

Submental intubation for orthognathic surgery in a patient with a history of pharyngeal flap construction: A case report

Takayuki Isatsu | Yoshikazu Kobayashi  | Yu Sekimoto | Min Jung Kim |
Takako Aizawa | Mitsuyoshi Yoshida

Department of Dentistry and Oral-Maxillofacial Surgery, School of Medicine, Fujita Health University, Toyoake, Aichi, Japan

Correspondence

Yoshikazu Kobayashi, Department of Dentistry and Oral-Maxillofacial Surgery, School of Medicine, Fujita Health University, 1-98 Dengakugakubo, Kutsukake, Toyoake, Aichi 470-1192, Japan.
Email: y.kobayashi.oms@gmail.com

Funding information

The authors received no financial support for the research, authorship, and/or publication of this article.

Abstract

Background: Submental intubation is an airway management technique wherein an endotracheal tube is guided through incisions in the floor of the mouth and the submental skin after normal orotracheal intubation.

Case presentation: A 20-year-old man with a history of pharyngeal flap construction for a cleft palate was planned for orthognathic surgery. Preoperative nasopharyngoscopy showed that the space lateral to the flap was too narrow for nasotracheal intubation; then submental intubation was performed. No intra- or postoperative complications were observed.

Conclusion: Submental intubation is a useful alternative to tracheotomy in patients with difficulty in nasotracheal intubation during surgeries requiring occlusal confirmation.

KEYWORDS

cleft lip and palate, nasopharyngeal endoscopy, orthognathic surgery, pharyngeal flap, submental intubation

1 | INTRODUCTION

Submental intubation is an airway management technique in which an endotracheal tube is guided through incisions in the floor of the mouth and the submental skin after normal orotracheal intubation. It is particularly useful in surgeries performed for multiple facial fractures that require intraoperative confirmation of occlusion and difficult nasal intubation. Herein, we present a case of submental intubation during orthognathic surgery in a patient with a history of pharyngeal flap construction after preoperative nasopharyngeal endoscopic evaluation.

2 | CASE REPORT

A 20-year-old male patient was referred to our outpatient clinic with complaints of malocclusion and facial asymmetry. He underwent

multiple operations for bilateral cleft lip and palate, including lip correction at 1 month of age, palatoplasty at 1 year and 7 months, pharyngeal flap construction at 5 years and 3 months, and alveolar bone graft from the iliac crest at 12 years. He acquired good velopharyngeal closure function and speech as evaluated by a speech-language pathologist at our hospital after pharyngeal flap construction. The frontal view showed a lateral deviation of the mandible to the left side and the lateral view showed retrognathia of the maxilla (Figure 1). Radiographs showed skeletal mandibular prognathism, discrepancy in the intermaxillary midline, and inclination of the occlusal plane with cant (Figure 2). Intraoral examination revealed a -2 mm overjet and 2 mm overbite and deviation of the mandibular midline 5 mm left of the maxilla (Figure 3). He was diagnosed with jaw deformity, and bimaxillary orthognathic surgery was planned.

Preoperative computed tomography revealed that the minimum diameter of each lateral orifice of the pharyngeal flap was

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2023 The Authors. *Oral Science International* published by John Wiley & Sons Australia, Ltd on behalf of Japanese Stomatological Society.



FIGURE 1 Preoperative facial view of the patient. Skeletal mandibular prognathism due to midfacial hypoplasia and left lateral deviation of the mentum.



FIGURE 2 Radiographs showing skeletal mandibular prognathism, discrepancy of the intermaxillary midline, and inclination of the occlusal plane with cant.

approximately 4 and 5 mm on the left and right sides, respectively (Figure 4). Owing to the existence of a pharyngeal flap, nasotracheal intubation was expected to be difficult. Therefore, we performed a preoperative nasopharyngeal endoscopy using a fiberscope with an outer diameter of 3.5 mm (Figure 5) (Video S1). The lateral space of the pharyngeal flap was narrow, making nasotracheal intubation difficult, with a high risk of injury to the flap. The endoscopic findings were shared with the patient, and the difficulties of nasotracheal intubation, even with fiber-optic intubation, and the issues with tracheotomy, including the high frequency of complications and prominent scarring, were explained. Airway management with submental intubation was suggested, and the patient consented to the plan.

After normal orotracheal intubation of the spiral endotracheal tube (inner diameter 8.0 mm, outer diameter 11.0 mm), it was

temporarily fixed at the corner of the mouth using adhesive tape. The submental intubation in this case was performed following a strict midline approach reported by MacInnis et al., modified from Altemir's conventional method.¹ A 3-cm skin incision was made in the submental area, and the mylohyoid and geniohyoid muscles were incised. Subsequently, a mucocutaneous incision was made in the center of the floor of the mouth, and the genioglossus muscle was incised to establish communication between the inside and outside of the oral cavity (Figure 6). An endotracheal tube was placed in the submental region and fixed to the skin for complete submental intubation. Le Fort I osteotomy and bilateral sagittal split ramus osteotomy were performed, according to the standard procedure. Intermaxillary fixation was required for positioning of the bone fragments, but the tracheal tube did not cause interference, due to submental intubation. After completion of the bimaxillary orthognathic surgery, the patient was again switched to oral intubation, and the access incision was sutured and extubated. Although redness was observed on the skin incision line, the postoperative course was good and no complications were observed (Figure 7). In addition, postoperative speech evaluation detected no abnormal articulation, including hypernasality.

3 | DISCUSSION

Injury to the pharyngeal flap may result in recurrent velopharyngeal closure insufficiency, complicate the surgical process, and complicate postoperative airway management. Similarly, we do not believe that cutting and reattaching the pharyngeal flap was appropriate in this case, due to the possibility of flap necrosis or deformity, which can lead to recurrent nasopharyngeal closure insufficiency. In this case,



FIGURE 3 Intraoral examination revealing -2 mm overjet, 2 mm overbite, and deviation of the mandibular midline 5 mm left of the maxilla.



FIGURE 4 Preoperative computed tomography revealing that the minimum diameter of each lateral orifice of the pharyngeal flap was approximately 4 and 5 mm on the left and right sides, respectively (arrows).

we evaluated the airway using nasopharyngoscopy and were able to visually determine the risk of injury to the pharyngeal flap.

There have been several reports of nasotracheal intubation in patients who underwent pharyngeal flap construction.²⁻⁷ However,



(A)



(B)

FIGURE 5 Endoscopic images revealing (A) the narrow space beside the pharyngeal flap against the outer diameter of the tracheal tube and (B) the laryngeal space (captured from Video S1).

the majority described the blind intubation method as relying on finger sensation and not directly viewing the residual space beside the pharyngeal flap.^{3,4,6} Matot et al. reported a case of nasotracheal intubation using a dental mirror and retrograde tracheal intubation equipment after the failure of normal intubation.⁶ Oh et al. reported a case of pharyngeal flap injury during nasotracheal intubation in a patient who had previously undergone pharyngeal flap construction.⁷ There exist some reports recommending preoperative nasopharyngoscopy.^{2,8} Takaishi et al. performed 3D-CT and endoscopy preoperatively to evaluate the opening of the pharyngeal space in a patient with a history of pharyngeal flap construction and attempted nasal intubation.⁸ They reported that an endotracheal tube was successfully inserted through the orifice with a short diameter of 3 mm, though they performed intubation through the left side of the nasal cavity, due to the difficulty of inserting the tracheal tube through the right side as scheduled preoperatively.⁸ Therefore, we should have attempted fiber-guided nasotracheal intubation in this case. The possibility of injury to the pharyngeal flap, as reported by Oh et al., should be explained to the patient as a risk of nasal intubation, and informed consent obtained. In this particular case, we and the patient made this



FIGURE 7 Findings in the incision area at 1 year postoperatively. The scar line was able to be recognized by lifting the chin up along the wrinkle line in the submental area.



FIGURE 6 Surgical procedure of submental intubation. After the normal oral intubation, intra- and extraoral incisions were made. The endotracheal tube was introduced through the incisions.

choice out of concern for the risk, albeit unlikely, of the tube damaging the pharyngeal flap during the intubation and intraoperative maxillary manipulation.⁷

Submental intubation is an airway management technique that was first reported by Altemir in 1986.⁹ The aim of this method is to alternate to tracheotomy in cases of trauma in the maxillofacial region that requires short-term intermaxillary fixation.⁹ It has also been widely used in cases of difficulty with nasal intubation. In the present case, we used the MacInnis technique, which is a modified version of Altemir's method. It has the advantage of avoiding Wharton's duct, the lingual nerve, and the sublingual gland. This is achieved by using a strict midline approach; it also has less vascularity in the pathway.¹

Although tracheotomy remains a common airway management method in surgeries selected by the majority of surgeons, complications such as tracheal stenosis or tracheoesophageal fistula have been reported in 14%–45% of cases.^{10,11} In contrast, complications of submental intubation are infrequent (9.0%) and can be treated with minimal interventions, according to a literature review of 1092 cases by Lim et al.¹²

Submental intubation offers multiple benefits compared to tracheotomy, including minimal complications, technical simplicity, rapid procedure (lasting 9.9 min on average), and less visible postoperative scarring.¹³ The drawbacks are that it is not indicated when prolonged airway management is required, and there is a risk of salivary fistula, mucocele, dislodged tube, tube pushing into a bronchus, and tube kinking.¹² Especially, problems relating to the tracheal tube require attention because of the potential delay in response compared to tracheostomy. However, these can easily be handled by the anesthesiologist by correcting the position of the tube or using a reinforced tube.¹² Based on a comprehensive evaluation of these advantages and disadvantages, submental intubation can be an alternative to tracheotomy for safe airway management and protection of the existing pharyngeal flap in patients for whom nasal intubation is impossible, as in this case.

Injury to the pharyngeal flap may result in recurrent velopharyngeal closure insufficiency, complicate the surgical process, and complicate postoperative airway management. Similarly, we do not believe that cutting and reattaching the pharyngeal flap was appropriate in this case, due to the possibility of flap necrosis or deformity, which can lead to recurrent nasopharyngeal closure insufficiency. In this case, we evaluated the airway using nasopharyngoscopy and were able to visually determine the risk of injury to the pharyngeal flap. We believe that submental intubation should be considered in such patients for safer airway management and protection of the existing pharyngeal flap.

4 | CONCLUSION

Submental intubation could be a useful alternative to tracheotomy for patients for whom nasotracheal intubation is difficult during surgeries that require occlusal confirmation and intraoperative intermaxillary

fixation. In addition, preoperative nasopharyngoscopy is an effective tool for planning this procedure.

AUTHOR CONTRIBUTIONS

Takayuki Isatsu: Writing—original draft. **Yoshikazu Kobayashi:** Writing—review and editing. **Yu Sekimoto:** Assessment of clinical images. **Min Jung Kim:** Assessment of clinical images. **Takako Aizawa:** Supervision. **Mitsuyoshi Yoshida:** Supervision. All the authors gave final approval of the manuscript.

ACKNOWLEDGMENTS

The authors received no financial support for the research, authorship, and publication of this article.

CONFLICT OF INTEREST STATEMENT

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENT

The data that support the finding of this study are available from the corresponding author, Yoshikazu Kobayashi, upon reasonable request.

ETHICS APPROVAL STATEMENT

N/A.

PATIENT CONSENT STATEMENT

The patient has provided informed consent for publication.

CLINICAL TRIAL REGISTRATION

N/A.

ORCID

Yoshikazu Kobayashi  <https://orcid.org/0000-0003-1416-7066>

REFERENCES

1. MacInnis E, Baig M. A modified submental approach for oral endotracheal intubation. *Int J Oral Maxillofac Surg.* 1999;28(5):344–6. <https://doi.org/10.1034/j.1399-0020.1999.285280506.x>
2. Bell CN, Macintyre DR, Ross JW, Pigott RW, Weller RM. Pharyngoplasty: a hazard for nasotracheal intubation. *Br J Oral Maxillofac Surg.* 1986;24(3):212–6. [https://doi.org/10.1016/0266-4356\(86\)90077-X](https://doi.org/10.1016/0266-4356(86)90077-X)
3. Becker DW Jr, Bass CB, Williams VL. An aid to nasotracheal intubation in orthognathic surgery. *Cleft Palate Craniofac J.* 1993;30(3):350. https://doi.org/10.1597/1545-1569_1993_030_0350_aatnii_2.3.co_2
4. Kopp VJ, Rosenfeld MJ, Turvey TA. Nasotracheal intubation in the presence of a pharyngeal flap in children and adults. *Anesthesiology.* 1995;82(4):1063–4. <https://doi.org/10.1097/00000542-19950400-00029>
5. Matot I, Hevron I, Katzenelson R. Dental mirror for difficult nasotracheal intubation. *Anaesthesia.* 1997;52(8):780–2. <https://doi.org/10.1111/j.1365-2044.1997.99-az0095.x>
6. Hee HI, Conskunfirat ND, Wong SY, Chen C. Airway management in a patient with a cleft palate after pharyngoplasty: a case report. *Can J Anaesth.* 2003;50(7):721–4. <https://doi.org/10.1007/BF03018717>

7. Oh JS, Choi HS, Kim EJ, Kim CH, Yoon JU, Yoon JY. Pharyngeal flap damage caused by nasotracheal intubation in a patient who underwent palatoplasty and pharyngoplasty. *J Dent Anesth Pain Med.* 2016;16(4):309–12. <https://doi.org/10.17245/jdapm.2016.16.4.309>
8. Takaishi K, Kawahito S, Fujiwara S, Kitahata H. Nasotracheal intubation through pharyngeal flap after pharyngeal flap construction. *J Clin Anesth.* 2018;44:121–2. <https://doi.org/10.1016/j.jclinane.2017.11.026>
9. Hernández AF. The submental route for endotracheal intubation. A New Technique *J Maxillofac Surg.* 1986;14(1):64–5. [https://doi.org/10.1016/S0301-0503\(86\)80261-2](https://doi.org/10.1016/S0301-0503(86)80261-2)
10. Waldron J, Padgham ND, Hurley SE. Complications of emergency and elective tracheostomy: a retrospective study of 150 consecutive cases. *Ann R Coll Surg Engl.* 1990;72(4):218–20.
11. Taicher S, Givol N, Peleg M, Ardekian L. Changing indications for tracheostomy in maxillofacial trauma. *J Oral Maxillofac Surg.* 1996; 54(3):292–5. [https://doi.org/10.1016/S0278-2391\(96\)90744-2](https://doi.org/10.1016/S0278-2391(96)90744-2)
12. Lim D, Ma BC, Parumo R, Shanmuhasantharam P. Thirty years of submental intubation: a review. *Int J Oral Maxillofac Surg.* 2018; 47(9):1161–5. <https://doi.org/10.1016/j.ijom.2018.04.015>
13. Jundt JS, Cattano D, Hagberg CA, Wilson JW. Submental intubation: a literature review. *Int J Oral Maxillofac Surg.* 2012;41(1):46–54. <https://doi.org/10.1016/j.ijom.2011.08.002>

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Isatsu T, Kobayashi Y, Sekimoto Y, Kim MJ, Aizawa T, Yoshida M. Submental intubation for orthognathic surgery in a patient with a history of pharyngeal flap construction: A case report. *Oral Sci Int.* 2023. <https://doi.org/10.1002/osi2.1215>