Anesthetic Management for Slide Tracheoplasty in a Patient with Tracheal Stenosis due to Inhalation Injury and Prolonged Intubation

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Introduction
Inhalation injuries can result in tracheal stenosis, typically the result of transmural injury by inhaled gases and heat that leads to granulation and scar formation. Inhalation injuries may be compounded by the additional trauma of long-term intubation potentially required during recovery.

Management of tracheal stenosis is challenging because of the high incidence of recurrent stenosis. Selection of treatment depends on the patient’s clinical status and tracheal anatomy.

Treatment options include resection and anastomosis for short segments, patch, repair, and slide tracheoplasty. Slide tracheoplasty reduces tracheal length by half while quadrupling cross-sectional area for airflow.

We present here the anesthetic management of a slide tracheoplasty for acquired mid-tracheal stenosis related to smoke inhalation injury.

Patient Presentation
A 16-year-old previously healthy male presented with burns covering approximately 50% of his body surface area after a fireworks explosion. He suffered burns to his face, chest, and arms as well as likely smoke inhalation injury. He initially required intubation for two weeks, and he was intubated multiple times thereafter for reconstructive treatments. He was eventually discharged with follow-up at an outpatient rehabilitation facility.

Three months after his initial injury, the patient developed worsening dyspnea on exertion. Furthermore, during his last few surgeries, anesthesia providers had noted some difficulty passing endotracheal tubes. His history of smoke inhalation injury and multiple intubations raised concern for possible tracheal stenosis. He subsequently underwent direct laryngoscopy and rigid bronchoscopy which revealed a 2cm segment of midtracheal stenosis that could tightly accommodate a 4mm rigid scope. The patient was therefore consented for slide tracheoplasty to attempt to improve his airway caliber.

Anesthetic Management
Since the patient had extensive sites of skin grafting in various stages of healing as well as multiple decubitus ulcers, careful attention was paid to placement of lines and monitors. The patient had previously been demonstrated to be easily maskable from above and therefore underwent an IV induction with propofol, remifentanil, and lidocaine. The vocal folds were easily visualized with a Miller 2 blade and a 5.0 cuffed endotracheal tube was placed. The small size of the tube made adequate ventilation for this patient a challenge, with many adjustments required during the case to avoid hypercarbia and high peak airway pressures. Because of the proximity of vascular structures to the trachea and the risk for bleeding, a second large-bore IV and an arterial line were placed after induction. Anesthesia was maintained with infusions of propofol and remifentanil.

Once the neck was dissected and the trachea exposed, the stenotic region was reconfirmed with rigid bronchoscopy. The endotracheal tube was withdrawn, the trachea was incised, and the lower tracheal segment was intubated with a sterile 4.5 cuffed ETT. During reconstruction of the trachea, ventilation was achieved with intermittent placement of the sterile ETT in the operative field. At the end of the procedure the patient was nasotracheally intubated with a 5.0 cuffed nasal RAE ETT with surgical assistance in the operative field to guide the tube cuff past the anastomosis. The neck was then closed and guardian sutures were placed on either side of the mandible to prevent neck extension.

Post-Operative Course
The patient remained intubated and sedated for five days. He returned to the OR on POD 5 for a second look bronchoscopy and was then extubated uneventfully. He was discharged home on POD 11. He developed some dyspnea two weeks later, which was managed with gentle dilation of the trachea. As of POD 28, his trachea was able to accommodate a 5.5 endotracheal tube without resistance.

Discussion
• The outlook for patients with long-segment tracheal stenosis has improved substantially in recent years. Slide tracheoplasty is an excellent treatment option, since it reduces tension on the anastomosis by better preserving tracheal length and native blood supply compared to resection or grafting [2].

• When managing a patient with tracheal stenosis, thorough understanding of the anatomy and pathophysiology is critical for the anesthesiologist. Initial bronchoscopy helps estimate the ET size that can be used for the reconstruction.

• Changes in ventilation intraoperatively may suggest obstruction with a clot or mucus, circuit disconnection, endobronchial intubation, or pneumothorax. Constant communication with the surgical team allows for early diagnosis and quick resolution of the underlying problem.

• After slide tracheoplasty the patient returns for a second look bronchoscopy on POD 5-7 to assess the reconstruction and evaluate for extubation. These patients often require dilation of the reconstructed segment [3].

References

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