INTRODUCTION

- Radial artery spasm is a vexing problem for anesthesiologists when placing an arterial line. Spasm prior to successful cannulation can make placement of the catheter difficult or impossible, and spasm after catheter placement often leads to poor pressure readings and an inability to draw blood samples.

- Our pictures, obtained with high frequency micro-ultrasound (HFMU), uniquely demonstrate the severity of radial artery spasm. We also discuss treatment options for spasm of the radial artery.

BACKGROUND

- Currently, most portable ultrasound systems used in anesthesia have a frequency range of 7-15 MHz with a maximum resolving power of 300 microns and a penetration of 60 mm. Advances in technology have led to the development of ultrasound probes with array technology in the 15-50 MHz range. The Vevo 2100 (Visual Sonics, Inc., a subsidiary of Sonosite, Bothell, WA, USA) is the first commercially available machine to feature this high frequency micro-ultrasound (HFMU) imaging system. The machine is equipped with 15, 20, 30, 40 and 50 MHz probes. The 50 MHz probe is only capable of imaging to a depth of 10 mm but has a resolution of 30 microns; for comparison, a red blood cell has a diameter of 8 microns.

- There are limited human studies with HFMU and none in small children. A feasibility study was therefore 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.

- The radial artery contains a high density of alpha-1 adrenoceptors and is more susceptible to spasm compared to many other arteries. The occurrence of spasm after successful cannulation can be directly treated with intra-arterial administration of a vasodilator, such as nitroglycerine, verapamil, or papaverine.

- However, when arterial spasm occurs before successful cannulation of the artery, subsequent cannulation may be impossible, as our picture shows. When this occurs, three choices remain: choose a new site for cannulation; wait for the spasm to resolve if access is required in that artery; or treat the arteriospasm.

- Treatment of arteriospasm to facilitate cannulation of the segment in spasm is not well studied. Reported treatment options include systemic administration of a vasodilator, with the risk of systemic hypotension, and subcutaneous peri-arterial administration of nitroglycerine, with or without local anesthetic.

- Subcutaneous nitroglycerine can be effective in rapidly re-establishing a palpable radial pulse, and ultrasound may aid in evaluating the extent of vessel in spasm and relaxation of spasm after treatment.

**CASE REPORT**

- A 6.5 kg 8 month old was undergoing arterial line placement under anesthesia for repair of congenital heart disease. The 50 MHz HFMU probe was used for guidance. With blood return in the needle, HFMU was able to demonstrate the needle bevel within the lumen of the radial artery, but the wire could not be advanced. Further ultrasound scanning of the artery demonstrated spasm, and a palpable pulse no longer could be felt in the wrist.

- The intraluminal diameter of the artery before attempted cannulation was 2.1 mm (figure 1A), and measurement of the segment in spasm revealed an intraluminal diameter of 0.4 mm (figure 1B). It seems reasonable then that the 0.38 mm diameter guide wire would not advance into the section in spasm and that advancement of the catheter off of the needle would not be possible.

**DISCUSSION**

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