Case Report

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Submental intubation in paediatric oral and maxillofacial surgery: Review of the literature and report of four cases

Olanrewaju Abdurrazaq Taiwo[1], Adebayo Aremu Ibikunle[1], Ramat Oyebunmi Braimah[1], Musa Kallamu Suleiman[2]

ABSTRACT

Several oral and maxillofacial surgery procedures require the simultaneous use of the oropharyngeal space by both the surgeons and the anaesthetists. This poses a lot of challenges especially in optimally securing the airway. Nasotracheal intubation or tracheostomy with their significant morbidity might even be contraindicated in these scenarios owing to several factors elucidated in the literature. Submental endotracheal intubation might be the last resort in adequately protecting the airway without interfering with the surgery. It also permits concurrent access to the dental occlusion and nasal pyramid without the risk associated with nasal intubation and morbidity of tracheostomy. Contraindications include patients who require long periods of assisted ventilation and a severe traumatic wound on the floor of the mouth. Complications include localised infection and sepsis, poor wound healing or scarring, and post-operative salivary fistula. The rationale for this study is to describe the indications, contraindications and the technique of submental endotracheal intubation as performed in our hospital.

Key words: Intubation, submental endotracheal intubation, tracheostomy

INTRODUCTION

Several oral and maxillofacial surgeries require the simultaneous use of the oropharyngeal space by both the surgeons and the anaesthetists.[1] This competition for the upper airway space poses a lot of challenges for safely securing the airway with conventional orotracheal intubation while achieving optimal delivery of general anaesthesia.[2-4] Moreover, the management of maxillofacial fractures with maxillomandibular fixation either as a temporary or permanent measure in securing occlusion and fracture alignment makes orotracheal intubation unsuitable.[5] Several alternatives to orotracheal intubation exist, which include the submental, nasotracheal, retromandibular and tracheostomy routes, with or without the use of fibre optics. However, not all are suitable for all cases of paediatric maxillofacial surgery.

Nasotracheal intubation may be contraindicated owing to concurrent nasal or skull base fractures,[1,2] while tracheostomy requires special surgical expertise, facilities and adequate post-operative care which might not be readily available in a resource constrained environment.[1] In addition, the airway in children is small and very reactive. The submental route is a viable alternative to both.

Therefore, submental endotracheal intubation offers adequate protection of the airway without any interference in the conduct of the surgery.[6] It also permits concurrent access to the dental occlusion and nasal pyramid without the risk associated with nasal intubation and morbidity of tracheostomy.[3] Contraindications include patients who require long periods of assisted ventilation and a severe traumatic

[1]Department of Dental and Maxillofacial Surgery, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria [2]Department of Anaesthesia, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

Address for correspondence:
Dr. Olanrewaju Abdurrazaq Taiwo, Department of Dental and Maxillofacial Surgery, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria
E-mail: droataiwo@yahoo.com

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wound on the floor of the mouth.[3,5] Although Caron *et al.*,[7] in their case series, reported its use post-operatively for a mean duration of 5.2 days (range, 1-24 days). However, two of their patients representing 8% of the cases reported required a tracheostomy because of prolonged respiratory failure. Complications include localised infection and sepsis, poor wound healing or scarring and post-operative salivary fistula.[2,5]

The retromolar intubation technique first described by Bonfils in 1983 has been used in maxillofacial surgery. This involves the passage of the tube through the space between the distal part of the last molar and the anterior part of the ascending ramus of the mandible across the alveolar margin.[1,8] While this technique is simple, atraumatic, fast and allows intraoperative monitoring of the dental occlusion while keeping the tube patent, it may be a great challenge passing it through the retromolar space in adults due to the possible presence of the mandibular third molar and attendant unpredictability of the space availability.[8] Furthermore, the surgical field may also be compromised especially in cases such as bilateral sagittal split osteotomy and the space occupied by the tube may interfere with the application of dental fixation devices.[8]

There is a paucity of reports of the use of this intubation technique in Nigeria and particularly the Northwest region. Hence, we present reports of the three cases in which this technique was used. To the best of our knowledge, this is the first of such study from our centre. The indications, contraindications and the technique of submental endotracheal intubation as performed in our hospital are outlined.

CASE REPORTS

Case 1

A 5-year-old female presented at our centre with 8 months history of right lower jaw swelling. Clinical examination demonstrated a bony hard swelling extended from the body of the right mandible along the ramus up to the tragus. Intraorally, there was a buccolingual expansion with derangement of occlusion. Following histopathology, a diagnosis of odontogenic fibromyxoma was made.

Right hemimandibulectomy under general anaesthesia was planned. Nasotracheal intubation was unsuccessfully attempted. The submental intubation technique rather than tracheostomy was opted for, after discussion with the anaesthetists [Figures 1 and 2]. This was uneventful and patient successfully extubated following surgery. No post-operative complication was experienced.

Case 2

A 9-year-old male presented with 4 months history of left recurrent swelling of the floor of the mouth. Clinical examination showed a soft, translucent swelling of the left floor of the mouth which raised the tongue on that side. The left submandibular gland was not ballotable on manual palpation. A clinical diagnosis of ranula (extravasation mucocele) was made.

Subsequently, excisional biopsy under general anaesthesia was planned. Nasotracheal intubation could not be attempted owing to intubation challenges. Orotracheal intubation was successfully combined with the submental route on the contralateral side. Thereafter, excision of the ranula with the right sublingual gland was performed. Recovery and healing were uneventful with no post-operative complication recorded.

Case 3

A 16-year-old female was referred to our unit by an otorhinolaryngologist with 3 years history of right mandibular ramus swelling. She had been managed earlier with antibiotics for recurrent parotitis.

On examination, there was right facial asymmetry secondary to a tender bony hard swelling of the right mandibular ramus. Intraorally, there was a buccal expansion of the right ramus without derangement of occlusion and involvement of the mucosa. Following histopathology, a diagnosis of ossifying fibroma was made.

Excision under general anaesthesia was planned. Following unsuccessful nasotracheal intubation, submental intubation technique rather than tracheostomy was adopted in consensus with the anaesthetists. Recovery and healing were uneventful with no post-operative complication witnessed.

Case 4

A 14-year-old male presented at our clinic with malocclusion secondary to a malunited Le Fort I maxillary fracture which he sustained following involvement in road traffic accident about 3 days prior to the presentation. He also had a hypertrophic scar measuring about 2 cm extending longitudinally from the floor of the left nostril to the white roll.

Examination revealed premature contact of the left maxillary segment and anterior down rotation of the

right maxillary segment. In addition, there was avulsion of the upper left central incisor and Ellis class 8 fracture of the upper left lateral incisor. A diagnosis of maxillary bone malunion was made.

The patient had Le Fort I osteotomy done to reduce the fracture and thereafter had stainless steel wire intermaxillary fixation done. Initially, the conventional orotracheal intubation was done, which was then converted to submental intubation in order to monitor occlusion intraoperatively as well as to achieve intermaxillary fixation without compromising the airway. Submental intubation offered satisfactory access to the mandibulomaxillary and nasal complexes while also affording us the chance of placing intermaxillary wire fixation while maintaining the airway. Post-operative recovery was uneventful, and there were no complications noted.

Submental intubation

The airway was secured through orotracheal intubation followed by a 1.5-2.0 cm long paramedian skin incision made in the submental region, just medial to the lower border of the mandible, that is, behind the parasymphyseal region. An orocutaneous tunnel (extra-periosteal) large enough to allow the passage of the appropriate sized endotracheal (regular or reinforced armoured flexometallic preferred) tube was created with blunt dissection by passing a medium-sized needle holder through the skin incision into the floor of the oral cavity traversing the subcutaneous fat, platysma, investing layer of deep cervical fascia, anterior bellies of digastric, mylohyoid, geniohyoid, genioglossus and sublingual mucosa [Figure 3]. Adequate exposure of the mouth was maintained with a mouth gag.

Consecutively, the endotracheal tube was disconnected from the ventilatory circuit with the universal connector removed and the open end of the tube was held with the needle holder. It was pulled extraorally through the wound along with the inflatable balloon while concurrently being anchored in place by an assistant, to prevent accidental extubation. Before re-attaching the connector, the open end of the tube was suctioned free of blood, and other substances and then the tracheal tube reconnected to the breathing circuit [Figure 4]. Direct laryngoscopy, bilateral breath sounds and capnography (end-tidal CO_2) were used to confirm the appropriate placing of the orotracheal tube and then the cuff was re-inflated. Careful monitoring of haemodynamic parameters and SpO_2 was made during the changeover period.

Extraorally, the tube was secured in place with 1-0 black silk suture and Elastoplast was used as reinforcement to prevent accidental displacement of the tube during manipulation of the mandible (Figure 4). Gauze throat pack was inserted in all the cases. Peak airway pressure was satisfactory throughout the procedure. Following, the ends of procedures, the anchor sutures were removed and the tube disconnected and reconverted retrograde back into orotracheal intubation via the submental route. The skin incision was then sutured, and successful extubation was achieved either immediately in the operating theatre or in the post-recovery room [Figure 5]. No prolonged post-operative mechanical ventilation was required, and there was no significant post-operative intubation-related problems observed. Skin sutures were removed post-operatively on day 5 or 7 and patients followed up. No complication or untoward incident was observed till discharge.

DISCUSSION

Hernadenz Altemir in 1986 first described and introduced submental intubation as an option in the management



Figure 1: Submental intubation in place



Figure 2: Submental intubation in place (note the pronounced right facial swelling)



Figure 3: Medium sized needle holder introduced through the submental incision

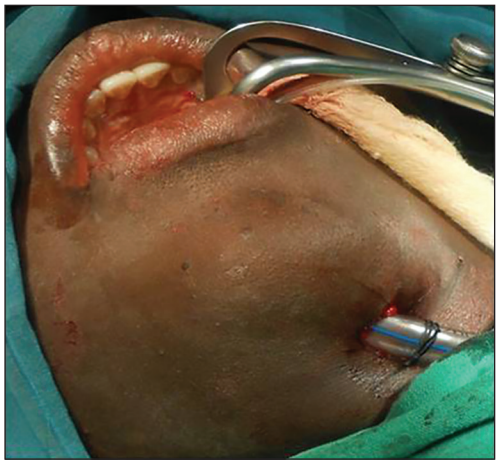


Figure 4: Submental tube in-situ

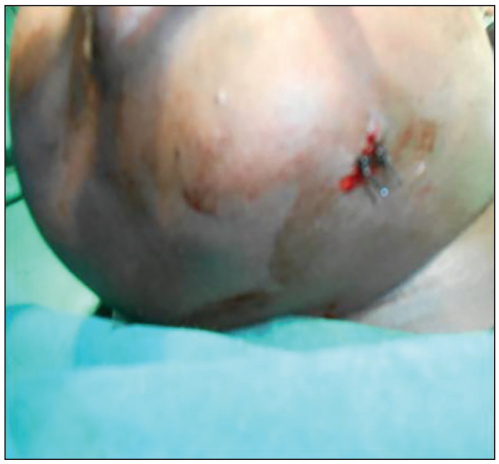


Figure 5: Sutured submental incision

of difficult airway in oral and maxillofacial surgery.[5] It's use has also been applied in our own environment.[2] Submental intubation has been heralded as a simple, secure and effective procedure for operative airway control in major maxillofacial traumas and it allows practitioners to avoid the risk of epistaxis, iatrogenic meningitis or trauma of the anterior skull base which may follow nasotracheal intubation.[4,9] The technique of submental intubation may be modified to the submandibular approach, and scars from the submental incision are thought to be less visible than a tracheostomy scar and is adjudged to be well tolerated by patients.[2,10]

Apart from tracheostomy and submental intubation, the retromolar intubation technique was also proposed for use in these cases, but this technique involves more time, with removal of bone from the retromolar region for making space for the endotracheal tube. In addition, damage to the lingual nerve is greatly increased by this technique.[9]

Indications for submentotracheal intubation have been extensively described in the literature. This include midfacial and panfacial fractures, orthognathic surgery, rhinoplasty, facial aesthetic surgery, skull based surgery, craniofacial cleft, closure of palatal fistula using tongue flap and others. Although, we did not cover the tube with a surgical glove finger as described in the literature, no incidence of any untoward effect of not covering the tube was observed.[2,4] It must be noted, however, that the tube was suctioned satisfactorily before re-connecting to the breathing circuit.

Although, some lesions might cross the midline necessitating placing the tube laterally on the floor of the mouth, anterior to the masseter and medial to the body of mandible (paramedian) rather than going strictly through the submental triangle. None of our cases required this modification.

In addition, this technique avoids the complications associated with tracheostomy such as tissue emphysema, pneumothorax, pneumomediastinum, blockage or displacement of the cannula, tracheitis, tracheal stenosis, tracheoesophageal fistula and sometimes death.[2,4] Furthermore, tracheostomy requires maintenance and has a slow learning curve. Fiberoptic intubation is an option for securing the airway in these patients, but it requires special training and equipment, which is a challenge in a resource limited environment like ours. Submental intubation is an easier procedure with lower morbidity that allows free intraoperative access intraorally.[4] It also avoids haemostatic difficulties often encountered with tracheostomy, although excessive bleeding may be encountered with the paramedian incision, this may be avoided with the midline incision where dissection may be carried through the relatively avascular space between the two bellies of the mylohyoid and the anterior bellies of the digastric

muscles.[2] Furthermore, it avoids scarring by hiding the scar in the submental region.[2]

CONCLUSION

Submental intubation is a viable alternative to tracheostomy and other airway management techniques. It is simple, safe, fast and prevents accidental intracranial placement of an endotracheal tube in skull base fractures. It also allows unfettered access to the nasal pyramid and the dental arches. Thus, it is a viable adjunct in the management of paediatric patients with maxillofacial lesions who do not require prolonged post-surgical ventilatory support.

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Conflicts of interest
There are no conflicts of interest.

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