

## A study of conservative management of tibial plateau fractures

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### ABSTRACT

**Background & Objectives:** Tibial plateau fractures have been studied and reported extensively and exhaustively but still controversy exists over its management, whether surgical or conservative. Although several methods of treatment have been devised, each method of treatment offers their own advantages and disadvantages. In this study we utilized conservative method which like any other mode of treatment restores articular congruity, axial alignment, joint stability, functional motion and avoids complications. This study was conducted with an objective to evaluate the functional and radiological outcome of conservative treatment. **Materials & Methods:** Forty two randomly selected cases of tibial plateau fracture in adults more than 20 years of age were treated with above knee plaster of Paris cast for 4 to 6 weeks. At the end of six months outcome of this study was analyzed by Modified Rasmussen clinical criteria and radiological evaluation. **Results:** The Clinical assessment showed that 48% had excellent, 28% had good, 10% had fair and 14% had poor outcome while radiological outcome of this study showed 40.5% excellent, 33.3% fair, 9.5% fair and 16.7% poor result. **Conclusion:** In appropriately selected cases conservative treatment is a reliable alternative and is certainly without the complications associated with surgery.

**Key words:** Articular depression; Modified Rasmussen clinical criteria; Tibial plateau fracture

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### INTRODUCTION

More than 1000 articles, thesis and books have documented the trials and tribulations of treating these capricious joints.<sup>1,2</sup> 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.<sup>3</sup> Various treatment methods have been used for years with varying results that ranges from traction,<sup>4</sup> closed treatment with bracing,<sup>5,6</sup> external fixation,<sup>7</sup> percutaneous screw fixation to open reduction and internal fixation<sup>9-12</sup> with various devices.

The proximal tibial articular surface can tolerate modest amount of articular displacements and in meticulously selected cases, non-operative treatment will result in excellent outcomes despite some articular irregularities. Therefore non operative treatment is indicated for tibial plateau fractures that will heal without a significant deformity or for elderly patients or patients with

associated medical problems where operative intervention is not an option. Localized depressions of up to 10 millimeters in the articular surface of lateral plateau may result in stable knees and have good outcomes when treated non-operatively.<sup>13</sup> This interventional and prospective study was conducted in minimally displaced and depressed tibial plateau fracture with displacement of less than 4 mm, depression of less than 8 mm and less than 10 degrees of instability to evaluate the functional outcome and complications of conservative treatment.

### MATERIALS AND METHODS

This interventional and prospective study included forty- two randomly selected cases of tibial plateau fracture in adults more than 20 years of age who presented in the Department of Orthopedics, College of Medical Sciences, Bharatpur, Chitwan, Nepal from August 2012 to July 2014 and treated with conservative method.

### Inclusion criteria

Table 1: Clinical Assessment

CLINICAL ASSESSMENT	NO. OF PATIENTS	%
<b>PAIN</b>		
None	15	35.7
Occasional	18	42.9
Stabbing pain in certain position	6	14.3
Constant pain after activity	3	7.1
<b>WALKING CAPACITY</b>		
Normal walking capacity for age	17	40.5
Walking outdoor more than one hour	16	38.1
Walking outdoor 15 mins	8	19.0
Walking indoor only	1	2.4
<b>KNEE EXTENSION</b>		
Normal	32	76.2
Lack of extension <10 degree	7	16.7
Lack of extension >10 degree	3	7.1
<b>KNEE FLEXION</b>		
Full	29	69.0
At least 120 degree	9	21.4
At least 90 degree	4	9.5
<b>POWER OF QUADRICEPS</b>		
Grade 5	28	66.7
Grade 3-4	14	33.3
<b>STABILITY</b>		
Normal in extension and 20 degree flexion	28	66.7
Abnormal instability in 20 degree flexion	8	19.0
Instability in extension <10 degree	6	14.3

Table 3: Correlation between articular depression and clinical result

Articular Depression	Clinical result				Total
	EXCELLENT	GOOD	FAIR	POOR	
NONE	15	1	0	0	16
<5MM	5	11	1	1	18
6-10MM	0	0	3	3	6
>10MM	0	0	0	2	2
<b>Total</b>	20	12	4	6	42

Table 2: Radiological Assessment

RADIOLOGICAL ASSESSMENT	NO. OF PATIENTS	%
<b>Condylar widening</b>		
NONE	13	31.0
<5MM	24	57.1
6-10MM	3	7.1
>10MM	2	4.8
<b>Varus valgus angulation</b>		
NONE	20	47.6
<10 DEGREE	15	35.7
10-20 DEGREE	5	11.9
>20 DEGREE	2	4.8
<b>Articular depression</b>		
NONE	16	38.1
<5MM	18	42.9
6-10MM	6	14.3
>10MM	2	4.8
<b>Osteoarthritis</b>		
NONE/ NO PROGRESS	17	40.5
PROGRESSION BY GRADE 1	21	50.0
PROGRESSION BY >GRADE 1	4	9.5

1. None displaced split stable fracture.
2. Minimally displaced and depressed fracture with displacement of <4mm, depression of <8mm. and <10 degree of instability.
3. Sub-meniscal rim fractures.
4. Fractures in elderly, osteoporotic patients and low demands for surgery.
5. Pathological fracture.

**Exclusion criteria**

1. Patients who have been diagnosed as closed unstable tibial plateau fracture.
2. Compound fracture Gustilo Anderson type II and III.
3. Fracture associated with ipsilateral femur, tibia and foot fracture.

All the cases meeting the above mentioned criteria were treated with above knee plaster of paris (POP) cast. The range of movement, extensor lag and valgus and varus deformity of the knee were measured and check X- ray was done at the time of cast bracing. Cast was continued for 4 to 6 weeks depending upon radiological sign of union. Early active and passive ROM of knee joint was started

**Table 4:** Correlation between radiological and clinical results

Clinical result	Radiological result				Total
	EXCELLENT	GOOD	FAIR	POOR	
EXCELLENT	14	20	4	0	20
GOOD	3	12	7	0	12
FAIR	0	4	2	2	4
POOR	0	6	1	5	6
<b>Total</b>	17	42	14	7	42

immediately after removal of cast. Patients were allowed toe- touch walking, partial, near- total and total weight bearing depending upon radiological features and clinical improvement of injured knee. At the end of six months outcome of this study was analyzed by Modified Rasmussen clinical criteria and radiological evaluation.<sup>14</sup>

All the statistical operations were done through SPSS for Windows, Version 22.0

**RESULTS**

The youngest patient in this study was 20 years, the oldest was 88 years and mean age was 44.9 years. There were 29 (69%) male and 13 (31%) female. Twenty four (57.1%) patients sustained injury secondary to road traffic accident, seven (16.7%) due to fall from height, three (7.1%) due to fall from stairs, seven (16.7%) due to slip on the floor and one (2.4%) due to physical assault. In this study 24 patients (57.1%) sustained Schatzker type 1, eight (19%) Schatzker type 2, three (7.1%) Schatzker type 3, two (4.8%) Schatzker type 5 and four (11.9%) Schatzker type 6 fractures. The right knee was injured in 30 (71.4%) and left knee in 12 (28.6%) patients.



**Fig 1:** Tibial plateau fracture

The clinical and radiological results are tabulated in the tables 1 and 2.

Overall clinical evaluation of this six months regular follow up study showed 20 (48%) excellent, 12 (28%) good, four (10%) fair and six (14%) poor outcome. In overall this study showed 86% satisfactory result. (p value= 0.002)

Overall radiological outcome of this study showed 17 (40.5%) excellent, four (9.5%) good 14 (33.3%) fair, and 7 (16.7%) poor result. This data showed almost 84% of satisfactory outcome. (p value= 0.000)

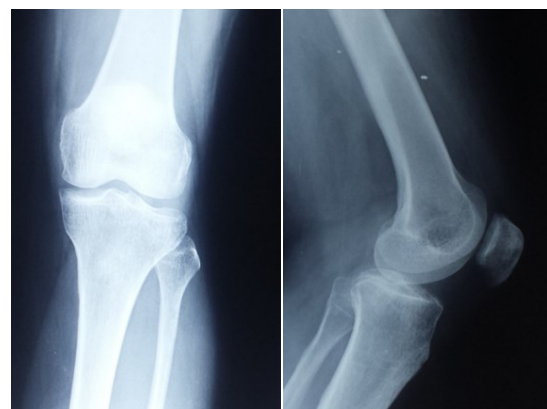
We found that 27 out of 34 patients with articular depression of 5 mm or less had excellent or good clinical result and all the eight patients with articular depression of 6 mm or more had fair or poor clinical result (Table 3).

Out of 32 patients who had excellent or good clinical result, 21 had excellent or good radiological result and out of 21 patients with fair or poor radiological result, 10 had fair or poor clinical result (Table 4).

**DISCUSSION**

The Tibial plateau fractures constitute approximately 1% of all fractures.<sup>15</sup> 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.<sup>16,17</sup> Sir Astley Cooper was the first to publish his method of treatment of tibial plateau fractures in 1825.<sup>18</sup> Apley stressed on early joint rehabilitation and developed successful methods of traction that permitted early range of motion of joints while maintaining sufficient immobilization for fracture union and reported satisfactory results in the tibial plateau fractures as compared with the results of surgery.<sup>19,20</sup>

In our study we found that tibial plateau fractures



**Fig 2:** Tibial plateau fracture at 6 weeks



**Fig 3:** Tibial plateau fracture at 6 months

were more common in active phase of life and in males. Road traffic accident, fall from height and slip on floor were the common modes of injury and type I and II fractures were more common than type III, IV, V and VI. Duration of hospitalization was more in fractures associated with large swelling, associated other injuries treated with skeletal traction and elderly patient with significant soft tissue injuries and other co-morbid conditions.

Like our study, various other studies have shown that there is a direct co-relation between articular depression and clinical outcome.<sup>5,14,21</sup> In our study many patients with less than satisfactory roentgenographic results had good to excellent functional results which correlated with a study done by Duwaliuss and Connolly<sup>22</sup> who concluded that observations based on roentgenographic examinations did not correlate with the functional end results.

Tibial plateau fracture treated by closed reduction and immobilization for six weeks in a well moulded cast have resulted in acceptable functional and clinical results in different studies.<sup>16,23,24</sup>

The strength of this study is the standardized and scientific manner in which the procedure was carried out. The limitations of this study include the length of the study and it being a single cohort study with no matched comparative groups of other techniques included.

## CONCLUSION

Hence we can conclude that overall clinical and radiological results are acceptable in tibial plateau fractures treated conservatively. Various intraoperative and post-operative complications along with burden of re-operation for implant removal are not expected with conservative management. So it is still a reliable, inexpensive and alternative treatment option in undisplaced and

minimally displaced fractures and fracture in osteoporotic bones with associated co-morbid body conditions.

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