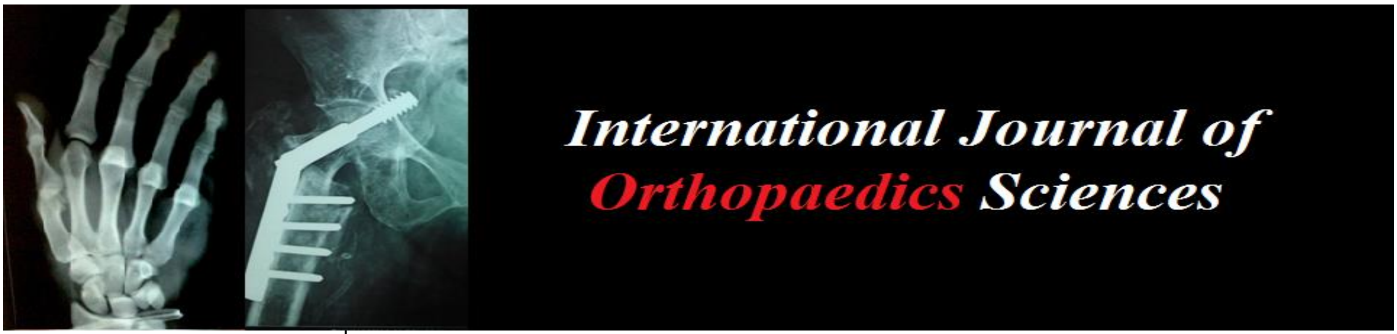

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Clinical profile of patients with tibial plateau fractures

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Abstract
It is estimated that approximately $1/3^{rd}$ of the tibial plateau fractures have an associated ligamentous injury. These ligamentous injuries may be the cause of postoperative residual knee instability resulting in poor functional outcome. The ligamentous injuries can be diagnosed using stress radiographs, clinical examination, and arthroscopy and MRI studies. The most frequently injured structures are the medial and lateral collateral ligaments, menisci and the anterior cruciate ligament. All cases of type VI Schatzker tibial condyle fractures on presentation to the emergency department were treated by initial resuscitation and temporary stabilization of fracture by lower tibial skeletal traction and later treated by definitive surgery. All the open fractures were grade IIIa according to Gustilo and Anderson's classification. 75% (15) of the patients were operated within 2 weeks of injury. The average delay for definitive surgery was approximately 12 days. There was a minimum delay of 5 days and maximum delay of 30 days.

Keywords: tibial plateau, arthroscopy, MP fracture

Introduction

The tibial plateau refers to the flattened articular surface of the upper end of tibia. The fractures of the proximal tibia involving the articular surface are referred to as tibial plateau fractures (TPF).

A clear understanding of the magnitude and direction of the forces responsible for the injury is essential to understand fracture patterns.

TPF are a result of forces acting predominantly in the frontal and transverse planes. Varying degrees of valgus/varus forces combined with axial loading result in the commonly described patterns of the TPF. [1]

The other factors that influence the pattern of fracture are the age of the patient, the density of the subchondral cancellous bone and the degree of flexion/extension of the knee at the time of injury and severity of injury. The magnitude of injury determines the degree of comminution and the displacement.

It is important to differentiate between the pure plateau fracture pattern and the fracture dislocation patterns that are associated with much greater degrees of instability, soft tissue damage and neurovascular injury [34].

In the classic "Bumper" fracture, there is a medially directed blow to the lateral aspect of the knee. This results in a primary valgus deforming force with associated axial loading of the lateral plateau by the lateral femoral condyle (between 1600-8000 lbs.). The femoral condyle exerts both a shearing and compressive force on the underlying TP. This result is a split fracture of the lateral TP with/without depression of the articular surface depending on the density of the subchondral bone [1].

The MCL acts like a hinge as valgus force drives the lateral femoral condyle into the TP. The LCL acts in a similar way with varus forces causing MP fracture.

The degree of flexion of the knee at the time of valgus loading determines the position of the LP fracture with the fracture being more posterior with increasing flexion [2].

With increase magnitude of trauma the lateral plateau displaces downwards and laterally and can result in an associated fracture of the neck of the fibula.

With the primary force is an axial compression force (exceeding 8000lbs) associated with valgus/varus loading as seen in fall from a height on an extended knee or due to high energy motor vehicle accidents, a severely comminuted fracture results. The configuration may include Bycondyler fracture with severe impaction and comminution of one or both articular surfaces or a comminuted plateau fracture with partial/complete dissociation of metaphysis from the diaphysis. [3]

It is estimated that approximately 1/3rd of the tibial plateau fractures have an associated ligamentous injury. These ligamentous injuries may be the cause of postoperative residual knee instability resulting in poor functional outcome. The ligamentous injuries can be diagnosed using stress radiographs, clinical examination, and arthroscopy and MRI studies. The most frequently injured structures are the medial and lateral collateral ligaments, menisci and the anterior cruciate ligament [4].

Though there is widespread evidence that knee ligament injuries associated with tibial plateau fractures must be repaired, primary repair is not always indicated. Primary repairs, ligament augmentation and reconstruction are difficult because of the presence of a fracture and associated internal and external fixation devices. Primary repair may prolong the operative time and predispose to infection [5].

In these patients, protected knee joint motion in a hinged knee brace, together with vigorous rehabilitation is advocated. In cases of persistent functional disability, late ligament reconstruction can be undertaken once the fracture has healed and the fixation devices removed.

Methodology

During the study period, 20 patients with Schatzker type VI tibial condyle fracture were treated by Ilizarov hybrid external fixator and followed up to evaluate the results. Al the required data was obtained from the patients during their stay in the hospital or during follow-up and from the hospital records, and recorded in the proforma.

All cases of type VI Schatzker tibial condyle fractures on presentation to the emergency department were treated by initial resuscitation and temporary stabilization of fracture by lower tibial skeletal traction and later treated by definitive surgery.

Plain roentgenograms were taken in the antero-posterior and lateral views and the following points noted.

- Schatzker type VI tibial condyle fracture confirmed
- Amount of articular surface widening
- Amount of articular surface depression

In highly communicated fractures, CT scan with 3D reconstruction was done to know about the fracture fragments. MRI and arthroscopic studies were not done. Preoperative and postoperatively antibiotics were given for all patients.

All surgeries were performed under either spiral or lumbar plexus block with Sciatic nerve block. Tourniquet was not used in any of the patients. Patient was positioned supine on the fracture table. Traction was given along the axis of the limb, fracture reduced by closed manipulation with the help of C arm. Condyles were fixed with 6 mm cannulated lag screws and olive wires. The cannulated screws were placed close to the articular surface so that the external fixation pins could subsequently be inserted inferior to the screws at a distance from the joint surface. The fracture at metaphysiodiaphyseal junction was stabilized by preassembled Ilizarov circular external ring fixator. Image intensifier views obtained in two planes assisted in the assessment of the reduction and in the placement of the cannulated screws. Extensile exposures, osteotomies of the tibial tuberosity, meniscal elevations, and other wide exposures of the joint surface were not used. Repairs of the ligaments and meniscectomies were not performed.

In one patient miniarthrotomy was done to reduce the fracture and for bone grafting using G bone. No patient had arthroscopically assisted reduction. The alignment of the shaft with the condyles was evaluated with the aid of fluoroscopy. Open approaches were not used to reduce the shaft to the condyles, thereby minimizing any additional soft-tissue stripping of the proximal part of the tibia.

Results

Table 1: Side affected

Side	Frequency	Percent	Cum Percent
Right	9	45.0%	45.0%
Left	11	55.0%	100.0%
Total	20	100.0%	100.0%

Table 2: Type of fracture

Type of fracture	Frequency	Percent	Cum Percent
Closed	15	75.0%	75.0%
Open	5	25.0%	100.0%
Total	20	100.0%	100.0%

All the open fractures were grade IIIa according to Gustilo and Anderson’s classification.

75% (15) of the patients were operated within 2 weeks of injury. The average delay for definitive surgery was approximately 12 days. There was a minimum delay of 5 days and maximum delay of 30 days.

Table 3: Duration of hospital stay

Hosp stay (wks)	Frequency	Percent	Cum Percent
3	7	35.0%	35.0%
4	7	35.0%	70.0%
5	3	15.0%	85.0%
6	2	10.0%	95.0%
7	1	5.0%	100.0%
Total	20	100.0%	100.0%

Duration of hospital stay ranged from min of 3 wks to a max of 7 wks with average being 4.1 wks.

Table 4: Associated injuries or illness

Asso. injuries	Frequency	Percent	Cum Percent
None	8	40.0%	40.0%
Medical disorders	2	10.0%	50.0%
Nerve injuries	1	5.0%	55.0%
Other fractures	9	45.0%	100.0%
Total	20	100.0%	100.0%

Most of the patients [9] had other bones fracture as a part of poly trauma. Two patients had medical disorders like diabetes mellitus and coronary artery disease. One patient had common peroneal nerve injury [neuropraxia] which recovered subsequently.

Discussion

Evaluation of X-rays provides information about the type of fracture, the degree of displacement of the fragments, the amount of articular surface depression and the quality of bone. In all cases a preliminary antero-posterior and a lateral view must be taken. In many plateau fractures, antero-posterior and lateral views provide insufficient information for determination of an optimal treatment plan. In such cases,

40^0 internal and external oblique views are indicated. The 40^0 internal oblique view profiles the lateral plateau, and the 40^0 external oblique view projects the medial condyle and plateau. The plateau view of Moore [6], taken with a caudal tube angulation of 10^0 to match the normal posterior slope of the plateau, gives more accurate measurements than does a standard antero-posterior view. Traction films, varus and valgus stress films may be needed in Bycondyler (type V and type VI) fractures.
CT scan is capable of providing images of the proximal tibia in several constructed planes. These images graphically demonstrate fracture lines and the direction and degree of fragment displacement. CT scans are valuable in any displaced plateau fracture but are most useful in Bycondyler fractures and should be used as a preoperative planning tool. Properly interpreted, Ct scans often influence the choice of surgical approach and guide insertion of percutaneous screws or placement of thin wires, when hybrid external fixation is used [7]. CT scans give limited soft tissue information. In comminuted fractures, a spiral CT with a three dimensional reconstructs can be extremely beneficial.
Soft tissue injuries associated with tibial plateau fractures can best be demonstrated my Magnetic Resonance Imaging (MRI). MRI is inferior to CT in evaluating the fracture patterns, but cruciate, collateral and meniscal injuries accompanying plateau fractures are well visualized especially in Schatzker type II, IV and VI.
Arthrography is rarely used with the freshly fractured knee, however, fracture depressions can be visualized using arthrography and, occasionally, torn menisci are diagnosed. Today arthroscopic evaluation of the knee has superceded arthrography.
Diagnostic arthroscopy before the definitive treatment of plateau fractures helps to evaluate the intra-articular structures. Fragments of bone and cartilage that are free in the joint can be removed. With the advent of MRI, the need for preoperative arthroscopy is obviated. Presently arthroscopy is utilized mainly for intraoperative assessment of the articular surface after bone grafting in depressed condylar fractures [8].
If an arthroscopic examination is to be done, a midline patellar tendon or a para patellar port on the side opposite the fracture is created to avoid the necessity of subsequently performing open reduction in the area of this portal.
If an arthroscopic examination is to be done, a midline patellar tendon or a para patellar port on the side opposite the fracture is created to avoid the necessity of subsequently performing open reduction in the area of this portal.
Though the ideal modality of management of TPF remains to be defined, there is general consensus regarding the aims of treatment. The ultimate goal in the management of TPF is to achieve a stable, mobile, pain free joint with minimal risk of post-traumatic OA.
The stability depends on the restoration of the alignment and normal mechanical axis as well as on the integrity of the soft tissue support.
The mobility depends on the preventing joint stiffness and muscle wasting. In other words early mobilization of the joint and quadriceps exercises are mandatory.
The risk of post-traumatic OA is minimized by restoring the congruency of the articular surfaces, maintaining the mechanical axis and repair of the meniscal injury. In summary, the “Ideal” and method of treatment is one that is simple, least risky and gives promise of articular surface reduction, restoration of alignment and knee stability, while permitting early rehabilitation.
According to Schatzker [9], enough experience has accumulated to formulate the following principles of treatment.
Immobilization for >4 wks, usually leads to some degree of joint stiffness.
ORIF combined with immobilization of the knee leads to even greater degrees of joint stiffness.
Regardless of the method or technique of treatment the knee joint must thus be mobilized early [10].
Impacted articular fragments cannot be dislodged by traction or manipulation alone, because there are no soft tissue attachments to level them upwards.
Depressed articular surface defects do not fill in with hyaline cartilage and remain as permanent defects, therefore any joint that is unstable as a result of joint depression or displacement remains unstable unless it is surgically corrected.
Absolute joint congruency can be restored only by ORIF.

Closed Management Techniques

This includes cast immobilization, traction with passive joint motion, and use of hinged knee casts and braces. The relative indications for non-operative therapy include:

- Undisplaced or incomplete fractures
- Stable minimally displaced LP fractures
- Selected unstable LP fracture in elderly patients with osteoporosis
- Presence of significant medical risk factors
- Open and infected fractures
- Spinal cord injury with TPF
- Non-operative fracture management should be used only in conjunction with early controlled knee motion. Traction usually reduces condylar fragments by ligamentotzxis, but impacted articular fragments do not reduce.

The goal of non-operative management is not to achieve anatomical reduction, but restoration of axial alignment and knee motion. Malalignment of $>7^0$ and varus/valgus instability of $>5\text{-}10^0$ precludes non-operative treatment as the ideal modality.

Conclusion

In the series of cases presented, 15 fractures were closed, and 5 fractures were open and all the open fractures were grade III according to Gustilo and Andersons Classification.

References

1. Moore TM, Patzakis MG, Harvey JB. Tibial plateau fracture definition, demographics, treatment rationale, and long-term results of closed traction management or operative reduction. J Orthop Trauma. 1987; 1:978-119.
2. Kennedy JC, Baitey WH. Experimental tibial plateau fractures: Studies of the mechanism and the classification. JBJS Am. 1968; 50:1522.
3. Bennet WF, Browner B. Tibial plateau fractures: A study of associated soft tissue injuries J Orthop Trauma. 1994; 8:183-188.
4. Hohl M, Hopp E. Ligament injuries in tibial condylar fractures JBJS. 1976; 58a:279.
5. Muller ME, Nazarain S, Koch P. The comprehensive classification of fractures of long bones: New York, Spreinger, 1990.
6. Moore TM, Maniey JP. Roentgenography measurement of tibial plateau depression due to fracture. J Bone Joint Surg. 1974; 56:155-160.

7. Dias JJ, Strung AM, Finally DB. Computerized Axial Tomography for tibial plateau fractures. J Bone Joint Surg, 1987; 699(b):84-88.
8. Vangsness CT, Ghaderi B, Hohl M, Moore TM. Arthroscopic evaluation of meniscal injuries with tibial plateau fractures. J Bone Joint Surg, 1994; 76B:488-490.
9. Schatzker J. Tibial plateau fractures. In Borwner, Jupiter, Levine and Trafton Skeletal Trauma. Philadelphia, WB Saunders, 1993; 1745.
10. 1Gausewitz S, Hohl M. The significance of early motion in the treatment of tibial plateau fractures. Clin Orthop, 1986; 202:135-138.