

The Influence of Reduction Clamp Position Relative to the Patient-Specific Trans-Syndesmotoc Axis Versus Direct Visualization and Manual Palpation on Objective Measures of Ankle Syndesmotoc Reduction

Christopher T. Cosgrove, MD¹; Amanda Spraggs-Hughes, BA¹; William M. Ricci, MD¹; Christopher M. McAndrew, MD, MS¹; Michael J. Gardner, MD²

¹Washington University in Saint Louis, Saint Louis, Missouri, USA

²Stanford University, Redwood City, California, USA

Purpose: There is little understanding of how much tolerance exists for off-axis reduction clamp position relative to the patient-specific trans-syndesmotoc axis (TSA). Controversy also exists as to whether or not percutaneous clamping is a superior technique compared to direct visualization with manual digital reduction. The purposes of this cadaveric model were to (1) determine the relationship between malreduction rates at various clamping positions relative to the patient's TSA, and (2) understand if direct visualization or palpation with manual digital reduction is superior to using a percutaneously applied reduction clamp.

Methods: 48 cadaveric through-knee specimens were imaged using CT prior to dissection. Measurements were performed to assess the native fibular position and TSA angle. The syndesmosis was then destabilized according to established protocol. Reduction clamp tines were then placed at positions 10° anterior to the TSA, along the TSA, and at both 10° and 20° posterior to the TSA. CT imaging was performed with the reduction clamp in each position. The unstable syndesmosis was then reduced with manual digital pressure using palpation of the anterior tibiofibular relationship alone, and again separately using direct visualization, to assess reduction.

Results: Palpation and direct visualization produced the overall lowest malreduction rates in all measurements: 4.9% and 3.0%, respectively. Off-axis clamping of >10° anterior or >20° posterior to the patient-specific TSA demonstrated an increased overall malreduction rate ($P = 0.02$). There was a significant difference in overcompression for all specimens where a reduction clamp was utilized (8.6%), as compared to the groups where manual digital reduction was performed alone (0%) ($P = 0.003$).

Conclusion: Reduction clamp placement is sensitive to off-axis clamping, particularly when the reduction clamp is placed beyond 10° anterior or 20° posterior to the patient-specific TSA. Use of reduction clamps increases the risk for syndesmotoc overcompression compared to manual digital reduction. This study adds to the increasing evidence that routine use of percutaneously applied reduction clamps may lead to an increased number of gross syndesmotoc malreductions and should be supplemented by, or replaced with, direct visualization or palpation of the syndesmosis.