Do Preoperative Computed Tomography Scans Influence Operative Management in Ankle Fractures?

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My disclosure is in the Final AOFAS Program Book. I have no potential conflicts with this presentation.
Routine radiographs may underestimate nature and extent of bony injury in distal tibial injuries.

For higher energy articular injuries of the tibial plafond (AO 43-B, 43-C), the role of CT in operative planning is well established.

No general consensus exists, however, on the role of CT scans in planning for malleolar ankle fracture (AO 44) fixation.

Use of preoperative CT is varied, depends on many factors:
- Institution
- Surgeon preference/experience
- Injury pattern

Study Purpose: To determine the role of preoperative CT scans in operative planning for malleolar ankle fractures (AO 44)
Study Design

- **Inclusion Criteria**
  - Malleolar ankle fractures (AO Type 44)
  - Concomitant XR and CT prior to definitive treatment, 2006-2010

- **Exclusion Criteria**
  - Fractures of the tibial plafond (AO 43), Isolated syndesmotic injuries

- **100** patients enrolled

- Six study participants (3 residents, 3 attendings) independently evaluated each patient’s radiographs:
  - Operative plan formulated
  - Positioning, approach, fixation, implants

- Each patient’s CT then examined:
  - Operative plan revisited
  - Significant changes noted (i.e. major changes in positioning, implants, etc)
  - New fractures requiring surgical attention?
Fracture and Radiographic Characteristics

Number of Malleoli Involved
- One = 10
- Two = 28
- Three = 62

AO Classification (level of fibular involvement)
- 44A = 4
- 44B = 72
- 44C = 24

Presence of dislocation on presentation
- Yes = 38
- No = 62

Nature of preoperative radiographs
- Out of plaster with dislocation = 3
- Out of plaster without dislocation = 21
- In plaster only = 35
- Both in and out of plaster = 41

N=100
44% Male
Avg Age = 47yo
59% Right sided
Results: Changes in Operative Strategy

- **24% of cases** had significant change after CT review
  - Range 14-32%, SD 7.9%
  - Residents 23%, Attendings 25% (p=0.57)

- Identified additional fracture worthy of fixation in 14% of cases

- 13% Major change in positioning

- 7% Different surgical approach/incision

- Intra-class correlation = 0.773 (strong)

- No influence of resident vs. attending reviewing case on change in operative plan (p=0.57)
What Part of Fracture Was Changed?

- Medial Malleolus: 30%
- Posterior Malleolus: 24%
- Tillaux: 19%
- Arthrotomy: 8%
- Syndesmosis: 7%
- Lateral Malleolus: 6%
- Other: 7%

- Posterior Malleolus: 24%
The number of malleoli involved and the level of fibular injury predicted significant changes in the number of cases with alterations in operative strategy.

* $p < 0.05$
The nature of preoperative X-rays + presence dislocation on presentation predicted significant changes in the number of cases with alterations in operative strategy.

* $p < 0.05$
Conclusions

- CT scans are useful adjuncts in preoperative planning for malleolar ankle fractures
- Operative plan may change up to 24% of the time with the help of a CT scan
- High interobserver reliability (both residents + attendings)
- CT scans are particularly helpful in the following situations
  - Trimalleolar fracture patterns (3x)
  - Fracture / dislocations (1.5x)
  - Poor quality preoperative radiographs (no views of reduced joint out of plaster) (2x)
  - Suprasyndesmotic ankle fractures (10x)

- Limitations: retrospective sample = selection bias?, smaller representation of low energy injury types, not an outcomes study

References: