Airway obstruction following intubation using a bonfils rigid intubating fiberscope and polyvinylchloride tracheal tube

Dear Editor,

Laryngeal edema causing airway obstruction is relatively common (22%)[1] after prolonged intubation, but is relatively rare after short periods of intubation. Although rare (2-15%), laryngeal edema in the immediate post-operative period following short surgeries is nevertheless known to occur.[2] Obstruction is seldom complete, however, and generally takes some hours to develop.

We report a case of a 50-year-old lady weighing 60 kg who was posted for total abdominal hysterectomy for fibroid uterus (size >14 weeks). She had no significant medical history or any allergies in the past. Physical examination, including airway evaluation was normal.

The patient was pre-medicated with tablet alprazolam 0.5 mg and injection glycopyrrolate 0.2 mg intramuscularly. A 17G epidural catheter was placed in L2-3 interspace for peri-operative pain relief. General anesthesia was induced with fentanyl 75 μg, propofol 100 mg and vecuronium 6 mg. Endotracheal intubation with a cuffed PVC 7.5 mm internal diameter [ID] orotracheal tube was done using Bonfils rigid intubating fiberscope™ (BRIF) (Bonfils; Karl Storz Endoscopy, Tuttlingen, Germany) via midline approach, while visualizing through the eyepiece, by a senior anesthesiologist with prior experience of more than 100 successful intubations using the device. Prior to intubation, after appropriate lubrication with a water soluble gel, the tracheal tube was mounted on the fiberscope with the tip of tube extending beyond the tip of fiberscope by about 0.5 cm. The first attempt at intubation was unsuccessful as there was some resistance felt on attempting to railroad the endotracheal tube into the trachea. However, there was no apparent trauma as visualized through the eye piece. On removing BRIF, the scope was found to be protruding beyond the endotracheal tube by about 1 cm, without any visible blood staining. A smaller size tube 7.0 mm ID was subsequently appropriately positioned and tightened on the fiberscope and intubation of trachea was easily achieved in the 2nd attempt using the same technique. The tracheal tube cuff was inflated up to 3 ml with air till there was no palpable leak. Anesthesia was maintained with air-oxygen mixture and propofol infusion (100-200 μg/kg/min) and a single top up dose of vecuronium 1 mg 1 h after the initial intubating dose. Morphine 3 mg with 8 ml of 0.25% bupivacaine was given epidurally.

The surgery lasted 160 min and propofol infusion was stopped 15-20 min before the completion of surgery. At the end of surgery, after antagonism of the neuromuscular block with neostigmine 3.0 mg and atropine 1.2 mg, the patient was breathing spontaneously with good tidal volume. The oropharynx was suctioned and the trachea was extubated when fully awake. There was no apparent blood stain on endotracheal tube on removal and the patient was responding to commands and was comfortable. However, about a minute later, the patient started complaining of difficulty in breathing. Oxygen saturation at this time was 99% on 100% oxygen and her respiratory efforts as judged by the movements of the reservoir bag and chest wall along with chest auscultation were normal. Gradually over next 2-3 min, use of accessory muscles of respiration was noted along with a mild inspiratory stridor. The patient was hemodynamically stable and maintained oxygen saturation of 98-99% on 100% O_2. However, SpO_2 decreased to 80-85% without oxygen supplementation.

A tentative diagnosis of laryngeal edema due to trauma or an allergic phenomenon was considered and the nebulization was performed with 1 mg L-adrenaline solution (1 ml of 1:1000 diluted to 5 ml with 0.9% saline). There was some relief in stridor and the patient had a subjective relief in respiratory difficulty within the next 4-5 min. Injection dexamethasone 8 mg was given intravenously. She was observed in the operating room [OR] for 30 min and received humidified oxygen by simple face mask. The patient gradually became more comfortable, the stridor resolved and she was able to maintain oxygen saturation >97%. She was shifted to the post-operative recovery room for observation. Rest of the post-operative course was uneventful.

Post-operative evaluation to identify allergic reaction (Serum IgE levels; skin testing to PVC, povidine iodine, latex, KY Jelly™ [methylcellulose gel, Johnson and Johnson] and anesthetic drugs) was negative.

The various high risk-factors mentioned for development of laryngeal edema in adults[3] were absent in this patient but for a possible traumatic intubation.

BRIF has been successfully used to intubate patients with normal as well as difficult airway anatomy.[4,5] In the first attempt, there was an inability to railroad the tracheal tube into trachea. This was found to be associated with protrusion of the fiberscope beyond the tube. The visualization through eye piece however, did not reveal any apparent trauma. On visualization of the larynx, during the 2nd attempt, the fiberscope was fixed on the glottis and a smaller size tube was atraumatically and smoothly inserted with rotatory movement. However, the possibility of trauma to the larynx during first attempt could not be ruled out. This could have been either small enough initially or would have been better visualized had a video-scope been available.

PVC tracheal tubes are stiff at room temperature[6] and may cause trauma particularly when inserted just near the glottic opening over a rigid fiberscope. PVC tracheal tubes have been found to exert 7-10 times higher forces and pressures on distal objects when compared to silicone and armored tracheal tubes.[7] They may be softened by immersing in warm water to make them less stiff and more pliable.[6] Intubating Laryngeal Mask airway [ILMA] dedicated tubes, with an atraumatic tip[6] could be another suitable option. These tubes are easier to advance over a flexible fiberscope and into the trachea than a PVC tube during both oral and nasal intubations.[6]

Direct visualization of the glottis using a flexible fiberscope may confirm a diagnosis of laryngeal edema. However, the patient's respiratory difficulty, inspiratory stridor, and decreased oxygen saturation on room air prompted us to proceed with treatment of the suspected cause at that time. The negative results to skin allergy testing, the absence of rhonchi on auscultation, inspiratory stridor and rapid relief of symptoms with aerosolized epinephrine suggest laryngeal edema, possibly induced by some mild trauma, to be the cause of airway obstruction in this case. Cuff leak test has been prescribed following prolonged intubation to predict the possibility of re-intubation from laryngeal edema. However, its use following short periods of intubation without any suspected risk, as in this case, has not been much emphasized.

While using a rigid device to facilitate intubation such as the BRIF, we suggest careful visualization to be done, preferably with a monitor, and use of an ILMA tube or a softened PVC tube. No attempt should be made to advance the tracheal tube if any, even slight, resistance is encountered. Furthermore, the choice of an appropriate sized tracheal tube with its adequate placement and tightening over the rigid fiberscope before attempting intubation cannot be overemphasized. Timely suspicion of airway edema even when using BRIF in the best hands and its early management with simple measures as described may prove to be sagacious in improving patient outcome.

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