Case Report

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Iatrogenic Tracheal Penetrating Injury Following Stylet-Assisted Endotracheal Intubation in a Patient with Goiter

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Thyroidectomy is the standard surgical procedure to remove part of or the whole thyroid gland due to malignant change or hyperfunctioning inadequately managed by medical treatment. The enlarged thyroid gland may compress or invade the trachea. Video-assisted intubation stylet has become one of the commonly used devices for tracheal intubation, particularly in patients with difficult airways and poor dental condition. Here we present a female patient with a goiter who received total thyroidectomy for which endotracheal intubation was performed with the assistance of a Trachway® intubating stylet. A perforation on the anterior wall of the upper trachea was observed by the surgeon during neck dissection, and the newly created tracheal penetrating injury was not caused by surgical manipulation or tissue invasion. We speculate that endotracheal tube advancement through a rigid intubation stylet may exert shearing forces on the anterior tracheal wall and potentially cause penetrating trauma to the upper trachea in patients with tracheal compression by a goiter.

Key words: tracheal injury, video-assisted intubation stylet, thyroidectomy

Introduction

Tracheal injury is a rare complication during surgery, and the overall incidence of perioperative tracheal injury caused by endotracheal intubation ranges from 0.05% to 0.37%.[1] Although mechanical airway lacerations due to endotracheal intubation is seldom life-threatening during the perioperative period, unrecognized cases may result in postoperative respiratory distress, mediastinal or subcutaneous emphysema, and pneumothorax.[2] Previous studies have reported the risk factors of intubation-related tracheal injury or laceration, which include difficult intubation, inappropriate endotracheal tube size, and severe cough after tracheal intubation.[3] Patient factors, such as female gender, old age (> 50 years), and trachea malacia, are also associated with a higher risk of tracheal injury during intubation.[4] Nevertheless, very few studies have reported the potential risk of tracheal injury associated with intubation devices, such as the newly developed video-assisted endotracheal intubating stylet. Here, we present a case of tracheal penetrating injury after endotra-

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cheal intubation using a video-assisted intubation stylet.

Case Report

A 65-year-old woman with a medical history of hypertension and diabetes mellitus had a nodule in the right lobe of the thyroid gland for one year. She denied any past history of prolonged endotracheal intubation or neck operation. The nodule enlarged progressively over the year and started to cause signs of airway compression during sleep; therefore, total thyroidectomy was planned. The neck lump was a smooth, soft, and fixed mass upon palpation. There were no signs of high-pitch breath sound, stridor, dysphagia, or dysphonia on physical examination. Preoperative computed tomography of the neck regions revealed intact tracheal cartilages. The thyroid nodule, which was 3 cm in diameter, compressed and displaced the upper trachea (Fig. 1). Endotracheal intubation general anesthesia was performed after an uneventful intravenous anesthetic induction and administration of rocuronium (0.8 mg/kg) for muscle relaxation.

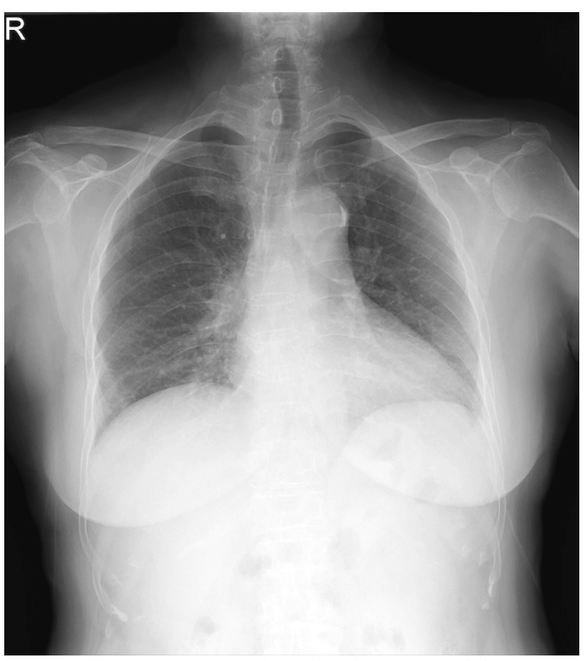

Fig. 1 Chest X-ray revealing displacement of the trachea to the left because of the thyroid mass.

Endotracheal intubation was performed using a video-assisted intubating stylet (Trachway, Biotronic Instrument Enterprise Ltd., Taichung, Taiwan) due to poor denture conditions (Fig. 2A). A cuffed endotracheal tube (6.5 mm I.D.) was successfully placed on the first attempt under visualization of the vocal cord on the video screen. The patient was then put on a mechanical ventilator using a volume control mode with a tidal volume of 8 mL/kg predicted body weight and positive end expiratory pressure of 5 cmH_2O. No air leak was detected by the ventilator under a fresh mixed oxygen (FiO_2 0.6) flow of 1 L/min.

After the dissection of the right neck tissue to expose the thyroid mass, the surgeon noticed a newly formed penetrating lesion on the anterior wall of the upper trachea (Fig. 3). The surgeon confirmed that the tracheal laceration injury was not caused by the electrocautery dissection and unlikely to be a result of direct tumor invasion. Visually, it was not a linear cut wound, so it was unlikey to be caused by the surgeon. Because the lesion was located in an area of the upper trachea that was more proximal than the endotracheal tube cuff, the mixture of fresh air and anesthetic gas delivered by the ventilator did not leak through the laceration wound. The tracheal wound was closed by simple sutures. Thyroidectomy was completed as scheduled and the patient was transferred to the intensive care unit for postoperative care. The endotracheal tube was removed in the next morning. The patient did not show any symptoms of dyspnea, irritating cough, hemoptysis, or subcutaneous emphysema. The patient was discharged from the ward on the fifth postoperative day.

Discussion

The incidence of tracheal wall injury during thyroidectomy has been found to be as low as 0.06%.[5] Intraoperative tracheal wall injury is usually caused by direct mechanical

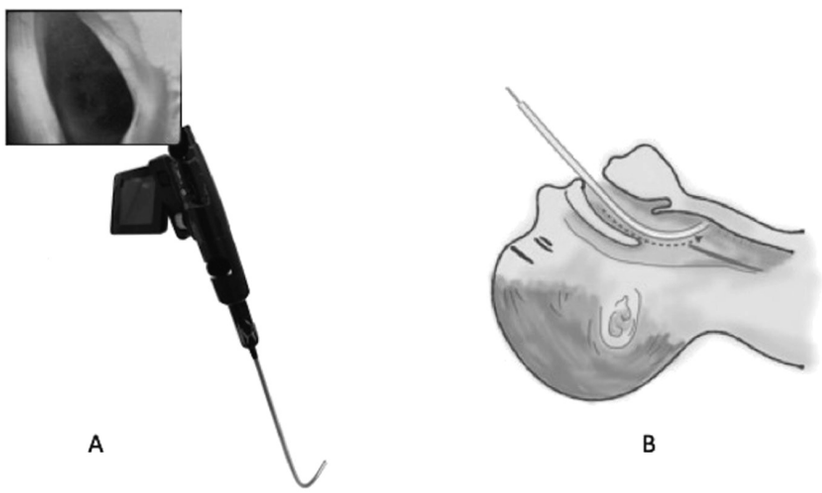

Fig. 2 (A) Trachway® and rideo display during intubation, (B) Illustration of Trachway®-assisted intubation

trauma and/or preexisting tracheal pathologies, such as tracheomalacia, airway inflammation, prior history of regional irradiation therapy, and aging-related tracheal fragility.[6,7] Mechanical tracheal injury commonly occurs during tracheal intubation from poor intubation technique, inappropriate size of endotracheal tube, and over-inflation of tube cuff or difficult airway management (e.g., urgent airway establishment and multiple intubation attempts).[4]

In this case report, a video-assisted Trachway® intubating stylet was used instead of direct laryngoscopy to avoid dental injury during endotracheal intubation. Trachway® is an airway device with a rigid intubating stylet, light source and a camera at the distal end of the style to directly visualize the vocal cords on the monitor.[8] The curved rigid malleable intubating stylet is preset to 70° to form an acute angle for the entry of the endotracheal tube into the larynx (Fig. 2B). Advancing the endotracheal tube through the angled stylet would inevitably cause impaction of the tip of the endotracheal tube on the anterior tracheal wall (Fig. 2). Under normal conditions, impaction of the tip of the endotracheal tube would pass smoothly along the tracheal mucosa to the distal portion of the trachea, as the upper trachea lies superficially underneath the skin and is relatively more mobile. In our patient, the enlarged thyroid nodule compressed the upper trachea and displaced the airway to the left side, thereby restricting the mobility of the upper trachea. The chronic compression of the expanding goiter on the tracheal ring may also cause tracheomalacia.[9] Therefore, the tip of the endotracheal tube may injure the vulnerable tracheal wall that was relatively fixed by the surrounding goiter tissue during endotracheal tube advancement with the intubating stylet, resulting in penetration of the anterior wall of the upper trachea. Although the neck dissection was performed by an experienced surgeon in this case, the possibility of iatrogenic tracheal injury during surgical manipulation could not be completely excluded.

In conclusion, although video-assisted intubating stylet devices have recently gained popularity in endotracheal intubation and have been found to be effective for reducing the incidence of dental injuries, endotracheal tube advancement using the rigid stylet may exert a shearing force on the anterior tracheal wall that could potentially cause penetrating trauma to the upper trachea entrapped in a goiter. Special attention should be paid to patients with fixed

Fig. 3 Laceration on the anterior tracheal wall (arrow).

neck masses before choosing a rigid intubating stylet for tracheal intubation.

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