Brief Reports

Airway management of a child after tracheal resection

Napoleon Burt MD,
Mary M. Pruner DO,
Andrea R. Williams MD

Purpose: To report a strategy for minimizing airway risks and optimizing airway management in the post-reanastomosis phase of the anesthetic management of a patient undergoing tracheal reconstruction.

Clinical features: A 14-yr-old boy with squamous cell carcinoma of his trachea underwent a tracheal resection and end-to-end reanastomosis for removal of tumour. This procedure was accomplished through a right thoracotomy. A thoracic epidural had been placed before induction of anesthesia through which 3 mg morphine and 10 ml bupivacaine 0.25% with epinephrine were administered during surgery. After chest wall closure the patient was allowed to recover spontaneous respiration and the trachea was extubated during deep anesthesia to eliminate airway response with coughing which might have stressed the anastomosis. An infusion of bupivacaine 0.0625% and morphine ($100 \mu\text{g}\cdot\text{ml}^{-1}$) was maintained until the third postoperative day. The patient had an unremarkable postoperative course and was discharged on the eighth postoperative day.

Conclusion: In this case thoracic epidural analgesia and tracheal extubation during deep anesthesia was a safe and effective strategy for minimizing airway risks and optimizing airway management in after the reanastomosis phase of tracheal resection.

Objectif : Décrire une stratégie pour minimiser les risques lors de l'intubation et optimiser le contrôle des voies aériennes d'un patient subissant une reconstruction trachéale.

Éléments cliniques : Un garçon de 14 ans présentait un épithéliome malpighien de la trachée. L'ablation de la tumeur a été réalisée par une résection trachéale, suivie d'une réanastomose termino-terminale, au moyen d'une thoracotomie droite. Un cathéter épidural thoracique a été mis en place avant l'induction de l'anesthésie et a servi à l'administration de 3 mg de morphine et de 10 ml de bupivacaine à 0,25 % avec épinéphrine pendant l'opération. Après la fermeture de la paroi thoracique, le patient a pu respirer spontanément et la trachée a été extubée pendant l'anesthésie profonde afin d'éliminer des réactions des voies aériennes causées par la toux et qui auraient pu créer une pression sur l'anastomose. Une perfusion de bupivacaine à 0,0625 % et de morphine ($100 \mu\text{g}\cdot\text{ml}^{-1}$) a été maintenue jusqu'au troisième jour postopératoire. Le patient a connu une convalescence normale et a reçu son congé le huitième jour après l'intervention.

Conclusion : L'analgésie épidurale thoracique et l'extubation trachéale pendant l'anesthésie profonde ont constitué, dans le cas présent, une stratégie sécuritaire et efficace de réduction des risques d'intubation et un contrôle optimal des voies aériennes pendant et après la réanastomose de la trachée lors de la résection d'une tumeur trachéale.

From the Department of Anesthesia & Perioperative Medicine, Children's Hospital, 165 Ashley Avenue, Suite 525, PO Box 250912, Charleston, South Carolina 29425 USA.

Address correspondence to: Napoleon Burt MD. Phone: 843-792-2322; Fax: 843-792-2726; E-mail: burtn@musc.edu

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PREVIOUS literature regarding airway management of patients undergoing tracheal resection have focused predominantly on the problems of oxygenation and ventilation during the resection and reanastomosis of the trachea. There was minimal discussion of the post-anastomosis and postoperative airway management of these patients.¹⁻¹⁰ While airway management during tracheal resection and reanastomosis is of critical importance, management during the post-anastomotic and postoperative phase is no less important. We describe one means of attaining effective post-anastomotic and postoperative airway management of a pediatric patient undergoing tracheal resection and reanastomosis.

Case Report

A 14-yr-old boy presented for resection of a tracheal tumour. His first clinical presentation was of respiratory arrest requiring intubation. He denied a history of coughing, wheezing, shortness of breath, or hemoptysis. Previous bronchoscopy and biopsy revealed a squamous cell carcinoma lesion approximately two centimeters in length, located on the left tracheal wall, extending to approximately one centimeter above the carina, without involvement of the carina or bronchi.

The patient was a well developed 60 kg teen with no signs of respiratory distress. He had no other medical history, was not taking medication, and had no known allergies. Vital signs on presentation to the O.R. were: BP 91/53 mmHg, P 60 bpm, R 20, T 36.1°C. Auscultation of the chest revealed no wheezes, rales or ronchi. Airway examination revealed a Mallampatti II classification. Pulmonary function tests demonstrated FVC 108% predicted value, FEV₁ 48% predicted value, and FEV₁/FVC 45% predicted value.

In the operating room, standard monitors were applied and the patient was given 2 mg midazolam *iv*. A thoracic epidural catheter was placed at T₉₋₁₀ using a loss of resistance technique with saline. A test dose (3ml lidocaine 1.5% plus 1:200,000 epinephrine) yielded no signs of intravascular or subarachnoid placement. General anesthesia was induced with 3 mg midazolam, 75 mg lidocaine and 200 mg thiopental, and 120 mg succinylcholine facilitated tracheal intubation with a 7.0 mm cuffed endotracheal tube. The lungs were oxygenated and ventilated without difficulty. A radial arterial line and a Foley catheter were inserted and the patient was placed in the left lateral decubitus position. Anesthesia was maintained with isoflurane 0.4-0.8%, air, and oxygen, and muscle relaxation with rocuronium.

With the trachea mobilized through a thoracotomy incision, the location of the tumour was verified using fiberoptic bronchoscopy. Because the endotracheal

tube (ETT) compromised surgical exposure, the trachea was reintubated with a cuffed 6.0 mm reinforced ETT. The trachea was then incised and the ETT was advanced across the surgical field into the left mainstem bronchus under direct visualization. Manual ventilation was maintained for the duration of the tracheal resection and reanastomosis. An arterial blood gas during one-lung ventilation revealed pH 7.38, PCO₂ 42 mmHg, PO₂ 86 mmHg, HCO₃ 24.3 mEq·l⁻¹, SpO₂ 99% breathing F_IO₂ of 1.0. The tumour was excised en bloc including at least two complete tracheal rings. The trachea was reapproximated with an end-to-end anastomosis. The cuffed reinforced ETT was then exchanged with a 6.0 uncuffed Portex tube and manual ventilation of both lungs was resumed. The resulting arterial blood gas was pH 7.3, PCO₂ 51 mmHg, PO₂ 405 mmHg, HCO₃ 23.4 mEq·l⁻¹, SpO₂ 100% with F_wO₂ of 1.0.

After tracheal reanastomosis, and approximately 90 min before extubation, 3 mg duramorph in 10ml bupivacaine 0.25% with epinephrine (1:200,000) were given through the epidural catheter. After chest wall closure the patient was allowed to recover spontaneous respiration. His head and neck were then splinted in a flexion position to minimize tension on the tracheal anastomosis. Tracheal extubation was then accomplished while the patient was deeply anesthetized. He had no breath holding or coughing and the lungs ventilated and oxygenated well. He was transported to the PACU with spontaneous respiration and good air exchange. Vital signs on arrival to the PACU were BP 124/73 mmHg, P 103 bpm, R 24, T 37.7°C, SpO₂ 100% breathing oxygen at 6 L·min⁻¹ via a face mask.

Postoperative analgesia was maintained with epidural morphine (100 µg·ml⁻¹) and bupivacaine (0.0625%) infusion at 6 ml·hr⁻¹. No supplemental analgesics were required. On the third post-operative day, the splint, the Foley catheter, and the epidural catheter were discontinued and the patient was managed using *po* medication. The patient had an uncomplicated hospital course and was discharged on the eighth postoperative day.

Discussion

Airway management strategies for patients undergoing resection and reanastomosis of the trachea must be considered in three phases. The first and second phases (pre-resection and during the resection) have been the primary focus in the literature. A variety of techniques has been advocated for maintaining oxygenation during the first two phases including the use of cardiopulmonary bypass, jet ventilation, and trans-oral

or trans-thoracic placement of various types of endotracheal tubes.¹⁻⁶ The third phase (post-reanastomosis and postoperative) has been given only minimal consideration. This case highlights one approach to the airway management of patients during the post-reanastomosis and postoperative phase after a trans-thoracic tracheal resection.

Recommendations for management post resection differ in regard to either immediate or delayed extubation. Immediate postoperative extubation has been advocated by both Abou-Madi and Geffin.^{6,7} Other authors advocate extubation at postoperative intervals ranging from hours to weeks.^{1,4,5,8} We chose immediate post-reanastomosis extubation because it eliminates the risk of endotracheal tube induced dehiscence of the tracheal anastomosis.

Pain management during the post-reanastomosis and postoperative phase of patients undergoing trans-thoracic tracheal resection and requiring early post-reanastomosis extubation cannot be overemphasized. Pain management must provide adequate analgesia post-thoracotomy. It must be associated with minimal sedation to minimize the likelihood of requiring airway interventions (jaw-thrust, chin-lift, or intubation) which might disrupt the tracheal anastomosis. Moreover, it must consider the fact that these patients require splinting in a position which places them at increased risk for airway obstruction. We achieved maximal patient alertness and optimal pain control by avoiding systemic narcotic regimens including patient-controlled-analgesia devices and using a thoracic epidural infusion of local anesthetic and narcotic medications.

Conclusion

Airway issues are no less critical after than before anastomosis in patients undergoing tracheal resection. The combined technique of thoracic epidural for pain control and deep extubation may help minimize the risk of anastomosis dehiscence in this patient group.

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