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Case Report: Sedation after laryngotracheal reconstruction: Case report and discussion of issues

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Introduction: Post operative sedation in pediatric patients after single stage laryngotracheal reconstruction is challenging. Some intensivists use deep sedation and neuromuscular blockade during the initial post operative period to prevent neck movement and allow surgical wound healing. Others prefer to avoid paralysis and attempt deep sedation for the 5 to 7 days of postoperative intubation. We discuss a case of difficult postoperative sedation resulting in the loss of the airway and strategies to avoid this in the future.

Case Report: The patient was a 4 year old, born at 27 weeks gestation with stage IV subglottic stenosis who underwent laryngotracheal reconstruction. Past surgical history is pertinent for tracheal reconstruction with posterior rib graft at 3 years of age. She subsequently developed recurrent subglottic stenosis. The operative course was uneventful and she was transferred to the PICU with a 4.5 uncuffed nasal ETT. The patient was initially sedated with midazolam and fentanyl infusions but was changed to lorazepam and morphine infusions on POD 2. Vecuronium was prescribed at 0.1mg/kg PRN q1h and the patient received 1, 4, 9, and 12 PRN doses on POD's 0, 1, 2, 3 respectively. Her sedation regimen was inadequate and a ketamine infusion was started on POD 2 at 5mcg/kg/min increasing to 10mcg/kg/min. On POD 3 the patient had what appeared to be an episode of emesis and the ETT was dislodged. Because of the flexed position of the neck to minimize traction on the suture line, adequate oxygenation was not achieved with mask ventilation by the PICU team. The patient developed bradycardia and hypoxia, at which time resuscitation per PALS protocol was initiated. She was given 3 boluses of epinephrine and 3 boluses atropine prior to the arrival of the on-call anesthesiologist, who gently repositioned the neck to improve ventilation. A 4.0 uncuffed ETT could not easily pass and the airway was secured with a 3.5 uncuffed ETT 13 minutes after the extubation.

The patient's sedation continued to be challenging. In spite of increasing doses of narcotics and benzodiazepines, the patient became agitated at times. On POD #8, the patient was started on dexmedetomidine in preparation for an OR visit to evaluate her airway and appropriate sedation was achieved at a rate of 0.7mcg/kg/hr. Because of concern about the repair and patency of the airway, a tracheostomy was performed on POD #10. The child was weaned from all sedatives and discharged home in stable condition.

Discussion: Neuromuscular blockade during the first 3-4 post operative days is often advocated to limit mobility and aid surgical healing after tracheal reconstruction. Recent studies have questioned the need for continuous paralysis. Roeleveld and colleagues conducted a chart review comparing short duration (less than 2 days) versus prolonged paralysis (greater than 3 days) and demonstrated that a short duration of paralysis led to fewer days of mechanical ventilation and a decrease in the number of PICU days (1). Bauman *et al* demonstrated that in a protocol using intermittent muscle paralysis in children, fewer cases of atelectasis developed and children could be extubated sooner (2). All patients demonstrated some degree of weakness and many took several days to weeks to return to preoperative ambulatory states. Jacobs and colleagues conducted a retrospective study to investigate the safety and efficacy of a postoperative approach that avoids pharmacological and physical restraints and allows liberal physical activity during the postoperative period (3). The study concludes that centers should consider a postoperative management that avoids sedatives, muscle relaxants, and physical restraints. Rather, they should allow liberal bedside physical activity in developmentally appropriate children. Our patient was not placed on a vecuronium infusion, but did receive multiple bolus doses of vecuronium during the first 3 postoperative days. Recent research regarding minimizing or eliminating the use of neuromuscular blockade is intriguing and should be explored in more detail (3).

The pharmacologic interventions for our patient included midazolam, lorazepam, thiopental, ketamine, propofol, fentanyl, morphine, and vecuronium. None of these were successful at controlling the level of sedation. The sedation regimen was changed frequently due to inadequate sedation and the preferences of the ICU attending. The addition of dexmedetomidine appeared to be a good alternative to previous medications. This has been used in other pediatric ICU's for sedation with good success (4). We are actively pursuing a standardized protocol for the postoperative sedation of children with laryngotracheal reconstructions that includes an infusion of dexmedetomidine. The literature demonstrates that this is a problem which is not unique to our institution, and further studies should be done to determine a more successful sedation protocol.

References:

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3. Jacobs BR *et al*. Crit Care Med 2001; 29: 164-168
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