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Retrograde Transbronchial Intubation: Solution for A 'Lost Airway' During Open Thoracic Surgery

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Abstract

Airway loss during an operative procedure is potentially fatal. This is especially challenging in patients that are positioned non-supine as is the case in lateral decubitus positioning that is standard for the majority of lung resections. We present a novel approach that enabled rapid control of a lost airway during open thoracotomy and endotracheal tube exchange for such a patient. Multiple other advanced airway maneuvers were unsuccessful to exchange a double lumen for a single lumen tube. Utilizing retrograde hydrophilic wire passage from the surgically exposed intra-thoracic right carinal stump, endotracheal intubation was successful.

Surgical Technique

A 50 year-old male with tobacco use and remote history of mediastinal radiation for Hodgkin lymphoma underwent planned lobectomy for T3N2 lung adenocarcinoma. Pre-imaging demonstrated a large locally advanced tumor without invasion into adjacent structures. He did not receive neoadjuvant radiation in light of prior radiation for lymphoma, and due to tumor size and airway compression multidisciplinary tumor board favored surgical resection over chemotherapy.

The patient was intubated with a left sided Double Lumen Endotracheal Tube (DLT). A right-posterolateral incision in full-decubitus position was made. The tumor was unexpectedly adherent to the Superior Vena Cava (SVC) and bleeding was encountered. The patient became markedly hypotensive leading to emergent initiation of Cardiopulmonary Bypass (CPB) via femoral artery cutdown and right atrial appendage cannulation. The resection was converted to pneumonectomy and the SVC was reconstructed with tubularized bovine pericardial graft sewn to the atrial appendage. The patient developed marked head and neck venous edema from SVC clamping.

During attempted airway manipulation near the conclusion of the case, control of the airway was lost. Endotracheal re-intubation with direct laryngosocpy, Glidescope® (Verathon, Bothell, WA) and flexible bronchoscopy were unsuccessful due to pronounced airway edema preventing visualization of the

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vocal cords. Tracheostomy was discussed, but was deemed prohibitively high risk in lateral position and full heparanization (Activated Clotting Time over 300 seconds).

As a salvage maneuver, the residual right mainstem bronchus was surgically re-exposed via the existing thoracotomy. An 18-gauge needle was used to anteriorly puncture the cartilaginous bronchus in a cephalad trajectory. A stiff 180cm Rosen wire was unable to be advanced safely beyond 10 centimeters likely due to the "J" shape of the wire tip and friction of the braided wire against edema of the proximal airway. Therefore, a 0.035 moistened 180cm length hydrophilic Glidewire® (Terumo, Somerset, NJ) was advanced through the bronchus, trachea, and ultimately the patient's oropharynx with relative ease. Holding both ends of the wire taut, a 7.5 endotracheal tube was advanced over the wire through the oropharynx and into the trachea using the wire as a rail **(Figure 1)**. Due to patient instability, risk of pressure to the right bronchial stump was accepted, and the tube was left in the mid-trachea after unsuccessful initial attempts to advance to the left-mainstem. The wire was removed via the oropharynx, and the right bronchus was repaired with pledgeted 3-0 prolene sutures and covered with an intercostal muscle flap. An air test demonstrated no leak, and the patient was transferred to the Surgical Intensive Care Unit in critical condition. Total time of airway loss was approximately 5-6 minutes. The patient was maintained on the CPB circuit during this interval.

Loss of airway in any surgical case presents an immediate threat to the patient's life. This speaks to the importance of avoiding any unnecessary airway manipulations in all operative cases but specifically those with lateral decubitus positioning which will alter patient airway anatomy and limit advanced airway techniques.

While retrograde intubation using a percutaneous transtracheal wire for emergency airway control is a described technique, the approach often uses a catheter introduced through the first tracheal space with stiff wires [1-4]. The stiff wires have been associated with injury of the tracheal wall [5] and in this case the stiffer wire was simply unable to be advanced. This case presents a novel approach using a hydrophilic wire which allowed easier passage past the edematous airway. Additionally, wire stiffness is irrelevant when both ends are controlled and held taut to form a rail for the ETT.

If an airway is lost during a thoracotomy, securing the airway should first be attempted with direct laryngoscope or video laryngoscope and invasive surgical airway is the next step which may require rapid supine positioning. The presented case of a lost airway in a laterally positioned patient with severe airway and facial edema is an extremely challenging clinical scenario. The multidisciplinary approach between Anesthesia, Thoracic, and Vascular surgery produced a novel solution to a life-threatening scenario without further surgical dissection. Maintaining the CPB circuit preserved oxygenation during attempts for airway control and can be considered in these life-threatening situations.

During open thoracic surgical resections, in the unfortunate case of lost control of an airway, retrograde transbronchial hydrophilic wire placement is a quick and efficacious way to re-establish airway control. This may represent a safer option than stiffer wires or continued attempts at standard antegrade intubation and should be part of an advanced airway armamentarium.

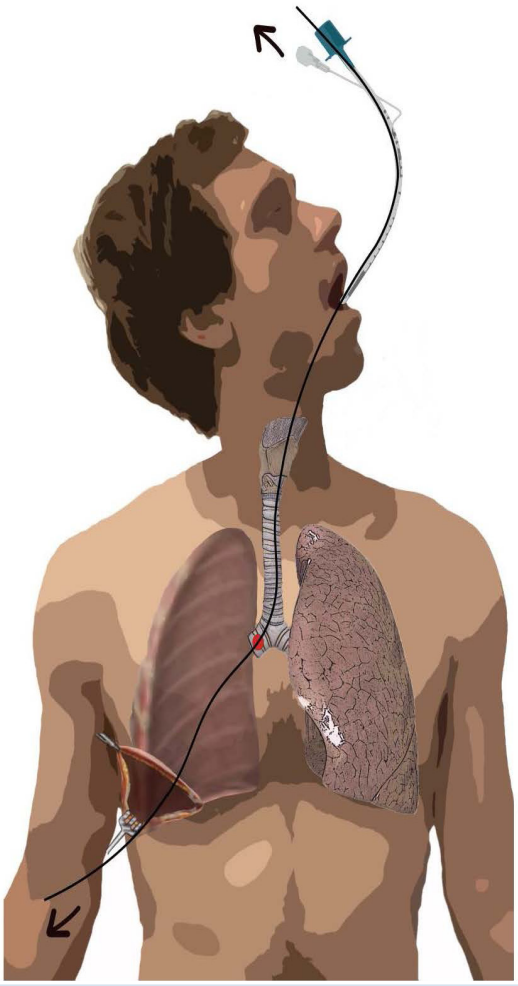

Figure 1: Demonstration of transbronchial retrograde access for wire guided single endotracheal tube placement. Wire access from right bronchus stump (red dot). Arrows demonstrate pulling the wire taut from either end to facilitate advancement of the endotracheal tube.

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