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RESEARCH ARTICLE

ROLE OF MDCT IN EVALUATION OF PROXIMAL TIBIA FRACTURES

[1]Dr. Sonali Sharma, *[,2]Dr. Jabreel Muzaffar, [3]Dr. Sudesh Sharma and [4]Dr. Omeshwar Singh

[1]SR Department of Radiology, GMC, Jammu
[2]JR Department of Orthopaedics, GMC, Jammu
[3]Professor Department of Orthopaedics, GMC, Jammu
[4]SR Department of Orthopaedics, GMC, Jammu

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ABSTRACT

Introduction: Proximal tibia articular fractures can be caused by motor vehicle accidents or bumper strike injuries ;however, sports injuries, falls, and other less violent trauma frequently produce them, especially in elderly patients. The treatment for these fractures aims to achieve anatomical reduction of the joint surface and stable osteosynthesis in order to enable early mobilization, so as to prevent complications such as joint stiffness and post-traumatic arthrosis. The diagnosis of tibial plateau fractures is typically made on plain radiographs. AP and lateral are standard examinations. Less frequently, oblique views are obtained but are not routine. CT scans have largely supplanted the need for these adjunctive views. CT has been shown to be more reliable in classifying the fracture and hence on deciding a treatment plan. 3D reconstructions have been increasingly used and found to demonstrate spatial relationships of fracture fragments better than plain radiographs.

Materials and Methods: Fourty consecutive patients of knee with proximal tibia fractures were taken up for study. All patients were subjected to plain radiography and non-contrast MDCT. The fractures were classified according to schatzkers classification .In all patients surgical plan and sequence of reduction was planned preoperatively using both techniques successively and then correlated with intraoperative findings and postoperative plain film.

Results: The fractures were underestimated in 16 (40%) cases with plain films. The surgical plan based on plain film was modified in 12 (30%) cases due to precise preoperative imformation on CT.

Conclusion: The use of MDCT is advisable for the accurate classification and management of tibial plateau fractures.

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INTRODUCTION

Proximal tibia articular fractures can be caused by motor vehicle accidents or bumper strike injuries; however, sports injuries, falls and other less violent trauma frequently produce them, especially in elderly patients. Fractures of the tibialplateau present risks to knee functioning, since these are joint fractures of the proximal third of the tibia where load transmission takes place. The treatment for these fractures aims to achieve anatomical reduction of the joint surface and stable osteosynthesis in order to enable early mobilization, so as to prevent complications such as joint stiffness and post-traumatic arthrosis. The diagnosis of tibia plateau fractures is typically made on plain radiographs. AP and lateral are standard examinations. Less frequently, oblique views are obtained but are not routine. CT scans have largely supplanted the need for these adjunctive views. CT typically demonstrates more articular displacement and comminution than is apparent on plain films.

Corresponding author: **Jabreel Muzaffar,**
JR Department of Orthopaedics, GMC, Jammu

CT has been shown to be more reliable in classifying the fracture and hence on deciding a treatment plan. 3D reconstructions have been increasingly used and found to demonstrate spatial relationships of fracture fragments better than plain radiographs.

MATERIALS AND METHODS

The study included 40 consecutive patients admitted in emergency with tibial plateau fractures. Every patient was subjected to plain radiographs (AP, Lat) and MDCT examination. The fractures were classified according to Schatzker classification with plain films and MDCT separately, by two experienced radiologists, by concensus in random order. After classifying, the surgeons established preoperative surgical plain first based on plain films and then on MDCT in order to confirm or modify plan made on plain films. The preoperative plans were compared with corresponding operative report and postoperative plain film.

RESULTS

Fourtypatients with tibial plateau fractures were recruited in the study, and their ages ranged between 20 and 55 years with

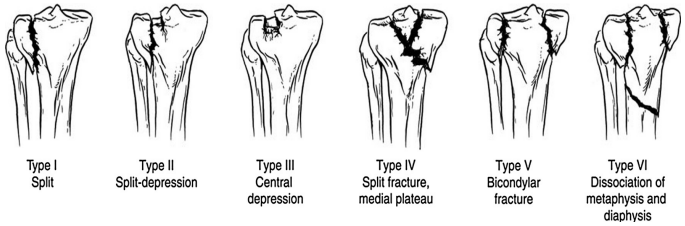
Table 1. Distribution of patients according to age

Age	No of patients	Percentage
20-25	8	20%
25-30	12	30%
30-35	8	20%
35-40	2	5%
40-45	4	10%
45-50	4	10%
50-55	2	5%

Table 2. Distribution of patients according to Schatzker classification based on plain film and MDCT

Type	Plain film	MDCT
I	3	1
II	16	18
III	9	5
IV	2	6
V	3	1
VI	7	9
Total	40	40

mean age 36.5 years. They were 24 males (60%) and 16females (40%). On comparing two techniques, classification was more severe in 16 (40%) patients with MDCT, whereas no diagnosis with MDCT was less severe than plain radiograph. On comparison of surgical findings plain radiographs underestimated fractures in same 16 patients but findings coincided with MDCT. Treatment plans of 40 patients based on plain radiographs were compared with that of MDCT. In 12 cases plan based on plain radiographs was modified due to gain in essential information on MDCT.



In 3 cases (typeIII) an arthoscopy could be done instead of arthotomy, the MDCT allowing demonstraion of pure limited depression which was reduced en-block during arthoscopy. In fivepatients (type II) MDCT showed integrity of tuberculum intercondylare allowing a gentler approach. In four patients (typeVI) posteromedial buttress plate was added as plain radiographs failed to show fracture of medial condyle in a coronal plane. When comparing 40 preoperative plans based on plain films with postoperative plain films, 28 plans were similar to final reconstruction. In other 12 patients where plain film based plans were modified on MDCT, final reconstructions were identical to MDCT plans.

DISCUSSION

Tibial plateau fractures are intraarticular fractures of weight bearing joint. They can evolve in secondary osteoarthritis because of residual incongruous articular surface, ligament us instability and enzymatic aggression of the cartilage. Efficient surgical management is necessary to decrease incidence of secondary osteoarthritis. This is possible only if surgeon understands the severity of fracture and plans correctly the sequence of surgical reconstruction. CT is used by most orthopedists to further characterize the fractures of the tibial plateau and assess the depression of the tibia and the degree of splitting of the fractured parts to plan for surgery and facilitate the treatment plan.

There are numerous classification systems used for tibial plateau fractures to help classify the fractures and facilitate the treatment plan. Schatzker, Hohl and Moore and Arbeitsgemeinschaft fur Osteosynthesefragen (AO) are the commonly used classifications. The Schatzker system is the commonly used among these. The three-column classification described by Luo *et al*. has been the recent addition to the previous classification systems. This classification system has been shown to be helpful to decide on operative approach and for fixation. In classification of tibialplateau fractures CT has been shown to be better than plain radiographs. MDCT allows high resolution thin sections for 3D surface reconstruction. The MDCT-3D allows precise demonstration of fracture fragments especially in intraarticular fractures. This technique can be easily applied in all patients and 3D reconstructions are fast and easy to develop. In our study MDCT gave more accurate diagnostic classification in 16 patients. Therefore severity of fractures was underestimated in 16 (40%) cases on plain radiographs.

The severity of fracture classified on MDCT corresponded to surgical operative report in all cases. Plan based on plain films was modified with MDCT in 12 (30%) cases only. Thus surgical plan wasn't modified in all cases underestimated by plain films. In all cases postoperative plain film confirmed plans established preoperatively on MDCT. According to our results in case of simple fractures (eg type II) plain radiographs are as informative as MDCT. But in complex injuries and where impacted fracture of tibial plateau is suspected MDCT affords accurate demonstration of trauma. The MDCT allowed modification of surgical plan based on plain radiographs in 12 cases. Thus MDCT is more accurate than plain radiographs in classifying proximal tibia fractures, like for other intraarticular fractures. This classification allows better understanding of fracture pattern, and therefore improves preoperative plan which results in better joint congruency and functional outcome postoperatively. The MDCT should not replace plain radiographs, but is an excellent complimentary tool in diagnosis and management of tibial plateau fractures.

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