Neonatal Hemodynamic Instability and Transesophageal Echocardiogram Probe Insertion

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Introduction: 

The most common indication for transesophageal echocardiography (TEE) in patients with congenital heart disease (CHD) is intraoperative assessment during cardiac surgery.\(^1\) TEE is beneficial pre-CPB for anatomic, hemodynamic and cannulae assessment. Post-CPB it is useful for evaluation of surgical repair and detection of residual defects.\(^2\) Several complications related to probe insertion noted in the literature include hemodynamic and respiratory complications resulting in hypotension, arrhythmias, and airway compression. We report two cases of rhythm disturbance after TEE probe insertion in neonates.

Case 1: 

A 7-day-old, 3.1 kg, ASA IV female with HLHS scheduled for Norwood surgery. She was on PGE-1 and CaCl\(_2\) infusions and had no prior arrhythmia history per ECG or chart review. She received pancuronium, fentanyl (8mcg/kg) and 0.4% sevoflurane prior to TEE insertion. Access included in situ RAC PICC, LFV central & R radial lines, and ETT. Despite ease of placement, the TEE probe immediately induced a narrow complex SVT (atrial flutter)\[Fig.1\]. She also had profound hypotension requiring chest compressions, adenosine, multiple attempts at synchronized cardioversion, and escalating doses of Epinephrine and Amiodarone prior to conversion to NSR. The case was cancelled due to elevated lactacid and persistent hypotension. On return to the OR 2 days later, she had 2 episodes of stable SVT after sternotomy, without use of TEE, that resolved spontaneously. Of note, on POD 0 she developed atrial tachycardia and PAC’s that required amiodarone. Additionally, she developed PACs, PVCs and junctional arrhythmia during a pre-Glenn catheterization with wire manipulations.

Case 2: 

A 13-day-old, 2.5 kg, ASA IV female with heterotaxy, dextrocardia, DORV, CAVC, L-TGA, PA and right-sided aortic arch scheduled for BT shunt and pulmonary artery stenosis repair was on PGE-1 and milrinone infusions. She had no prior arrhythmia history per ECG or chart review. She received pancuronium, fentanyl (8mcg/kg) and 0.4% sevoflurane prior to TEE insertion. Access included umbilical and radial arterial lines as well as RUE PICC, PIV and ETT. TEE probe placement was straight forward, however, within seconds the neonate was pale and there was total loss of umbilical & radial arterial tracings as well as ETCO\(_2\), with apparent SR suggesting PEA\[Fig.2\]. The TEE probe was removed immediately with complete resolution of symptomatology. No additional intervention was required. There were no further TEE studies attempted during this procedure.

Discussion: 

The most common indication for intraoperative TEE with CHD is assessment during cardiac surgery. TEE is reported to be a safe procedure in pediatric patients as small as 1.4 kg, however additional caution is noted when inserting a probe in patients weighing less than 3 kg.\(^3\) The reported incidence of complications during TEE evaluation of the pediatric patient is 1-3% with hemodynamic compromise at 1.7%.\(^4\) Reported complications related to probe insertion include hemodynamic compromise (hypotension, arrhythmias), respiratory (airway compression, ventilatory compromise), and esophageal (trauma, inability to pass).\(^5\)

We reported two distinct cases with two different arrhythmias (SVT and PEA) and significant hemodynamic compromise related to TEE probe insertion that resulted in cessation of TEE examination. One which required aggressive resuscitation. Previous reports have documented SVT and innominate artery compression with TEE probe insertion causing hemodynamic compromise.\(^6\) Therefore, one must be vigilant in monitoring for instability during TEE probe insertion and examination, especially in very small infants and be prepared to initiate resuscitative efforts. However, given the value of TEE, use should not be limited due to fear of these complications.\(^7\)

Learning Points:

- Incidence of TEE complications 1-3%
- Hemodynamic compromise w/ TEE 1.7%
- Awareness/prompt recognition of compromise
- Remove probe as part of resuscitation

Conclusion: 

These cases are a reminder that extreme hemodynamic instability requiring aggressive resuscitation does occur with TEE and requires prompt recognition and intervention.

References:


Figure 1: Case 1: Narrow complex SVT (atrial flutter) with dampened arterial line tracing.

Figure 2: Case 2: PEA with total loss of umbilical and radial arterial tracings.