Diagnosing Fractures of the Distal Tibial Articular Surface: Is CT Always Necessary?

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Background

- Tibia shaft fractures are often associated with fractures of the distal tibial articular surface, with reported rates as high as 43%[1-5]
- Articular fracture identification is crucial for pre-operative planning and long-term functional outcomes[6-10]
- Articular fractures can be difficult to identify on plain radiographs
- Some surgeons advocate routine use of computed tomography (CT) scans for tibia shaft fractures with unknown articular involvement[1,11]
- The indications for and utility of CT scan in diagnosing fractures of the distal tibial articular surface remain controversial.

A-B: Intra-articular fracture seen on plain radiograph
C-E: Intra-articular fracture seen on CT

Study Objectives:

1) To identify the incidence of distal tibial articular fractures in a large series of tibial shaft fractures.
2) To determine the utility of CT scan in diagnosing tibia shaft fractures with intra-articular involvement.

Methods

- Retrospective review at a single academic Level 1 trauma center over a 10-year period (2008-2017)
- Inclusion Criteria: Adults with a displaced tibia fracture; adequate radiographs (AP and lateral injury films)
- Exclusion Criteria: Age <18; prior tibia fracture; pilon fractures; non-displaced fractures
- Operative and radiographic notes reviewed. Variables collected:

  - General patient demographics (age, gender, BMI, smoking status)
  - Fracture pattern and treatment (fracture location, reduction and fixation methods)
- Radiographic studies and operative reports used to determine **when** and **how** fractures were identified
  - Pre-operative vs. intra-operative vs. post-operative
- Measurements completed on:
  - 101 fractures with associated articular surface fractures
  - 100 fractures with no articular involvement

Results

- 565 patients met inclusion criteria.
- 74% (n=417) had fractures of the distal third of the tibia (average age 44.1yrs (see Table 1)).
- Of the distal third fractures, **24% (101/417) had a fracture of the distal tibial articular surface**
  - 94% (95/101) of distal tibia articular fractures were identified pre-operatively (Figure 1)
    - **92% (87/95) of pre-operatively identified fractures identified by radiographs alone**
    - 8/95 (8%) identified by pre-operative CT scan
  - 6% (6/101) identified intra-operatively
- When including all 565 tibia fractures, **16%** of pre-operative CT scans found an intra-articular fracture not previously identified by radiograph

Figure 1.

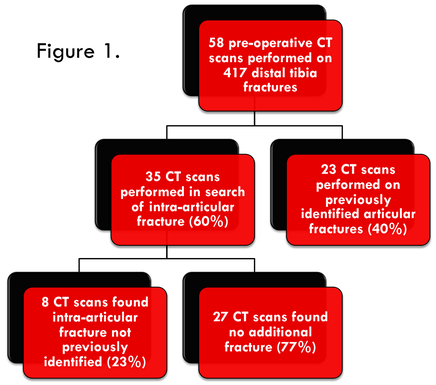

Table 1. Demographic Data for all distal tibia shaft fracture.

	Total (n=417)	Intra-articular fracture (n=101)	No articular fracture (n=316)	p-value
Age, years	44.1 ± 16.6	46.8 ± 14.7	43.2 ± 17.1	0.058
Male	274 (66%)	57 (56%)	217 (69%)	**0.030**
BMI	29.0 ± 6.6	28.5 ± 5.8	29.1 ± 6.8	0.425
Current Smoker	108 (26%)	27	81	0.896
Open Fracture	134 (32%)	22	112	**0.010**
ASA Score	2.0 ± 0.7	1.9 ± 0.6	2.0 ± 0.7	0.197

Discussion

- Tibia shaft fractures are commonly associated with fractures of the distal tibial articular surface. In our study, **24%** of distal tibia shaft fractures had an associated intra-articular fracture
- The widespread use of pre-operative CT scans for identifying intra-articular fractures is controversial. In our study, the yield for identifying a distal articular fracture was 16% overall and 23% for distal third tibia fractures.
- Further directions: Investigate "RIDEFAST" (Radiographic Investigation of the Distal Extension of Fractures Into the Articular Surface of the Tibia) criteria in our cohort of tibial shaft fractures.

Conclusions

- 92% of distal articular fractures diagnosed pre-operatively were identified on plain radiographs alone.
- While CT imaging can provide useful information for surgical planning, the low yield of identifying intra-articular fractures indicates that a large number of patients are exposed to unnecessary radiation and cost.

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