

## **Augmentation of Peripheral Venous Diameter for Ultrasound-Guided Peripheral Intravenous Line Insertion (AAEM22)**

Ciccarelli B; Reiss A; Balakrishnan V; Stankewicz H, St Luke's Hospital Network

**Background/Objectives:** Ultrasound-guided intravenous line placement is often utilized in the emergency department for venous access in patients whose veins are difficult to cannulate by traditional methods. This study aims to evaluate the performance of various interventions in augmenting venous cross-sectional area using ultrasound imaging.

**Methods:** Resident and medical student volunteers, totaling 41 participants, had their basilic vein identified on ultrasound with no intervention, and measurements of area proximal to its branching point at the antecubital fossa were taken with the arm positioned parallel to the floor and approximately 30-60 degrees below the level of the bed. These two positions were repeated with the following interventions: one rubber tourniquet applied approximately 5 cm proximal to vein measurement, an additional rubber tourniquet applied 5 cm proximal to first tourniquet, blood pressure cuff inflated to between 160 to 200 mmHg, CAT tourniquet application, and soaked warm towel applied to brachium for up to one minute. The primary outcome of this study was increase in venous cross-sectional area from baseline measurement.

**Results:** All interventions were statistically significant in increasing venous cross-sectional area as compared to no intervention, with the most significant being CAT tourniquet ( $p < 0.001$ , mean change  $+7.32$  mm<sup>2</sup>, 95% CI  $+5.73$  to  $+8.91$  mm<sup>2</sup>). The addition of change in position of the arm was not statistically significant for any intervention except for CAT tourniquet ( $p = 0.0056$ , mean change  $-1.74$  mm<sup>2</sup>, 95% CI  $-0.54$  to  $-2.93$  mm<sup>2</sup>). Notably, there was no significant difference between application of two tourniquets and blood pressure cuff ( $p = 0.496$ , mean change  $+0.58$  mm<sup>2</sup>, 95% CI  $-1.13$  to  $+2.29$  mm<sup>2</sup>), but there was a significant increase in cross-sectional area with CAT tourniquet use compared to blood pressure cuff ( $p = 0.018$ , mean change  $+1.62$  mm<sup>2</sup>, 95% CI  $+0.29$  to  $+2.95$  mm<sup>2</sup>). Lastly, two tourniquets significantly increased cross-sectional area compared to one tourniquet ( $p < 0.001$ , mean change  $+2.20$  mm<sup>2</sup>, 95% CI  $+1.14$  to  $+3.26$  mm<sup>2</sup>).

**Conclusions:** This study identified several potential interventions for maximizing venous cross-sectional area on ultrasound. All the tested interventions resulted in statistically significant increase in cross-sectional area. The addition of arm positioning did not show significant changes in most interventions, with the exception being the CAT tourniquet. The devices used in this study are readily accessible in most emergency departments, allowing the results to be broadly applicable to practicing emergency physicians. Further study should be conducted to assess how these interventions affect overall success when used in ultrasound-guided intravenous line placement.