FUNCTIONAL OUTCOME OF BICOLUMNAR PLATING IN TIBIAL PLATEAU FRACTURES SCHATZKER TYPE V AND VI USING MODIFIED CLINICAL RASMUSSEN SCORING SYSTEM

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BACKGROUND

Tibial plateau fractures are one of the commonest intra articular fractures. Results from indirect coronal or direct axial compressive forces. Among Tibial plateau fractures, Schatzker type V and VI tibial fractures are complex injuries, usually treated with open reduction and internal fixation (ORIF) using bicolumnar plates.

AIM:

This study was done to determine functional outcome of Schatzker V and VI tibial plateau fractures treated with bicolumnar plates with a regular follow-up of 6 months.

MATERIALS AND METHODS:

Total 34 cases of tibial plateau fracture type V and VI treated with bicolumnar plating via 2 incisions were studied from January 2021 to December 2021 in National Trauma Center, National Academy of Medical Sciences, KATHMANDU. The follow up duration ranged from One week to 6 months. The patients were operated through an anterolateral approach for lateral plate and a medial column plate was put through a minimally invasive medial approach or an open posteromedial approach.

RESULTS:

Total 34 patients were evaluated postoperatively thoroughly for functional outcome by Modified clinical Rasmussen Assessment criteria which showed 3 patients (8.82%) had excellent,25 patients (73.52%) had good,4 patients (11.73%) had fair and 2 patients (5.88%) had poor outcome

CONCLUSION:

We concluded open reduction and internal fixation of high-energy tibial plateau fractures with bicolumnar plates have good functional outcome with minimal soft tissue complications. Thus, a minimally invasive approach should be used which helps in preventing soft tissue problems and helps in early wound healing. Fixation done by Dual plating is important for early mobilization of knee joint. Early mobilization leads to better range of movements and thereby better functional outcome.

INTRODUCTION

Fractures of proximal tibia extending to the knee joint are termed as tibial plateau fractures [1]. Tibial plateau fractures constitute approximately one percent of all fractures [2]. Fractures of the tibial plateau are caused by a combination of varus or valgus force with axial loading which leads to malalignment, depressed articular surface

and high risk of osteoarthritis [3,4]. Tibial plateau fractures are intra articular fractures of the proximal tibia that occurs in adults with high incidence in the fifth decade of life. The fracture pattern is dictated by magnitude and direction of force that injure the knee [5].

Tibial plateau fractures have proved to be fascinating therapeutic challenges during nearly two centuries of written experience. Various treatment methods have been used for years with varying results that ranges from traction**,** closed treatment with bracing, external fixation, percutaneous screw fixation to open reduction and internal fixation with various devices. The most widely used and accepted classification system of tibial plateau fractures is proposed by Schatzker [6].

Tibial plateau fractures have been studied and reported extensively and exhaustively but still controversy exists over its management, whether surgical or conservative. AO/ASIF techniques emphasized on anatomic reconstruction and rigid internal fixation but with such techniques soft- tissue complications occurred in as high as 50% of cases [7,8]. The more interesting fact is excellent results have been published in both groups which gives definitive conclusion of not all fractures of the proximal tibial articular surface require surgery and not all displaced intra-articular fractures need to be surgically reduced [9].

These fractures encompass many and varied fracture configurations that involve the medial condyle (10-23%), lateral condyle (55-70%) or both (11-30%) with differing 4 degrees of articular depression and displacement. In case of improper restoration of the plateau surface and the axis of the leg, these fractures could lead to development of premature osteoarthritis, injury in ligaments, as well lifelong pain and disability [2]. Tibial plateau fractures may be accompanied by meniscal and ligamentous injuries to the knee too [10]. For assessment of the initial injury, planning management and prediction of prognosis, orthopedic surgeons widely use the Schatzker classification system, which divides Tibial plateau fractures into six types. Each increasing numeric category specifies increased level of energy imparted to bone thereby increasing severity of fracture [3]. First four are unicondylar and type V and VI are bicondylar. Each fracture's pattern in Schatzker classification helps to direct orthopedic surgeons to adopt appropriate treatment modality [11].

Schatzker type V and VI are complex Tibial plateau fractures usually associated with high energy trauma. These fractures have intricate injury pattern with compromised soft tissue envelope which lead to unpleasant prognosis with significant morbidity. There has been a dramatic evolution in the management of these fractures in the past century. It started with traction and cast bracing to recent arthroscopic assisted internal fixation. Despite availability of numerous modalities, many patients have unsatisfactory clinical results with significant residual dysfunction and wound complications. Treatment goals of high-energy Tibial plateau fractures are to restore the joint stability, congruity, and alignment with minimal soft tissue dissection to allow early joint motion and weight bearing. However, these aims may be difficult to achieve because of the high complication rates and the poor outcomes associated with the surgical treatment. For example, external fixators often cause permanent joint stiffness due to the restriction of early range of motion following the operation. Traditional open reduction and internal fixation with insertion of a single or double buttress plate through a single incision usually requires extensive stripping of the tenuous soft tissue envelope of the proximal tibia, leading to considerable devascularization of fracture fragments, thus delaying fracture healing and increasing the risks of infection and non-union [12].

OBJECTIVES

GENERAL

- To assess the functional outcome of Bicolumnar plating in Tibial plateau fracture Schatzker V and VI using Modified Clinical Rasmussen scoring system.

SPECIFIC

- To determine pain via visual analogue score.
- To determine range of motion.
- To determine activity limitation.
- To determine the clinical sign of effusion

METHODOLOGY

Ethical clearance was taken from IRB, BIR hospital and Observational study was done in Department of Orthopedics, National Trauma Centre, Mahankal ,Kathmandu and Civil Service Hospital, New Baneshwor, Kathmandu. Duration of study was one year 9 January 2021- December 20210. Purposive sampling technique was used and sample size was calculated to be 34 with the following formula: n=z2 pq/d2, n = (1.96 x1.96 x 0.902x 0.098) / 0.1*0.1 = 34.

All skeletally mature patients (>18 years) with closed tibial plateau fracture Schatzker type V and VI was taken. Open Tibial plateau fractures, associated neurovascular injuries, Schatzker type I, II, III, IV Tibial plateau fractures, Fractures associated with ipsilateral neurovascular deficit and knee dislocation, any previous pathology or fracture around knee joint, any history of surgery around knee joint were excluded.

Data was collected in a pretest proforma which included various demographic parameters like age, sex, etc. Patient from emergency room and orthopedics outpatient department, history, general and local examination were performed. Consultation to the concerned specialists for appropriate management of the associated injuries were done. Intensive cares were given to those patients who presented with shock and immediate resuscitative measures were initiated. Once the patient's general condition was fit, relevant x-rays were taken. Higher investigations like CT and MRI were done as needed for Tibial plateau fractures with ligamentous and meniscal injuries of the knee. Tibial plateau fracture Schatzker type V and VI. Were selected, primarily managed with long knee immobilizer for few days till the swelling subside and subsequently treated with open reduction and internal fixation with bicolumnar plating. Those operated patients were observed in 1 week, 2weeks, 4weeks and 3 months regularly for bony union and post-surgical soft tissue complication. Postoperatively Splints were removed and mobilization of limbs started on the 3rd and 4th postoperative day, non-weight bearing mobilization was started from the first operative week till 6-8 weeks depending on the fracture pattern and partial weight bearing after confirmation of the beginning of healing process till fracture union. Static quadriceps exercises were started on the 1st postoperative day and active or active assisted bedside mobilization was started from 2nd postop day. The patients were then followed up regularly for minimum period of 3 months, and at the end of 6 months clinical evaluation done by using modified clinical Rasmussen criteria [70]

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	3
Walking outdoor <15 mins	1
Walking indoor only	0
Wheelchair or bed ridden	-3
KNEE EXTENSION	
Normal	4
Lack of extension<10 degree	2
Lack of extension >10 degree	0
Lack of extension >20 degree	-2
TOTAL RANGE OF MOTION	
Full	6
At least 120 degrees	5
At least 90 degrees	3
At least 60 degrees	1
<60 degree	-3
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**

RESULTS

Out of 34 cases, 7(21%) were female and 27(79%) were male. 20(58.8%) had right and 14(41.2%) had left knee tibial plateau fracture. 16(47.1%) had Schatzker V and 18(52.9%) had Schatzker VI tibial plateau fracture. Maximum no of cases of age group 21-30 years (35%) and mean age of patient is 39.5 years. RTA causing (76.50%) cases followed by fall injury 23.50 % .38.2% of patient had occasional pain over knee while 29.4% didn't complain of pain and 32.4 % had stabbing type of pain. (38.2%) can walk more than one hour while 35.3% can walk for>15 minutes and 26.5 % walk normally. For range of motion 61.8 % have normal knee extension,35.3% had lack of extension < 10 degree and 2.9 % had lack of extension > 10 degree. 41.2% had full ROM. 67.6 % of patients had grades 5 and 32.4 % had grade 3-4 power of quadriceps. 32 cases had no sign of effusion (95%) and 2 cases had sign of effusion (5%).8.8 % (3) had excellent clinical outcome while 73.5% (12) had good,11.8% (4) had fair,5.9% (2) have poor clinical results.

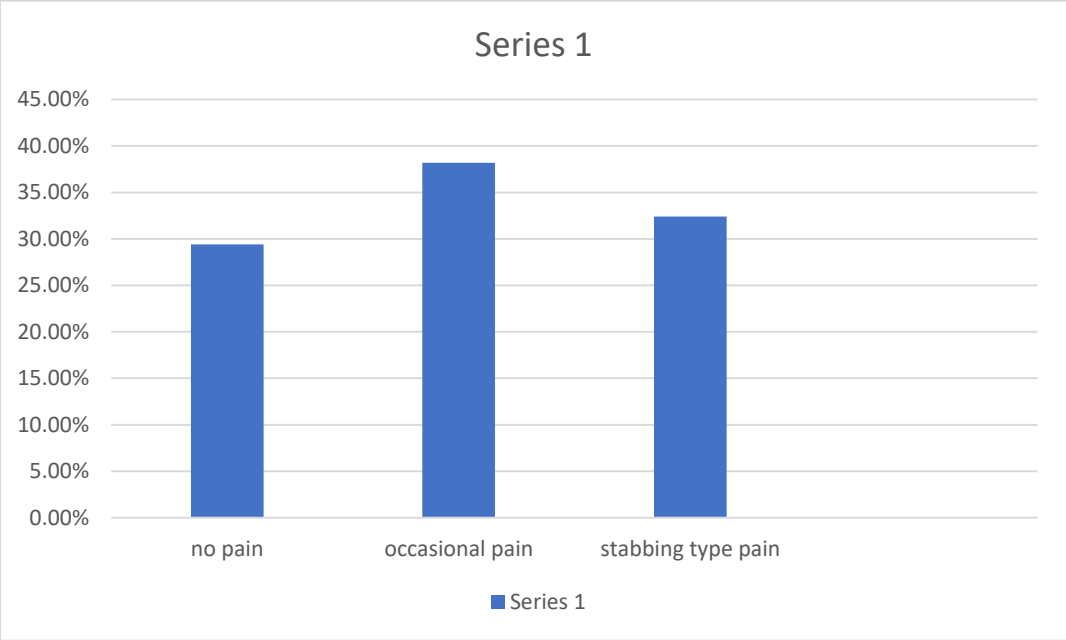

Figure 1 Bar diagram showing pain severity

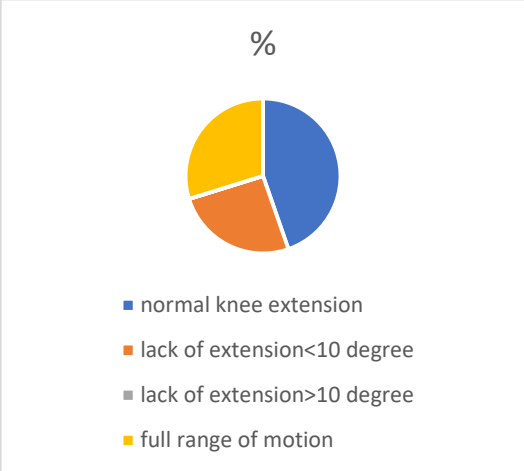

Figure 2 pie chart showing range of motion

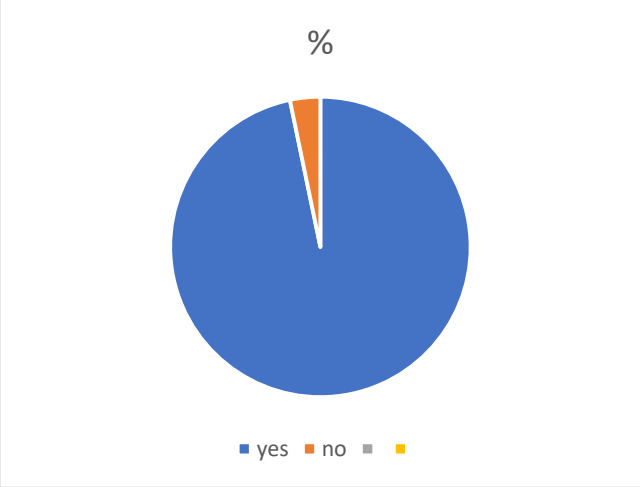

Figure 3 pie chart showing knee swelling

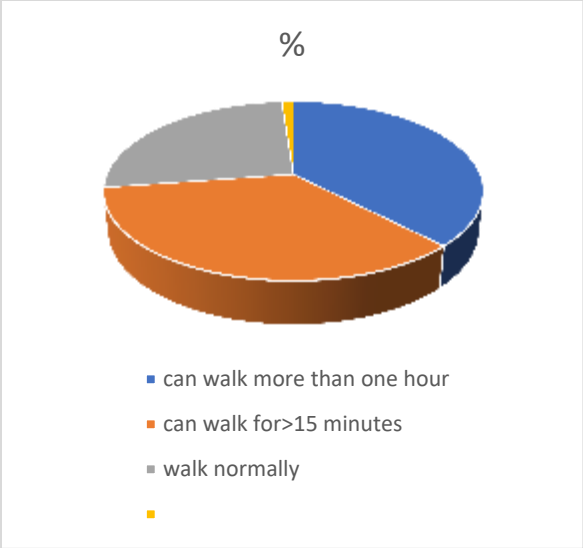

Figure 4pie chart showing activity limitation

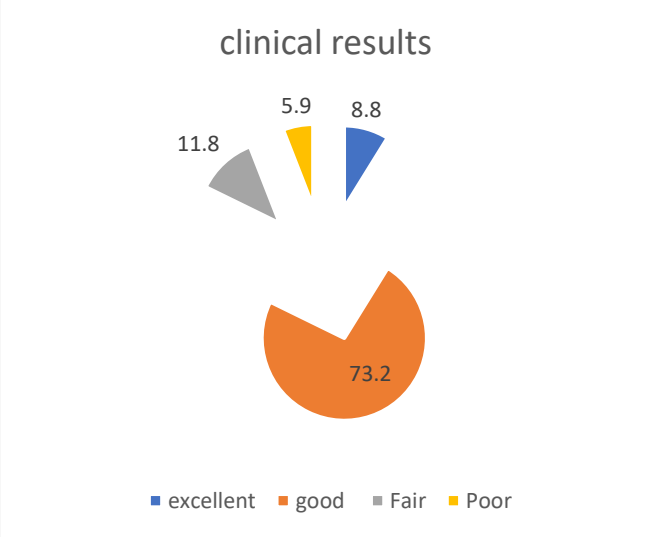

Figure 5pie chart showing clinical results

DISCUSSION

The optimal treatment of tibial plateau fractures SCH type V and VI includes options like cast application, external fixator, limited internal fixation plus external fixator, MIPPO and open reduction and internal fixation with plate. None of them has emerged as standard method of treatment as they have their own advantages and disadvantages. Recent inclination is towards ORIF with bicolumnar plating for tibial plateau fractures SCH TYPE V and VI.

In our study, the mean age of patient who sustained tibial plateau fractures SCH V and VI was 39.5 years. It was comparable with mean age of 31.73 years and 42.98 years in the study done by Yash Parikh et.al [16] and Khatri et.al [15] respectively. younger and economically productive age group of our country sustained these fractures. Incidence of these fractures is higher in males because males are more commonly involved in outdoor activities.

Out of 34 27 (79%) patients were male and rest 7 (21%) were female. These findings are comparable to study done by S. K Venkatesh Gupta and Gottipati Sunil et.al [19], in which, out of 48 patients of tibial plateau fracture, 32(67%) males and 16 (33%) female patients. Most common mode of injury is higher energy trauma like road traffic accident.

Out of the 34 cases studied 26 (76.5%) patients sustained fractures due to RTA, 8 (23.5%) patients were injured in fall injury similar to study done by Dr. Vadhiraj Krishna Jb et.al [14], on 45 cases, 41 (91.1%) cases of RTA. in study done by Yash Parikh et.al [16], 80% cases were of RTA and 20 % cases were due to other cases, which is similar to the results of our study.

Out of 34 patients, 18(52.9%) were of SCH VI tibial plateau fractures while 16(47.1%) cases of them were SCH V tibial plateau fractures, which is comparable to study done by Dr. Kirthi Shivalingaiah et.al [13] which showed 85 % cases are SCH VI tibial plateau fracture. Thus, we can say SCH type VI tibial plateau fracture is more common than SCH type V tibial plateau fractures.

Out of 34 patients, 20 patients (58.8%) had right knee tibial plateau fractures and 14 patients (41.2%) had left knee tibial plateau fractures which is comparable to the study done by Dr. Vadhiraj Krishna JB et.al [14] which showed 24(53.3%) right and 21(46.7%) left knee tibial plateau fractures.

We calculated the functional outcome using modified clinical Rasmussen criteria. which showed that 25 cases (73.5%) had good outcome, 4 cases (11.8) had fair outcome, 3 cases (8.8%) had excellent outcome and 2 cases (5.9%) had poor outcome which was comparable with the study done by Mahesh Kumar Dindivanam et.al [17] in

which, out of 30 cases of 18 months follow up duration, 56.7% had excellent, 26.7 % had good, 10% had fair and 6.7% had poor functional outcome.

CONCLUSION

Open reduction and internal fixation of high-energy tibial plateau fractures with bicolumnar plates has good functional outcome with minimal soft tissue complications. Thus, a minimally invasive approach should be used which helps in preventing soft tissue problems and helps in early wound healing. Fixation done by dual plating is important for early mobilization of knee joint. Early mobilization leads to better range of movements and thereby better function.

LIMITATIONS

Study was limited to 2 hospitals only.

Small sample size.

Less follow up time-6 mts

Doesn't include-

- Schatzker type I, II, III, IV, Open Tibial plateau fractures, associated neurovascular injuries
- Fractures associated with ipsilateral neurovascular deficit and knee dislocation,
- Any previous pathology or fracture, history of surgery around knee joint were excluded

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