# EVALUATION OF THE ROLE OF COMPUTER TOMOGRAPHY SCAN IN THE MANAGEMENT OF COMPLEX ANKLE MALLEOLAR FRACTURES

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## Introduction

Ankle fractures represent the second most common orthopaedic trauma injuries after hip fractures. The management must provide adequate alignment for the joint line because anatomic reduction has been shown to give a better long-term result as restoration of function requires good reduction of the fractured fragments. Conventionally plain radiograph was the tool that most orthopaedic departments depend on to diagnose and classify ankle fractures. Because of the complex 3-dimensional anatomy and complexity of injuries, plain radiographs may be not sufficient to give the exact details and pattern of the fracture. So additional imaging should be considered as computer tomography scan.

## Aim of the work

The aim of this study was to analyze the role of preoperative CT scans in planning the management of complex ankle malleolar fractures and to determine when additional imaging beyond plain radiographs is indicated.

## Patients and Methods

This prospective study was conducted on 100 consecutive patients with complex ankle malleolar fractures presented to EL-Hadra University Hospital with preoperative plain x ray and computer tomography scan. The age of the patients ranged between 17to 77 years old. There were 35 males and 65 females. Three observers orthopaedic two professors and a lecturer had participated to this study. The team of this study was asked individually to make a plan for each case at first according to the plain radiographs then according to the CT scan. The management plan was discussed according to a questionnaire included the main plan, position, approach and implant choice for the medial, lateral and posterior malleolus fracture. The results were collected and compared before and after the CT scan.

## Results

**Table 1:** Assessment of the significance of the CT scan in alteration the main plan, position and approach for ankle malleolarfracture

| | | X ray | | CT | | MH | p |
|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | | |
| Position | **A** | | | | | | |
| | Lazy lateral | 77 | 77.0 | 65 | 65.0 | 2.693* | <0.001* |
| | Prone | 20 | 20.0 | 25 | 25.0 | | |
| | Supine | 3 | 3.0 | 10 | 10.0 | | |
| | Lateral | 0 | 0.0 | 0 | 0.0 | | |
| | **B** | | | | | | |
| | Lazy lateral | 75 | 75.0 | 63 | 63.0 | 3.279* | 0.001* |
| | Prone | 22 | 22.0 | 27 | 27.0 | | |
| | Supine | 3 | 3.0 | 8 | 8.0 | | |
| | Lateral | 0 | 0.0 | 2 | 2.0 | | |
| | **C** | | | | | | |
| | Lazy lateral | 75 | 75.0 | 65 | 65.0 | 2.398* | <0.001* |
| | Prone | 18 | 18.0 | 21 | 21.0 | | |
| | Supine | 5 | 5.0 | 12 | 12.0 | | |
| | Lateral | 2 | 2.0 | 2 | 2.0 | | |
| Approach | **A** | | | | | | |
| | Medial and lateral | 77 | 77.0 | 66 | 66.0 | 2.958* | 0.011* |
| | Medial and posterolateral | 20 | 20.0 | 25 | 25.0 | | |
| | Posteromedial and lateral | 1 | 1.0 | 9 | 9.0 | | |
| | Lateral | 2 | 2.0 | 0 | 0.0 | | |
| | **B** | | | | | | |
| | Medial and lateral | 69 | 69.0 | 60 | 60.0 | 2.598* | 0.034* |
| | Medial and posterolateral | 28 | 28.0 | 33 | 33.0 | | |
| | Posteromedial and lateral | 1 | 1.0 | 7 | 7.0 | | |
| | Lateral | 2 | 2.0 | 0 | 0.0 | | |
| | **C** | | | | | | |
| | Medial and lateral | 75 | 75.0 | 66 | 66.0 | 2.693* | 0.016* |
| | Medial and posterolateral | 22 | 22.0 | 25 | 25.0 | | |
| | Posteromedial and lateral | 1 | 1.0 | 9 | 9.0 | | |
| | Lateral | 2 | 2.0 | 0 | 0.0 | | |

χ**MH: Marginal Homogeneity Test**
p: p value for comparing between **X ray** and **CT**
*: Statistically significant at $p \leq 0.05$

| | | X ray | | CT | | MH | p |
|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | | |
| MM | **A** | | | | | | |
| | None | 4 | 4.0 | 2 | 2.0 | 2.915* | <0.001* |
| | Screws | 80 | 80.0 | 68 | 68.0 | | |
| | TBW | 13 | 13.0 | 21 | 21.0 | | |
| | Buttress | 3 | 3.0 | 9 | 9.0 | | |
| | **B** | | | | | | |
| | None | 4 | 4.0 | 2 | 2.0 | 2.646* | 0.002* |
| | Screws | 74 | 74.0 | 66 | 66.0 | | |
| | TBW | 15 | 15.0 | 21 | 21.0 | | |
| | Buttress | 7 | 7.0 | 11 | 11.0 | | |
| | **C** | | | | | | |
| | None | 4 | 4.0 | 2 | 2.0 | 2.915* | 0.002* |
| | Screws | 74 | 74.0 | 64 | 64.0 | | |
| | TBW | 15 | 15.0 | 23 | 23.0 | | |
| | Buttress | 7 | 7.0 | 11 | 11.0 | | |
| PM | **A** | | | | | | |
| | None | 80 | 80.0 | 70 | 70.0 | 5.050* | 0.017* |
| | Screws | 5 | 5.0 | 8 | 8.0 | | |
| | Buttress | 15 | 15.0 | 22 | 22.0 | | |
| | **B** | | | | | | |
| | None | 78 | 78.0 | 68 | 68.0 | 4.848* | 0.023* |
| | Screws | 6 | 6.0 | 10 | 10.0 | | |
| | Buttress | 16 | 16.0 | 22 | 22.0 | | |
| | **C** | | | | | | |
| | None | 82 | 82.0 | 72 | 72.0 | 5.339* | 0.025* |
| | Screws | 3 | 3.0 | 6 | 6.0 | | |
| | Buttress | 15 | 15.0 | 22 | 22.0 | | |

**Table 2:** Assessment of the significance of the CT scan in the change of the used implant for lateral, medial and posterior malleolar fractures

χ**MH: Marginal Homogeneity Test**
p: p value for comparing between **X ray** and **CT**
*: Statistically significant at $p \leq 0.05$

## Conclusion

- The CT has significant role in the management plan of ankle malleolar fracture regarding the patient position, approach and implant used for medial and posterior malleolus.
- No effect of the CT scan was found on the decision of the main plan while the plan for lateral malleolus implant altered in few cases but with no statistical significance.
- There is significant correlation between the change in the operative strategy and the number of the affected malleoli as the change occurred more with trimalleolar cases compared to bimalleolar cases.