Arterial cannulation is routine performed in children undergoing cardiac surgery to aid the intraoperative and intensive care management. Most commonly cannulated peripheral site in children is radial artery, and alternatives include posterior tibial, dorsalis pedis, and rarely superficial temporal artery (STA). Two specific situations in cardiac surgery where STA cannulation and monitoring was useful during the surgical procedure are reported. To our knowledge, such selective use of STA pressure monitoring has not been reported in the literature previously. Our experience suggests that STA monitoring can be useful and reliable during repair of coarctation of aorta or administration of anterograde cerebral perfusion in patients having associated aberrant origin of the right subclavian artery.

Key words: Aberrant right subclavian artery; Cardiac surgery; Invasive arterial pressure monitoring; Superficial temporal artery cannulation

INTRODUCTION

Arterial cannulation is routinely advocated in children undergoing cardiac surgery to aid the intraoperative and intensive care management. Cannulation of superficial temporal artery (STA) had been practiced since long time in neonates and patients requiring intensive care treatment, but not well reported for perioperative monitoring understandably due to the availability of other easier and safer sites. We report two cases where STA pressure monitoring was particularly useful during cardiac surgery. To the best of our knowledge, such selective use of STA pressure monitoring has not been reported in the literature previously.

CASE REPORTS

The manuscript has been approved by the Institutional Review Board with a waiver of consent (No. 13392).

Case 1
A female neonate was diagnosed to have truncus arteriosus type 1, interrupted aortic arch type B, a large ventricular septal defect, patent ductus arteriosus and aberrant right subclavian artery (ARSA). She was scheduled for repair of truncus arteriosus and interrupted aortic arch. Inside the operating room, after inducing general anesthesia using standard techniques endotracheal intubation was done and positive pressure ventilation was instituted. A right femoral arterial catheter and a right internal jugular venous triple lumen catheter were inserted subsequently. Though it is our routine practice to insert a right radial arterial catheter for pressure monitoring in patients expected to require...
anterograde cerebral perfusion (ACP), considering the aberrant origin of right subclavian artery, right STA was cannulated by percutaneous method using 24G cannula [Figure 1]. On transduction, the STA showed good reliable pressure trace with the normal contour. The surgical repair was done under cardiopulmonary bypass (CPB) with deep hypothermic circulatory arrest (DHCA). ACP was administered through the right carotid artery for 47 min at a rate of 50 ml/kg/min during the period of DHCA. Cerebral perfusion pressure was monitored by transducing the STA catheter. Cerebral oximetry was also used during the procedure to facilitate the monitoring during ACP. The child was weaned off CPB at the completion of the surgical repair and was shifted to Intensive Care Unit (ICU). STA catheter was removed in the ICU on the same day, and the child had an uneventful recovery.

**Case 2**

A 6-month-old male baby, weighing 5.8 kg, was diagnosed to have Shone syndrome with mitral stenosis, multiple ventricular septal defects, coarctation of aorta (CoA) and aortic arch hypoplasia and was scheduled for repair of CoA and pulmonary artery banding through left posterolateral thoracotomy. After induction of anesthesia using standard techniques, endotracheal intubation was done, and controlled ventilation was initiated. It is a standard practice to cannulate the right radial artery for pressure monitoring during repair of CoA to facilitate continuous pressure monitoring while the aorta is clamped. Since the child had aberrant origin of the right subclavian artery, right STA was cannulated percutaneously using 24G cannula. A left internal jugular venous triple lumen catheter and a left femoral arterial catheter were also inserted. The surgical procedure was completed with aortic cross clamp time of 20 min. The STA catheter showed a good normal pressure waveform during the procedure and showed comparable pressure with the femoral arterial catheter after repair of CoA. The STA catheter was removed on the same day in the ICU and the child had an uneventful recovery.

**DISCUSSION**

A percutaneous arterial cannulation is routinely done in patients undergoing cardiac surgery for continuous invasive blood pressure monitoring and blood gas analysis. Most commonly cannulated peripheral site in children is radial artery, and alternatives include posterior tibial, dorsalis pedis, and rarely STA. In small babies femoral and brachial artery, cannulation is also practiced especially when distal arterial cannulation is difficult or failed. Rarely surgical cut down is done when percutaneous cannulation attempts are failed. STA cannulation has been described as safe and useful in children in the intraoperative and intensive care setting in the literature although it is not a common practice in most institutions.[1,2] Complications of STA cannulations, like any other cannulations, include thrombosis, local infection, positive blood cultures, and local scarring.[3] Cerebral embolization has also been described with STA cannulation due to air or blood clot.[4]

ACP is often used in congenital cardiac surgery when repair of cardiac lesions with aortic arch reconstruction is done using DHCA. The perfusion of the brain is maintained by forward flow through the right carotid artery using the CPB machine. The flow has to be maintained at the optimal level in order to provide adequate perfusion while avoiding excess pressure causing damage to the vasculature and hyperperfusion of the brain. During ACP, it has been shown that a flow of at least 50 ml/kg/min is required for a good outcome in neonates. Though the delivery pressure is monitored during ACP, during deep hypothermia where there is systemic vasoconstriction, the delivery pressure does not always equate the perfusion pressure. Bifrontal cerebral oximetry along with transcranial Doppler if available, provides a reliable monitoring during ACP.[5] ACP is done during DHCA and hence the femoral artery pressure monitoring will not be useful. Cerebral perfusion pressure during ACP is monitored commonly by direct cannulation of the right radial artery in patients with a normal branching pattern of arch vessels. Occasionally right brachial artery

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**Figure 1:** Actual photograph showing right superficial temporal artery cannulation
is cannulated if radial arterial cannulation is failed or rarely even as a first choice. Due to the aberrant origin of the right subclavian artery in our patient cannulation of right radial or brachial artery was not an option. Hence, STA was cannulated electively and monitored during ACP. ARSA and its association with other vascular anomalies and cardiac lesions are well described in the literature.[6,7] Cerebral oximetry was also used to compliment monitoring to ensure adequate perfusion.

Right radial artery cannulation is also done in patients with the normal origin of right subclavian artery undergoing repair of CoA in order to monitor the proximal blood pressure once the aortic cross clamp is applied. Again, since our second patient had aberrant origin of the right subclavian artery, cannulation of right radial or brachial artery was not an option. In both patients, the STA catheters were removed on the same day after the procedure, and the invasive blood pressure monitoring was continued with femoral artery catheter. There were no catheter-related complications reported in the postoperative period. Both the catheters were removed early in order to prevent the development of rare, but potentially serious complications like thrombosis and cerebral embolization.

In summary, monitoring of STA can be useful and reliable during selective procedures like repair of CoA or administration of ACP in patients having associated aberrant origin of the right subclavian artery. Early removal of the catheter should be considered to prevent complications.

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**Conflicts of interest**
There are no conflicts of interest.

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