

Δ The Impact of Skin Suture Pattern on Incision Perfusion Using Intraoperative Laser Angiography: A Randomized-Clinical Trial of Ankle Fracture Patients

Peter Shorten, MD; Robert David Nesbit; Craig Scott Bartlett, MD; Mark Haimes, MD; Patrick Christopher Schottel, MD

University of Vermont Medical Center, Burlington, VT, United States

Purpose: Maximizing perfusion to skin edges is an important modifiable variable in wound closure, but there is little evidence to suggest the superiority of 1 technique over another. Indocyanine green laser angiography (ICGLA) is a vascular imaging tool that provides real-time objective measurements of soft-tissue perfusion. The purpose of this research was to assess which primary wound closure technique- simple interrupted (SI), vertical mattress (VM), horizontal mattress (HM), Allgöwer-Donati (AD), or running subcuticular (SubQ)-enables the greatest degree of perfusion as measured by ICGLA following open reduction and internal fixation (ORIF) of ankle fractures.

Methods: 75 patients undergoing ORIF of ankle fractures (AO/OTA 44-A, B, or C) via a lateral or posterolateral approach were prospectively randomized to SI, VM, HM, AD, or SubQ closure (n = 15 per group). After ORIF, wounds were closed in layers in a standardized fashion. Immediately after skin closure, perfusion was evaluated intraoperatively using the ICGLA device and software system, which quantifies perfusion in fluorescent units on a scale of 0-255. 30y points were assessed: 10 along the incision and 10 pairs anterior and posterior to the incision. Mean incision perfusion was calculated as the average of the 10 points along the incision, with higher values indicating greater blood flow. Mean perfusion impairment is the difference between the average of the 20 points adjacent to the incision and the 10 points along the incision. Lower values indicate incision perfusion is closer to that of the surrounding tissue. These parameters were compared with 1-way analysis of variance (ANOVA) and pairwise comparisons using the Tukey method.

Results: The mean patient age was 46.5 years (range, 19-81) and the majority were female (n = 43, 57%). There was no significance difference in patient demographics (age, gender, body mass index [BMI], tobacco use, diabetes mellitus, and PVD [peripheral vascular disease]) or operative parameters (time to surgery, incision length, tourniquet time, and fracture classification) between patient cohorts. SubQ closure had significantly better perfusion compared to the other techniques studied. Mean incision perfusion in fluorescent units was as follows: SubQ, 57; AD, 41; VM, 41; HM, 36; and SI, 32 (ANOVA P <0.0003). Pairwise comparisons showed a statistically significant difference in mean incision perfusion between SubQ and all other closure patterns (SI, P <0.0002; HM, P <0.003; VM, P <0.03; AD, P <0.03). Mean perfusion impairment was as follows: SubQ, 17; AD, 20; VM, 28; HM, 29; and SI, 30 (ANOVA P <0.003). Pairwise comparisons showed SubQ closure had significantly lower mean perfusion impairment than all other suture patterns except AD (SI, P <0.01; HM, P <0.03; VM, P <0.04; AD, P <0.1).

Conclusion: Running subcuticular suture pattern best enables incision perfusion compared to simple interrupted, horizontal mattress, vertical mattress, and Allgöwer-Donati techniques following ORIF of ankle fractures.

Δ OTA Grant

See the meeting app for complete listing of authors' disclosure information.