

Fast Track Pediatric Cardiac Surgery:

Objectives:

1. Define the clinical practice of fast track recovery/extubation in the pediatric patient following cardiac surgery.
2. Discuss patient selection for fast track recovery and indications and contraindications to early extubation following pediatric cardiac surgery.
3. Review the literature regarding benefits and risks associated with fast track recovery and extubation in the pediatric cardiac surgery population.
4. Develop an anesthetic and post operative sedation plan for the pediatric patient presenting for cardiac surgery with the goal of early extubation, adequate analgesia and appropriate sedation.
5. Discuss the clinical application of dexmedetomidine in the pediatric cardiac patient including pharmacokinetics and pharmacodynamics.

Case 1:

A 6-month-old female (weight 5 kg) presents for repair of a perimembranous ventricular septal defect (VSD), secundum type atrial septal defect (ASD), and cleft mitral valve. The patient undergoes repair of all defects through a limited sternotomy with cardiopulmonary bypass (CPB) and cross-clamp (CCT) times of 70 and 45 minutes, respectively. The patient weaned from CPB without Inotropes or vasoactive infusions. Post-repair TEE demonstrated a good repair without residual defect. She is hemodynamically stable, warm, and in sinus rhythm. The sternum has been re-approximated and the surgeon is inquiring about extubation.

Questions:

1. Does the intraoperative course change your pre-op anesthetic plan as discussed with the family?
2. Is this patient a candidate for early extubation? In the operating room? Soon after arrival to ICU?
3. What aspects of the patient's history make her a good/bad candidate for fast track recovery?
4. If not previously performed, would you consider regional techniques for post-operative analgesia?
5. What is your plan for post-operative sedation and analgesia for this patient?

Case 2:

A 2 yr old male with history of HLHS s/p Bi-directional Glenn shunt now presents for completion Fontan. His pre-BDG cath data were found to be favorable for Fontan. His mother reports that he has been well, although he is starting to slow down when playing with his brothers. He is s/p Nissen and gastrostomy tube, but is now gaining weight appropriately and only uses the g-tube for feeds. His hospital course following BDG was uneventful. The patient's cardiologist mentioned to the family that Fontan patients usually do better when allowed to breathe on their own and are usually extubated soon after surgery. The family is inquiring about expectations for the post operative course, including timing of extubation and management of analgesia and sedation.

Questions:

1. What is your anesthetic plan for this patient? Would you consider regional?
2. Is this patient a “fast track” candidate? If yes/no, explain how that impacts your peri-operative management.
3. What aspects of the patient’s history make him a good/bad candidate for fast track recovery?
4. How would you address the family’s questions regarding post-operative sedation and analgesia?
5. How do you counsel the family regarding timing of extubation?
6. What do you tell the family regarding the benefits of spontaneous ventilation and early extubation in Fontan patients? How does this affect your practice? What is the practice at your institution?

Case 3:

Part A:

A 3 month old (3.5kg) male infant with balanced AV canal and failure to thrive (FTT) presents for complete repair. He has a balanced lesion without evidence of over circulation or cyanosis. He was hospitalized at 6 weeks of age for non-RSV bronchiolitis. His genetic studies have been negative for trisomy or other defects. He has been receiving supplemental nutrition via an NJ tube. His pre-operative echo reveals the above defect with systemic RV pressures. The family is inquiring about expectations for the post operative course, including timing of extubation and management of analgesia and sedation.

Questions:

1. What is your anesthetic plan for this patient? Would you consider regional?
2. Is this patient a “fast track” candidate? If yes/no, explain how that impacts your peri-operative management.
3. What aspects of the patient’s history make him a good/bad candidate for fast track recovery? Would your management change if the patient had Trisomy 21? 22q11 deletion?
4. How would you address the family’s questions regarding post-operative sedation and analgesia?
5. How do you counsel the family regarding timing of extubation?

Part B:

The patient underwent complete repair of a balanced AVSD with CBP and CCT of 121 and 61 minutes respectively. She weaned from CPB in sinus rhythm on low dose dopamine. Post repair TEE showed an excellent repair, trace AV valve insufficiency, no residual shunt, and good bi-ventricular function. The child has ½ systemic RV pressures by pullback. The sternum has been re-approximated and the surgeon is inquiring about extubation and plans for post-operative care.

Questions:

1. Does this information change your pre-op anesthetic plan as discussed with the family?
2. Is this patient a candidate for early extubation? In the operating room? Soon after arrival to ICU?

3. If not previously performed, would you consider regional techniques for post-operative analgesia?

Discussion Questions:

1. Define fast track pediatric cardiac surgery.
2. List Inclusion/Exclusion criteria for patient selection.
3. Discuss the purported benefits and risks associated with fast track cardiac surgery?
4. Systems based practice: What are the potential benefits of fast-tracking in surgery for CHD? Who actually benefits from fast track/early extubation? Is patient outcome improved? Is parent satisfaction improved? If there are cost-savings associated with fast-tracking, who reaps the rewards: patient, provider, or hospital?
5. Discuss anesthetic management options including; regional, opioid sparing vs short acting opiates, volatile anesthetics and concerns for neurocognitive effects in neonates, TIVA, dexmedetomidine?
6. What are the goals for an ideal post op/ICU sedation and analgesia plan for the cardiac surgery patient? For the patient extubated in the OR? For rapid weaning of the intubated patient? How does the anesthetic management intra-op affect the post op sedation and analgesia plan?

Fast tracking in Pediatric Cardiac Anesthesia

Fast tracking is not a new concept but one that is being revisited in this era of increased attention to cost containment, reduced resource utilization, desire for improved patient safety and reduced patient harm(1,2). Fast tracking was popular in 1960's and 70's when it was more of a necessity due to limited abilities to provide post op mechanical ventilation. It then fell out of favor with the advent of modern synthetic opiates and advances in mechanical ventilation. There was a renewed interest, first in adult cardiac patients and now in children. There is no consensus definition, but generally involves early extubation whether in the OR, or within a few hours of surgery, rapid weaning from mechanical ventilation, rapid normalization of the patient (i.e. removal of lines, wires, and tubes), early discharge from the ICU to lower acuity setting, early ambulation and early hospital discharge(1-3). The goal is to improve patient care, reduce ICU and hospital lengths of stay, promote throughput by earlier discharge, reduce hospital charges, and reduce perioperative morbidity (1-4).

Selected Reading:

-Howard F, Brown KL, Garside V, Walker I, Elliott MJ. Fast-track paediatric cardiac surgery: the feasibility and benefits of a protocol for uncomplicated cases. *Eur J Cardiothorac Surg* 2010;37:193-6.

- Winch PD, Nicholson L, Isaacs J, Spanos S, Olshove V, Naguib A. Predictors of successful early extubation following congenital cardiac surgery in neonates and infants. *Heart Lung Circ* 2009;18:271-6.

-Morales DL, Carberry KE, Heinle JS, McKenzie ED, Fraser CD, Jr., Diaz LK. Extubation in the operating room after Fontan's procedure: effect on practice and outcomes. *Ann Thorac Surg* 2008;86:576-81; discussion 81-2.

-Yuen VM. Dexmedetomidine: perioperative applications in children. *Paediatr Anaesth* 2010;20:256-64.

References:

1. Vricella LA, Dearani JA, Gundry SR, Razzouk AJ, Brauer SD, Bailey LL. Ultra fast track in elective congenital cardiac surgery. *Ann Thorac Surg* 2000;69:865-71.
2. Laussen PC, Reid RW, Stene RA, Pare DS, Hickey PR, Jonas RA, Freed MD. Tracheal extubation of children in the operating room after atrial septal defect repair as part of a clinical practice guideline. *Anesth Analg* 1996;82:988-93.
3. Howard F, Brown KL, Garside V, Walker I, Elliott MJ. Fast-track paediatric cardiac surgery: the feasibility and benefits of a protocol for uncomplicated cases. *Eur J Cardiothorac Surg* 2010;37:193-6.
4. Thammasitboon S, Rosen DA, Lutfi R, Ely BA, Weber MA, Hilvers PN, Gustafson RA. An institutional experience with epidural analgesia in children and young adults undergoing cardiac surgery. *Paediatr Anaesth* 2010;20:720-6.