Brief Clinical Reports

Complete upper airway obstruction during awake fibreoptic intubation in patients with unstable cervical spine fractures

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Purpose: To describe the presentation and management of complete upper airway obstruction with life threatening arterial oxygen desaturation that occurred during attempted awake fibreoptic intubation in two patients presenting with unstable C-spine injury.

Clinical Feature: Complete upper airway obstruction occurred during awake fibreoptic intubation of two men (ASA II; 68 & 55 yr old) presenting with unstable C-spine fractures. In both cases, bag and mask ventilation with CPAP failed to relieve the progressive hypoxemia. A surgical airway was established urgently to oxygenate the two patients who were suffering progressive life-threatening oxygen desaturation. One patient had trans-cricothyroid jet ventilation performed through a 16G intravenous cannula prior to an urgent tracheostomy. In the other patient, an emergency tracheostomy was inserted. Interestingly, both patients had been sedated in the Neurosurgical Intensive Care Unit with morphine and benzodiazepines before their scheduled surgeries. The most likely etiology for the complete upper airway obstruction was laryngospasm due to inadequate topicalization of the airway and additional sedation given in the operating room. Neither patients suffered any new neurological deficits following these events. They went on to have uneventful surgeries.

Conclusion: This case report suggest that prior to awake fibreoptic intubation, oxygenation, adequate topicalization with testing to verify the lack of pharyngeal and laryngeal responses and careful assessment of sedation levels in the operating room are prudent for a safe endoscopic intubation.

Objectif : Décrire le tableau clinique et le traitement de l'obstruction complète des voies aériennes supérieures, accompagnée d'une dangereuse désaturation du sang artériel en oxygène, survenue pendant qu'on tentait une fibroscopie vigile chez deux sujets souffrant d'une instabilité de la colonne cervicale.

Éléments cliniques : Une obstruction complète des voies aériennes supérieures s'est produite pendant une fibroscopie vigile chez deux hommes (ASA II ; 68 & 55 ans) qui présentaient des fractures de la colonne cervicale. Dans les deux cas, la ventilation manuelle au masque et au ballon et une ventilation spontanée avec pression expiratoire positive (PEP) n'a pu soulager l'hypoxémie progressive. Le rétablissement chirurgical du conduit aérien a été réalisé d'urgence pour oxygéner les deux patients qui souffraient d'une désaturation progressive en oxygène mettant leur vie en danger. On a procédé, chez l'un des patients, à une ventilation à jet transcricothyroïdienne au moyen d'une canule intraveineuse 16G avant la trachéotomie d'urgence. Chez l'autre patient, une trachéotomie d'urgence a été pratiquée. Il est intéressant de noter que les deux patients avaient reçu une sédation à l'unité des soins intensifs neurochirurgicaux avec de la morphine et des benzodiazépines avant la chirurgie élective. L'étiologie la plus probable de l'obstruction complète des voies aériennes supérieures était un laryngospasme causé par une pulvérisation inadéquate du conduit aérien et par la sédation supplémentaire administrée dans la salle d'opération. Les patients n'ont pas subi de nouveau déficit neurologique à la suite de ces incidents. La chirurgie prévue s'est déroulée normalement.

Conclusion : Ce compte rendu propose qu'avant la fibroscopie vigile, il est prudent d'assurer l'oxygénation, la qualité de la pulvérisation suivie d'un examen permettant de vérifier les réactions pharyngiennes et laryngées et de procéder à l'évaluation attentive des niveaux de sédation dans la salle d'opération afin que l'endoscopie soit faite en toute sécurité.

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WHEN tracheal intubation is indicated but not urgent in patients with unstable cervical spine injury, the options are limited to: in-line manual stabilization with orotracheal intubation,[1,2] blind nasotracheal intubation,[3,4] fibreoptic intubation,[5] light wand-guided oral intubation,[6] retrograde intubation[7] and tracheostomy with local anesthetic infiltration. Although the skill level and need for postintubation neurological assessment influence the choice of the intubation technique, in our institution awake fibreoptic intubation is usually the preferred approach. In this report we describe two patients with cervical spine injury in whom complete upper airway obstruction with severe hypoxemia occurred during attempted awake fibreoptic intubation.

Case Report

Case 1

A 68-yr-old man (ASA-II; 75 kg) fell off his bicycle. Radiological studies showed evidence of unstable C_5 spinous process fracture with cervical spinal stenosis and spinal cord myelomalacia. There was also extensive ligamentous injury with evidence of central cord syndrome manifested by progressive flaccid left hemiparesis. The neck was immobilized with a halo and 5 kg traction. In the Neurosurgical Intensive Care Unit (NICU), he received morphine and midazolam for pain control and sedation. Two days later, he was scheduled for posterior cervical laminectomy

In the operating room, he was calm and sedated and continued to receive supplemental oxygen. A total of 50 µg fentanyl and 1.5 mg midazolam *iv* were given as well as 0.4 mg glycopyrrolate *iv*. Topicalization of the airway was performed using lidocaine spray 1% and trans-cricothyroid membrane injection of 3 ml lidocaine 2%. After introducing the fibreoptic scope orally, there were abnormal amounts of secretions in the pharynx which were cleared by suctioning. During manipulation of the endoscope, the patient became stridorous and then developed complete upper airway obstruction with progressive oxygen desaturation. The procedure was immediately abandoned. Bag and mask ventilation with oxygen 100% failed to restore arterial oxygen saturation. In the face of unable to ventilate/unable to intubate situation with progressive hypoxemia, oxygen jet ventilation of the lungs was immediately achieved through a 16G intravenous catheter inserted through the cricothyroid membrane. Tracheostomy was then performed and the lungs were ventilated with oxygen 100% . The oxygen saturation increased gradually to 99%, the patient was allowed to recover and neurological examination showed no signs of new sensory or motor deficits. The patient was then positioned awake in the prone position and reassessed neurologically. General anesthesia was induced and the surgical procedure was completed successfully.

Case 2

A 55-yr-old man (ASA-II; 72 kg) was involved in a motor vehicle accident. He suffered a fracture sublaxation of C_4 associated with right deltoid weakness, hoarseness of the voice and dysphagia. An MRI study showed displacement of C_4 and C_5, a fracture of the spinous process and lamina of C_4, disrupted anterior ligaments and protrusion of the $C_{4\text{-}5}$ disc. The patient's cervical spine was immobilized in a halo with 5 kg traction. In the NICU, pain control and sedation were achieved by administration of morphine and benzodiazepines as needed. Two days later, he was scheduled for posterior cervical laminectomy, discectomy and decompression with fusion.

In the operating room, he was sedated but was still complaining of dysphagia and hoarseness of voice. He was given 0.4 mg glycopyrrolate and 2 mg midazolam *iv*. After topicalization of the upper airway with swabs soaked with lidocaine 4%, his breathing became laboured. The fibreoptic scope was inserted and the vocal cords were visualized but the scope could not be passed into the trachea because of gagging and coughing. The fibreoptic scope was withdrawn, but the patient rapidly developed complete upper airway obstruction and the arterial oxygen saturation decreased progressively to 78%. During this period attempts of bag and mask ventilation with CPAP, suctioning and direct laryngoscopy failed to improve the arterial oxygen saturation or secure the airway. A surgical airway was established urgently by the surgeon through a tracheostomy procedure. The spine surgery was canceled to reassess the patient neurologically. No new deficits were detected and the patient had an uneventful surgery the next day with the tracheostomy tube *in situ*.

Discussion

Fibreoptic intubation with a degree of conscious sedation is considered one of the safest choices to secure a difficult airway. The present report, however, demonstrates that a life-threatening complication could be encountered during fibreoptic intubation with sedation without extrinsic or intrinsic distortion of normal airway anatomy.[8,9]

In our institution, a total of 35 cases of unstable traumatic C-spine injuries were treated by surgical intervention within 2-3 days of injury in 1996 and 1997. This report reviewed the only two cases in this

series (2/35) in whom awake fibreoptic endoscopy failed to secure the airway because of the development of complete upper airway obstruction. This life threatening complication was successfully managed by either trans-cricothyroid membrane jet ventilation or by urgent tracheostomy.

Causes of failure of fibreoptic intubation are mainly the presence of secretions and blood, decreased space between the tip of the epiglottis and the posterior pharyngeal wall, inability to advance the endotracheal tube, distorted airway anatomy and the occurrence of a complication. The major complications encountered during fibreoptic intubation that might cause a failure to intubate the trachea are laryngospasm, gagging and/or vomiting, epistaxis, regurgitation and respiratory depression with hypoxemia.[10]

In the cases presented, complete upper airway obstruction most probably developed because of a combination of heavy sedation in the NICU or operating room and incomplete topicalization with local anesthetic. Deep sedation will decrease the tone of the pharyngeal muscles, hence promoting supraglottic obstruction. While incomplete topicalization preserves the upper airway reflexes thus causing laryngospasm during stimulation of the pharyngeal mucosa, especially in a sedated patient. In the second case, an additional factor that may have contributed to air-way obstruction is retropharyngeal edema, manifested by hoarseness of voice and dysphagia that can occur in cases of cervical spine trauma.

In conclusion, oxygenation with nasal prongs and adequate topicalization with testing to verify the lack of pharyngeal and laryngeal responses are prudent for safe endoscopic intubation in patients with unstable C-spine injury. Also, the patient's sedation level should be carefully and continuously assessed in the operating room before additional administration of sedatives, hypnotics or narcotic analgesics. Reversal agents for opioids and benzodiazepines as well as surgical personnel should be immediately available.

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