# The Use of a Novel Device Improves Real-Time Ultrasound Guided IV Access

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## Abstract

Study Objective.

Real-time ultrasound guided intravenous (USGIV) access improves the success and decreases complications of central intravenous access. However, the ability to perform this procedure requires skill and practice. The purpose of this study was to determine if a novel ultrasound device improved emergency medicine residents (EMR) first-pass success rate compared with the traditional technique.

Methods.

This prospective, randomized, crossover study was approved by our IRB. A novel ultrasound probe (Soma Development LLC, Greenville, SC) which uses a small phased array transducer with an integrated needle guide and Hall effect sensor to graphically represent projected needle path and real-time needle position, was demonstrated to residents 1-2 weeks before study enrollment. EMR used the Soma device and traditional technique 1-2 times on a peripheral vein phantom during the introductory demonstration.

The number of USGIV access procedures performed prior to the study was obtained for each EMR, who were then block randomized to start with either the Soma device or with the traditional technique. The traditional technique involved a two-handed technique with a 10-5 MHz linear transducer of a SonoSite M-turbo (SonoSite Inc., Bothel, WA). Each EMR performed USGIV access on three different simulated veins (peripheral, internal jugular and subclavian) in both the long and short vessel axis using Blue Phantom ™ models. Successful needle placement was confirmed by fluid aspiration. Primary outcome was first pass success rate. Secondary outcomes included: total time to intravenous access, needle tip visualization at time of vessel puncture, posterior wall vessel puncture, number of forward needle passes, and number of attempts.

Data was collected using a standardized form and entered into an 2007 Excel spreadsheet (Microsoft Corp., Redmond, WA) where statistical analysis was performed using Pearson's chi-square for non-parametric data and Student's t-test for parametric data.

Results.

Twenty-four EMR participated (7 PGY-1, 7 PGY-2, 10 PGY-3). The mean number of USGIV performed by all EMR before the study was 23.75 (range 6-57). A total of 288 USGIV attempts were analyzed. There were 4 failures to obtain USGIV access with the traditional technique and none with the Soma device.

First pass success rate for all USGIV attempts was significantly better with the Soma device (99.3%) vs. 37.1% for the traditional technique, $x^2=127$, $p<0.001$. This statistical significance for first pass success rate remained true in subgroup analysis of all vessels: peripheral (Soma 100% vs. traditional 36.2%, $x^2=45$, $p<0.001$), subclavian (Soma 97.9% vs. traditional 21.7%, $x^2=56$, $p<0.001$), and internal jugular (Soma 100% vs. traditional 53.2%, $x^2=30$, $p<0.001$).

Needle tip visualization at vessel entry was significantly better for the Soma device 100% vs. 39.8% for the traditional technique, $x^2=125$, $p<0.001$. Time to obtain USGIV access was also significantly better with the Soma device 15.1 seconds vs. traditional 52.3 seconds, $t=7.35$, $df=286$, $p<0.001$.

Conclusion:

USGIV access performed by EMR with the Soma device significantly improves first-pass success rate for peripheral, subclavian, and internal jugular veins compared with the traditional two-hand technique in a phantom model.