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To study the functional outcome of tibia plateau fracture managed with internal fixation and bone grafting

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Abstract

Introduction: Proximal tibial fractures are common with an incidence of 10.2/100.000. Those displaced and involving the articular surface will often require surgical treatment These are especially challenging to surgeons because of their complexity and variety. In this article we are discussing about the functional outcome of tibia plateau fracture with internal fixation and bone grafting (SCHATZKER TYPE 2,3,4)

Aim of Study: To assess the functional outcome of tibia plateau fracture with internal fixation and bone grafting (SCHATZKER TYPE 2,3,4)

Materials and Methods: 46 patients were studied with tibia plateau fracture which were managed with open reduction and internal fixation with bone grafting at our institute.

Results: All the selected 46 cases were followed up. The average time for union of fracture was 14weeks ranging from 18-20 weeks. Weight bearing was permitted only after radiological signs of union or after minimum 12 weeks. An average mean time for achieving range of motion of about 0-100 degree was around 7 days with ranging from 4-13 days. Postoperative complications that were observed included pain, wound dehience, varus/valgus collapse, knee stiffness/arthritis

Conclusion: open reduction and internal fixation of depressed tibia plateau fracture with bone grafting has been found to give good functional outcome and results

Keywords: Patients, Grafting, Fragments.

Introduction

Proximal tibial fractures are common with an incidence of 10.2/100.000 (1)

Each tibia plateau fracture type has its own features

morphology and respond differently to different modalities of treatment Fractures of proximal tibia are especially challenging to surgeons because of their number, variety, and complexity. The treatment of tibial plateau fractures is evolving. Surgical treatment involves reduction of the fracture, management of subchondral bone defects with a bone substitute, and fixation of the fracture with an angular stable plate [(2)] ·Open reduction and internal fixation has been implicated by using good choice of implants like locking compression plates, buttress plate ,L plate with bone grafting to achieve good outcome and optimal knee function.

Aim of study

To study the functional outcome of tibia plateau fracture (schatzker type 2, 3, 4) using open reduction and internal fixation with bone grafting

Method

The study will comprise of 46 patients with tibia plateau fractures admitted in male and female ward in our hospital. Demographic data of the patients were obtained from data sheet recorded at admission in the hospital. All patients were subjected to same protocol of investigations in form of X ray (knee with leg lateral and antero-posterior) and CT (knee with leg plain ct) scans, temporary splints, limb elevation and ice fomentation to decrease the swelling. After confirmation of diagnosis on CT scans and X ray's patient will be posted for surgery after taking operative consent with due anesthetic fitness. Patient will be operated with autologous bone graft after taking consent for bone grafting.

All our patients were operated under regional anaesthesia in supine position on a standard operative table. All the cases were operated by antero-lateral approach. Reduction of Intraarticular fragments was confirmed by image intensifier and a sub-meniscal arthrotomy was done as needed. In type II, fractures lateral plateau was rotated laterally with it's soft tissue attachments. This allows for direct inspection of the joint impaction. The depressed articular fragments were elevated and directly reduced. In bicondylar fractures, in addition to lateral tibial plateau fixation, the medial fragment was fixed with 6.5mm cancellous screws using lag screw principle. In type III fractures, cortical window was made below the depressed condyle and the articular depression was elevated by periosteal elevator. Autologousillac crest graft were used to support the articular surface and fill the bone defect. The reduced articular fragments were temporarily fixed by multiple K-wires, buttress plate was then applied on the antero-lateral aspect of tibial condyle and secured with appropriate cancellous screws. Cortical screws of size 4.5mm were used to attach the plate to shaft of tibia.

All patients will be assessed after taking consent for clinical pictures during intra OP with and post op period for operative timing, blood loss intra operative and post operative complications, hospital stay. Postoperatively patients were given skin traction and mobilisation. Check dressing will be done on 2nd, 5th, and 8th day. Isometric quadriceps exercises and intermittent and knee range of motion were encouraged from 3rd day. Suture removal will be done on 12th day. Then follow up after 1st, 2nd, 3rd, 6th month. The radiologic evaluation and functional assessment were done according to Rasmussen 's knee score.

Inclusion criteria

- Adult patients over age 18 yrs up to 65 yrs of age both male and female having closed proximal tibia fracture.

- Radiological diagnosis of fracture with classifications based on schatzker classifications type 2,3,4.
- All cases will be treated with open reduction and internal fixation and with bone grafting.
- Fixation can be done by Cannulated cancellous screw fixation, T or L-plate buttress plate, Locking Compression Plate.
- Follow up and assessment will be performed using modified Rasmussen's Clinical and Radiological criteria.

Exclusion criteria

- Patients with age above 65 yrs
- Patients with medical contraindications to surgery
- Patients with compound fracture of proximal tibia and soft tissue injury around knee
- Patients with manifest infection
- Radiological assessment of fracture with Schatzker's classification.[3,4,5]

Table 1: Schatzker Classification (3,4,5)

Type I	Pure cleavage
Type II	Cleavage combined with depression
Type III	Pure central depression
Type IV	Fractures of medial condyle
Type V	Bicondylar fractures
Type VI	Plateau fracture with dissociation of Metaphysis and diaphysis

Table 2: Modified Rasmussen Criteria For Clinical Assessment (3,4,5)

Clinical characteristics	Score
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
Walingoutdoor15min-1 hr	3
Walking outdoor <15min	1
Walking in door only	0
Wheel chair or bedridden	-3
Knee extension	
Normal	4
Lack of extension<10º	2
Lack of extension >10º	0
Lack of extension >20º	-2
Total range of motion	
Full	6
Atleast120º	5
Atleast90º	3
Atleast60º	1
<60º	-3
Power of quadriceps	
Grade5	2
Grade3-4	1
Grade<3	-2
Maximum scores	30
Excellent	28-30
Good	24-27
Fair	20-23
Poor	<20

Results

Table 3: Schatzker Type wise distribution of the study.

	Frequency	Percent
2	23	50.0

3	13	28.3
4	10	21.7
Total	46	100.0

Table 4: Side wise distribution of the study

	Frequency	Percent
L	33	71.7
R	13	28.3
Total	46	100.0

Table 5: Associated Injury wise distribution of the study

	Frequency	Percent
NIL	38	82.6
Bimalleolar #	1	2.2
Calcaneum fracture	1	2.2
Clavicle #	2	4.3
Collles #	1	2.2
Femur shaft #	1	2.2
Patella #	1	2.2
Radius ulna shaft#	1	2.2
Total	46	100.0

Table 6: Mode of fixation wise distribution of the study

	Frequency	Percent
Buttress plate	40	87.0
Cancellous screw	6	13.0
Total	46	100.0

Table 7: Complication wise distribution of the study

	Frequency	Percent
Nil	31	67.4
Infection	2	4.3
Loss of reduction	2	4.3
Pain	6	13
Stiffness	5	10.9
Total	46	100.0

Table 8: Descriptive Statistics of the study

	N	Minimum	Maximum	Mean
Rom in days	46	4	13	6.15
Union time in weeks	11	11	14	12.18

Fig :1 bone graft used to fill the void.

Fig 2:intra op reduction tibia plateau fracture

Fig 3:clinical pic of patient after 6 months follow up

The range of motion was 10 to 80 degrees at the 2-week follow-up, 0–125 degrees at the 6-week follow-up, and 0–140 degrees (full range of motion) at 12 months. The patient performed 15 rises in the 30-second chair-stand-

test at the 2-week follow-up and 29 rises at the 1-year follow-up.

Discussion

Tibial plateau fractures are difficult to treat considering the local skin condition and fear of compartment syndrome. The majority of depressed tibial plateau fractures are occurs due to high speed motor vehicle accidents, violent trauma and fall from height where fractures results from direct axial compression usually with a valgus (more common) or varus moment and indirect shear forces. Aim of study was to find out results of type 2,3,4tibial plateau fractures with internal fixation and bone grafting. The objective of treatment of tibial plateau fractures is precise reconstruction of the articular surface. Most surgeons preferred to elevate significantly depressed articular surfaces in an attempt to avoid deformity or instability. The goal of operative treatment is restoring the depressed articular surface to its normal level and maintain it until fracture healing occurs [5]. The traditional operative method consists of elevating the depressed articular fragment and fill the void with bone graft. Once reduction of articular surface was achieved there was a large cavity beneath the elevated articular surface. This space was filled by harvesting bone grafts from iliac crest and filling the cavity. This filling with bone grafts gave minimal support to the elevated articular surface, So the elevated articular surface had to maintained at the elevated level. We in our analysis of schatzker type 2,3,4,treated by elevation bone grafting and cancellous screw/ plating fixation have found good results. Comparing of our results with these studies found that the functional results we obtained were similar to them. For fractures with depression of more than 5-10 mm indirect reduction achieves of articular surface. Image intensifier or C-arm machine can be used to assess articular congruence. The use of bone allografts to support the articular surface after reduction is debatable. In tibial plateau fractures with significant depression of articular surface ,bone graft are used to maintaining elevation of a depressed tibial plateau fragment. Superiority one bone graft substitute over other is still debatable. Cancellous autograft from the iliac crest has been the "gold standard" but recent studies has mentioned complications read to it [(6)]A study has found that synthetic bone substitutes have good results as compared to biological substitutes for preventing loss of reduction [(7)]It is important to know that surgical technique of implementation is as important as type of bone graft used Veitch et al. suggested a compaction morselized bone grafting technique [8] for better support, especially in the elderly osteoporotic patient, but did not allow early weight bearing. The use of large fragments of bone allograft, which afterward is highly compacted, provide excellent mechanical stability. Careful evaluation of fracture personality and surrounding soft issue, timing of surgery as well as handling of soft tissue can optimize treatment results in tibial plateau fractures [6].

The technique is a good method to permit early mobilization with good functional outcome.

Conclusion

In our study, we have assessed the functional outcome of depressed tibia plateau fractures managed with internal fixation and bone grafting using Rasmussens scoring system. Internal fixation of depressed tibial plateau fractures with elevation of depressed fragment and filling of void with bone graft gives excellent to good functional outcome with advantages of having anatomic reduction with congruent articular surface, less

degenerative changes etc. Rigid fixation obtained with plate and screw fixation with bone grafting results in lesser complications of loss of reduction, varus /valgus collapse, post-operative stiffness etc Regaining full range of movements depends on early and aggressive knee mobilization, and this goes a long way in ensuring optimal functional recovery and patient satisfaction.

We conclude that Internal fixation of depressed tibial plateau fractures with elevation of depressed fragment and filling of void with bone grafting is a promising option for treating such fractures as it provides better mechanical support and osteogenic potential, a good reduction and functional recovery with relatively fewer complications .

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