Original Research Article

A Study on Intramedullary Supracondylar Interlocking Nail in the Management of Supracondylar and Intercondylar Fractures of Distal Femur

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Abstract

Aim: Our aim was to treat these fractures by rigid internal fixation, allow early knee motion and to know the outcome of this IMSC nail in such fractures.**Methodology:** In this study we have taken 30 cases of supracondylar and inter condylar fractures of distal 15 cms of femur which are ideal for inter locking IMSC Nail.**Results:** The maximum number of patients were seen in the age group between 31-40 yr.Males were slightly more in number compared to females. Regarding mechanism of injury incidence for RTA is more. In young patients fracture resulted from high velocity injury and in elderly due to simple fall (low velocity injury), because of osteoporosis. Majority of the cases were simple with only 4 Compound fractures. Associated vascular and ligamentous injuries are none but other bony injuries are common. Surgery was performed by closed technique in 28 patients and Open technique in 2 patients with static locking in 28 patients and dynamic locking in 2 patients. Radiological union is seen at an average of 12 weeks. Average knee ROM observed is 102^0.The complications encountered were difficulty in closed reduction due to the pull of Gastrocnemius, difficulty in proximal locking in 2 patients, infection in 2 patients of whom one had compound fracture. 2 patients had mild pain around distal Interlocking screws, and 1 patient with pathological fracture had backing out of single Interlocking screw. End results were Excellent in 14 cases, Good in 10 cases, Fair in 4 cases and poor in 2 cases according to Functional Evaluation scale. **Conclusion:** Analysis of our results showed that it is a good method for treating Type-A and Type-C fractures and extended indications for pathological fractures, failed distal femoral osteosynthesis and fractures in osteoporotic bones. In Type-C fractures good articular congruity is achieved by fixing the fragments with condylar screws.

Keywords: Condylar screws, Femur Fractures, Articular congruity, Osteoporotic bones, Interlocking Nails.

Introduction

Orthopaedic science has advanced much from the HIPPOCRATIC AGE in which a fracture was treated by external splints with wooden pieces and by giving rest to affected limb for over a long period, to the present state where after a bony injury the fracture is fixed immediately within hours or as early as possible and the patient is mobilized normally.

Advance in mechanization and the acceleration of travel have been accompanied by increase in the number and severity of fractures and these in the distal part of the femur are of no exception.

High velocity injury sustained in automobile disaster's and the increase in road traffic accidents as a whole is creating an ever growing problem.

The knee has become the most vulnerable of all Joints. Since man has taken to travelling at high speeds in the position of flexed hind limbs, when the machine in which the subject is travelling stops suddenly, much of the impact is taken first upon the patella, then the condyles of the femur and then the tibia in varying proportions, in varying positions. Alternatively the stationary lower limb may be struck by a moving object. [1, 2]

This is the common pedestrian injury, the so called bumper fracture, the bumper of most vehicles being placed roughly at knee height.

On the other hand, in elderly patients, fractures frequently occur after a minor slip and fall on a flexed knee, usually leading to comminuted fractures of distal femur through compromised osteoporotic bone.

The 21st century has seen a lot of changes in medical field, especially in Orthopaedic trauma. A better understanding of biomechanics, quality of implants, principles of internal fixation, soft tissue care, antibiotics and asepsis have all contributed in this radical change.

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Thus we have advanced from the conservative approach to internal fixation of fractures and is an accepted mode of treatment.

Supracondylar and intercondylar fractures of the femur are difficult fractures to treat because of their intra articular involvement, associated ligamentous injuries and patellar fractures. Thin cortices, comminution, osteopenia and a wide medullary canal make secure internal fixation difficult to achieve in supracondylar region of femur. These fractures are not only difficult to reduce but also difficult to maintain in the reduced position as the origin of gastrocnemius pulls the distal fragment posteriorly. [3]

Most studies over the past 20 years have attempted to compare the results of non surgical with those of surgical methods. Traditionally non-operative management has included an initial closed reduction, a prolonged period of skeletal traction and finally a variable period of external immobilisation. For an adult this method of treatment carries considerable morbidity, is time consuming and expensive, and may be complicated by knee stiffness, malunion and non union. [3]

Open reduction and internal fixation has been advocated using various implants including angled blade plates, Zickel's device, Ender's nails, Rush rods and Dynamic condylar screw.

Now in this era of interlocking for fractures of long bones, the intramedullary supracondylar nail (IMSC) extends the indications for interlocking nails to include supracondylar fractures of the distal femur. In this study we report the results of intramedullary supracondylar interlocking nail in the management of supracondylar and intercondylar fractures of distal femur.

Aims and Objectives

1. To give rigid internal fixation. Fractures involving knee joint or fracture near a knee joint should be stabilized with a rigid internal fixation system, so that early mobilisation of the knee can be started.
2. To restore articular congruity at knee and limb alignment. Anatomical reduction of intra articular fractures and fractures near a joint is important to maintain the joint congruity and axis and thereby to prevent arthritis.

3. To foster early knee motion and improve quadriceps and hamstrings power. Early mobilisation is the most important aspect of treatment because, after the first few weeks adhesions of the synovial surfaces and capsular contractures make restoration of movement less and less likely.
4. To study the role of intramedullary supracondylar interlocking nail in the treatment of supracondylar and inter condylar fractures of femur and complications of these fractures.

Materials and Methods

30 patients with 22 supracondylar and 8 intercondylar fractures of distal 15 cms of femur were treated from November 2017 to February 2020 at Pujitha Hospital, Vijayawada.

All fractures were treated operatively using a intra medullary supracondylar interlocking nail. (IMSC).

Most of the patients were brought to the casuality, clinical assessment of skeletal, soft tissue injuries and general condition was done. The selection of cases was random who had supracondylar and intercondylar fractures of distal third of femur.

Vital signs were recorded; peripheral nerve and vascular injuries were also looked for. Local examination of the fractured limb in majority of cases revealed, lateral rotation and shortening from l cm to 4 cm. There was swelling at the fracture site, tenderness, abnormal mobility and crepitus. Out of 30 patients 24 had fresh fractures which were traumatic in nature.

The injured limb of all the patients were immobilized by skin traction as a primary treatment and injectable analgesics were given to relieve pain. X-ray of lower half of thigh including knee joint in AP and lateral views were taken, X-ray of ipsilateral hip is also taken to rule out associated fractures (or) dislocation.

Eighteen patients were male and twelve were female, with an average age of 47.13 years, the youngest having 22 years and oldest 65 years. The mode of injury was motor vehicle accident in 21 patients (70%) and a fall in 9 patients (30%) With fall from a height in 5 patients and simple fall in 4 patients.

There were associated injuries in 7 patients (23.33%). One patient had fracture patella, one had compression fracture of Ll vertebra, with foot drop on same side. One patient had fracture both bones of leg, one had fracture shaft of femur on contralateral side, 1 had a deep wound over petit's triangle and 2 patients had multiple injuries. There were no associated vascular injuries.

One female patient underwent surgery previous to this study twice, once with L plate and later with DCS in whom both the times there was implant failure and it went for non-union. Later she was operated with IMSC nail with static locking. One patient presented to us with bent and broken interlocking femur nail and non union of supracondylar fracture 2 years after surgery. Broken implant was removed and IMSC nail was put to this patient. One more, patient had a pathological fracture of distal femur due to paget 's disease, and this fracture was also fixed by IMSC nail with static locking.

Muller's classification was used to grade the fractures. There were 16-Type Al, 6-Type A2,2-Type Cl, and 6-Type C2 fractures. There were 2 compound fractures with Gustilo's type Il wound. Patients with compound fractures were immediately taken to emergency operation theatre and thorough debridement was done.

The interval between injury and definitive operative treatment ranged from 3 days to 35 days. The delay in surgery was attributable to multiple trauma (or) poor medical condition of the patient. In patients where there was a delay for surgery for more than a month, we used upper tibial skeletal traction.

Once the general condition of the patient is stabilised, definitive treatment is Planned. Pre-operatively routine blood and urine examinations were done. The Patients status for anaesthesia was determined by appropriate investigations. If essential, pre operative blood transfusion was given.

Implants Used Are

1) Intra Medullary Supracondylar Nail (IMSC)

The nail is available in 9mm, 10mm, 11mm and 12 mm outer diameter with wall thickness of 3mm. The available lengths are 20cms, 22cms, 25cms and 30cms. It has an 80 anterior bend near the distal end to accomodate the geometry of the posterior aspect of the femoral condyles. The distal end has a diameter of 14mm for any sized nail.

2) **Interlocking Screws**

These are usually self tapping 5 mm screws used for locking the IMSC nail both proximally and distally.

3**) Cancellous Screws (6.5mm)**

These are used to achieve lag effect, in intercondylar fractures of femur.

Operative Technique

Entry Point

The entry point is made in the center of the inter condylar notch, just (2-5mm) anterior to the femoral attachment of PCL, or approximately 5mm anterior to the posterior cortex. The entry point should be centralised with the condyles in anatomic alignment to ensure that the alignment will not deviate into a varus or valgus position. The entry portal should be aligned with reference to the condyles, not the femoral shaft and if this is neutral to the condyles a long nail will centralise within the isthmus which will help ensure proper alignment of the condyles to the shaft.

Reaming

After creating the entry portal, the awl is removed and a standard ball tipped guide wire is passed. Medullary canal reaming performed distally up to 14mm.

Assembly Preparation

An IMSC nail of proper length and diameter is then connected to the jig and the nail with the jig faced laterally is advanced over the guide wire into the distal condyles. Traction is applied at this time with gentle pull behind the gastrocnemius with the knee in 45-55^0 offlexion. Flexion of more than 55^0 is avoided because the patella will interfere with the entry portal for nail. The nail is passed over the guide wire across the fracture site and into the diaphysis with hand pressure until the distal end of the nail is countersunk by 2-5mm below the surface of the intercondylar notch.

Interlocking

This is performed with standard 5 mm locking screws. Usually distal interlocking screws are placed first and a balanced osteosynthesis is worked out with 3 screws distal in the condyles and 2 screws in the proximal femoral diaphysis.

The hexagonal bolt is then removed to dis-engage the jig. At this point, the knee is taken through a full range of motion to ensure fracture stability and articular function. Then the knee joint is copiously irrigated with pulse lavage and wound closed in layers after putting a suction drain in situ.

Post-Operative Management

Required amount of IV fluids were given, and depending on the amount of operative blood loss and post operativeHb%, one pint of compatable blood is given.

Higher antibiotics and appropriate analgesics were used for all patients. The wound was inspected once on 2ndpost operative day and sutures removed on 10thpost operative day. Mean while check X-ray of the involved part is taken.

In general no post operative external immobilisation was given,

One case above knee P.O.P. slab was given. this is because he had a undisplaced fracture patella.

Patients were started on static quadriceps exercises on 2ndpost operative day and alternatively continuous passive motion program is also started. On 5thpost operative day active range of motion exercises of knee were started. During the 1st post operative week the patient was made ambulant either with crutches or a walker and only touch down weight bearing allowed in patients with stable fixation.

Follow Up

All the patients were followed up regularly at an interval of 4 weeks in the first 3 months and later at 2 monthly intervals. Patients were examined in detail and their progress was assessed both clinically and radiologically. X-rays of the affected femur with knee joint were taken in both AP & lateral views and looked for the signs of union. If

callus is seen at fracture site patient is allowed partial weight bearing, and this is progressed to full weight bearing in successive weeks depending on the progressive healing of the fracture by radiographs.

Observation and Analysis of Data

This series consists of 30 cases of supra condylar and intercondylar fractures of the femur treated surgically by internal fixation with a IMSC interlocking nail between November 2017 and February 2020. All the patients were available for follow up.

Age Distribution

The average age was 47.13 yrs with the youngest having 22 years and oldest 65 years.

Table 1: Age Incidence

Age in Years	No. of Patients	Percentage
21-30	4	13.3
31-40	10	33.3
41-50	6	20.0
51-60	6	20
61-70	4	13.3

Sex Distribution: There were 18 males (60%) and 12 females (40%) in our series.

Table 2: Sex Incidence

Sex	No. of Patients	Percentage
Male	18	60.0
Female	12	40.0

Mode of Injury

21 cases resulted from road traffic accident 5 cases due to fall from a height and 4 cases were from a simple fall at home.

Table 3: Mode of Injury

Type	No. of Patients	Percentage
RTA	21	70.0
Fall from Height	5	16.6
Simple fall	4	13.3

Associated Injuries

Out of 30 patients, 7 patients (23.31%) had associated injuries. One patient had fracture patella, one had compression fracture of Ll vertebra with foot drop on same side. One patient had fracture both bones of leg on same side, one had fracture shaft of femur on contralateral side, 1 had a deep wound over petit's triangle and 2 patients had multiple injuries. There were no associated vascular injuries in this series.

Time of Admission

20 patients presented on the same day of injury to the casuality and 7 patients between 3-5 days. I patient was operated twice elsewhere, once with L-plate and later with DCS but there was implant failure and non union. Later she came to us. 1 patient presented to us with a bent and broken femur inter locking nail with non union 2 years after surgery. 1 more patient had a pathological supracondylar fracture, of left femur, and he was on synthetic cast for 2 months. But, there were no signs of union, so we have to intervene by surgery.

Side Affected

Left femur was involved in 16 patients (53.3%) and right femur in 14 patients (46.6%).

Table 4: Side Affected

Side	No. of Patients	Percentage
Left	16	53.3
Right	14	46.6

Table 5: Fracture Classification

Type	No. of Patients	Percentage
A1	16	53.3
A2	6	20.0
C1	2	6.7
C2	6	20.0

The fractures were classified according to Muller's Clasification for distal femoral fractures.

Type of Fracture: 26 patients (86.6%) had simple fractures and 4 patients (13.4%) had compound fractures with Gustilos type. I & II of 2 each.

Table 6: Type of Fracture

Type	No. of Patients	Percentage
Simple	26	86.6
Compound	4	13.4

Statistics of Surgery

Timing of Surgery: The interval between injury and definitive operative treatment ranged from 3 days to 35 days and about 75% of patients were operated within 1 week. The delay in surgery was attributable to the patients being brought late to the Hospital, Multiple trauma and poor general condition of the patient.

Anaesthesia: Spinal anaesthesia was used in 20 patients, general anaesthesia in 4 patients and epidural anaesthesia in 6 patients.

Technique Used: Closed technique was used in all cases except in 2 cases which needs opening at # Site.

Implants: The various sizes of IMSC nails used are as follows, The minimum diameter used is 10mm and maximum 12mm. The minimum length of nail used is 20 cms and maximum 30 cms.

Table 7: Implants

Size (mm x cms)	Number
10x20	2
11x22	8

11x25	4
11x30	4
12x22	4
12x25	8

Locking

Static locking was done in 28 cases (93.3%) and dynamic locking in 2 cases (6.6%).

Table 8: Locking

Type	No.of Patients	Percentage
Static	28	93.3%
Dynamic	2	6.6%

Bone grafting was used in one case.

Duration of Surgery

The average duration of surgery was about 126 min with minimum of 90 min and maximum of 180 min.

Complications

Intra Operative

In 1 patient with 7 type Al fracture, we want to operate by closed technique.So, a mid line skin incision was given and patellar tendon was split and entry point made. But we couldn't reduce the fracture and pass the guide wire through proximal fragment, on repeated attempts. Then we have to open the fracture site and found that there is interpositioning of muscle between the fragments.

In one case we noticed splintering of intercondylar area while advancing the distal part of the IMSC nail. This was fixed by cancellous screws anteriorly and posteriorly.

There was no shortening or valgus / varus angulation or ligamentous instability in any of the cases.

Post Operative Complications

There were two infections, one is a case of compound fracture and other had a crush injury of ipsilateral foot with infected wound. In the former the infection was deep and infected granulation excised and local antibiotic impregnated & later wound healed. In the later pus was sent for culture and sensitivity. Antibiotics given accordingly and the wound healed gradually.

Time of Discharge

In all other patients wound healed by about 10 days and the statures were removed. Later the patients were discharged after advising, not to bear weight on affected limb, to do active ROM exercises and to come for follow up after 4 weeks.

Condition at Discharge

All the patients except 2 patients with multiple injuries were ambulant on walker /crutches. The average range of knee flexion was 100^0, and only 3 patients had quadriceps lag, one with 5^0 and two other with 10^0.

Follow Up Period

Follow up was available on all patients and ranged from 2 months - 26 months with an average of 9.6 months.

Radiological Union

The time to healing, defined, as the interval to the formation of circumferential bridging callus across the fracture ranged from 10 weeks to 15 weeks (average of 12 weeks) in 24 patients. One patient went for delayed union in whom there was post operative infection.

Dynamisåtion: In 5 patients where there was delayed union, we did dynamisation after10 weeks, and allowed weight bearing partially. Later after 4 weeks we noticed good amount of bridging callus. One patient among these had implant failure, previously.

Movements of Knee Joint

The average range of motion of knee (flexion) was 102^0 with a minimum of 70^0 and maximum of 130^0at the time of resent follow up examination, There is an extension lag of 5^0 in one patient and 10^0 in 2 patients.

Weight Bearing

The duration of non weight bearing ranged from 4-6 weeks (average 4.5 weeks). The average time to full weight bearing was 8 weeks (range 7-10 weeks).

Quadriceps Strength

24 (80%) of the injured extremities had normal strength of quadriceps muscle. One had Grade-4 power and another had Grade-3 power.

Return to Work

As soon as the patient developed sufficient confidence to walk, after good bony bridging of the fracture, they returned to their original duties on our advice. Those cases with delayed union were deliberately kept off from the duties till such time, the fracture showed sound union.

Late Complications

One female patient, (who had implant failure both with L-plate and DCS previous to our study) presented to us with broken IMSC nail 6 months after the Surgery. The reason for this failure was, the patient had delayed union of the fracture and we advised her for dynamisation after 3 months. But patient didn't turn up, and started full weight bearing on the affected extremity which gave way. So, we removed the broken nail and fixed the fracture, again with the IMSC nail of bigger diameter. This time also there was delay in callus formation and we dynamised it after 10 weeks, She had good bridging callus 4 weeks after dynamisation.

TWO patients had mild pain around the distal locking screws while walking. This is because the interlocking screws were slightly longer. We removed these screws after the fracture had healed and the pain was relieved.

In one patient with pathological fracture where static locking was done, we noticed one proximal inter locking screw backing out 2 months after surgery.

Table 9: Complications

SI. No.	Complication	Number	Percentage
1	Difficulty in proximal locking	03	10
2	Infection	02	6.66
3	Delayed union	01	3.33
4	Broken nail	01	3.33
5	Backing out of IL screw	02	6.66
6	Pain around distal locking screw	02	6.66
7	Shortening	01	3.33

NEER and associates assessed the results on the basis of 6 variables namely pain, walking capacity, joint movement, work capacity, anatomy and roentgenograms which were used to analyse the subjective, functional and anatomical condition of each patient. The point system Was used to rate the results, and excellent has > 85

points, satisfactory, 70 to 85 points, unsatisfactory , 55 to 69 points and poor < 55 points.

Table 10: According to Neer's Criteria, Our Study Series Showed

Result	Number of patients	Percentage
Excellent	16	53.3
Satisfactory	10	33.3
Unsatisfactory	2	6.6
Poor	2	6.6

Sanders et al developed a functional evaluation scale, for distal femoral fraction.This evaluation scale assesses ROM, pain, walking ability, return to work, and deformity (alignment and shortening) as measured on radiographs. It is a 40 point scale and excellent has 36 to 40 points, Good - 26 to 35 points, Fair - 16 to 25 points and Poor - 0 to 15 points.

Table 11: According to functional evaluation scale

Result	Number of patients	Percentage
Excellent	14	46.6
Good	10	33.3
Fair	4	13.33
Poor	02	6.66

Table 12: Results for each fracture group

Type	No.	Excellent	Good	Fair	Poor
A1	16	7	5	3	1
A2	6	4	2	-	-
C1	2	1	1	-	-
C2	6	2	2	1	1

Factors which contributed to poor results were infection in 1 patient and the other was due to multiple injuries to the affected limb which delayed the mobilization and function of the limb.

3. Shelbourne K.D & Brueckmann: emphasized more on obtaining full extension of knee than flexion and taken into consideration ROM, angulation, pain & shortening.

Table 13: According to this scale our series showed

Result	Number of patients	Percentage
Excellent	16	53.3
Good	8	26.6
Fair	4	13.3
Poor	2	6.6

Discussion

Supra condylar and intercondylar fractures of the distal femur are complex fractures that are difficult to treat. Successful treatment of intra articular fractures especially in weight bearing joints, requires restoration and maintainence of the congruence of the 2 articular surfaces. The use of plates and screws in the fixation of these fractures has the inherent drawback of producing a load - shielding device. The resultant osteopenia creates a substantial risk of refracture proximal to the plate. This is very much important in elderly patients who have osteoporotic bones. A condylar screw can some what improve reduction in the sagittal plane, but it will not improve varus / valgus alignment over the condylar blade plate.

So intramedullary supra condylar interlocking nailing has become the preferred method of treatment for the fractures of distal femur. Retrograde insertion of an IMSC nail from the knee stabilises fractures below the isthmus and facilitates return of good knee function early compared to lateral fixation devices. Inter locking neutralises the rotation stresses and restricts the telescoping of fragments, thereby preventing rotational instability and shortening.

30 cases of supra condylar and intercondylar fractures of distal femur were studied after fixing them with IMSC nail in a short period of about 2 years 3 months. They were followed up for an average of 9.6 months. The purpose of our study was to evaluate the end results of treatment in these patients.

Age Distribution

The average age of all the cases in this series was 47.13 yrs, showing that the fracture is more common in middle age, and incidentally we found more patients in the age group between, 31 and 50 years.10 out of the 12 females were having > 45 Years. The average age noted by other authors is shown in the table below.

Table 14: Age Distribution

SI. No.	Authors	Average Age
1	John et al [4]	54.5 years
2	John M. Siliski (1989) [5]	47.2 years
3	Lucas S.E. (1993) [6]	39.0 years
4	Gellman R.E. (1996) [7]	50.0years
5	Present study (2020)	47.13 years

Our study 's average age is correlating with that of John.M. Siliski. [5]

Sex Distribution

There were 18 male and 12 female patients, showing slight preponderance towards males. Lucas S.E. et al (1993) [6] also reported male preponderance which is similar to our study. Gelman RE. et al, [7]noticed preponderance towards females in his series.

Nature of Violence

The mechanism of injury was R.T.A (High velocity injury) in 21 patients and a fall in 9 patients. In 4 elderly patients it resulted from a simple fall (low energy trauma) at home all of whom had osteoporotic bones and in 5 due to fall from height. This series showed increased incidence for RTA, in similar with other studies.

Associated Injuries

7 patients (23.3%) had associated injuries in whom, 2 had multiple injuries, denoting that the injury was due to high energy trauma.

Many other authors have reported associated injuries to the popliteal artery and ligaments of the knee joint. However, in this series there were no significant vascular and ligamentous injuries.

Side Affected

In this sereis there is slight preponderance for left sided fractures.

Type of Fracture

All the fractures located in the distal 15cms of the femur were taken for study and in our series of 30 patients, Muller's type-A fracture (Extraaricular) were more in number i.e., about 22 of which 16 were of type Al & 6 were of Type A2. There were 8 type C (intra articular) fractures of which type Cl was 2 and Type C2-6

Gellman R.E. [7] and Lucas S.E [6] in their study reported more munber of cases of Type-C than that of Type-A. There were 2 open fractures of Gustilo's Type-Il.

Surgery

All cases were performed by closed technique except 2 cases of type which needed open technique.

Locking

Static Locking was done in 28 patients and dynamic locking in 2 patients, and that too because of non correspondence of jig for proximal locking.

Bone Grafting

Bone grafting was done in 3 cases, 2 for comminuted fractures and the other for re surgery in a bent femur.

Duration of Surgery

In cases with simple extra articular fractures we could do the surgery fast within 2 hours but intra articular fractures took nearly 3 hours. This time period is in relation with that of studies made by Lucas S.E. and Gellman RE. Who had an average operative time of 156 minutes and 154 minutes respectively.

Radiological Union

The average healing time was 12 weeks in our study with a range of 10-15 wks. Type-A fractures healed faster than Type-C fractures. The average time to union in other studies is shown below.

Table 15: Radiological Union

SI. No.	Authors	Implant	Radiological Union (Months)
1	Gellman et al [7]	IMSC	3.0
2	Danziger et al [8]	IMSC	3.3
3	Present Study	IMSC	3.0

The average healing time, in our study is similar to that of the study made by

Gellman et al and the healing time is more when DCS are L-plate is used.

Movements of Knee Joint

The average range of motion of knee was 102^0.3 patients had extension lag one with 5^0 and 2 other with 10^0, Type A fractures had good ROM compared to Type-C fractures and also younger patients had good knee motion when compared with older patients. The table below shows the average ROM by different authors.

Table 16: Average Knee Range of Motion

SI. No.	Authors	Implant	ROM
1	Kolmert et al [9]	Semielastic Nail	92^0
2	John et al [4]	DCS	120^0
4	Lucas S.E. et al [6]	IMSC	100^0
5	Gellman R.E. et al[7]	IMSC	104^0
6	Present study	IMSC	102^0

The average ROM in this study compares well with that of Lucas & Gellman.

Complications

1) Locking

The intra operative complications we faced is difficulty in proximal locking. This is attributed to the quality and precision of the Indian implants and instruments used which needs improvment.

2) Infection

3) There were 2 infections, while could be treated with appropriate antibiotics.

The studies made by Gellman [7] and Lucas didn't have any infections but SiliskiJ.M. [5] (L-plate) noticed deep infections with compound fractures.

3) **Shortening**

This was not a problem in our study and is similar to that of Lucas S.E. [6] & Gellman R.E., [7] but, in studies made by John M. Silski, [5] and John et al. [4] where L-plate and DCS were used respectively.

4) **Deformities**

None of our patients had varus / valgus angulation, which is in contrast with the studies made by John M. Siliski and John et al [4], who noticed varus/valgus malalignment.

5) **Delayed Union**

This was noticed in 1 patient and advised surgery for dynamisation, but patient lost follow up at that particular period and later came with implant failure. In this case we operated with the IMSC nail again with bone grafting and did static locking after removing the broken implant. This time dynamisation was done after 10 weeks and union was noticed 4 weeks later.

6) **Implant Failure**

One case with implant failure was noticed in our series and Lucas S.E. [6] or Gellman R.E [7]. didn't have any such in their series.

Other complications like malunion, pulmonary embolism and nerve palsy were not a problem in this study.

Several rating systems, for supra condylar fractures are reported in literature. Of them the Functional evaluation scale developed by Sander's et al was chosen because it emphasizes most important patient outcome factors, pain and knee ROM.

Table 17: Comparison of results in percentage WITII other IMPLINTS

SI. No.	Authors/Implant	Excellent	Good	Fair	Poor
1	Study Series (IMSC)	46.6	33.3	13.33	6.66
2	Gellman et al (IMSC) [7]	17.4	65.2	8.7	8.7
3	John M.Si1iski (L-plate) [5]	50.0	60.7	11.6	7.7

The study made by Gellman et al with IMSC had more number of patients with good results which is in contrast to our study where the number of patients were more with excellent results but when both excellent and good results were clubbed the percentage is almost similar in both studies.

Summary

In this study we have taken 30 cases of supracondylar and inter condylar fractures of distal 15 cms of femur which are ideal for inter locking IMSC Nail.

Our aim was to treat these fractures by rigid internal fixation, allow early knee motion and to know the outcome of this IMSC such fractures.

The maximum number of patients were seen in the age group between 31-40yr. Males were slightly more in number compared to females.Regarding mechanism of injury incidence for RTA is more.

In young patients fracture resulted from high velocity injury and in elderly due to simple fall (low velocity injury), because of osteoporosis.

Majority of the cases were simple with only 4 Compound fractures.

Associated vascular and ligamentous injuries are none but other bony injuries are common.

Surgery was performed by closed technique in 28 patients and Open technique in 2 patients with static locking in 28 patients and dynamic locking in 2 patients.

Radiological union is seen at an average of 12 weeks.

Average knee ROM observed is 102^0.

The complications encountered were difficulty in closed reduction due to the pull of Gastrocnemius, difficulty in proximal locking in 2 patients, infection in 2 patients of whom one had compound fracture. 2 patients had mild pain around distal Interlocking screws, and 1 patient with pathological fracture had backing out of single Interlocking screw.

End results were Excellent in 14 cases, good in 10 cases, fair in 4 cases and poor in 2 cases according to Functional Evaluation scale.

Conclusion

This study was conducted to assess the outcome of Intra medullary supra condylar (IMSC) Nail in the treatment of supra condylar and intercondylar fractures of distal femur.

Analysis of our results showed that it is a good method for treating Type-A and Type-C fractures and extended indications for pathological fractures, failed distal femoral osteosynthesis and fractures in osteoporotic bones. In Type-C fractures good articular congruity is achieved by fixing the fragments with condylar screws.

Retrograde insertion of nail stabilized the fractures below the isthmus, and interlocking neutralised the rotation stresses and restricted telescoping of fragments, thereby preventing angulation (varus / valgus), rotational instability and shortening.

This stability allowed us to mobilize the knees early and improve the Range of Motion (ROM) and quadriceps power. These are the advantages noticed with this nail, which are not so, when lateral fixation devices are used. Closed technique has the advantage of less soft tissue dissection, decreased operative blood loss and time and this has to be practised by gaining experience for better results.

Although our period of study is short, within the timeframe we followed up we had encouraging results and IMSC is a good alternative to lateral fixation devices which provides rigid fixation in a region of the femur where a widened canal, thin cortices and frequently poor bone stock make fixation difficult.

To conclude, this study has given 80% success rate both in our set up and also in the hands of other authors who published their series and hence this is a best alternative for fixing supra condylar and intercondylar fractures of distal femur.

The results will be more rewarding if, standard instruments and implants are used, utmost care taken to combact infection in compound fractures of Type I and Il, accurate size of Interlocking screws used to avoid pain around the screws.

The distal femur locking plate with MIPO technique is also been used in place of open method fixation devices and results are comparatively good.

Further clinical research continued with innovation in surgical techniques and implant design will be necessary to improve the results of last decade.

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