

Fast Track in Anesthesia for Pediatric Cardiac Surgery: Benefits and Risks

Salah M Asida*

South Valley University, Qena Governorate, Egypt

Abstract

Anesthesia for pediatric cardiac surgery has special features and considerations regarding the patient, the pathophysiology and the surgical maneuver which will be done. When planning to do fast track anesthesia one should put this in mind from the start during induction of anesthesia. Good selection of the patient, proper management of anesthesia and co-operation with the surgeon together with follow up of the patient in the pediatric intensive care unit will ensure successful early extubation. Fast tracking has many advantages regarding safe recovery, less hospital stay, more free beds in the intensive care, early assessment of the results of the surgery and avoiding and diminishing the risks of prolonged mechanical ventilation. We recommend this technique as much as it is safe and beneficial to the patient.

Keywords: Cardiac anesthesia; Extubation; Pediatrics

Fast Track in Anesthesia

Anesthesia for pediatric patients requires special considerations regarding the differences in anatomy and physiology of the child. Various factors affect our decision when planning general anesthesia for a child. According to the body weight, the age, the preoperative general condition and the type of surgery we put our plan of anesthetic management.

In anesthesia for pediatric cardiac surgery planning of extubation timing is important and thinking of early extubation on the table has many advantages.

'Fast-tracking' refers to the concept of early extubation. It was practiced in anesthesia for adult cardiac surgery and is increasingly popular in the pediatric population. It decreases the length of stay in pediatric or cardiac intensive care unit (PICU, CICU) and allows earlier hospital discharge [1-4]. This is done as part of efforts to reduce perioperative morbidity and even costs.

The anatomical feature of the pediatric airway does not favor prolonged intubation. The presence of the endotracheal tube as a foreign body in the trachea reduces the lumen through which air or oxygen pass increasing the dead space and decreasing the ventilation capacity. Other problems of prolonged endotracheal intubation in pediatric patients include laryngotracheal trauma, obstruction by mucous plugging of the endotracheal tube, ventilator-associated infections, atelectasis and pulmonary hypertensive crises secondary to suctioning of the endotracheal tube. These events add to the risk of bad outcome [1-4]. The need for prolonged mechanical ventilation equals the need for prolonged sedation with its problems including the risk of delirium, decreased bowel motility and delayed adequate enteral nutrition in a small size and weight baby.

Fast tracking or early extubation means removal of the endotracheal tube after fulfillment of the necessary criteria regarding cardiorespiratory parameters of safe unaided stable and adequate respiratory and cardiovascular status in the operating room or at the end of the operation or within 6 h [1,2,4]. In some articles the time limit is increased up to 24 h after certain types of surgery [5].

Does fast track has a role in the progress and outcome of pediatric cardiac patients? In fact Pediatric cardiac surgery patients are wide and dynamic clinical entities to manage, and early postoperative intubation and ventilation may help or hinder their way to recover. They are also

a heterogeneous group regarding cardiopulmonary status pre and post operatively. The change of respiratory mechanics from positive pressure ventilation intra operatively to the normal physiological spontaneous respiration being negative in the inspiratory phase and positive in the expiratory phase will benefit for example children with single-ventricle anatomy after bidirectional superior cavopulmonary anastomosis (Glenn) and also those who undergo total cavopulmonary connection (Fontan) operation. These patients will benefit also from increased systemic venous return and pulmonary blood flow generated by negative intrathoracic pressure during inspiration phase of spontaneous breathing. And conversely, positive pressure breathing, and positive intrathoracic pressure decreases the pressure gradient for venous return to the heart and Patients response cannot be guaranteed.

Another benefit of spontaneous breathing immediately postoperatively was noticed regarding its effect on carbon dioxide tension, It has been shown in mechanically ventilated children after the Glenn procedure that mild hypercapnia (up to 55 mmHg/7.3 kPa) with respiratory acidosis improves systemic, pulmonary and cerebral blood flow, arterial oxygenation, reduces oxygen consumption and arterial lactate levels, which actually can be achieved with spontaneous respiration [6,7]. Therefore, mild hypercapnia related to early extubation in patients after Glenn procedure is well tolerated.

For successful fast tracking the patient should be pain free to diminish the effect of pain on the respiratory effort. For decades, the main anesthetic regimen in children and adults undergoing cardiac surgery has been a high-dose opioid-based anesthesia plan as it provides hemodynamic stability and effective suppression of the stress response to surgery [8,9]. This technique necessitated some period of postoperative ventilation, to allow sufficient time for opioid effects to wear off.

***Corresponding author:** Salah M Asida, Professor of Anesthesia, South Valley University, Qena Governorate 83523, Egypt, Tel: +2 0100 5262075; E-mail: salasida59@gmail.com

Received November 28, 2017; **Accepted** November 28, 2017; **Published** December 04, 2017

Citation: Asida SM (2017) Fast Track in Anesthesia for Pediatric Cardiac Surgery: Benefits and Risks. J Anesthesiol Pain Res 1: e102.

Copyright: © 2017 Asida SM. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Our current practice is to use shorter-acting opioids and sedatives such as remifentanyl and dexmedetomidine. Also, regional anesthesia techniques, mainly caudal block, reduced the need for postoperative opioids and reduced the risk of respiratory depression after extubation. Such analgesics and adjuvants when well titrated and tailored according to the patient's response allowed minimal respiratory depressant effect, best cardiovascular stability and adequate ventilator drive to allow for early safe extubation [10].

Neonates and small children are often unable to express their degree and severity of discomfort and pain. Pain management in this group of patients should be given more attention. We believe that effective pain management by a specialised pain team is an essential component of the fast-track process. Referral to the acute pain team is our standard of care, and we feel that good-quality analgesia can be achieved by proper management and follow up of pain status of the patient specially those who were early extubated [11].

Who will manage and attend the pediatric cardiac patient in the early postoperative period in the pediatric intensive care unit (PICU)? The pediatric anesthesiologist or the pediatric intensivist or the pediatric specialist which of them can reintubate the patient if needed? In fact the answer of this question has a major role in deciding early extubation, for example In Scandinavia, fast tracking policy in children undergoing cardiac surgery is not a common practice, this has an explanation as the pediatric anesthesiology specialists manage and attend patients in the pediatric intensive care unit around the clock. The extubation in the PICU takes place based on the same criteria as that in the early extubation concept. Extubation happens when there are no signs of haemodynamic instability, including significant pulmonary hypertension, no significant bleeding, no rhythm disturbances, no airway compromises, and arousal from general anesthesia. The extubation is done at the discretion of the anesthesiologist and the surgeon in charge of the patient [12].

So, we should plan fast track anesthesia for pediatric cardiac patients from the start (during induction of anesthesia) in well selected patients as more than required mechanical ventilation is no longer done now a days ensuring adequate postoperative pain relief under the supervision of pediatric cardiac anesthesia specialist.

Funding

None.

Conflict of Interest

None.

References

- Harris KC, Holowachuk S, Pitfield S, Sanatani S, Froese N, et al. (2014) Should early extubation be the goal for children after congenital cardiac surgery? *J Thorac Cardiovasc Surg* 148: 2642–2648.
- Alghamdi AA, Singh SK, Hamilton BC, Yadava M, Holtby H, et al. (2010) Early extubation after pediatric cardiac surgery: systematic review, meta-analysis, and evidence-based recommendations. *J Card Surg* 25: 586–595.
- Mittnacht AJ, Hollinger I (2010) Fast-tracking in pediatric cardiac surgery- the current standing. *Ann Card Anaesth* 13: 92–101.
- Morales DL, Carberry KE, Heinle JS, McKenzie DE, Fraser CD, et al. (2008) Extubation in the operating room after Fontan's procedure: effect on practice and outcomes. *Ann Thorac Surg* 86: 576–582.
- Zakaria D, Rettiganti M, Gossett JM, Gupta P (2017) Factors associated with early extubation after superior cavopulmonary connection: Analysis from single ventricle reconstruction trial. *Acta Anaesthesiol Scand* 61: 722–729.
- Hoskote A, Li J, Hickey C, Erickson S, van Arsdell G, et al. (2004) The effects of carbon dioxide on oxygenation and systemic, cerebral, and pulmonary vascular hemodynamics after the bidirectional superior cavopulmonary anastomosis. *J Am Coll Cardiol* 44: 1501–1509.
- Li J, Hoskote A, Hickey C, Stephens D, Bohn D, et al. (2005) Effect of carbon dioxide on systemic oxygenation, oxygen consumption, and blood lactate levels after bidirectional superior cavopulmonary anastomosis. *Crit Care Med* 33: 984–989.
- Anand KJ, Hansen DD, Hickey PR (1990) Hormonal-metabolic stress responses in neonates undergoing cardiac surgery. *Anesthesiology* 73: 661–670.
- Hickey PR, Hansen DD, Wessel DL, Lang P, Jonas RA, et al. (1985) Blunting of stress responses in the pulmonary circulation of infants by fentanyl. *Anesth Analg* 64: 1137–1142.
- Heinle JS, Diaz LK, Fox LS (1997) Early extubation after cardiac operations in neonates and young infants. *J Thorac Cardiovasc Surg* 114: 413–418.
- Morton N, Errera A (2010) APA national audit of paediatric opioid infusions. *Paediatr Anaesth* 20:119-125.
- Gaies M, Tabbutt S, Schwartz SM, Bird GL, Alten JA, et al. (2015) Clinical epidemiology of extubation failure in the pediatric cardiac ICU: A report from the pediatric cardiac critical care consortium. *Pediatr Crit Care* 16: 837–845.