



A PROSPECTIVE STUDY EVALUATING ASSOCIATION BETWEEN TIBIAL PLATEAU FRACTURE MORPHOLOGY WITH LIGAMENT AND MENISCAL INJURY AROUND KNEE.

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ABSTRACT

INTRODUCTION: In the modern world, due to advent of high speed motor vehicles, high energy trauma commonly involves the knee joint and results in complex tibial plateau fractures and associated ligament and meniscal injuries. Proper diagnosis and management of these injuries reduced the chances of degenerative changes around knee joint later on.

MATERIAL AND METHOD: A prospective study was conducted in the Department of Orthopaedics in a tertiary health care center of western Rajasthan from January 2018 to December 2020. A total of eighty patients (62 males: 18 females) with tibial plateau fractures and associated soft tissue injuries were included. Patients were assessed both clinically and radiologically and "SCHATZKER'S" classification was used to classify the tibial plateau fractures. Pre-operatively in every case CT-scan was used to study fracture pattern and MRI was done to see fracture morphology and associated soft tissue injuries.

RESULT: A total 80 patient was included in our study, out of which 73 (91.25%) having ligaments (Cruciate and Collaterals) and meniscal injury. Injury to the lateral meniscus was found most frequently in Schatzker II fracture ($p < 0.0006$) and medial meniscus in schatzker IV ($p < 0.011$). Variable association was shown by ACL and PCL injuries with tibial plateau fracture morphology, but as the grade of designation increases within schatzker classification as does the frequency of cruciate ligament tear. Overall incidence of LCL rupture occurred least frequently in Schatzker II fractures (7 of 34; 20.5%), which was statistically significant ($P < 0.01$). Complete MCL tear occurred in 27 (33.7%) of all fractures and in 41% of Schatzker II fractures. PLC tear had shown significant association with medial tibial plateau fracture (schatzker IV).

CONCLUSION: The likelihood of the cruciate, collateral ligament and PLC injury increases as the grade of designation within schatzker classification (schatzker I-VI). PLC injury had a significant association with medial tibial plateau fracture (schatzker IV) and MCL had a significant association with lateral tibial plateau fracture.

KEYWORDS :

INTRODUCTION

The knee joint is a form of hinge joint and its function depends upon both bony as well as soft tissue components. The tibiofemoral articulation is stabilised by cruciate (ACL and PCL) and collateral (MCL and LCL) ligaments. Whereas meniscus act as a cushion between tibio-femoral articulation.¹⁻⁴ In the modern world, due to advent of high speed motor vehicles, high energy trauma commonly involves the knee joint and results in complex tibial plateau fractures and associated ligament and meniscal injuries. Proper diagnosis and management of these injuries reduced the chances of degenerative changes around knee joint later on.

In the previous studies we found that the incidence of multiligamentous knee injuries ranges from 0.001 to 0.013% in all patients evaluated for orthopedic injuries.⁵ But in recent years there is a surge in numbers, most likely because of the improved survival of the critically injured trauma patient and the increased awareness of ligamentous injuries.⁶

Therefore this study is planned to determine the Association between tibial plateau fracture morphology and concomitant ligament and meniscal injury

AIM :

The aim of our study is to determine association between tibial plateau fracture morphology and concomitant soft tissue injury (cruciates, collaterals and meniscal injuries).

MATERIAL AND METHODS

A prospective study was conducted in the Department of Orthopaedics in a tertiary health care center of western Rajasthan from January 2018 to December 2020. A total of eighty patients (62 males: 18 females) with tibial plateau fractures and associated soft tissue injuries were included. Informed consent was taken from all the patients before considering them for study.

Inclusion criteria- patients age group within 20-60 years of either gender, having displaced tibial condyle fracture (displacement > 2mm) and concomitant soft tissue injuries.

Exclusion criteria- (a) Skeletally immature patients, (b) Fracture caused by trivial trauma in osteoporotic bone and (c) Pathological fracture.

Patients were assessed both clinically and radiologically and "SCHATZKER'S" classification was used to classify the tibial plateau fractures. Pre-operatively in every case CT-scan was used to study fracture pattern and MRI was done to see fracture morphology and associated soft tissue injuries. The percentage of each ligament and meniscal injury relative to the total number of fractures was calculated and they were compared with the Schatzker classification to analyze any significant predilection. The statistical significance level was set to P value < 0.05 .

RESULT

A total 80 patient was included in our study, out of which 73 (91.25%) having ligaments (Cruciate and Collaterals) and meniscal injury. In our study we have 62 males and 18 females patients, male to female ratio was 6:1. The mean age in our study group was 40 ± 11.9 years (20-60 years), 68 (85%) patient suffered from RTA, 9 (11.2%) fall from height and 3 (3.7%) having pedestrian injury. We did not include those fractures which was occurred due to trivial trauma. Fracture types was distributed according to the Schatzker classification, which was as follows: 4 Schatzker I, 34 Schatzker II, 2 Schatzker III, 10 Schatzker IV, 16 Schatzker 5, and 14 Schatzker VI injuries.

Tibial plateau fracture and meniscal injury

Acute intrasubstance tear or separation of the lateral capsule from the joint line was considered as a meniscal pathology. Overall, 54 (67.5%) of the study patients had a significant injury to the lateral meniscus. Of the 34 Schatzker II fractures, 27 (79.4%) had associated lateral meniscal injuries. Medial meniscal tears was found in 36 (45%) of fractures, and in 10 of the 34 (29.4%) of the Schatzker II, 9 of the 10 (90%) of the schatzker type IV injuries. Injury to the lateral meniscus was found most frequently in Schatzker II fracture (p < 0.0006) and medial meniscus in schatzker IV (p < 0.011), which was statistically significant. Incidence of meniscal injury according to schatzker classification was shown in table-1

TABLE-1

SCHATZKER TYPE	n	MM tear	p value	LM tear	p value
I	4	0	-	2 (50)	1.000
II	34	10 (29.4)	0.016	27 (79.4)	0.0006
III	2	0	-	0	-
IV	10	9 (90)	0.011	7 (70)	0.205
V	16	9 (56.2)	0.617	7 (43.7)	0.617
VI	14	8 (57.1)	0.592	11 (78.5)	0.032

TIBIAL PLATEAU FRACTURE AND CRUCIATE LIGAMENT TEAR

Cruciate ligament injury were classified as complete tear, partial tear and avulsion. ACL complete tear, partial tear and avulsion was found 8 (10%), 35 (43.7%) and 29 (36.2%) respectively. Incidence of PCL injury was much lower with 15 (18.7%) patients having avulsion and 6 (7.5%) and 23 (28.7%) patients having complete and partial tear respectively. Both ACL and PCL avulsion was seen in only 3 (3.7%) cases. Variable association was shown by ACL and PCL injuries with tibial plateau fracture morphology, but as the grade of designation increases within schatzker classification as does the frequency of cruciate ligament tear. overall incidence of each ACL and PCL injury according to fracture morphology (schatzker classification) were shown in Table-2

Schatzker type	N	ACL tear	Acl avulsion	p value	Pcl tear	Pcl avulsion	P value
I	4	1	1	1.000	1	0	0.317
II	34	16	10	0.002	12	5	1.000
III	2	0	0	-	0	0	-
IV	10	4	2	0.527	4	4	0.057
V	16	11	5	<0.0001	4	4	1.000
VI	14	11	3	0.0001	8	2	0.108

TIBIAL PLATEAU FRACTURE AND collateral ligament injury

lateral collateral ligament (LCL) and medial collateral ligament (MCL) tear were determined as either partial or complete (Fig. 3). Overall incidence of LCL rupture occurred least frequently in Schatzker II fractures (7 of 34; 20.5%), which was statistically significant (P < 0.01). Complete MCL tear occurred in 27 (33.7%) of all fractures and in 41% of Schatzker II fractures. Partial tear of MCL was seen in 43 (53.7%) fractures.

Schatzker type	n	Complete lcl tear	Partial lcl tear	p value	Complete mcl tear	Partial mcl tear	p value
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I	4	0	1	0.317	1	2	0.317
II	34	5	7	0.086	14	15	<0.0001
III	2	0	0	-	0	0	-
IV	10	5	4	0.011	1	2	0.205
V	16	6	5	0.133	5	7	0.045
VI	14	8	3	0.032	4	6	0.108

TIBIAL PLATEAU FRACTURE AND PLC injury

Overall incidence of PLC injury was 57.5%. Popliteofibular ligament (PFL) tear was seen in 6 out of 10 (60%) schatzker type IV fracture. popliteus tendon (PT) tears occurred in 10 (12.5%) of all fractures. PLC tear had shown significant association with medial tibial plateau fracture (schatzker IV).

TABLE-3

SCHATZKER TYPE	n	Popliteofibularliga tear	Popliteus tendon tear	p value
I	4	2 (50)	0	1.000
II	34	15 (47)	4 (14.7)	0.492
III	2	0	0	-
IV	10	7 (60)	2 (10)	0.011
V	16	6 (37.5)	3 (18.7)	0.317
VI	14	12 (85.7)	1 (7.1)	0.001

DISCUSSION

Open reduction internal fixation of tibial plateau fracture may lead to poor functional result despite of anatomical realignment and fixation. This may be due to undetected ligament and meniscal pathology. Shepherd and associates³ reported an overall 90% (18 of 20) incidence of the non-displaced tibial plateau fractures having associated soft-tissue lesions, comprised of 80% (16 of 20) meniscal tears, as evaluated by MRI, which was not detected by physical examination alone. In a arthroscopic study Abdel-Hamid and colleagues⁸ reported a 71% (70 of 98) frequency of associated soft-tissue injuries in fractures of the tibial plateau; peripheral meniscal injury was the most common lesion in all six types of Schatzker classified fractures but they found no significant correlation between fracture type and incidence of soft-tissue injury. But arthroscopy requires increased operative time, which incurs extra costs and may increase the risk of patient morbidity at the surgical site.

we had also used preoperative MRI in all patient to detect soft tissue pathology. In a largest MRI series of operative plateau fractures to date, Gardner and coworkers⁹ reported an overall higher incidence of soft-tissue injury than previously reported as determined by preoperative MRI. Of 103 patients, 94 (91%) patients had significant injury to the lateral meniscus, medial meniscus lesions were reported in 45 (44%) patients, and a total of 102 (99%) showed evidence of disruption of soft tissue structures surrounding the knee joint. The most common fracture type seen with lateral meniscus tears was Schatzker II (81%); a Schatzker IV fracture pattern was associated most frequently (76%) with a medial meniscus injury. Preoperative management plans changed significantly after evaluating MRI in addition to plain radiographs as compared to a group with plain radiographs alone reported in a study done by by Yacoubian and colleagues¹⁰

In our prospective study we had found that there was a significant association between lateral tibial plateau fracture (schatzker II) and lateral meniscal injury with p value 0.0006 and medial tibial plateau fracture (schatzker type IV) with medial meniscus injury (p < 0.011).

PCL did not have a statically significant association with fracture morphology (medial vs lateral). ACL have a variable association with schatzker II, V and VI. Bicondylar tibial plateau fracture (schatzker V, VI) exhibited ACL injury in all 30 patients and PCL injury in 18 out of 30 patients, either avulsion or tear.

PLC injury had a significant association with medial tibial plateau fracture (schatzker IV) ($P=0.011$) and MCL had a significant association with lateral tibial plateau fracture ($p=$).

Limitation of this prospective study includes the less number of patient, inclusion of only high energy fractures, and it may overdiagnose the extent of soft tissue injuries by MRI .

CONCLUSION

The likelihood of the cruciate , collateral ligament and PLC injury increases as the grade of designation within schatzker classification (schatzker I-VI). PLC injury had a significant association with medial tibial plateau fracture (schatzker IV) and MCL had a significant association with lateral tibial plateau fracture .if we detects these ligament and meniscal injuries preoperatively and repair them at the time of fracture fixation ,it will improve the functional outcome.

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