Perfusion Pressure Lacks Diagnostic Specificity for the Diagnosis of Acute Compartment Syndrome

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Purpose: We evaluate the diagnostic performance of various thresholds of perfusion pressure (PP) using a novel diagnostic reference standard for acute compartment syndrome (ACS).

Methods: 191 patients with high-risk leg injuries were enrolled in a multicenter observational trial designed to validate a clinical decision rule predicting ACS. Each patient had a standardized data set collected prospectively regarding their injury, evolution of symptoms and vital signs (Q4H [every 4 hours]), surgeries, and 6-month outcome. Outcome data included photos and radiographs of the injured limb, SMFA [Short Musculoskeletal Function Assessment] score, and detailed assessment of motor function and sensation. The data also included continuous intramuscular pressure measurement, to which the treating surgeon had been blinded. The diagnostic reference for each patient was the median likelihood of ACS assigned by a panel of 9 experienced orthopaedic trauma surgeons, who independently reviewed each patient's data set and assigned a likelihood of ACS from 0 (no ACS) to 1 (certain ACS). Cases with discordance were reviewed in a meeting of the entire panel, and then patients were rescored. Consensus was not forced. Patients were grouped based on median likelihood ratings into 3 categories: low likelihood (≤0.3); uncertain (0.31 to 0.7); and high likelihood (>0.7). Sensitivity analyses were performed using different definitions of likelihood. The diagnostic performance of PP thresholds between 10 and 30 mm Hg were evaluated using the categorization of the panel as the diagnostic standard for each patient. The PP criterion was defined as positive if PP was ≤ the specified threshold for at least 2 consecutive hours as proposed in the current literature.

Results: 150 subjects had ≥2 hours of PP data in at least 1 compartment; 138 were assessed as low likelihood of ACS, 6 as uncertain, and 6 as high likelihood. A PP threshold of 30 mm Hg yielded 65 false positive (FP) cases and 1 false negative (FN) result, with diagnostic sensitivity = 0.83, specificity = 0.53, positive predictive value = 0.07, and negative predictive value = 0.99.Results were similar for other PP thresholds (10, 15, 20, 25 mm Hg) and were insensitive to narrower ranges of low or high likelihood, or when patients were excluded for whom there was less agreement among the panel (those with larger deviations from the median likelihood).

Conclusion: No value of PP had ideal diagnostic performance; each tested threshold had many FP and some FN results. Using PP of ≤30 mm Hg for >2 hours as a threshold for fasciotomy would have resulted in 47% of the patients with a low likelihood of ACS being treated surgically. These data question published recommendations and suggest the need for further research to develop better diagnostic tests for when to perform fasciotomy.

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