Age and Posterior Malleolus Size Are Associated with Displacement of Trimalleolar Ankle Fracture-Dislocations

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INTRODUCTION:

Trimalleolar ankle fracture-dislocations present a unique treatment challenge in that many of them are unstable ankle fractures. There are not clear guidelines currently to determine which trimalleolar ankle fractures would benefit from external fixation while awaiting definitive open reduction internal fixation. In our experience, it is difficult to determine which of these fractures will secondarily displace in a splint while awaiting definitive fixation.

METHODS:

This is a retrospective review that evaluated all trimalleolar ankle fracture-dislocations that underwent fixation at our level 1 trauma center. All patients were initially treated with closed reduction and splinting until operative management. Patients were divided into two groups: those who maintained a stable reduction versus those who had displacement in the splint. Displacement was defined as a talar shift of at least 3 mm on the AP radiograph and/or a central plumb line not bisecting the talar dome. Analysis was performed to identify risk factors for displacement. Receiver operating characteristic (ROC) curve analysis was performed for significant factors.

RESULTS:

The study included 53 patients with adequate alignment after closed reduction. The rate of displacement in the splint was 41.5% (22 patients). Patients with displacement had a similar BMI as well as similar rates of smoking, diabetes, and neuropathy compared to patients with a stable reduction. These patients were older, with an average age of 53.14 ± 12.5 years compared to 44.8 ± 12.5 years for patients with a stable reduction. Furthermore, these patients had a larger posterior malleolar fragment, with an average of 28.9% ± 9.4% compared to 23.7% ± 9.0%.

ROC analysis showed area under the curve was 0.69 for age and 0.65 for posterior malleolar size (Figure 1). Determining cutoffs for displacement in the splint showed that an age of 50 years would have a sensitivity of 64% and specificity of 32%. Posterior malleolus size cutoff of 20% and 25% had sensitivities of 82% and 64%, respectively, and specificities of 68% and 48%, respectively. Applying these cutoffs to our patients showed that 80% of patients would maintain a stable reduction if they were either younger than 50 years or had a posterior malleolar fragment less than 25% of the articular surface. The odds ratio of displacing in the splint was 4.57 (95% CI: 1.11 to 18.76) for those either older than 50 years or those with a posterior malleolar fragment greater than 25% of the articular surface.

DISCUSSION AND CONCLUSION:

A significant portion of patients with trimalleolar fracture-dislocations treated with closed reduction and splinting had displacement in the splint. Displacement was associated with an older age and a larger posterior malleolar fragment. Patients younger than 50 years and those with a posterior malleolus fragment less than 20-25% of the articular surface would most likely maintain a stable reduction in a splint. Patients with these risk factors may benefit from temporizing external fixation to minimize complications associated with loss of reduction such as treatment delay and potential skin complications.