CASE REPORT: JS is an active 13 year old female undergoing elective repair of partial anomalous pulmonary venous return with a large sinus venous ASD. Cardiac symptoms included mild exercise intolerance. Preoperative workup included transthoracic echocardiogram and cardiac MRI. She presented to Doernbecher Children’s Hospital for repair in her normal state of good health. Preoperative history revealed longstanding history of Raynaud’s phenomenon. She reported symptoms of episodic cold induced extremity change from white, to blue, to red, confirmed by her parents. She was on no baseline medications. She used hand warmers, wore gloves, and warm wool socks to mitigate symptoms. Preoperative discussion of the anesthetic risks included the loss of distal arterial perfusion with arterial line placement specifically in the context of Raynaud’s phenomenon. The options presented to the family included: no surgery, usual arterial line placement, arterial line placement in a large vessel, or arterial line placement with local nerve block. JS proceeded to the operating room where she had a smooth induction and intubation. Two peripheral intravenous lines and a right internal jugular central line were placed without complications. A left 22-gauge radial arterial line was placed on the first pass. Using ultrasound guidance, a left axillary block using a 22-gauge stimulating needle was performed. With ultrasound guidance the median, ulnar, radial, and musculocutaneous nerves were visualized and the Ropivacaine 0.2% plain 20 mL was incrementally injected. The pulse oximeter was placed on the left hand. JS tolerated the procedure well. All four extremities were monitored with pulse oximetry throughout the procedure, especially during cardiopulmonary bypass (CPB). She was cooled to 34 degrees, on CPB for 35 minutes with an aortic cross clamp time of 30 minutes. Her hand remained warm and well perfused throughout. In fact, her left hand was warmer to the touch than her other extremities throughout the entire procedure. At the conclusion of the procedure, JS was transferred, in stable condition on milrinone 0.5 mcg/kg/min and nicardipine 3 mg/hr, to the pediatric intensive care unit. The arterial line was removed on post-operative day one and JS experienced no sequela in her hand from the arterial line placement. The block lasted approximately 12 hours in duration.

DISCUSSION: Raynaud’s phenomenon is the abnormal sensitivity of small arteries and arterioles to cold temperatures and emotional stress, with the response of recurrent vasospasm (1,2). The fingers and toes are the most affected. The pathophysiology of Raynaud’s phenomenon is still not completely understood. It has been suggested that this disease has three board categories of pathologic mechanisms—vascular, neural, and intravascular abnormalities (2). Although large epidemiological studies have shown this disorder to be more prevalent in women, the true prevalence of it is not known (2). Primary Raynaud’s phenomenon, as described here, is distinctly different from secondary Raynaud’s disease, which is associated with progressive systemic sclerosis and, in pathophysiology, severity of symptoms, prognosis, and treatment (2). This case posed an interesting question for us: in an individual with Raynaud’s phenomenon, which artery is the safest to cannulate? According to a frequently used textbook of pediatric anesthesia, the femoral artery should not be the first choice for cannulation in children (3); however it is frequently cannulated in pediatric cardiac surgery. There have been multiple case reports of various blocks, including stellate ganglion block, lumbar block, and thoracic sympathetic block increasing perfusion, temperature, and even aiding in healing the digits (1,4,5). Theoretically larger arteries may experience less spasm, however there is no data to support that notion. If the femoral artery was cannulated in this patient and went into arterial vasospasm, she was at risk to lose her leg. In addition, monitoring and potentially warming upper extremities while in the operating room is technically easier than the lower extremities. Using her non-dominant hand we had easy access to the limb for monitoring, potentially warming, and arguably would be less devastating of a loss. We decided to proceed with a radial arterial line and then place an axillary block resulting in a sympathectomy to ensure good perfusion to the hand. The hand was monitored with pulse oximeter, visual inspection, and tactile inspection throughout the case. In addition, we chose a 22-gauge catheter, rather than a 20-gauge, in an attempt to improve hand perfusion. This patient experienced no short or long-term sequella from arterial line placement. It is likely that as long as JS had a reasonable pulse, we could have chosen either the radial or ulnar artery to cannulate (6). It remains unclear which artery is the safest, most efficacious, and least likely to cause long-term sequella to cannulate in patients with Raynaud’s phenomenon or secondary Raynaud’s disease that come to the operating room for procedures requiring invasive blood pressure measurement.

Conclusions:
1. If you don’t ask the patient specific questions regarding their past medical history you will not get a complete history.
2. It remains unclear the best location to cannulate an artery in a patient with Raynaud’s phenomenon.

References:
1) Omote, K et al, Anesth Analg 1993;77:1057-60.
4) Skeehan, TM; Anesthesiology 1986;64:119-120.