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Effectiveness of the different surgical modalities of treatment of tibial plateau fractures

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ABSTRACT

Background: *Fractures that involve the proximal tibia affect knee function and stability. The present study was conducted to assess effectiveness of the different surgical modalities of treatment of tibial plateau fractures and their functional outcomes.*

Materials & Methods: *84 patients of tibial plateau fractures of both genders were divided into 2 groups of 42 each. Group I patients were treated with cannulated cancellous screws in which two/more transverse cancellous screws were used and group II patients were treated with locking compression plate.*

Results: *Group I had 30 males and 12 females and group II had 26 males and 16 females. Outcome found to be excellent in 28 in group I and 20 in group II, good in 10 in group I and 14 in group II and fair in 4 in group I and 8 in group II. The difference was significant (P< 0.05).*

Conclusion: *Both cannulated cancellous screws and locking compression plate were found to be equally effective in management of tibial plateau fractures.*

Key words: Cannulatedcancellous screw, Locking compression plate, Tibial plateau fractures

I. INTRODUCTION

Fractures that involve the proximal tibia affect knee function and stability. Generally, these injuries fall into two broad categories – low energy and high energy fractures. The tibial plateau fractures are usually caused by motor vehicular accidents or bumper strike injuries, once called bumper fractures.[1] Sport injuries, falls and less violent trauma also caused them, especially in elderly with osteoporosis. The tibial plateau fractures produced by high energy mechanisms may be associated with neurological and vascular injury, compartment syndrome, deep vein thrombosis, contusion, crush injury to the soft tissues or open wounds.[2]The spectrum of associated injuries, potential complications and outcomes vary with fracture pattern. Injuries to this joint can result in functional impairment, as they affect knee alignment, stability and movement. These fractures constitute about 1% of all fractures and 8% of fractures in elderly.[3]

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.[4]

Each increasing numeric category specifies increased level of energy imparted to bone thereby increasing severity of fracture. First four are unicondylar and type V and VI arebicondylar. Each fracture's pattern in Schatzker classification helps to direct orthopeadic surgeons to adopt appropriate treatment modality.[5]The present study was conducted to assess effectiveness of the different surgical modalities of treatment of tibial plateau fractures and their functional outcomes.

II. Materials & methods

The present study was conducted among 84 patients of tibial plateau fractures of both genders. Their enrolment in the study was initiated after they agreed to participate in the study.

Data such as name, age, gender etc. was recorded. They were divided into 2 groups of 42 each. Group I patients were treated with cannulated cancellous screws in which two/more transverse cancellous screws were used. Indication was Schatzker's Type I and few type II fractures and group II patients were treated with locking compression plate. Indications was type VI fracture patterns. Local examination of the operated site was done such as range of motion, power, tone, muscle wasting etc. Radiological assessment of union and fracture callus quality were done in addition to functional limb assessment by Rasmussen's in follow up period. Results of the study was recorded and assessed statistically using Mann Whitney U testwith p value less than 0.05 significant.

III. Results

Table I Distribution of patients

Groups	Group I	Group II
Method	Cannulated cancellous screws	Transverse cancellous screws
M:F	30:12	26:16

Table I, Graph I shows that group I had 30 males and 12 females and group II had 26 males and 16 females.

Graph I: Distribution of patients

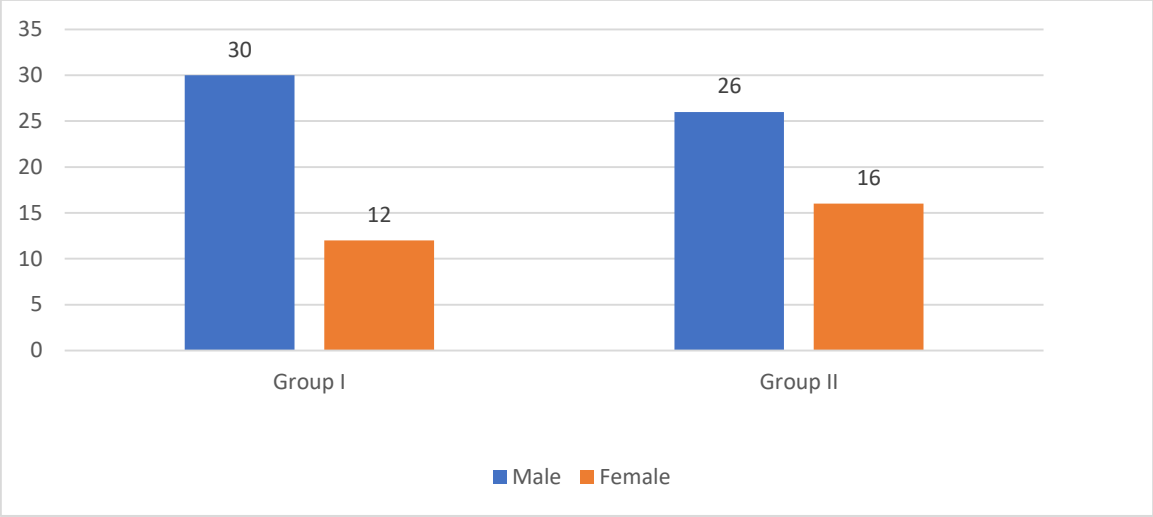
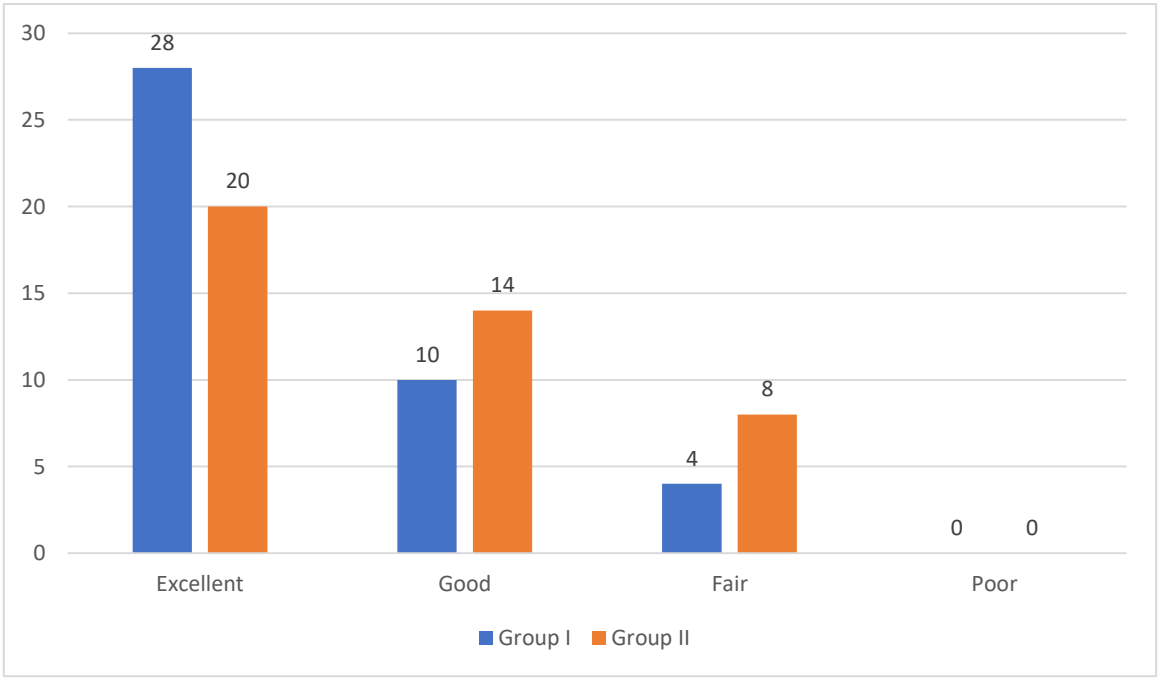


Table II Functional outcome

Outcome	Group I	Group II	P value
Excellent	28	20	0.05
Good	10	14	0.09
Fair	4	8	0.02
Poor	0	0	0

Table II, graph II shows that outcome found to be excellent in 28 in group I and 20 in group II, good in 10 in group I and 14 in group II and fair in 4 in group I and 8 in group II. The difference was significant (P< 0.05).

Graph II: Functional outcome



IV. Discussion

Tibial plateau fractures result from indirect coronal and/or direct axial compressive forces. Although historically these fractures usually occurred when the bumper of an automobile struck the lateral aspect of a pedestrian's leg, recent series have indicated that tibial plateau fractures are now most commonly the result of falls and motor-vehicle accidents.[6]Fracture-fragment size, location, and displacement are determined by the magnitude, direction, and location of the generated force, the bone quality, and the degree of knee flexion at the moment of impact.[7] The interplay of varus stress and compression results in medial plateau fractures, while the combination of valgus stress and compression produces lateral fracture patterns. The prevalence of lateral plateau fractures is related to the valgus inclination of the anatomic axis and the usual lateral direction of the applied force.[8]The present study was conducted to assess effectiveness of the different surgical modalities of treatment of tibial plateau fractures and their functional outcomes.

In present study, 84 patients were divided into 2 groups of 42 each. Group I patients were treated with cannulatedcancellous screws and group II patients were treated with locking compression plate. Group I had 30 males and 12 females and group II had 26 males and 16 females. Lee et al[9] conducted a study in which thirty-six

tibial plateau fractures in 35 patients were treated with the less invasive stabilisation system (LISS). Patients' mean age was 42 years. There were 27 type C fractures and nine type B fractures according to AO/OTA classification. The average time to healing was 4.2 months (3-7 months). Deep infection developed in two cases. One patient healed in 6 degrees of varus, and seven patients had an increased articular angulation of 6 degrees (4-8 degrees) in the sagittal plane. There were no cases of loss of reduction, non-union, or deep vein thrombosis. The LISS system could be considered for the management of tibial plateau fractures.

We found that functional outcome found to be excellent in 28 in group I and 20 in group II, good in 10 in group I and 14 in group II and fair in 4 in group I and 8 in group II. Pasaet al[10]used fixation with a cancellous screw and washer in 25, and a buttress plate in 27 patients. They also reported that better results were achieved in treatment of intra-articular fractures of the proximal tibia by minimally invasive fixation with cancellous screws. Rademakerset al[11]analysed the long-term functional and radiologic results of surgically treated fractures of the tibial plateau.Two hundred two consecutive tibial plateau fractures were included in this study. Functional results of these 109 patients were graded with the Neer- and HSS-knee scores. Radiologic results were graded with the Ahlbäck score. An uneventful union was present at the 1 year follow-up in 95% of the patients, along with a mean knee ROM of 130 degrees (range, 10-145 degrees). One hundred nine patients had a long-term follow-up visit after a mean period of 14 years (range, 5-27 years). The mean ROM at this time was 135 degrees (range, 0-145 degrees). Functional results showed a mean Neer score of 88.6 points (range, 56-100 points) and a mean HSS score of 84.8 points (range, 19-100 points). Monocondylar fractures showed statistically significant better functional results compared to bicondylar fractures. In 31% of the patients, secondary osteoarthritis had developed but was well tolerated in most (64% of the patients). Patients with a malalignment of more than 5 degrees developed a moderate to severe grade of osteoarthritis statistically significant more often (27% of the patients) compared to patients with an anatomic knee axis (9.2%; MWU, P = 0.02). Age did not appear to have any influence on the results.

Ratcliff et al[12]compared the mechanical stability of a medial tibial plateau fracture model secured with a lateral locking periarticular plate versus a medial buttress plate in cyclic testing and load to failure.Medial tibial plateau fractures were created in 6 matched pairs of fresh cadaveric tibias. In each pair of tibias, 1 side was randomly selected to be fixed with a lateral locking plate on 1 side and the contralateral limb to be fixed with a medial buttress plate. The fixated tibias then underwent cyclic testing followed by single-cycle failure compressive loading. Statistical analyses revealed relevant trends in fixation strength during cyclic testing, but neither the mean maximum displacement during nor mean residual displacement after cyclic testing were statistically different between the 2 fixation techniques. Statistically significant differences were observed for the mean forces to failure however. The medial buttress plate construct provided greater fixation strength with its failure force of 4136 +/- 1469 N compared with the lateral locking plate mean failure force of 2895 +/- 1237 N ($P < 0.05$).

V. Conclusion

Authors observed that cannulated cancellous screws and locking compression plate were found to be equally effective in management of tibial plateau fractures.

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