

A CLINICAL STUDY ON SURGICAL MANAGEMENT OF TIBIAL PLATEAU FRACTURES-FUNCTIONAL AND RADIOLOGICAL EVALUATIONT. Bhavani Prasad¹, B. Sasibhushan Reddy², B. Vennala³, T. Dinesh Kumar⁴, Sandeep Nalla⁵**HOW TO CITE THIS ARTICLE:**

T. Bhavani Prasad, B. Sasibhushan Reddy, B. Vennela, T. Dinesh Kumar, Sandeep Nalla. "A Clinical Study on Surgical Management of Tibial Plateau Fractures-Functional and Radiological Evaluation". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 43, October 26, 2015; Page: 7737-7752, DOI: 10.18410/jebmh/2015/1045

ABSTRACT: BACKGROUND: Tremendous advance in mechanization and fastness of travel have been accompanied by steep increase in number and severity of fractures and those of tibial plateau are no exception. Knee being one of the major weight bearing joints of the body, fractures around it will be of paramount importance. **AIM OF STUDY:** This study is to analyze the functional outcome of CRIF or ORIF with or without bone grafting in tibial plateau fractures in adults. **MATERIALS AND METHODS:** 30 cases of tibial plateau fractures treated by various modalities were studied from 1-8-2012 to 31-1-2014 at our institution and followed for a minimum of 6 months. Fractures were evaluated using Modified Rasmussen's Clinical, Radiological grading system. **RESULTS:** The selected patients were evaluated thoroughly and after the relevant investigations, were taken for surgery. The fractures were classified as per the SCHATZKER'S types and operated accordingly with CRIF with Percutaneous cannulated cancellous screws, ORIF with buttress plate/LCP with or without bone grafting. Immobilization of fractures continued for 3 weeks by POP slab. Early range of motion was then started. Weight bearing up to 6- 8 weeks was not allowed. The full weight bearing deferred until 12 weeks or complete fracture union. The knee range of motion was excellent to very good, gait and weight bearing after complete union was satisfactory, knee stiffness in 3 cases, wound dehiscence and infection in 1 case and non-union in none of our cases was noted. **CONCLUSION:** Functional outcome is better in operatively treated tibial plateau fractures in adults, because it gives excellent anatomical reduction and rigid fixation to restore articular congruity and early motion thereby preventing knee stiffness.

KEYWORDS: Tibial Plateau, Battress Plate, Internal Fixation, Proximal tibia.

INTRODUCTION: Tibial plateau fractures are one of the commonest intra-articular fractures. They result from indirect coronal or direct axial compressive forces. This makes about 1% of all fractures and 8% of the fractures in elderly. Most injuries affect lateral tibial condyle (55 to 70%) and isolated medial condyle fractures occur in 10 to 23% whereas the involvement of bicondylar lesions is found in 10 to 30% of the reported series.

Due to advancement, especially in orthopedic trauma a better understanding of biomechanics, quality of implants, principles of internal fixation, soft tissue care, antibiotics and asepsis have all contributed to the radical change. Thus we have advanced from the conservative approach to internal fixation in fractures as an acceptable mode of treatment. Nevertheless, tibial plateau fractures remain challenging because of their number, variety and complexity. Despite a

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plethora of articles, written in the past 50 years that have addressed the problems of classification and results of various treatments, the optimal method of management remains controversial.⁽¹⁾

AIMS & OBJECTIVES:

- 1) To evaluate the Functional outcome in tibial plateau fractures treated with CRIF, ORIF.
- 2) To assess and compare Functional vs Radiological outcomes after surgery.

BACKGROUND: The lack of information about fractures of the proximal articular surfaces of the tibia leads to confusion and an inability to agree on a universally acceptable name for these injuries. A workable classification based on clearly defined clinical, radiological entities to separate plateau fractures dislocation on one hand and knee dislocations on other was made.⁽²⁾

Appley G in 1956 showed good results of union, satisfactory knee motion in lateral condyle fractures treated with skeletal traction and early mobilization.⁽³⁾

The fracture of tibial plateau and proximal tibia which extend into the knee joint can produce major disability. At University of Iowa authors began treating tibial plateau and bicondylar proximal tibial fractures with early application of a cast brace. They encouraged early motion, weight bearing to tolerance and unrestricted activities using crutches or other supports only when necessary which lead to improved knee function.⁽⁴⁾

In the early half of the 20th century an author reported two studies having satisfactory percentage of good to excellent short and long term results with surgical method of treatment.^(1,5)

Roberts JM in 1968 reported 100 cases of tibial condyle fractures treated by conservative and surgical. The results were good in 72% conservative, 80% tractions-mobilisation and 81% surgical. He advocated early mobilization, preservation for menisci and repair of torn ligaments for best results.⁽⁶⁾

Another study of 68 cases by Porter B in 1970, both non-surgical and surgical methods observed excellent-good results in 96% of cases by conservative methods with depression < 10mm, 47% in depression >10mm and 80% in surgical methods. They advocated good anatomical reduction for best results.⁽⁷⁾

Schatzker, in 1979, reported 70 cases of tibial plateau fractures of all types treated by conservative (56%) and surgical (44%) methods with average follow-up of 28 months. Acceptable results were obtained in 58% of cases of conservative group and 78% by open methods. Fractures treated by ORIF with buttress plate and bone grafting achieved 88% acceptable results.⁽⁸⁾

A study of 278 cases of tibial plateau of fractures with an average follow up of 2.5 years, all treated by surgical methods. 89% acceptable results when surgery was done by inexperienced surgeons, 97% when done by experienced. They concluded the prognosis improves with the experience and with accurate reconstruction of articular surface. They also said posttraumatic osteoarthritis was directly proportional to the amount of displacement.⁽⁹⁾

Augusto Sarmiento, 1979 in their series evaluated fractures of the proximal end of the tibia, particularly intra-articular ones. They are considered to be difficult management problems because of the malalignment, incongruity and instability that frequently result from their surgical or nonsurgical treatment. Cadaveric and clinical studies reproduced the same results. They concluded

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that loss of articular congruity leads to the degenerative arthritis and is less likely to produce so if joint function is maintained. However, there is no general agreement or clear understanding as to the degree of incongruity, malalignment or residual instability necessary to produce such clinical symptoms.⁽¹⁰⁾

Moore TM reported 132 cases of Tibial plateau fractures – dislocation treated by conservative (35%) and surgical (65%) methods. He concluded that Moore's group III, IV and V had unstable knee and also associated neurovascular impairment.⁽²⁾

A retrospective study of 110 tibial condyle fractures between 1972-78, reviewed using Hohl's 100 point knee rating system treated by all methods showed overall the results were acceptable in 84% of patients.⁽¹¹⁾

Blokker CP, Rorabeck CH and Bourne PB in review and assessment of 60 patients with Tibial plateau fracture over an average follow up of 3 years treated conservatively and surgically showed that single most important factor in predicting the outcome was adequacy of reduction.⁽¹²⁾

Lansinger O in 1986 did a 20 years follow up of his earlier study extended in a series of 260 fractures of one of both condyles. 90% of the patients achieved excellent-good results and 10% achieved fair or poor result. The inferior results were seen in the unstable split – depressed and depressed fractures in which a depression of articular surface >10mm persisted. They also advocated bone grafting for depressed and split depressed fractures. The functional results were done according to 30 points scoring system ⁽¹³⁾.

Lachiewicz PF and Funik's published report in 1990, studied 43 displaced Tibial plateau fracture treated by surgical methods (AO-ASIF principles) and followed for an average of 2.7 years. They obtained excellent - good results in 93% cases. Poor results were due to technical faults or absence of bone graft. ⁽¹⁴⁾

Jensen DB, Rude C, Duus B and Nielsen AB, in their study they evaluated the long term results of 109 tibial plateau fracture, 61 treated by skeletal traction and early knee motion and 48 treated by surgery at an average follow up of 70 months the functional results were much the same, though meniscectomy had been performed in almost half of the surgical procedure. Time in bed and hospital stay was less in surgical group. They concluded that conservative management is a valid alternative to surgery, but should probably be reserved for cases where operation is desirable.⁽¹⁵⁾

The tibial plateau fractures are associated with soft tissue injuries in 10-30% of cases, need to be evaluated pre-operatively as well as after fixation. The ligament injuries to be treated immediately or after fracture union. The instability can be overcome by adequately treating such injuries, is shown by recent studies. ^(16,17)

Segal D in 1993 published a report on treatment of 86 lateral Tibial plateau fracture treated by conservative (49%) and surgical (51%) methods. All Tibial plateau fracture with depression more than 5mm were operated. Overall 95% of patients with Hohl type I, II or V had satisfactory results. Type III fracture treated operatively had good results.⁽¹⁸⁾

Tscherne H and Lobenhoffer P, in their study of 'complex trauma', authors suggest a 4 grade classification system of closed and open soft tissue injury. Preferred treatment is ORIF in all displaced and unstable tibial plateau fracture. Primary treatment includes closed reduction, wound

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debridement, if necessary ORIF and complex bone and soft tissue reconstruction are performed in a second operation after the soft tissue recovery. A follow up study of 190 of 244 cases between 1981-87 showed good results after operative treatment, even in extensive fractures with tolerable complication rate. The functional recovery was relatively impaired in multiple injured patients and in complex knee trauma. ⁽¹⁹⁾

MATERIALS AND METHODS: This is a study of surgical management of tibial plateau fractures conducted in the department of orthopedics at KING GEORGE HOSPITAL, VISAKHAPATNAM between August 2012 to January 2014. Clearance was obtained from hospital ethical committee.

During this period 30 patients were treated for tibial plateau fractures in which all patients were treated by internal fixation, out of which, 10 with Percutaneous cancellous screw fixation method, 9 with ORIF with buttress plate, 7 with ORIF with buttress plate and bone grafting and 4 with Locking compression plate.

All the required data was collected from the patients during their stay in the hospital, during follow up at regular intervals and from the medical records.

The Inclusion Criteria:

- 1) Patient who has been diagnosed as Closed, Unstable tibial plateau fracture.
- 2) Age group of 20–70 years of both sexes.

The Exclusion criteria:

1. Skeletally immature individuals.
2. Open fractures of tibial plateau.
3. Fractures associated with knee dislocation.
4. Patients with associated ipsilateral femur, tibia and foot fractures.
5. All patients are selected on the basis of history, clinical examination and radiography.
6. The Schatzker's classification was used to classify these fractures. The patients were followed up for an average period of 6 months.
7. Fractures will be defined as unstable if any of the following are present:
 - Depression > 4mm.
 - Displacement >10mm.
 - Instability >10°.
8. All cases will be treated with open reduction and internal fixation.
9. Fixation can be done by Cannulated cancellous screw fixation, AO type T or L-plate, Locking Compression Plate.
10. Follow up and assessment will be performed using modified Rasmussen's Clinical and Radiological criteria.

MANAGEMENT: The patients were first seen in the casualty. The history was taken followed by general and local examination of the patient. Concerned specialists undertook appropriate management of the associated injuries. Intensive care was given to those patients who presented with shock and immediate resuscitative measures were taken. Once the patient's general condition

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was fit, relevant X-rays were taken and the degree of instability graded. The patients were taken for surgery at the earliest possible time depending on their medical condition, skin condition and the amount of swelling. All surgeries were done under C-arm image intensifier control. Fractures were fixed either with percutaneous technique or by open reduction and internal fixation. The fixation devices consisted of T-Buttress plate, L Buttress plates, 4.5 mm Cortical screws and 6.5 mm Cannulated and Non-cannulated Cancellous screws.

Bone grafts, Bone graft substitutes were used in depressed and comminuted fractures. The source of bone graft was ipsilateral iliac crest.

POST-OPERATIVE PROTOCOL: Postoperatively patients were immobilized with an above knee posterior slab or a compression bandage for 3 weeks. The sutures were removed on the 12th postoperative day. Antibiotics were given till suture removal by 5 days of intravenous and 7 days of oral. The patients were advised static quadriceps exercises for initial 3 weeks followed by passive range of motion with protected knee brace and non-weight bearing crutch walking up to 6 weeks. After 6 weeks knee mobilization and weight bearing crutch walking was advocated. An immediate postoperative X-ray was also done, later on repeated at 6 weeks, 3 months and 6 months.

FOLLOW UP PROTOCOL: The First follow up was done at 2 weeks, during which the surgical scar was inspected and range of movements noted.

The Second follow up done at 6 weeks during which an X-ray was taken to look for signs of fracture union and loss of reduction if any.

The Third follow up was done at 3 months during which one more X-ray was done and a clinical evaluation of union done. Based on the clinical and radiological signs of union patients were allowed partial weight bearing and gradually progressed to full weight bearing.

The patients were then followed up at 6 months, during which time the anatomic and functional evaluation was done using the modified Rasmussen clinical and radiological criteria.

IMPLANTS USED IN PROXIMAL TIBIAL FRACTURES:

- 1) 6.5 mm Cancellous bone screw with 8mm spherical head and 3.5mm hexagonal recess, thread length 16mm, with 4.5mm shaft, 3mm core, 3.2 mm drill bit and 6.5 mm tap.
- 2) 4mm Cancellous bone screw, with 6mm head, 2.5 mm hexagonal recess, core diameter 1.9mm, 1.7mm pitch, 2.5mm drill bit and 4mm tap.
- 3) 4.5 mm Cortical bone screw, with 4.5mm shaft, 3mm core, 3.2mm drill bit and 4.5mm tap.
- 4) K- wires.

BUTTRESS PLATES:

- T Buttress plate.
- L buttress plate with right and left offset.

LOCKING COMPRESSION PLATES: With Locking screws 4.5mm for Proximal Tibia.

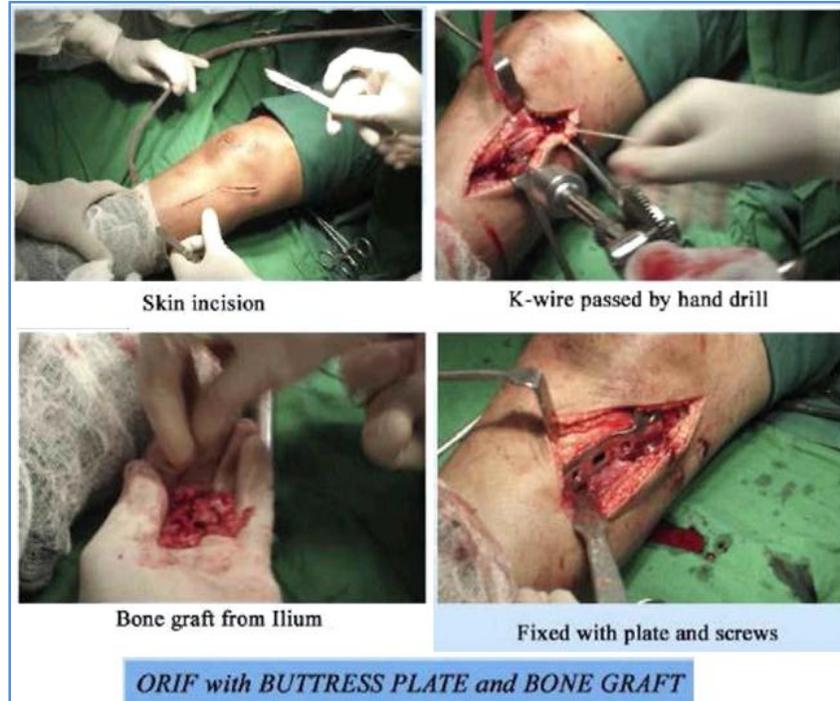
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Instruments



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SEX INCIDENCE: In this study 66.6% were male patients and 33.4% patients were female patients. Highly significant association of this study with male patients.

Sex of the Patient	No of patients	Percentage
Male	20	66.6%
Female	10	33.3%
Total	30	100%

Table 1: Frequency of Sex incidence

AGE INCIDENCE: In this study 66.6% were in the 3rd and 4th decade. Highly significant association fracture in the 3rd and 4th decades.

Age of the Patient	Frequency	Percentage
<30	4	13.4%
31-40	9	30%
41-50	11	36.6%
51-60	6	20%
TOTAL	30	100%

Table 2: Frequency of Age incidence

INCIDENCE IN OCCUPATION: The high incidence of fracture is seen in occupation involved in more mobility like businessmen and employee which is around 53.4%.

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Occupation	No. of cases	Percentage
Employee	8	26.7%
Businessman	8	26.7%
Housewife	8	26.7%
Labourer	6	20%
Total	30	100%

Table 3: Frequency of Occupational incidence

MODE OF INJURY: In this study mode of injury is highly associated with road traffic accident which accounts for about 56.6%.

Mode of injury	Frequency	Percentage
RTA	17	56.6%
FFH	7	23.4%
FLS	6	20%
Total	30	100%

Table 4: Frequency of mode of Injury

SIDE OF INJURY: In this study 63.4% of the patients sustained injury on the left side and 36.6% on the right side. In our study, there was left sided predominance, compared to the right side.

Side of injury	Frequency	Percentage
RIGHT	11	36.6%
LEFT	19	63.4%
Total	30	100%

Table 5: Frequency of Side of injury

TYPE OF FRACTURE:

SCHATZKER'S CLASSIFICATION: In our study, the majority of the fractures were found to be of type II fracture types i.e. Cleavage combined with Depression fractures.

Schatzker	No. Of cases	Percentage
Type Of Fracture		
TYPE I	5	16.6%
TYPE II	9	30%
TYPE III	7	23.4%
TYPE IV	1	3.4%
TYPE V	3	10%
TYPE VI	5	16.6%
TOTAL	30	100%

Table 6: Frequency of Type of Fracture

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METHODS OF TREATMENT: 10 cases were managed with percutaneous cannulated screws, 9 were managed with Buttress plate, 7 by Buttress plate along with B one graft and 4 cases with locking plate.

Methods of Treatment	No. Of cases	Percentage
PCCS	10	33.3%
OR IF with BP	9	30%
ORIF with BP + BG	7	23.3%
ORIF with LCP	4	13.4%
Total	30	100%

Table 7: Frequency of Methods of Treatment

COMPLICATIONS: All fractures united within expected time, not a single non-union was noted in our series. The cases with wound infection also had stiffness of the knee joint.

Complication	No. of cases	Percentage
Knee stiffness	3	10 %
Varus/valgus	1	3.4 %
Deformity		
Infection,wound	2	6.8 %
Dehiscence		
Normal	24	79.8%
Total	30	100%

Table 8: Frequency of Complication

ASSOCIATED LIGAMENTOUS INJURIES:

MCL injury was the most commonly associated ligament injury in our series followed by ACL, LCL.

Aso. Ligament injury	No. of cases	Percentage
MCL	3	10%
LCL	1	3.3%
ACL	2	6.7%
TOTAL	6	20%

Table 9: Associated Ligament injury

All the ligamentous injuries were managed conservatively by a Brace. The patient's function and outcome were good even without addressing these injuries.

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GRADING CRITERIA:

MODIFIED RASMUSSEN CRITERIA FOR CLINICAL ASSESSMENT:

Pain	
None	6
Occasional	5
Stabbing pain in certain position	3
Constant pain after activity	1
Significant rest pain	-3

Walking Capacity	
Normal walking capacity for age	6
Walking outdoor more than one hour	5
Walking outdoor 15 mins – 1 hr	3
Walking outdoor < 15 mins	1
Walking indoor only	0
Wheel chair or bed ridden	-3

Knee Extension	
Normal	4
Lack of extension <10 ⁰	2
Lack of extension >10 ⁰	0
Lack of extension >20 ⁰	-2

Total Range of Motion	
Full	6
Atleast 120 ⁰	5
Atleast 90 ⁰	3
Atleast 60 ⁰	1
<60 ⁰	-3
Stability	
Normal stability in Extension and 20 ⁰ Flexion	6
Abnormal instability in 20 ⁰ Flexion	4
Instability in Extension <10 ⁰	2
Instability in Extension >10 ⁰	0
Power of quadriceps	
Grade 5	2
Grade 3-4	1
Grade < 3	-2
Maximum score	30
Excellent	28-30
Good	24-27
Fair	20-23
Poor	<20

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MODIFIED RASMUSSEN CRITERIA FOR RADIOLOGICAL ASSESSMENT:

Articular depressions:

None	3
<5mm	2
6-10 mm	1
>10 mm	0
Condylar widening	
None	3
<5mm	2
6-10 mm	1
>10 mm	0
Valgus/Varus angulation	
None	3
<10 ⁰	2
10 ⁰ -20 ⁰	1
>20 ⁰	0
Osteoarthrosis	
None / No progress	1
Progression by 1 grade	0
Progression by > 1 grade	-1

Maximum score	10
Excellent	9-10
Good	7-8
Fair	5-6
Poor	<5

CLINICAL EVALUATION: The mean Rasmussen Functional score at final follow up was 25.062 (range 15-30). Out of 30 cases treated with surgical procedure, 10 cases gave excellent result, 15 cases came out with good result, fair in 3 cases and 2 cases had poor result, mainly due to the severity of the injury and infections.

Clinical result	No. of cases	Percentage
Excellent	10	33.3%
Good	15	50 %
Fair	3	10 %
Poor	2	6.7 %
Total	30	100%

Table 11: Clinical Assessment

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RADIOLOGICAL EVALUATION: The mean Rasmussen Radiological score at final followup was 7.68 (range 0-9). Out of 30 cases treated with surgical procedure, 2 cases gave excellent result, 22 cases came out with good result, fair in 4 cases and 2 cases had poor result.

Radiological Evaluation	No. of cases	Percentage
Excellent	2	6.7%
Good	22	73.2%
Fair	4	13.4%
Poor	2	6.7%
Total	30	100%

Table 12: Radiological Assessment

Criteria	Excellent	Good	Fair	Poor
Pain evaluation	13	9	8	0
Walking capacity	13	12	3	2
Extension lag	14	12	3	1
Range of movement	15	8	4	3
Stability	20	10	0	0
Functional results	10	15	3	2
Radiological results	2	22	4	2

Rasmussen's grading

It was also noted that Clinical results had no significant association with follow up Radiographs (Chi square test, p value = 0.176)

DISCUSSION: Aim of study is to assess functional outcome in operatively treated tibial plateau fractures in 30 cases. The analysis of the results were made in terms of - age of the patient, sex distribution, occupation, mode of injury, side of fracture, analysis of the types, modalities of treatment, complications, associated injuries and the functional outcome.

Tibial plateau fractures are more commonly seen in the active productive age group (31-50 years) due to high-energy trauma. Closed treatment of these injuries has had little success in reducing depressed or displaced fracture fragments, this necessitates open treatment in most displaced and unstable fractures. It is extremely important to do a stable fragment fixation and in order to regain the complete range of motion.

In our series majority of the patients were Males. This can be attributed to more involvement in RTA. The significance of tibial plateau fracture-related sex distribution was not available to comment on them.

Occupationally tibial plateau fractures were seen in people with high level of activity, movement and travel. It is most commonly seen with people with high mobility like businessmen (26.7%), employees (26.7%), and labourers (20%).

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In our study, there was Left sided predominance, compared to the right side with left side 63.4% and right side 36.6%.

In our study, the majority of the fractures were found to be of type II i.e. Cleavage combined with Depression fractures account for about 30%. Type IV was least with 3.4%.

In this series we studied 30 cases of tibial plateau fractures treated only by surgical methods. Different authors use different criteria for the surgical management of these fractures. Seppo E, Honkonen conducted 130 tibial plateau fractures taking into consideration the following for the surgical management:

Condylar widening of >5mm Lateral condyle step off >3mm All medial condylar fractures

In our study, the indications for the surgery were the same standard indications as above and 3mm depression was considered as an indication for surgery in our series.

In our series we have not formulated any criteria as to particular method of fixation for particular type of fracture. So each case was individualized and treated accordingly as it needed. Most of the type I, some type II were treated with Percutaneous cancellous screw fixation. The split fracture, of >3mm displacement was treated by ORIF. Bone grafting was included along with ORIF with Buttress plate/LCP and screws in type II, III, IV, V and VI wherever necessary.

The major problem faced by us during the study was Knee stiffness and Infection, hence immobilization was more in these patients for stiffness. The infection might be attributed to nosocomial infection.

In spite of all the associated Ligament injuries and Complications, we were able to achieve 33.4% excellent result, 50% good result (overall 83.4% acceptable results). In addition we have 10% fair and 6.6% poor results. These results are comparable and on par with other documented standard studies.

Study	Satisfactory Results
Rambold, 1992	93%
Seppo E, 1993	86%
Joseph Schatzker, 1986	86%
Our Study, 2012	83.4%

Probably, if we were less invasive at surgery, still more rigid in fixation and further aggressive in physiotherapy, we would not even have had these complications (stiffness & infection) and at the same time would have achieved the best results.

CONCLUSION: To manage different types of tibial plateau fractures depends on good clinical judgment. The surgeon must have sound knowledge of the personality of the injury and a clear understanding of the knee examination, imaging studies and must be familiar with variety of techniques available at present for treating tibial plateau fractures.

The conclusions of these studies are:

- 1) Displaced condylar fractures of tibial plateau those belonging to Schatzker's type I and II, the treatment of choice is Closed reduction internal fixation/Open reduction internal fixation with Cannulated cancellous screws. Results are excellent to good by this method.

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- 2) The main aim of surgical treatment include accurate reconstruction of the articular surface with elevation of the depressed bone fragment, bone grafting, stable fragment fixation allowing early range of movement.
- 3) Schatzker's type III managed operatively with ORIF with Buttress plate and bone grafting gives good to fair results.
- 4) In Schatzker's type IV fractures which were managed by ORIF and Buttress plating had fair to good results.
- 5) In high velocity injuries belonging to Schatzker V and VI which were managed with Buttress plate/LCP, number of good to fair results were seen. This is mainly due to adequate reconstruction of the articular surface during operative period and prevention of collapse of reconstructed articular surface.
- 6) Complication seen in our series are knee stiffness, infection and wound dehiscence and valgus or varus deformities these complications are mainly seen in high energy injuries (Schatzker's type V, VI).
- 7) Retrospectively it was found that high velocity injuries (type V – VI) have poor outcome than low velocity injuries (type I-IV).
- 8) It was also noted that Clinical results had no significant association with follow up Radiographs.

SUMMARY: This is a study of surgical management of tibial plateau fractures involving 30 patients and followed up over 18 months. In our series all patients were treated operatively out of which 10 were managed by CRIF with Percutaneous cannulated cancellous screws, 7 patients were managed by ORIF with Buttress plate and Bone grafting, 9 patients were managed by ORIF with Buttress plate and 4 with LCP. Patients were followed up for a minimum period of 6 months. Functional evaluation of the knee was done, based on Rasmussen clinical and radiological criteria.

Our series concludes that closed reduction and internal fixation with percutaneous cannulated screws is the treatment of choice for displaced fractures belonging to Schatzker type I and II. Schatzker's type III fractures have good results when managed operatively with ORIF with buttress plate and bone grafting. Schatzker's type V and VI managed by ORIF with Buttress plate/LCP and bone grafting provides perfect anatomical reconstruction of the articular surface, stable fixation and early mobilization and has good results.

There were minimal to moderate complications seen in operatively managed patients and high velocity injuries patients. Surgical reconstruction of the articular surfaces reduced the incidence of osteoarthritis. It would be preferable to do follow up for longer period to know the exact incidence of posttraumatic osteoarthritis and other late complications.

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