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A study on clinical, functional and radiological outcome of high velocity tibial plateau fractures managed by dual plating

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Abstract

Tibial plateau fractures are intra-articular fractures of major weight bearing joint [1]. These fractures represent a wide spectrum of severity which ranges from simple injuries with predictably excellent outcome after nonoperative treatment to complex fracture patterns that challenge even most experienced surgeons [2]. Among wide spectrum of operative management Dual plating via two incision is preferred technique as it has its own advantages when compared to other modalities of treatment such as Lateral locking plate, Hybrid external fixator, Ilizarov, LISS, External fixator with limited internal fixation. Hence this study is done to emphasise the importance of double plating in management of Scahtzker type V & VI fractures based on Honkonen Jarvinen criteria (1992) and reported the results.

Keywords: Tibial plateau fractures, dual plating

Introduction

The management of tibial plateau fractures has improved dramatically for the past 50 years. In the early 1950's these fractures were treated none operatively and many surgeons published favourable results by this management [2].

Operative treatment includes:

1. Isolated lateral locking plate
2. Dual plating with lateral locking plate and posteromedial buttress plate
3. Hybrid external fixator
4. Ilizarov
5. LISS

Each technique has its own merits and demerits. Dual Plating is preferred over other techniques as it has several advantages:

- Better visualisation of fracture fragments, especially posteromedial fragment and articular surface [9].
- Dual incision reduces wound complications [9].
- Both lateral and medial column is fixed to obtain stability [6].
- Achieves interfragmentary compression [7].
- Rigid construct [7].

Hence we preferred the dual plating as our fixation of choice and reported the functional and radiological outcome

Aim of the Study

The aim of the study is to prospectively analyse the clinical, functional & radiological outcome of high velocity tibial plateau fractures managed by dual plating at Govt. Kilpauk Medical College Hospital between August 2013 and August 2015.

Materials and Methods

Our study is a prospective study conducted at Department of Orthopaedics, Govt. Kilpauk Medical College Hospital between August 2013 and August 2015.

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Inclusion Criteria

Patients with High velocity tibial plateau fractures who are,

1. Skeletally mature & age between 20-60 years.
2. Included in the criteria of depression / displacement of articular surface of >2 mm
3. Included in Schatzker's Classification of tibial plateau fractures Type V & VI.

Exclusion Criteria

Patients with

1. Open fractures
2. Pathological fractures
3. Associated pre-existing joint disease (osteoarthritis)
4. Associated Neurovascular injury / head injury
5. Skeletally immature patients.
6. Twenty one patients were included in the study who satisfied these criteria.

Age Distribution

Age	Number	Percentage
30-40	7	33.3
40-50	11	52.4
50-60	3	14.3

Sex Distribution:

Male: 16

Female: 5

Mode of Injury All 21 sustained Road traffic accident.

Side of Injury

Side	Number	Percentage
Right	9	42.9
Left	12	57.1

Fracture Types

Fracture type	Number	Percentage
Type V	7	33.3
Type VI	14	66.7

Time of surgery

The average period from day of injury to surgery was 5.3 days with a range between 3 to 9 days.

Post-Operative Follow UP

Patient was reviewed in Out Patient Department every 4 weeks and X rays were taken every month for first 6 months to assess union. Partial weight bearing was started after 8 weeks. Full weight bearing was allowed after radiological evidence of bony union was achieved. After 6 months patients were reviewed every 3 months.

Assessment

The Clinical, Functional and Radiological assessment was done based on Honkonen Jarvinen Criteria (1992).

Our patients had average follow up for 15.7 months ranging from 9 to 22 months.

Result

- The incidence of male was more compared to females in the
- Ratio-3.2:1.
- The nature of injury is high velocity injury as it is explained by all patient sustaining road traffic accident. None had sustained injury as a result of trivial trauma as

occurs in elderly with osteoporotic bone.

- The incidence of fracture in right side was 42.9% and in left side was 57.1% which nearly equal.
- Among 21 cases, the incidence of fracture in age group 40-50 was 52.4%
- Of 21 fractures, 7 patients (33.3%) had Type V fracture and 14 patients (66.7%) had Type VI fracture.
- There were no associated injury in all patients
- All patients underwent standard surgical procedure by anterolateral & posteromedial approach.
- Lateral locking plates were used for lateral plateau and T/L Buttress, Semi tubular, Recon plates were used for medial plateau.
- Bone Grafting was used for 9 patients (42.9%) to fill metaphyseal defect.
- Time required for union ranged from 11 to 16 weeks with average being 12.9 weeks

Result Analysis

Honkonen Jarvinen Criteria was used for evaluating Clinical, Functional and Radiographic results.

HJ Clinical Outcome

Criteria	Excellent	Good	fair	poor
Extension lag	21(100%)	-	-	-
Knee flexion	11(52.3%)	8(38.1%)	2(9.5%)	-
Thigh atrophy	19(90.5%)	2(9.5%)	-	-
Instability	17(81%)	4(19%)	-	-
Mean %	81%	16.6%	2.4%	

- None of the patients had extension lag.
- The average knee flexion was 125.9° with range from 95° to 135°. The reason for fair range of motion in two patients was poor adherence to physiotherapy.
- The average thigh atrophy was 0.09 cm with range from 0-1 cm.
- There was grade 1 anteroposterior instability in 4 patients.

HJ Functional Outcome

Criteria	Excellent	good	fair	Poor
Walking	21(100%)	-	-	-
Stair climbing	20(95%)	1(4.8%)	-	-
Squatting	13(61.9%)	8(38.1%)	-	-
Jumping	11(52.4%)	6(28.6%)	3(14.3%)	1(4.8%)
Duck walking	11(52.4%)	5(23.8%)	4(19%)	1(4.8%)
Mean %	72.3%	19.1%	6.7%	1.9%

- All 21 patients were able to walk excellent.
- 20 patients had excellent stair climbing function but it was impaired in 1 patient due to pain.
- 13 patient were able to squat well while it was impaired in 8 patients due to pain.
- 11 patients were able to jump normally and it was impaired due to pain in 6 patients. 3 patients were able to jump only with the aid of uninjured leg. 1 patient was not able to jump.
- 11 patients were able to duck walk normally and 5 patients were able to keep only a few steps. 4 patients were able to keep only one step. 1 patient was unable to do.

HJ Radiological outcome

Criteria	excellent	good	fair	Poor
Plateau tilt	19(90.5%)	2(9.5%)	-	-
Varus / valgus tilt	21(100%)	-	-	-
Articular step off	18(85.7%)	3(14.3%)	-	-
Condylar widening	17(81%)	4(19%)	-	-
Joint space narrowing	16(76.2%)	4(19%)	1(4.8%)	-
Mean %	87%	12%	1%	-

- 19 patients scored excellent and 2 patients had scored well with $<5^\circ$ plateau tilt compared to opposite side.
- All 21 patients had excellent results with no varus / valgus tilt.
- 18 patients did not have any particular step off. 3 patients had 1-3 mm articular step.
- 17 patients had no condylar widening. 4 patients had condylar widening of 1-5 mm.
- 16 patients did not have any joint space narrowing, 4 patients had $<50\%$ joint space narrowing 1 patient had $>50\%$ joint space narrowing.

Complications

- 3 patients had superficial infection which improved with wound debridement, sterile dressing and intravenous antibiotics.
- 2 patients had knee flexion of $<100^\circ$ which was due to poor physiotherapy.
- 1 patient had implant prominence of 4mm cancellous screw which was removed and revised with another screw.
- 4 patients had occasional pain which was managed with analgesics

Discussion

Complex tibial plateau fractures still remain a challenge to most Orthopaedic surgeons. Road traffic accident being the commonest mode of injury leading to these high velocity fractures. To reconstruct a stable painless mobile knee is a tough task and requires expertise and sufficient technical knowledge. Historically due to poor technique of fixation with dual plates with single midline incision or Mercedes Benz incision, alternate methods of fixation with Ilizarov ring fixation hybrid external fixation were being employed. Single incision technique had high incidence of wound breakdown and infection [6].

With the advent of isolated lateral plating with locking compression plate the spectrum has shifted towards locking plate with medial fragment being stabilised by screws passed through lateral plate. Varus collapse in these patients raised the question of its sustainability and the reason found to be inadequate fixation of posteromedial fragment. This has paved way for dual plating via two incision technique. A double incision Double plating technique is recommended by the Association for Osteosynthesis / Association for the Study of Internal Fixation for the treatment of complex tibial plateau fractures [9].

Locking plates provide fixed angle stability and we hypothesised that using lateral locking plates instead of buttress plate may help to prevent Secondary loss of reduction and alignment. If secondary loss of reduction occurs, osteoarthritis will occur even if primary was satisfactory [8].

In our study, males outnumbered females in the ratio 3.2:1. This is explained by more active life style of males and higher chance of road traffic accidents. This is in accordance with the series of 14 patients reported by Eggli *et al.* in which 10

were male and 4 were female [11]. All 21 patients sustained road traffic accident. Distribution of incidence between sides were near equal. We had 7 schatzker Type V & 14 schatzker Type VI with preponderance of the latter.

Our study reported Honkonen Jarvinen Clinical outcome to be 81% excellent, 16.6% good and 2.4% fair. The functional outcome was 71.3% excellent, 19.1% good, 6.7% fair and 1.9% poor. The Radiological outcome showed 87% excellent, 12% good, 1% fair results.

As this is a short term study, the results may also vary with further follow up.

Bone grafts were used in 9 (42.9%) of 21 patients after elevation of depressed articular surface. The mean time of union was 12.9 weeks ranging from 11 to 16 weeks. Bone grafting did not contribute to faster healing as metaphyseal defects heal well without bone grafts. In the report published by Eggli *et al* bone grafting was employed in 11 of 14 patients [11].

Knee flexion of 95° and 100° was noted in two patients and physiotherapy was encouraged. Superficial infection occurred in 3 patients and healed with debridement, wound dressing and intravenous antibiotics. Occasional pain in 4 patients was managed with analgesics. There were no associated injuries in our patients

Conclusion

- From our study we conclude that,
- High velocity tibial plateau fracture have excellent to good clinical, functional and radiological outcome.
- Early mobilisation of the joint provides good range of motion.
- Posteromedial plating provides a buttress to posteromedial fragment and thereby prevents varus collapse.
- The patients with good soft tissue cover should undergo anatomical reduction and rigid fixation immediately without deferring time.
- This is a short term study and need follow up to predict the further outcome.

Case Illustration

60 year old Male who sustained Road traffic accident to his right leg had Type V Schatzker tibial plateau fracture and was operated after 8 days with ORIF using dual plating. His Post Op Period was uneventful and started Knee Mobilization: 3rd day, partial weight bearing: 12th week, Full weight bearing: 16th week. During his Follow up at 18 months, His HJ clinical, functional and radiological outcome were good



Pre op



Immediate post op



18 Months Post Op



Range of movements

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