National Journal of Clinical Orthopaedics

ISSN (P): 2521-3466
ISSN (E): 2521-3474

www.orthoresearchjournal.com
2018; 2(4): 82-84
Received: 11-08-2018
Accepted: 12-09-2018

Dr. Gaurav Agarwal
Assistant Professor,
Department of Orthopaedics,
Bundelkhand Medical College,
Sagar, Madhya Pradesh, India

Dr. Gaurav Jain
Assistant Professor,
Department of Orthopaedics,
Amaltas Institute of Medical Sciences, Dewas,
Madhya Pradesh, India

Correspondence
Dr. Gaurav Jain
Assistant Professor,
Department of Orthopaedics,
Amaltas Institute of Medical Sciences, Dewas,
Madhya Pradesh, India

To assess how the surgical plan changes after introducing CT scans

Dr. Gaurav Agarwal and Dr. Gaurav Jain

Abstract
Background: This study aims to assess how surgical plans changes after introducing CT scans, which is conducted at Amaltas Institute of Medical Sciences, Dewas, (M.P.) The patient‟s clinical history and examination findings were recorded prospectively in a case record form. Then radiological investigations like X-ray and CT scan were ordered.
Opinions of operating consultant surgeon were taken in two separate proformas regarding their findings, diagnosis and plan of management. First opinion was taken on the basis of the X-ray alone and second opinion was taken after showing the CT scans. Any change in the plan of management was noted.
Result: After availability of CT scans, bi-condylar plating was done in 04 cases, antero-lateral plating with bone grafting was done in 02 cases, antero-lateral plating was done in 01 cases and postero-medial plating was done in 01 case. These were the cases which were included in, drastic change‟ category.
Conclusion: Plain radiographs are indispensable for initial evaluation of patients with acute knee trauma, they should not be replaced by CT scan. Rather CT scan should be used to supplement the plain radiographs for better diagnosis, pre-operative evaluation. Antero-lateral plating planned on X-ray had most “Drastic change” in management plan to include Bone grafting or to undergo Bi-condylar plating after CT scan.

Keywords: Surgical plan, CT scan, bi-condylar plating & antero-lateral plating

Introduction
The need for additional diagnostic interventions also depends on experience level of the operating surgeon. Majority of experienced surgeons can dictate the appropriate surgical approach, pattern of fixation and potential complications just by looking at plain radiographs. But it is difficult to do so for the young surgeons with limited experience. The inexperienced surgeons after operating often regret their decisions regarding the plan of surgery. These surgeons need better visualization and evaluation of the fracture pattern before commencing the surgery. CT scan can be such a tool [1, 2].
So there was a need to study the importance of CT scan in diagnosis and preoperative planning of these fractures and to find out whether CT scan should be done mandatorily in all types of proximal tibia fractures or it is just an additional diagnostic tool enabling surgeons to plan better.

Material & Method
The present study entitled “To Assess How the Surgical Plan changes after Introducing CT Scans” was conducted at Department of Orthopaedics, Amaltas Institute of Medical Sciences, Dewas (M.P.)

Time frame to address the study
The study was carried out from January 2016 to June 2017

Study population
All the patients coming to the Department of Orthopaedics in our institution during the study period and diagnosed with proximal tibia fracture.

Sample size and sampling technique
For the study, we had included 60 cases presented to us during the study period. We used conventional sampling techniques for selection of the patients.

Inclusion Criteria
1. Traumatic fractures of the proximal tibia.
2. Patients of age group 15-65 years.

Exclusion Criteria
1. Those conditions which may require Total Knee Replacement in recent future (like Grade 4 and Grade 5 Osteoarthritis)

Investigations Used
1. Conventional/Digital X-ray (AP and Lateral views)
2. CT Scan

Approach
The study was explained in detail to the patient and/or his/her legally acceptable representative regarding risks, benefits, surgery, approach etc. After obtaining their verbal consent, a voluntary written informed consent was taken from them, prior to initiation of any study related procedures.
The patient‟s clinical history and examination findings were recorded prospectively in a case record form. Then radiological investigations like X-ray and CT scan were ordered.
Opinions of operating consultant surgeon were taken in two separate proformas regarding their findings, diagnosis and plan of management. First opinion was taken on the basis of the X-ray alone and second opinion was taken after showing the CT scans. Any change in the plan of management was noted.

Investigation details
Computed tomography was done after taking opinion of the operating surgeon on the basis of roentgenogram (Siemens Somatom Definition AS scanner and Carestream Dryview 5950 laser imager were used).

Fig 1: CT scanner used in this study (Siemens Somatom Definition AS)

Data collection methods
Proforma 2 (Findings, Diagnosis and plan of management after seeing CT scans)

Outcome Measures
The changes in plan of management of each case were divided into 3 groups: No change, subtle change and drastic change. Those cases in which there was no change in the plan of management after seeing X-ray and CT scans were included in "No change" group.
Those cases where there was a minor change in management like change in reduction maneuvers, supplementation of fixation with CC screws, immobilization and restriction of weight bearing for longer durations were included in "Subtle change" group.
In cases where after seeing the CT scans, operating surgeon advised a major change in the treatment strategy like complete change in modality of treatment, change in method of fixation, change of plate position, addition or removal of one or more plates, change in surgical approach or addition of bone grafting, were included in the "Drastic change" group.

Results

Table 1: Comparison of procedure planned (on CT scan) and change in management plan: N=42

Procedure planned on CT scan	Drastic change	Subtle change	No change	Total
Conservative	00	02	03	05
CC screw fixation	00	02	01	03
Antero-lateral plating	01	01	08	10
Antero-lateral plating	02	00	00	02
+ Bone grafting				
Antero-lateral plating	00	04	00	04
+ CC screw				
Antero-medial plating	00	01	00	00
Bi-condylar plating	04	00	09	13
Medial plating	00	00	01	01
Postero-medial plating	01	00	01	02
Postero-medial plating	00	01	00	01
+ CC screw				
Total	08	11	23	42

After availability of CT scans, bi-condylar plating was done in 04 cases, antero-lateral plating with bone grafting was done in 02 cases, antero-lateral plating was done in 01 cases and postero-medial plating was done in 01 case. These were the cases which were included in Drastic change category.

Table 2: Initial plan and final plan of management for those cases which showed Drastic change in our study:

Initial Plan	Final Plan	Number
CC screw fixation alone	Postero-medial plating	01
Antero-lateral plating	Bi-condylar plating	02
Antero-lateral plating	Antero-lateral plating + BG	02
Postero-medial plating	Bi-condylar plating	01
Postero-medial plating + CC	Bi-condylar plating	01
Bi-condylar plating	Antero-lateral plating	01
Total		08

This table shows the treatment plans that most commonly get altered after CT scans are shown to the operating surgeon. Most commonly changed plan is antero-lateral plating which got changed to bi-condylar plating in cases. Similarly, 02 cases where antero-lateral plating was recommended on X-ray, ultimately required bone grafting as well. 01 case of CC screw fixation alone was changed to postero-medial plating, 01 cases each of postero-medial plating and postero-medial plating with CC screw were changed to bi-condylar plating. 01 case in which bi-condylar plating was planned on X-ray got changed to antero-lateral plating after CT scan.

Discussion
In our study, diagnosis of 09(21.43%) cases got changed after addition of CT scans. The plan of treatment was changed in 15 (35.71%) cases after seeing CT scans. Similar observations were seen in study by S. H. Chan *et al*. where classification of fracture got changed in 12% cases and treatment was changed in 26% cases. They concluded that addition of CT scans to plain

roentgenograms increases the inter-observer and intra-observer agreement on treatment plan. Similarities exist between our study and an article by Tsifountoudis *et al*. [3]. They have shown that surgical plans based on plain radiographs were modified in 6-60% of cases after CT scans. In their opinion, CT scan especially 3D CT images are more accurate for Schatzker‟s classification, and use of cross-sectional images can improve surgical planning. Our study agrees with Rafii *et al*. They found that in 3 out of 20 patients, treatment was changed. And in other 3 cases, classification was changed after seeing CT scans. They also found that the degree of depression and separation are measured more accurately with CT scans [4].

With time, numerous new diagnostic modalities have been introduced like computed tomography, Multi-detector CT (MDCT), Multi-planar reconstruction CT (MPRCT), CT with 3D reconstruction. Some authors have studied the role of these in evaluation of tibial plateau fractures. In 2004, Macarini *et al*. evaluated the role of MDCT with plain radiographs.

They found disagreement of diagnosis in 52% cases. They concluded that patients with clinical evidence of fracture may benefit from examination with CT scans instead of X-rays [5]. In 2005, Mustonen *et al*. compared MDCT with plain radiographs and stated that MDCT is fast and accurate examination and reveals the fracture anatomy better than X-rays [6]. In 2009 Hu Y.L. *et al*. compared role of 3D CT reconstructions with plain X-ray and 2D CT scans. In their study, the degree of agreement among 4 surgeons increased from „substantial‟ to „almost perfect‟ with introduction of 3D CT scans. They concluded that more sophisticated imaging techniques can improve the reliability of fracture classification systems [7].

Conclusion

Plain radiographs are indispensable for initial evaluation of patients with acute knee trauma, they should not be replaced by CT scan. Rather CT scan should be used to supplement the plain radiographs for better diagnosis, pre-operative evaluation. Antero-lateral plating planned on X-ray had most „Drastic change‟ in management plan to include Bone grafting or to undergo Bi-condylar plating after CT scan.

References

1. Apley's. Solomans Consise System of Orthopedics and Trauma 4th Ed, 443-445.
2. Leonora W. Mui, Eliyahu Engelsohn, Hilary Umans. Comparison of CT and MRI in patients with tibial plateau fracture: can CT findings predict ligament tear or meniscal injury? Steletal radiolody. 2007; 36(2):145-151.
3. Tsifountoudis I, Sidiropoulos MDD, Kalaitzoglou I, Dionisiadis E, Haritandi MPA, Dimitriadis AS. Thessaloniki/GR. The role of CT and MRI in the assessment of tibial plateau fractures according to Schatzker classification. ESSR, 2015, 0093.
4. Mahvash Rafii, Hossein Firooznia, Cornelia Golimbu, John Bonarno. Computed tomography for tibial plateau fractures. American Journal of Roentgenology. 1984; 142:1181-1186.
5. Macarini L, Murrone M, Marini S, Calbi R, Solarino M, Moretti B. Tibial plateau fractures: evaluation with multidetector-CT. Radiol Med. 2004; 108(5-6):503-14.
6. Mustonen AO1, Koskinen SK, Kiuru MJ. Acute knee trauma: analysis of multidetector computed tomography findings and comparison with conventional radiography. Acta Radiol. 2005; 46(8):866-74.
7. Higgins TF, Kemper D, Klatt J. Incidence and morphology of the postero-medial fragment in bi-condylar tibial plateau fractures. J Orthop Trauma. 2009; 23(1):45-51.