AB002. Tracheal surgery

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Abstract: The need for tracheal surgery is uncommon. Many of the basic principles of evaluation, resection and reconstruction were developed by Dr. Hermes Grillo often times referred to as "the father of tracheal surgery". These principles have stood the test of time. Indications for tracheal surgery include post-intubation tracheal stenosis, idiopathic subglottic stenosis, subglottic stenosis, tumors, secondary tumors including thyroid invasion of the airway, tracheoesophageal fistulas, trauma and distal tracheal or carinal pathology. Careful radiologic evaluation is essential. Tracheal computerized axial tomography utilizing axial, sagittal and coronal images are standard. Surgeons must be facile in the use of rigid bronchoscopy. It provides precise measurements of extent of pathology. Rigid scopes can be used for dilation or core out of tumor. Dilation is done under direct vision with gentle pressure visualizing the airway throughout. The degree of vascularity and consistency can be assessed with initial biopsies through a rigid system. The rigid system can assess the quality of mucosa and the secretions beyond the stenosis. Management of the airway is essential. Placing a small endo tracheal tube (number 5.5) over the adult flexible bronchoscope will allow placement of the endotracheal tube beyond the stenosis after it has been dilated. The use of a laryngeal mask airway (LMA) is helpful in certain circumstances. Dilation also allows time for stabilization of other comorbid conditions, weaning of steroids or treating bronchitis in preparation for future reconstructive surgery. The most common incision utilized for upper airway pathology is a low collar incision. If more distal exposure is required, partial division of the sternum through the manubrium can be performed. A sternotomy is rarely required. If a laryngeal release is required, a separate incision over the hyoid bone is utilized for cosmetic purposes. Our preferred anastomotic technique has been use of traction sutures of 2-0 Vicryl and individual sutures of 4-0 Vicryl. The anastomotic sutures are placed 3 to 4 mm in depth and 3 to 4 mm apart. By convention, the first suture is placed posteriorly at the 6 o'clock position as if one were looking at the face of a clock from the operative field. Sutures are placed so the knots will eventually end on the outside. Each subsequent suture is placed in front of the previous suture and carefully clipped to the drapes. This placement is performed as well on the opposite side starting at the 6 o'clock position. Once these sutures have been placed and secured to the drapes, the anterior sutures are placed again securing them to the drapes. Once completed, the traction sutures are pulled together reducing any tension on the anastomosis and each individual suture is tied in the reverse order in which it was placed. The neck is gently bent forward to reduce tension. The airway is checked for its integrity by deflating the balloon and ventilating with the mouth open to hear a rush of air around the tube. Once that has been established, an assistant occludes the mouth and nose with the cuff still down and pressure exerted from 20, 30 and 40 cm of water. Any air leak is repaired. The local strap muscle is mobilized and secured over the anastomosis to separate the anastomosis from the innominate artery. The technique is very similar for subglottic stenosis with the slight difference being the use of a membranous wall flap. This flap requires technical precision and attention to detail but has been very effective in resurfacing the posterior cricoid. The same principles apply as for tracheal resection. If concern still exists, a small tracheostomy can be placed at least two rings below the anastomosis and most importantly separated from the anastomosis by a strap muscle. If the innominate artery is of some concern, a second strap muscle can be placed beneath the tracheostomy to serve as a buffer. The most common complication following airway surgery is early edema. Air leak, wound infection or subcutaneous emphysema could portend more serious complications. It is of utmost importance to secure the airway and explore the wound if there is any concern. Hyperbaric oxygen has been invaluable in treating some patients with an intact airway with necrosis of a cartilage or a small fistula. Anastomotic complications may be evident while in the hospital or present weeks later. The risk factors for anastomotic complications have been defined by the analysis of over 900 patients. Diabetes, reoperation, surgery in patients less than 17 years, resection greater than 4 cm and the presence of a preoperative tracheostomy are risk factors in development of anastomotic complications. Reoperation following failed primary trachea resection reconstruction is possible. There must be a strategy to maintain the airway during this interval either through serial dilations or placement of a small tracheostomy tube. Good results of primary resection and reconstruction can be achieved between 90% and 95% of patients. Mortality should be under 3% when performing tracheal resection and reconstruction. Redo operations have a slight increased risk of morbidity and mortality but

still quite low. Carefully selected patients for reoperation can be successfully reconstructed 90% of the time. Failure and death should be in the vicinity of 3% to 5%. Idiopathic subglottic stenosis is a rare condition involving Caucasian females. Successful reconstruction is achievable in 90% to 95% of patients. All patients must have exclusion of Wegner's granulomatosis, connective tissue or autoimmune disorders and significant gastroesophageal reflux. Mortality is less than 1%. Post-intubation or post-tracheostomy subglottic stenosis is very challenging. The margin for error is less. The presence of a tracheostomy tube at the time of resection is a negative prognostic factor. If the principles of surgery are maintained, satisfactory outcome can be expected following resection and reconstruction. Good results can be achieved in nearly 90% of patients. Bioprosthetic materials, especially aortic homografts, are used in dealing with complex airway problems. This novel approach has led to very good results. Bioprosthetic materials can be used for even more complicated problems of the airway. These complicated problems often times include fistulas between the airway and the esophagus that are not amenable to standard procedures. Aortic homografts have been used in the majority of cases, always with some type of well vascularized tissue as a buttress to improve healing and tissue ingrowth. These are complicated procedures requiring strict attention to detail for a successful outcome.

Keywords: Tracheal surgery; tracheal resection

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