Cannulation of small arteries and veins in young children can be challenging. Although anesthesiologists frequently use ultrasound for placement of central venous lines and nerve blocks, its use for cannulation of small, peripheral vessels is less helpful. Ultrasound systems (7-15 MHz) currently used in clinical practice focus poorly at the sub-10 mm space and thus lack the resolution to allow accurate ultrasound-guided cannulation of small vessels. High frequency micro-ultrasound (HFMU) is a new technology that allows higher resolution (15-50 MHz) compared to conventional ultrasound. The Vevo 2100 (Vevo 2100, Visual Sonics, Inc., a subsidiary of Sonosite, Bothell, WA, USA) is the first commercially available machine to feature a HFMU imaging system. Limited human studies have been performed thus far with HFMU, and none have been performed in young children or for vascular access. This study was conducted to determine the feasibility of using HFMU to visualize and cannulate peripheral arteries and central veins in children under the age of 6 years old.

Forty children were recruited, and successful arterial cannulation was achieved with HFMU guidance in 33/40 children. The mean cannulation time, as recorded from skin puncture to successful guidewire placement in the artery, was 3:46 minutes (median 1:26 min). Success of and mean time to cannulation varied across age groups. Overall, the artery was cannulated on the first puncture in 13/33, and arterial access required more than 3 attempts in 4/33 patients. In 28 patients, both the radial and ulnar arteries on the same wrist were visualized. In those 28 children, the mean diameter of radial arteries was 1.71 mm ± 0.48 mm (median 1.83 mm), and the mean diameter of ulnar arteries was 1.53 mm ± 0.46 mm (median 1.42 mm).

The anesthesiologists involved in this study found the 50 MHz HFMU probe useful for cannulation of peripheral arteries, especially in the youngest children. The higher frequency probes were less helpful for internal jugular vein cannulation because it was not always possible to view the carotid artery while cannulating the vein. The experience gained in this feasibility study suggests that HFMU could be a valuable addition to our armamentarium for difficult vascular access in the future.