiffness, prolonged bed rest, malunion over the past three decades there has been changing philosophy towards surgical treatment of these fractures. This is because of improved surgical instrumentation, implants, extensive surgical experience, improved theatre conditions, antibiotics, and postoperative rehabilitation technique.

However no single management has overcome all of the problems associated with this fractures [39].

The present study consists of 50 cases of fractures of distal femur treated by various conservative and surgical methods.

In this series attempt has been made to determine the personality of each fracture and patient [17] and the treatment has been given accordingly.

Aims and Objective

1. To study management of fractures of distal femur with various conservative and surgical method.
2. To study result of these method of treatment.
3. To study method of postoperative management, physiotherapy and follow up.
4. To study postoperative complication.
5. To study advantage and disadvantage of these method of treatment.

Material and methods

All the patients having fractures of distal femur, who were treated and followed up in Shri. Chatrapati Shivaji Maharaj General Hospital, Solapur in the period July 1999 to December 2000 are included in this series.

Thorough clinical examination was carried out to find out the nature of fracture associated injuries and general condition of the patients.

Pathological fractures and fractures in children are not included in this series.

Haematological investigations are carried out on emergency basis.

The patients were admitted in the ward after skeletal traction or proper temporary splintage.

Debridement was done for compound injuries at the earliest possible. Antibiotics, Inj tet glob 250 I.U, Inj AGGS 10000 I.U. were administered for compound injuries.

Data of the patient was collected in the form of name, age, sex, address, occupation, mechanism of injury time since injury and associated injuries.

Treatment Protocol

Each case was treated as an emergency. Where surgery was chosen as the method of treatment surgery was carried out earliest possible unless there was an absolute contraindication (Such as head injury, poor general condition, poor local skin condition etc) In such cases temporary splintage / traction was provided until the problem had resolved. The fracture was then dealt with accordingly as soon as the condition of the patient allowed.

In Patients treated by open reduction and internal fixation the following principles were followed strictly.

- 1) Meticulous articular surface reconstruction.
- 2) Stable and adequate fixation.
- 3) Use of inter-fragmentary and axial compression whenever possible.
- 4) Autogenous bone grafting in severely comminuted fractures.
- 5) Mobilization of the knee joint as early as possible after surgery.
- 6) Avoidance of weight in preoperative perioperative and post operative period.

The following table shows the treatment modalities followed for the fifty cases in the present study.

Conservative Method		Operative Method	
Modality	No of cases	Modality	No of cases
1. Skeletal traction and cast brace	4	1. ORIF with DCS and Plate	23
2. Cast in situ	5	2. ORIF with condylar blade plate	06
		3. Internal Fixation with IMSC	08
		4. ORIF with MCS	04

Procedure

1. Undisplaced condylar fractures (AO /ASIF type B₁, B₂, B₃)

These fractures were treated conservatively. The haemarthrosis was aspirated. An above knee cast was applied and retained till fracture union occurs (usually to 10 to 12 weeks). In some cases functional cast brace was applied, after removing the cast at 3 – 4 weeks. Static quadriceps exercises were initiated in the cast and active range of movement exercise in the brace. Full weight bearing was allowed only after the fracture had united clinically and radiologically.

2. Displaced condylar fracture (AO/ ASIF type B₁, B₂, B₃)

These fractures were treated by open reduction and internal fixation usually with multiple cancellous screws. Post operatively a posterior plaster slab was applied static quadriceps exercises were begun from first post operative day. Gentle range of movement exercise were started once the swelling had subsided. Splint was discarded at 2 weeks. Non weight bearing crutch walking was started, progressing by 8 to 10 weeks to partial weight bearing. The limb was supported

by a cast brace if the fixation was not satisfactory. Full weight bearing was not permitted till the fracture healing was evident (usually 12 to 14 weeks).

3:- Supracondylar:- Intercondylar fractures (AO/ASIF type A₁, A₂, A₃ and (C₁, C₂, C₃) In elderly osteoporotic patients, and patients with medical illness these fractures were treated conservatively. A upper tibial skeletal traction was given for 4 to 6 weeks. Followed by functional brace till union.

Young active patients were managed surgically. Implants used for internal fixation were dynamic condylar screw and plate, 95 degree condylar blade plate, intramedullary supracondylar nail.

DCS is cannulated and consists of proximal cylindrical shank distal threaded portion. The cylindrical shank part is flattened in two planes. This corresponds to similar configuration of the barrel of side plate. The proximal cannulated part is threaded to received top nut. The screws are available in sizes ranging from 50mm to 95 mm. The side plate assembly consists of a side plate and barrel, long axis of which forms an angle of 95 degrees.

Ninety five degree condylar blade plate has fixed angle of 95

degree between its blade and plate portion. The blade has U profile available in lengths of from 50 to 80 mm. The normal angulation between the femoral shaft and knee joint axis is greater than the angled blade plate. Therefore the extra introduction of blade in the femoral condyles result in a preload along the medial cortex. Thus, the device restores alignment and provides stable fixation.

Intramedullary supracondylar [IMSC] nails are also called as GSH (Green, Seligson, Henry) nail. It is fully cannulated nail and comes in 11 and 12 mm diameter and length is available in 150, 200 and 250 mm. Five drill holes are present in the nail for placement of interlocking screws.

Operative Technique

A) Open reduction and internal fixation with dynamic condylar screw

The surgery was usually carried out under spinal anesthesia. Patient was given lateral position Pneumatic tourniquet was applied to the proximal thigh after scrubbing of the limb, painting and draping was done Midline lateral incision was made on the distal thigh. Incision was carried distally to the lateral Para patellar region up to the midway between inferior pole of patella and tibial tuberosity.

Subcutaneous tissue and fascialata were incised in line with the skin incision. Incision was made through lateral retinaculum and capsule. Between vastus lateralis and lateral intermuscular septum plane was developed.

Perforating vessels were ligated. By this time fracture site was exposed. With curette bony ends were cleared. Intercondylar fracture was reduced and fixed temporarily with 'K' wires crossing across the fracture the fracture These 'K' wires were passed such that they would not interfere with subsequent positioning of DCS.

Then one guide wire was passed along the knee joint line (A) and another was passed flush to the anterior aspect of both the femoral condyles (B) Two cms proximal to the knee joint line and parallel to wire (A) and wire (B) third guide wire was passed through the lateral condylar. This point of entry was in line with the axis of shaft of femur i.e. at the junction of anterior 1/3 rd and posterior 2/3rd of longest. anteroposterior diameter of the lateral condyle. Another similar guide wire was passed with slight variation. To check the position of guide wires anteroposterior and lateral roentgenogram were taken and the guide wire in the best position was selected.

Length of the DCS to be inserted was determined from the selected guide wire. The condyles were reamed over the guide wire with triple reamer with the prefixed length. After reaming tapping was done. The selected DCS was passed in the tapped channel with a wrench. A barrel of appropriate side plate was slid over the DCS and plate was aligned to the axis of the shaft. The top nut was passed in the DCS, so as to achieve intercondylar compression. Fracture reduction was assessed by passing a finger over the patella-femoral surface and the intercondylar notch. The side plate was fixed to the shaft femur with 4.5 mm cortical screws. Through the lowermost two 2 holes of the plate 6.5 mm cancellous screws were passed; obliquely to give additional hold on the distal condylar fragment. To improve the stability of the fracture additional lag screws were used parallel to the plate when required.

Check roentgenogram were taken stability and range of knee movement were checked. Patellar retinaculum was sutured.

After release of tourniquet through saline wash was given and suction drain tube inserted. Wound was closed in layers. cancellous bone grafts from iliac crest were packed in bone

void if necessary before closure of wound.

B) Open reduction and internal fixation with ninety five degree, condylar blade plate

Through standard lateral incision the fracture site and condyles were exposed. Reduction of fractured of two condyles achieved and fixed with 'K' wires. Area for insertion point of blade was marked 1.5 to 2 cm proximal in the middle 1/3 of anterior 1/2 of lateral femoral condylar. Two 6.5 mm cancellous screws were passed through lateral condyle Two 6.5 mm cancellous screws were passed through lateral condyle such that will not interfere with subsequent path of blade plate. 'K' wires used for temporary fixation were removed. Two 'K' wires one through knee joint and one posterior to center of patella were passed. Third 'K' wire was passed 1 cms above the articular surface of the lateral condyle and parallel to first and second 'K' wires. Parallel to this 'K' wire three holes were drilled. These holes were expanded to create window for seating chisel. Seating chisel was placed parallel to femoral shaft and inserted into the femoral condyle parallel to the the wire.

Proper length and depth blade and plate was inserted into the path created by the chisel and was fully seated. Through distal holes of plate one or two cancellous screws were inserted. Plate portion was attached to lateral aspect of femur with bone holding forceps. Axial compression to the fracture site was applied by tension device and plate was secured to femoral shaft.

C) Closed reduction and internal fixation with intramedullary supracondylar nail^[40]

Incision was made on the knee joint in midline and medial Para patellar capsular incision was made. Inter condylar fractures were reduced and stabilized with cancellous screws at least 14 mm apart. Entry point was made in the center of intercondylar notch just anterior to origin of the posterior cruciate ligament. K.awl was used to make the entry portal.' K' awl was advanced to metaphyseal junction with reference to the condyles.

After removal of 'K' awl; guide wire was passed across the reduced fracture into diaphysis under C arm control. Entry point was reamed 1.5 mm larger than selected nail.

Nail of proper length and diameter was connected to the guide with alignment rod. The guide bar was positioned laterally and the nail was advanced over guide wire into the distal condyle until the distal end is counter sunk 2 to 5 mm below the surface of inter condylar notch. The guide wire was removed.

Two distal interlocking screws and two proximal interlocking screws were placed.

All assembly was removed. After irrigation wound closed in layers over suction drain.

Post Operative Management

Limb was elevated and kept in 90-90 position over pillows. Patient was administered systemic antibiotics for 5-6 days.

Usually after 36-48 hours drain was removed sutures were removed usually on 10-12 post operative day once the pain reduced thee static quadriceps exercises were started form 2nd post operative day. The patient was allowed to dangle his feet over the edge of the bed on 2-3rd post operative day. Flexion and extension movement of knee were encouraged. Once the muscle strength was gained active flexion extension was started. On 10 th or 12 th day the patient was made to stand up. Then he was allowed Non weight bearing with crutches or

walker.

Patient was usually discharged by 16th day and was asked to attend orthopedic OPD fortnightly.

Toe touch walking on crutches was allow by. 6th week post operatively.

Depending on clinical and radiological findings further weight bearing was allowed.

At Each follow up following points were noted.

- 1) Presence of pain in the affected limb.
- 2) Condition of operative scar.
- 3) Any deformity of affected limb.
- 4) Shortening of affected limb.
- 5) Range of motion at knee joint.
- 6) Any instability of knee.
- 7) Roentgenogram for evidence of union and comparison with previous roentgenogram.

Weight bearing was protected till there was good clinical and radiological evidence of progressive fractures healing.

Long term result were evaluated by the NEER's Rating System.

Observations and results

The following observations have been found from the present study

1. Age distribution

Table 1

Age (Years)	No of Patients
15 to 30 yrs	8
31 to 40 yrs	16
41 to 50 yrs	14
51 to 60 yrs	9
Above 61 yrs	3
Total	50

The average age of patients was 42.46 years (Range from 16 years to 77 years)

The average age for males was 40.5 years and females it was 49.6 years.

2. Sex Distribution

The following table shows sex distribution in 50 cases.

Table 2

Sex	No of Cases	%
Male	39	78
Female	11	22
Total	50	---

Overall male predominance was observed.

3. Side of the fracture

Following table shows incidence of side of fracture

Table 3

Side of Fracture	No of cases	%
Right	30	60
Left	20	40
Bilateral	0	0
Total	50	---

4. Mechanism of injury

Table 4

Mechanism of Injury	No of Cases	%
1. Road Traffic Accidents	32	64
2. Fall from height	8	16
3. Pedestrian knock over	8	16
Indirect Trauma	2	4
Total	50	---

64% of fractures were sustained due to the RTA resulting from high velocity trauma.

5. Nature of fracture

Table 5

Nature of fracture	No of cases	%
Closed	42	84
Open	8	16
Total	50	---

In present study there were 8 open fractures 5 being Grade II and 3 being Grade I (Gustilo-Anderson Classification)

6. Type of fracture

The fractures of distal femur were classified according to AO/ASIF (Muller *et al* Classification

Table 6

Fracture Subtype	No of Cases
A ₁	8
A ₂	6
A ₃	6
B ₁	5
B ₂	4
B ₃	0
C ₁	9
C ₂	11
C ₃	1

Type A fracture was seen in 20 patients

Type B fracture was seen in 9 patients

Type C fracture was seen in 21 patients

7. Associated Injuries

Table 7

Type	No of Cases	%
Isolated Injury	35	70
Associated with other injury	15	30
Total	50	---

Medical illness was seen in three cases.

8. Mode of Treatment

Incidence of conservatively and surgically treated patients was as follows.

Table 8

Type	No of Cases	%
Conservative	9	18
Surgical	41	82
Total	50	---

9. Period of Hospitalization.

The following table shows period of hospitalization in fifty cases.

Table 9

	Average Days	Minimum Days	Maximum Days
Conservative	21.1	1	44
Surgical	24.3	14	57

10. Period for radiological union of fracture

The following table shows period for radiological union of fracture

Table 10

	Average Weeks	Minimum Weeks	Maximum Weeks
Conservative	15	13	19
Surgical	15.5	13	24

11. Follow up of patients after treatment is as follows

Table 11

Duration in months	No of Patients
Up to 4 Months	3
5&6	5
7&8	27
9&above	15
Total	50

Average follow up was 7.9 months Range of follow up was 4 to 14 months.

12. Knee Range of motion

Table 12

Knee flexion	No of Cases	
	Conservative	Surgical
Less than 80 degree	2	2
80 degree to 110 degree	1	7
More than 110 degree	6	32
Total	9	41

Average range of knee motion for conservative group was 101.66 degree and operative group was 113 degree.

13. Table at which full weight bearing achieved.

Table 13

Period in weeks	No of Cases	
	Conservative	Surgical
12-14	4	16
15-17	3	13
18-20	2	11
21-23	0	0
More than 24	0	1

Average time taken for full weight bearing for conservative cases. 15.44 weeks operative cases 16.09 weeks.

14. Complication.

Following table shows complications in 50 cases.

Table 14

Complications	No of Cases	
	Conservative	Surgical
Superficial infection	—	3
Deep infection	—	1
Delayed union	—	1
Non union	0	0
Mal union	2	4
Shortening	2	4
Implant back out	—	2
Bursitis	—	2
Extension lag	0	1
Pin tract infection	1	—
Plaster sore	1	—

15. Final Results:- According to Neer's Rating system

Table 15: Final result were rated using Neer's Rating system which allots points for pain function, work ability, joint movements, radiological and gross appearance.

Rating	Points	Conservative		Operative	
		No. of cases	%	No. of cases	%
Excellent	> 85	5	56	25	61
Good	70 to 84	2	22	10	24
Fair	50-60	1	11	5	12
Poor	< 50	1	11	1	3

Discussion

Fractures of distal femur is a serious injury. Treatment of these fractures long been a controversial subject. There has been a shift in the trend from conservative management in the early years to operative management in the recent years. Despite this conservative management remains the treatment of choice for these fractures, for certain fracture situations & in certain intuitions where experience, surgical instrumentation, rehabilitation technique are not available [17].

Though the improved techniques and implants for the internal fixation have obtained better results, they demand superb skill. experience, great facilities and still possess a potential threat of complications such as deep infection, skin, necrosis, knee stiffness, etc.

The implants available for internal fixation of these fractures are 95 degree condylar blade plate, condylar buttress plate, Dynamic condylar screw with 95 degree plate, T plate, Reamed antegrade intra medullary supracondylar (GSH) nail. In this series the implants used for internal fixation of fractures of distal femur are 95 degree condylar blade plate, Dynamic condylar screw with 95 degree plate. Intra medullary supracondylar nails, and multiple cancellous screws.

In this series, fifty fractures of distal femur treated with operative and conservative methods are included are included. The results were evaluated in terms of return of function, complications and disabilities.

The result were compared to those of previous series. Thus advantages and disadvantages of each method have been pointed out.

Age Factor

In the present study 38 cases out of 50 were younger than 50 years and 12 were above age of 50 years. So these fractures are common in the active age group of the population.

The average age in present study was 42.46 years.

Sex

In present series 78% patients were male and 22% patients were female. This is because male population is more susceptible to high energy trauma.

Classifications

The Fractures were classified according to AO/ASIF (Muller et al) System.

There were 20 extra articular fractures in this series (i.e A₁, A₂, A₃) and total articular fractures were 21 (i.e C₁, C₂, C₃) in present series type B (B₁, B₂, B₃) Fractures were found in nine patients which were less than extraarticular (type A) and total articular (type C) Cases.

Nature of Injury

In this Series 8 out of 50 cases (16%) were having compound injuries No amputation or vascular injuries were observed in this series.

Poor result were obtained in 2 out of 8 cases in present series. J.M. Siliski^[49] *et al* noted 3 poor results in operated compound fractures.

Associated injuries

There were 15 cases having associated injuries in present series out of which 12 cases gave good to excellent results there were 3 cases having head injury two having collar's fractures, Radius ulna in two cases, fracture ribs in two cases, fracture Tibia fibula in two cases, fracture humerus one case, fracture patella in one case, fracture tibial condyle in one case, fracture metatarsal in one case.

Associated medical illness was seen in 3 cases one patient having cardiac disease was treated conservatively.

Mechanism of injury

In the present series 64 % of the fractures were caused by RTA Most of the victims were young adults.

Investigations

Routine anteroposterior and lateral view X- rays were considered sufficient in the patient (type C fracture) treated with DCS and plate or 95 degree angle blade plate, X- rays of the opposite side were obtained for measurement of anatomical axis condylar width etc.

Treatment

Average follow up of patients was 7.9 months (minimum 4 month and maximum 14 month)

A) Conservative method

Nine patients were treated conservatively. Five patients were treated by application of cast in situ four patients were treated by traction and early mobilization. The average period when full weight bearing allowed 15.44 weeks (range from 13 to 20 weeks) The average knee ROM was 101.6 Degrees.

Final Results

In the present series 56 % excellent results and 22 % good result were obtained in cases treated conservatively. Thus we have 78% satisfactory results in the patients treated conservatively.

The high incidence of success is mainly Due to the majority of simple undisplaced condylar fractures included in this group Most of these patients had excellent results.

Cast In Situ

This method was applied in five patients out of which three were having lateral condylar fractures and two were having medial condyle fractures. This method was adopted for these fractures because they were undisplaced unicondylar fractures. After aspiration of hematoma these patients were given above knee cast for 12 weeks. One of the patients was having fractures of II and III metatarsal on same side.

Because of the simplicity of the fracture the results in four of these cases were excellent and one was good.

Traction and Early Mobilization

Four patients were treated by this method one of the patients was having cardiac problem one was having post polio residual paralysis of the same limb and two of them were elderly osteoporotic ladies. So they were treated conservatively with skeletal traction for a period 4-6 weeks to be followed by cast brace mobilization. We had one excellent one good one fair and one poor result.

Surgical Method

Forty one patients were treated by this method.

Full Weight bearing was started after an average period of 16.09 weeks (Range From 14 to 26 weeks) The period is more than that of the conservative group because more comminuted and extensive fractures were included in the surgical group. The average knee ROM was 113 degree. Achievement of a better range of movement was because of stable and adequate fixation, proper post operative splinting, and institution of early intensive physiotherapy and avoidance of infection.

Final Results

In present series 61% excellent results and 24% good result (Neer's Rating system) were obtained in cases treated surgically. Thus we have 85% satisfactory acceptable results in the patients treated surgically.

Implants used

1. Cancellous Screws	-	4 patients
2. DCS with plate	-	23 patients
3. 95° Condylar Blade plate	-	6 patients
4. IMSC nail	-	8 patients

Complications

In the present series complications associated with long riddance like pneumonia, bed sores, thromboembolisms were not observed.

1. Deep infection

This is most dreaded complication of internal fixation. In the present series deep infection was developed in grade II compound fracture treated with DCS.

2. Superficial Infection

This complication was developed in three patients which were treated by internal fixation It subsided completely with appropriate antibiotics and dressings.

The relatively low incidence of infection was noted in present series. This was because of use of prophylactic, antibiotics, and strict asepsis.

3. Non Unions

There was no case of nonunion in present series stable and adequate fixation avoidance of infection, and use of bone

grafts in comminuted fractures were responsible. For this, in the patient with deep infection the union was delayed up to months.

4. Implant migration and implant failure

Implant failure or breakage was not found in present series. There were two cases of implant back out found in the patient treated by ORIF with multiple cancellous screws they were associated with bursitis these implants were removed.

5. Shortening

Significant shortening was noted in two cases treated conservatively and four cases treated surgically mainly because of metaphyseal comminution.

6. Malunion

In present series no rotational deformities were noted. significant varus deformity (more than 5° angulation) was found in two cases treated conservatively. significant posterior angulation in one case, significant varus angulation in one case and valgus angulation in two cases were noted in surgically treated patients.

7. Limited Movements of Knee

In the patients treated conservatively two patients had less than 80° knee ROM. In the patients treated surgically two patients had less than 80° knee ROM. One patient had extension lag of 10°.

8. Pin tract infection

One patient developed pin tract infection which subsided after removals of Steinman pin.

9. Plaster sore

One patient developed plaster sore. For this the cast brace was changed.

Summary

Fifty cases of fractures of distal femur were included in the present study. AO/ASIF classification was followed. There were twenty types A, nine types B, and twenty one types C cases. Nine cases were treated conservatively and forty one cases were treated surgically. Early knee mobilization and gradual increase in weight bearing according to clinic radiological picture was followed. Neer's rating system was used for evaluation of final results.

Average age of patient was 42.46 years. And predominance was observed. Most of fractures were sustained due to road traffic accidents resulting from high velocity trauma.

In cases treated surgically average period of hospitalization was 24.3 days average period for radiological union was 15.5 weeks and average time taken for full weight bearing was 16:09 weeks. Incidence of complication was low. There were no non-unions or implant failure. Deep infection and delayed union was observed in one case. Only two patients had less than 80 degree knee ROM. Average knee ROM was 113 degree and overall 85% good to excellent results were obtained.

In cases treated conservatively average knee ROM was 101 degree two patients had less than 80 degree knee ROM. Over all 78% good to excellent results were obtained.

Conclusions

1. Dynamic condylar screw with plate and 95 degree condylar blade plate are effective internal fixation for

treatment of fractures of distal femur.

2. Result of intramedullary supracondylar nails are encouraging.
3. Undisplaced unicondylar fractures can be treated satisfactory by conservative methods.
4. The AO/ASIF (Muller *et al*) classification is useful for planning of surgery.
5. Good anatomical reduction rigid and adequate internal fixation and post operative knee mobilization are essential to gain good range of knee motion.

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