

TEE as a Monitor of Intraoperative Ventricular Volume and Function and Iv Fluid Management: The Impact on Intra and Postoperative Fluid Management in the Partial Separation of Conjoined Twins

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Abstract

Background: Thoracoabdominal conjoined twins presented for partial separation after worsening hemodynamic and respiratory compromise. They had a large volume shunt causing IgH output cardiac failure in BG2 and hypotension and oliguria in BG1. Their unique anatomy and shared systems required innovative imaging to optimize their preoperative, intraoperative, and postoperative course.

Objective: To examine the use of the intracardiac echocardiogram when used as a transesophageal echocardiogram in the preoperative, intraoperative, and postoperative care of conjoined twins.

Methods: Pediatric TEE was too large for these babies, so an ICE probe was used as TEE. TEE was used for preoperative positioning by examining cardiac depression on each side. Intraoperatively, TEE was used to examine cardiac filling post shunt separation. Fluid boluses were based on TEE findings. In the postoperative period, providers were assured that shunt was closed and no additional shunts were present based on TEE.

Conclusions: After the complete liver separation and shunt closure, the hemodynamics of each baby improved dramatically, with normalization of blood pressures and heart rates, as well as urine output. The use of the ICE probe as a transesophageal echocardiogram allowed for optimized preoperative planning, and a unique method of intraoperative fluid management. Physiological cardiac rearrangement after partial separation and closure of the shunt was able to be witnessed in real time.

Keywords: TEE; Intraoperative Ventricular; Postoperative Fluid; Conjoined Twins

Introduction

Conjoined twins remain rare, only accounting for 1 out of every 200,000 births worldwide. Approximately half of those will be still-born, and an additional 30 - 35% will only survive one day. For those who do survive, separation presents a unique challenge for medical providers. Diligence is needed to sort out the various anatomical connections prior to surgery and innovation is often required to obtain the best images. In this case study, an intracardiac echocardiogram probe was utilized as a transesophageal echocardiogram for preoperative evaluation as well as for intraoperative fluid management and cardiac monitoring during the partial separation of conjoined infants [1-3].

Case Report

Female thoraco-omphalopagus conjoined twins (BG1 and BG2) came to our attention for possible organ separation on day of life 7 (Figure 1).

Delivered at 36 weeks by c/section to a G1 mother. Twins sister weight were 2, and 2.2 Kg.

Pre-birth imaging suggested common liver and severe cardiac abnormalities. Upon birth, hearts actually relatively functional, each with ASDs. BG1's ventricle compressed that of BG2. Imaging confirmed the common liver with large truncus venous shunt connecting. Shared over 90% of their intravascular volume through volume shunt with flow going from BG1 to BG2. The hepatic BG2 became polyuric and hypertensive, subsequently developing high cardiac output failure with secondary concentric LVH.

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Figure 1

BG1 was oliguric and hypotensive. Both were intubated for worsening oxygen saturation and PaO₂. It became clear that partial, if not complete separation, was needed for their survival. Because of their unique anatomy, innovation was needed to prepare for surgery and to manage them intraoperatively and postoperatively.



Figure 2

Methods

Underwent GA for organ separation. Each had PIVs, arterial lines, central lines, and ETTs. Total weight 4.2 kg, too small for pediatric TEE probe. ICE probe used to examine cardiac function pre-op determined that BG2 had severely depressed left ventricular systolic function when placed on her left side. BG1 had no derangements with position. Using this information, children were placed in optimized positioning for surgery. Intraoperative TEE was performed using 6F ICE probe in esophagus of BG1, allowing simultaneous visualization of both hearts. Prior to hepatic division: both children had good biventricular systolic function - BG2's heart moderately hypertrophied (Figure 2), BG1's left ventricular thickness appeared normal.

After hepatic division: immediate increase in caliber of BG1's IVC and hepatic veins with subsequent increase in her ventricular volume BG2's LV became grossly underfilled leading to hypotension and desaturation. BG2 received fluid boluses and calcium with improvement. No changes were seen in BG1 in response to BG2's treatment. Information was relayed to surgical team who were assured no additional volume shunts were present. TEE facilitated the amount of IV fluids needed intraoperatively, avoiding both overloading and underloading.

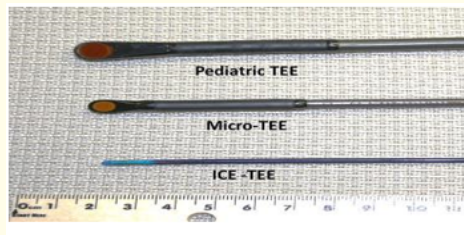


Figure 3

Discussion and Conclusion

After the complete liver separation and shunt closure, the hemodynamics of each baby improved dramatically, with normalization of blood pressures and heart rates, as well as urine output. The information gained from intraoperative TEE assisted in postoperative fluid administration as well as it was known that no additional volume shunts were present (the twins were now “separate”. The use of the ICE probe as a transesophageal echocardiogram allowed for optimized preoperative planning, and a unique method of intraoperative fluid management, and ideal postoperative care. Physiological cardiac rearrangement after partial separation and closure of the shunt was able to be witnessed in real time.



Figure 4

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