
Rigid Bronchoscope-Assisted Endotracheal Intubation Yet, Another use of the Gum Elastic Bougie

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Introduction: The use of the gum elastic bougie to facilitate difficult intubation has gained widespread popularity in Europe, and especially in the U.K., as the first line intubation aid in the difficult airway management (1, 2). It has been suggested to be superior to the stylet in facilitating simulated difficult intubation (3) and is associated with 99.5% intubation success rate when the endotracheal intubation is difficult (2). Despite these reports, use of the gum elastic bougie in the U.S. remains uncommon. We report a case of use of the gum elastic bougie to facilitate endotracheal intubation in a patient undergoing rigid bronchoscopy, in whom securing airway by conventional means was deemed to be very difficult.

Case report: A 39-yr-old woman with systemic lupus erythematosus, chronic renal insufficiency and chronic anticoagulation secondary to the antiphospholipid-A syndrome complicated by the history of stroke, presented to our hospital with E. Coli urosepsis and increased shortness of breath. On the evening of admission, she required emergent intubation with 7.0 endotracheal tube (ETT) for acute respiratory failure and was placed on the ventilatory support, demonstrating large $PAO_2 - PaO_2$ gradient and high (30-40s cm H_2O) peak inspiratory pressures. Chest radiograph performed after intubation showed near-complete atelectasis of the left lung. Her sepsis was managed with fluid therapy and vasoactive drugs administered under the guidance of the pulmonary artery catheter (PAC), and broad-spectrum antibiotics. Flexible bronchoscopy performed through the ETT demonstrated complete occlusion of the left mainstem bronchus by the tightly adhered blood clot. Repeated attempts at suctioning, endobronchial lavage and breaking down the clot with the forceps introduced through the flexible bronchoscope were unsuccessful, and the patient was referred to the thoracic surgeons for rigid bronchoscopy and clot removal. On the day before surgery, the PAC was changed to the triple lumen CVP catheter which was complicated by formation of the large neck hematoma. On hospital day #8, patient presented for rigid and flexible bronchoscopy in the OR. Under adequate total intravenous anesthesia, a combination of rigid and flexible bronchoscopy was performed by the surgeons to remove the organized clot extending through the left mainstem bronchus to its branches in the upper and lower lobe. The patient tolerated the procedure well, without episodes of desaturation (SpO_2 92-95%) or hemodynamic instability. After the surgical procedure was completed, significant intraoral edema was noted, which was worrisome because the patient required reintubation for continued ventilatory support in the ICU. 15.0 Fr gum elastic bougie was passed into the patient's trachea through the lumen of the bronchoscope until the resistance was met, and was stabilized in place by the funnel end of the rubber-tip suction catheter. The technique of withdrawing the bronchoscope over the bougie-catheter assembly mimicked the removal of the intubating LMA over the endotracheal tube utilizing a stabilizer rod. Once the bronchoscope was withdrawn to a sufficient distance, the bougie was grasped inside the patient's mouth, the catheter was removed and the withdrawal of the bronchoscope over the bougie was completed. 7.0 ETT was then "railroaded" into the patient's trachea over the bougie, assisted by 4.0 MAC laryngoscopic blade placed inside the patient's mouth. The patient was transported to ICU intubated, sedated, and monitored. She was extubated the following day without complications and discharged from the hospital on HD # 16.

Discussion: Compared to flexible bronchoscopy, rigid bronchoscopy allows introduction of large forceps and administration of large bore suctioning, but necessitates patient extubation. Reintubation by conventional direct laryngoscopy in this patient was anticipated to be very difficult due to significant intraoral edema caused by the long duration of the upper airway instrumentation and pre-existing large neck hematoma. When the bougie is used during difficult intubation, two signs of successful tracheal placement are sought: tracheal clicks when the tip of the bougie moves over the tracheal cartilages, and the resistance (distal hold up) when it reaches a small bronchus. The reliability of the distal hold up sign is 100% (5), and eliciting it in our case

guaranteed sufficient depth of bougie placement to prevent its accidental removal from the trachea during the bronchoscope withdrawal. Holding bougie in place with the funnel end of the suction catheter resulted in a sufficient length of the bougie-catheter assembly (approximately 95 cm) to permit safe withdrawal of the 40 cm long bronchoscope. While weighing the options for reestablishing airway in this patient, we also considered use of the airway exchange catheter (AEC). In addition to serving as a reintubation guide, the AEC has an advantage of allowing oxygen insufflation and jet ventilation, should the reintubation fail. Such AEC was at our disposal (Cook AEC 14.0 Fr), and its length (83 cm) would have been sufficient to allow safe withdrawal of the bronchoscope. We, however, decided against its use in this particular patient for the following reasons: 1) Gum elastic bougie is not only flexible, but also appropriately stiff, and may provide a better reintubation guide as compared to the Cook AEC. Nolan and Wilson (6) studied 75 patients with the bougie-assisted intubation, and documented 100% success rate of "railroading" the ETT into the trachea once the bougie was correctly placed. In comparison, the use of the Cook AEC (11.0 Fr) for reintubation was formally evaluated in only 3 ICU patients (same 100% success rate), but it was accidentally removed from the trachea in 2 out of 40 patients, perhaps because of its somewhat excessive flexibility (7, 8); 2) We were concerned about deep placement of the AEC and potential perforation of bronchi or lung parenchyma. Subcarinal placement of the AEC is not recommended, as increasing the depth of insertion directly increases the risk of perforation of the tracheobronchial tree (9, 10). Yet, given relative flexibility of the Cook AEC 14.0 Fr, we would have been forced to place it sufficiently deep below the carina to prevent its accidental removal from the trachea during the bronchoscope withdrawal. We were less concerned about the possibility of complications with the deep bougie placement because of its favorable technical characteristics (perfectly round and smooth angulated tip which would not allow the bougie to reach a very small bronchus); 3) The ability to provide adequate oxygenation through the AEC would have been severely affected by the pre-existing shunt. Safe administration of jet ventilation also would have been problematic: the exhalation time would likely be markedly prolonged because of the significant upper airway edema, and the danger of provoking fresh bleeding from the remaining clot by the jet of air (11) would be present.

The presented technique of the bougie-assisted endotracheal intubation through the rigid bronchoscope may be useful in a variety of clinical situations when establishing of the emergent airway by means of the rigid bronchoscope is required. It can also be used for securing airway during routine panendoscopy procedures in patients with abnormal airway. Risks and benefits of passing the bougie vs the AEC for facilitating endotracheal intubation must be carefully weighed in each particular patient depending on the clinical situation and the airway pathology. In our patient, gum elastic bougie has proven again to be an indispensable tool in the difficult airway situation. Formal studies comparing different brands of the AEC as guides for blind endotracheal intubation would be very helpful in establishing reliability and success rate of these versatile devices.

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