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Case report

Submental tracheal intubation: A useful alternative during orthognathic surgery in an acromegalic patient with a history of cranial base surgery

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ABSTRACT

Submental tracheal intubation is an alternative technique for use in patients with airway difficulties in whom oro- or naso-tracheal intubation is contraindicated. Here, a planned submental tracheal intubation was used during orthognathic surgery in an acromegalic patient who had previously undergone trans-sphenoidal surgery (TSS) for removal of a pituitary adenoma, which involves removal of the sellar bone covering the anterior surface of the cavernous sinus. This helped prevent serious complications, such as intracranial penetration during nasotracheal intubation. Submental tracheal intubation can reduce the morbidity associated with repeated attempts at tracheal intubation in acromegalic patients who have undergone cranial base surgery and in whom orthognathic surgery is planned.

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1. Introduction

Maxillofacial surgery, especially orthognathic surgery, requires complex and precise intraoral work with intermaxillary fixation for correct occlusion. In terms of securing the airway during such surgery, orotracheal intubation is usually contraindicated, as it could interfere with these maxillofacial surgical procedures. Therefore, nasotracheal intubation is generally considered suitable for many types of orthognathic surgery [1].

However, in trauma victims with extensive maxillofacial injuries, including midface and skull base fractures, nasotracheal intubation might be contraindicated due to the many possible traumatic complications of the procedure, such as epistaxis, bacteremia, and perforation of the pharyngeal mucosa, even though intraoperative intermaxillary fixation for reconstruction of occlusion is required [2–4]. In particular, attempting nasotracheal intubation in patients with fractures of the skull base, sphenoid sinus and cribriform plate may result in intracranial penetration and placement of endotracheal tubes in the brain parenchyma. The situation could be further complicated by unre-

lated anatomical difficulties, such as hypertrophic obstruction of the nasal passages, in patients requiring orthognathic surgery [5]. When neither orotracheal nor nasotracheal intubation is suitable, tracheostomy is often used as the conventional technique of airway management. However, due to the number of inherent complications of the procedure, such as hemorrhage, recurrent laryngeal nerve damage, subcutaneous emphysema, tracheal stenosis, and the resultant cosmetically undesirable scar [6–8], oral and maxillofacial surgeons are often hesitant to perform elective tracheostomies.

Submental tracheal intubation has been focused on as an alternative technique for resolving most of the problems described above. The technique of introducing an endotracheal tube via the submental route has been widely established for airway management. Except for extensive craniomaxillofacial trauma, this approach has already been used in patients with nasal obstruction requiring reconstruction of fractures and orthognathic surgery [9].

Acromegaly is a disease most often caused by benign somatotrophic pituitary adenomas that lead to elevated secretion of growth hormone (GH) and insulin-like growth factor 1 (IGF-1) [10,11]. A persistent increase in these hormones leads to known acromegaly-associated systemic comorbidities, including heart failure, arthritis, impaired glucose tolerance, and craniofacial abnormalities. Mandibular prognathism is one of the typical craniofacial changes, which may cause malocclusion. Pituitary adenomas are treated surgically via a trans-sphenoidal approach,

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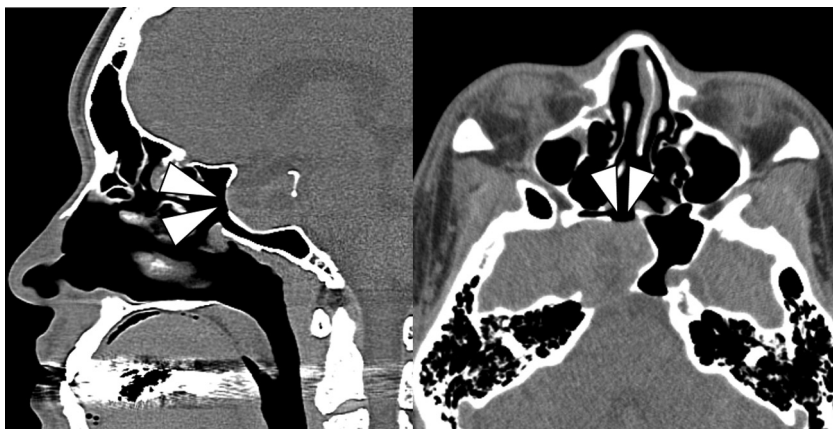


Fig. 1. Radiographic examination of the skull base was performed before orthognathic surgery. Right panel: sagittal CT scan demonstrating the bone defect in the sella turcica (arrowhead). Left panel: axial CT scan demonstrating the same bone defect (arrowhead).

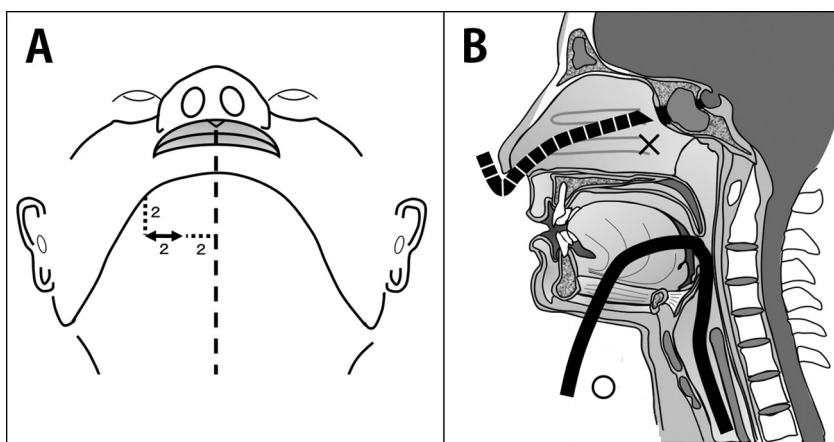


Fig. 2. Schematic diagram of the skin incision and route of endotracheal tube for submental tracheal intubation. (A) The incision follows the ‘2-2-2 rule’. The incision line lies 2 cm from the midline and 2 cm medial to the mandible in the submental region, and is 2 cm long. (B) When performing nasotracheal intubation, the tip of the endotracheal tube may inadvertently penetrate the intracranial space in patients with anatomical difficulties, such as skull base bone defects (dashed line). Hence, orotracheal intubation as the first step of the submental intubation procedure is preferred in such cases. After initial standard orotracheal intubation, the proximal end of the endotracheal tube is pulled out through the floor of the mouth.

which preserves normal brain tissue but requires removal of the sellar bone covering the anterior surface of the cavernous sinus [12]. These patients often require repeated operations, and hence, repeated endotracheal intubations. The intubation procedure is, however, associated with the risk of unexpected events, such as intracranial penetration via the bone deficit by the endotracheal tube, particularly if nasotracheal intubation is attempted [13].

The purpose of this report is to discuss a clinical case of submental tracheal intubation for airway management during orthognathic surgery in an acromegalic patient undergoing trans-sphenoidal surgery.

2. Case description

A 30-year-old female, weighing 87.4 kg and 176.7 cm tall, was referred to our hospital with the chief complaint of a protruding lower jaw in October 2010. The patient was previously diagnosed with a growth hormone-secreting pituitary adenoma, for which she underwent trans-sphenoidal surgery (TSS) three times within 4 years (between the age of 18–22 years) at our hospital. Extraoral examination revealed mandibular prognathism, bulging of the eyebrow arch, enlargement of the nose and thickened lips. Intraoral examination revealed macroglossia, class III malocclusion with

interdental separation of mandibular incisors, and a 2 mm shift of the mandibular midline to the right. Lateral cephalometric photography showed a sella–nasion–A point angle (SNA) of 74.1°, sella–nasion–B point angle (SNB) of 80.1°, and A point–nasion–B point angle (ANB) of -5.9° , significant prominence of the mentum, ballooning of the sella turcica, and expansion of the frontal sinus. Based on the radiological and clinical findings, a diagnosis of midface hypoplasia and severe mandibular prognathism associated with acromegaly was made. Following the case analysis for planning treatment, she was scheduled for presurgical orthodontic treatment and orthognathic surgery (maxillary advancement by Le Fort I osteotomy and mandibular set back by sagittal split ramus osteotomy). These procedures usually involve securing of the airway using the nasal route. However, we anticipated difficulties in using the nasal route for intubation, due to the defective cranial vault resulting from TSS. Computed tomography (CT) confirmed the presence of an approximately 10 mm \times 10 mm size bone defect at the bottom of the sella turcica near the anterior surface of the cavernous sinus (Fig. 1), which could lead to occurrence of the serious complication of intracranial penetration during nasotracheal intubation. Hence, nasotracheal intubation was contraindicated in our patient. Orotracheal intubation was naturally avoided due to the fact that intermaxillary fixation is needed for correct occlusion. After discussion with the anesthesiologists,

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