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Endotracheal Intubation under Image Guidance for a Child with Tracheal Stenosis

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ABSTRACT

A case of successful endotracheal intubation using an image intensifier in a 9-year-old boy with tracheal stenosis was reported. After the induction of anesthesia, the trachea was observed by use of mobile surgical X-ray apparatus under artificial ventilation using a face mask. Because the tracheal wall of the stenotic part was smooth and seemed soft, we selected a plain 5.5 mm diameter endotracheal tube and intubated under observation using an image intensifier. We observed the tube pass through the stenotic part of the trachea without difficulty. We consider that endotracheal intubation under image guidance is useful in a patient with tracheal stenosis.

Key words: *Tracheal stenosis, Endotracheal intubation, Image guidance*

Since airway management is essential to ensure safe general anesthesia, tracheal stenosis is a very serious problem to anesthesiologists. It is necessary to know the extent of tracheal stenosis and the character of the tracheal wall of the stenotic part to accomplish endotracheal intubation for the patient with tracheal stenosis. Several diagnostic methods such as cervical roentgenography, computerized axial tomographic scan and magnetic resonance image scan have been used for this purpose. However, real time observation of the trachea and endotracheal tube is difficult by these methods.

We succeeded in performing endotracheal intubation in a child with tracheal stenosis resulting from a thyroid tumor by using an image intensifier during endotracheal intubation.

CASE REPORTS

A 9-year-old boy, height 119 cm, weight 19 kg, had been suffered from subfever and cough for about one year. A diffuse disseminated milliary shadow was revealed by chest roentgenogram seven months ago. Under diagnosis of milliary tuberculosis he received anti-tuberculosis therapy which failed to succeed. Neck swelling and respiratory distress appeared a month before the operation. A biopsy of cervical lymph node was performed and the pathological diagnosis was papillary adenocarcinoma of thyroid grand. To relieve respiratory distress and to manage the respiratory system during subsequent radio- and chemotherapy, mass reduction of the thyroid tumor and tracheostomy were scheduled.

Before operation, the patient had a neck swelling and complained of respiratory distress. The arterial blood gases with 3 liter/min oxygen face mask were P_aO_2 63.0 mmHg and P_aCO_2 32.0 mmHg. Chest roentgenogram revealed a tracheal stenosis starting 20 mm below the vocal cords and extending for 27 mm, and a milliary shadow of both lung fields. A computerized axial tomographic scan and a magnetic resonance image scan also showed the tracheal stenosis (Fig. 1). The narrowest caliber was 3 mm.

After intravenous administration of atropine 0.15 mg as a premedication, anesthesia was induced with fentanyl 100 μg and midazolam 1 mg intravenously and maintained with 0.5–3.0% sevoflurane and 0–67% nitrous oxide in oxygen. Vecuronium 2 mg provided muscle relaxation. Blood pressure was monitored with a radial arterial catheter. An electrocardiogram, a pulse oximeter, and a capnometer were used continuously. The anteroposterior view of the trachea was observed by the use of mobile surgical X-ray apparatus (Siremobile 3N, Siemens, Erlangen) under artificial ventilation using a face mask. We considered that the tracheal wall of the stenotic part was smooth and soft, since the measured diameter of the stenotic part was bigger than that evaluated by the computerized axial tomographic scan and magnetic resonance image scan before anesthesia (Fig. 2A). We selected a plain endotracheal tube

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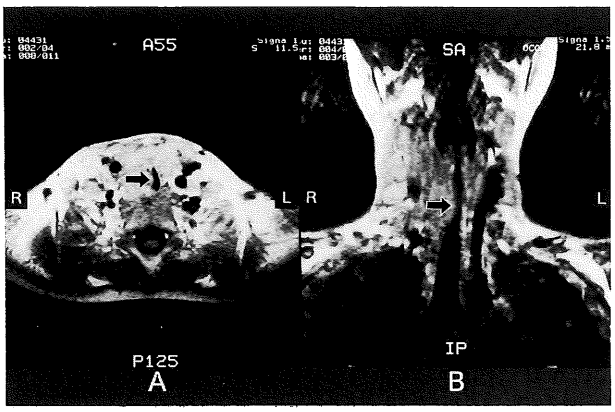

Fig. 1. The horizontal (A) and coronal (B) scan of the magnetic resonance image scan showed the tracheal stenosis (arrow). The narrowest caliber was 3 mm.

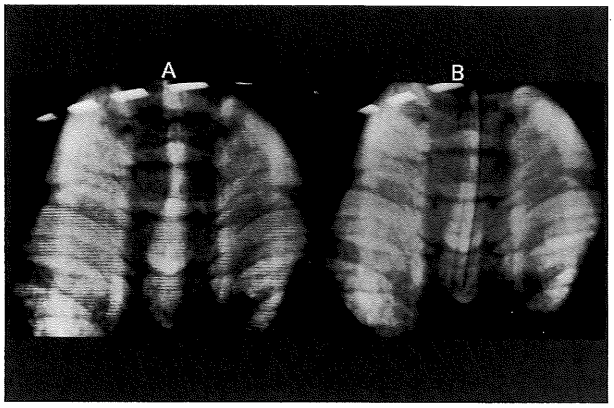

Fig. 2. Image by mobile surgical X-ray apparatus before endotracheal intubation (A) and during intubation (B). We could see the endotracheal tube pass through the stenotic part of the trachea.

(5.5 mm internal diameter) and intubated under observation using the X-ray apparatus. The endotracheal tube was inserted softly and we could see the tube passing through the stenotic part of the trachea without difficulty (Fig. 2B).

After orotracheal intubation was successful, tumor resection was performed. The tumor had adhesion with the trachea. After tracheostomy was performed, a tracheostomy tube (7 mm internal diameter) was inserted.

DISCUSSION

Anesthesia induction for a patient with tracheal stenosis is particularly difficult when the stenosis cannot be bypassed by tracheal intubation. Several authors report difficulty in conventional intubation in patients with tracheal stenosis[3–5].

In adult patients with tracheal stenosis, Holmes et al[2] and Wei et al[6] recommend endotracheal intubation while the patient is awake and intubation under fiberoptic endoscopic guidance, respectively. Since the cooperation of the patient is essential for these two techniques, we did not choose either of these methods for our child patient.

Asai et al[1] reported that they used a laryngeal mask in a child case of canthoplasty with congenital tracheal stenosis. Since an endotracheal tube can injure the trachea, leading to edema of the airway, they recommend the use of a laryngeal mask for endotracheal intubation in patients with tracheal stenosis. In our case, because the operational manipulation would extend to the trachea, we considered that upper airway management by the use of an endotracheal tube was essential.

The advantages of this method are as follows: 1) the ability to observe the character of the tracheal wall (smooth or rough, hard or soft) 2) the ability to choose an adequate size of endotracheal tube 3) the ability to observe the insertion of the tube and avoid violent manipulation. From these advantages, we recommend image guided endotracheal intubation, either by itself or in combination with other methods, for the patients with tracheal stenosis, especially infants.

In summary, we reported the use of an image intensifier during tracheal intubation in a child with tracheal stenosis caused by thyroid cancer. We consider that endotracheal intubation under image guidance is helpful in patients with tracheal stenosis.

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