



Split Fracture and Displacement of Mandibular Lingual Cortical Plate of Mandibular Symphysis Requires Fixation

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Abstract

The first priority in the management of comminuted mandibular fractures is the prevention of acute upper airway obstruction. Each division of mandibular fractures may cause respiratory obstruction. Among the variety of such fractures, split fracture of the symphyseal lingual cortical plate has a significant influence on the oropharyngeal and laryngopharyngeal airway spaces, and causes a markedly restricted ventilatory function. As the bony fragment is pedicled to the geniohyoid and genioglossus muscles, this type of fracture restricts hyoid movements, which may result in disturbance of deglutition.

We present two cases of split fracture and displacement of the mandibular lingual cortical plate of the mandibular symphysis, which were successfully treated with open reduction. We believe that precise reduction and fixation of the fragment of the symphyseal lingual cortical plate are indispensable for both relieving the airway obstruction and preventing disturbance of deglutition.

Keywords

Split fracture of mandibular, Displacement of fragment, Symphysis fracture, Open reduction

Introduction

The primary considerations in the treatment of comminuted mandibular fractures are open reduction and internal fixation to restore a satisfactory occlusion and shorten the period of orofunctional rehabilitation [1]. However, patterns of mandibular fracture vary; some dislocations involving fragmentation require special attention for the prevention of both acute upper airway obstruction and postoperative swallowing dysfunction [2]. We present two cases of split fracture and displacement of the mandibular lingual cortical plate of the mandibular symphysis, which caused obstruction of the upper airway and required open reduction.

Case Reports

Case 1

A 27-year-old male was referred to our emergency unit

complaining of marked neck swelling and airway obstruction resulting from a car accident. As the patient had extensive oral bleeding, he immediately underwent intra-tracheal intubation. An emergent cerebral angiogram revealed extravasation of the mental artery; thus, transcatheter arterial embolization was performed. Computed tomography (CT) showed both maxillary and mandibular open fractures (Figure 1a). The menton had fractured into pieces,

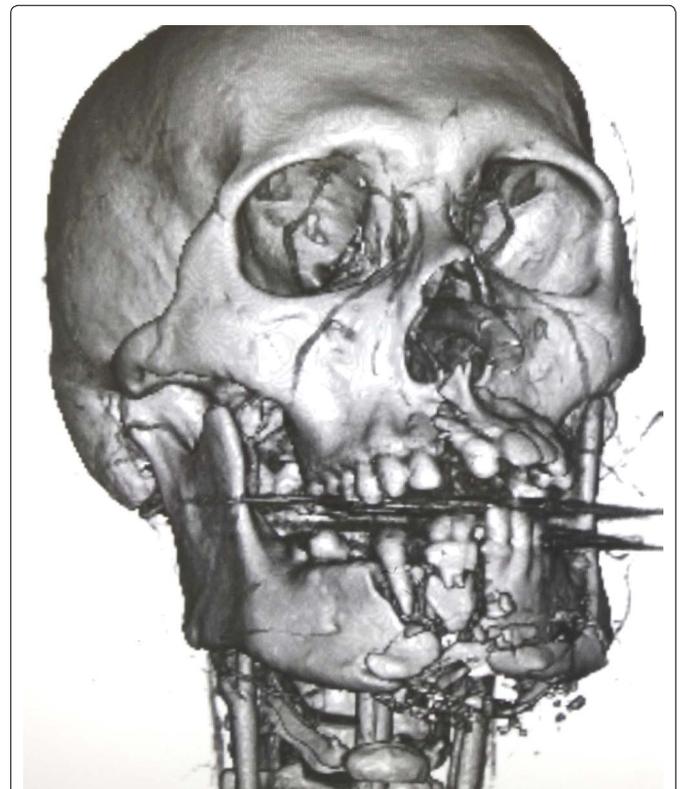


Figure (1a): Case 1. 3D-CT showed that both maxillary and mandibular open fractures.

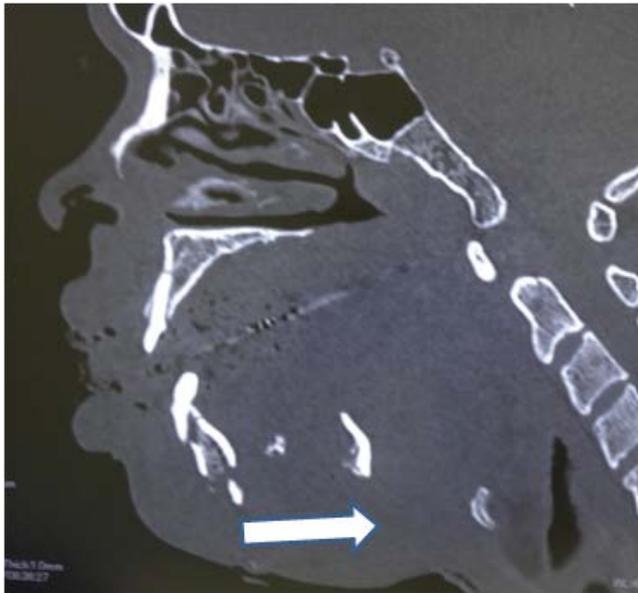


Figure 1b): Case 1. Sagittal slice CT showed that the fragment of the lingual cortical plate (arrow) was displaced 40 mm posteriorly.

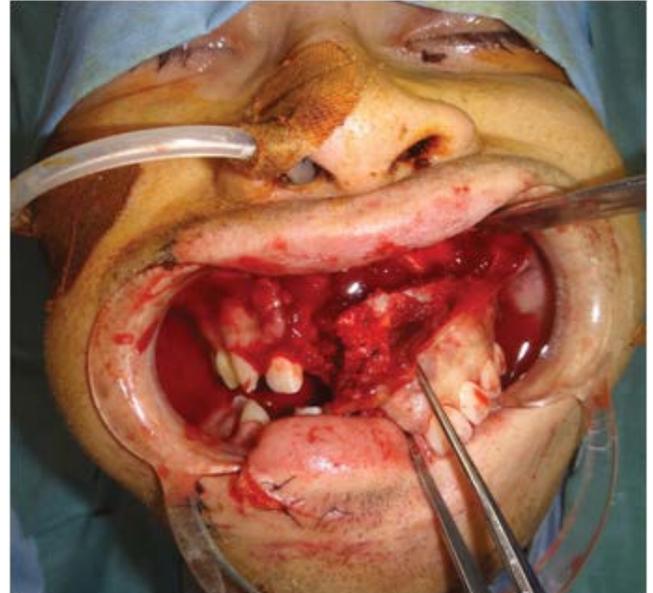


Figure 1d): Case 1: Intra-operative photography of maxillary fracture.

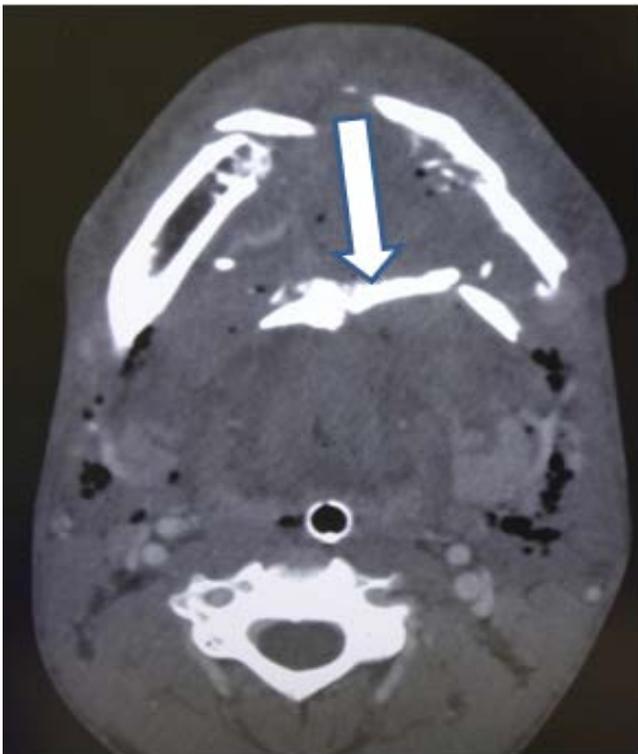


Figure 1c): Case 1. Axial slice CT showed that the fragment (arrow) was displaced posteriorly, and the upper airway was obstructed.



Figure 1e): Case 1: Intra-operative photography of repaired outer plates of mandibular fracture.

and the largest fragment of the lingual cortical plate (45 X 20 mm) was displaced 40 mm posteriorly (Figure 1b and Figure 1c). Six days later, open reduction was performed. At first, osteosynthesis of the maxillary fracture and intermaxillary fixation using arch-bars were performed (Figure 1d). The comminuted mandibular fractures were exposed by both intra-oral buccal sulcus and mental skin incisions, and mandibular bone reduction and fixation with mini-plates (Figure 1e). The fragment of the lingual cortical plates, which was moved backward by pulling the attached geniohyoid muscle, was securely fixed with lag screws (Figure 1f, Figure 1g and Figure 1h). Post-operative CT showed that the fragment of the lingual cortical plate was attached to the menton and formed favorable bone alignment. (Figure 1i and Figure 1j) Intermaxillary fixation was removed 2 weeks after surgery, and plates were removed after 6 months. The postoperative diet and swallowing function were satisfactory.



Figure 1f): Case 1: Intra-operative photography of the fragment of the lingual cortical plates, which was moved backward. The dotted line indicates the displaced fragment.

Case 2

A 72-year-old male sustained a detrition injury to the maxilla

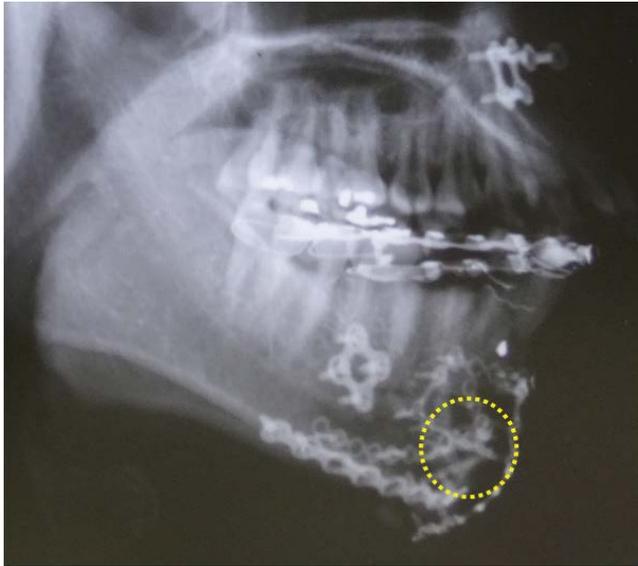


Figure (1g): X-ray photo 3 weeks after surgery showed 2 lag screws which fixed fragment (dotted circle).

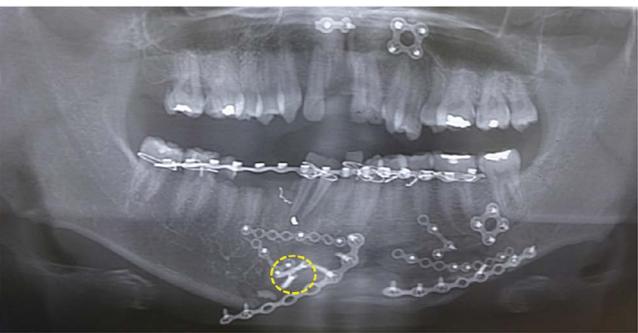


Figure (1h): Panorama tomography 3 weeks after surgery showed 2 lag screws which fixed fragment (dotted circle).



Figure (1i): Sagittal slice CT 3 weeks after surgery showed favorable reconstruction and rigid fixation with lag screws of the broken fragment (arrow).

and mandible due to being struck by the moving hook of a crane. He underwent immediate intra-tracheal intubation to relieve the airway obstruction. CT showed that the patient had a fracture of



Figure (1j): Axial slice CT 3 weeks after surgery showed favorable reconstruction of the broken fragment (arrow), which resulted in opening of the airway.

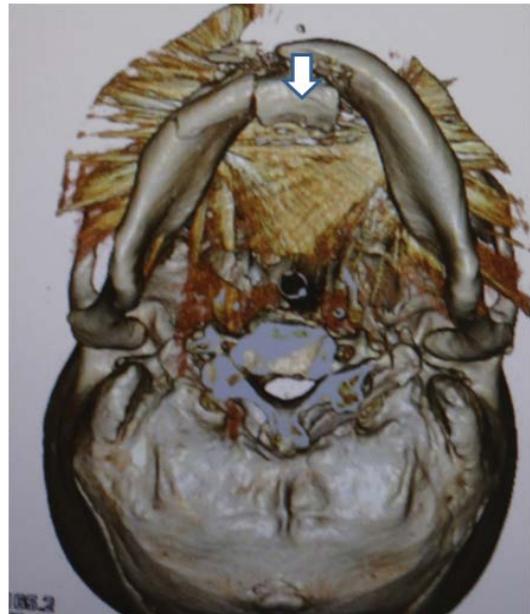


Figure (2a): Case 2: 3D-CT showed that mandibular open fractures. The fragment of the lingual cortical plate (arrow) was displaced 20 mm posteriorly,

the mandible, and a fragment of lingual cortical plate (24 X 20 mm) was displaced 20 mm posteriorly (Figure 2a, Figure 2b and Figure 2c). The patient underwent an immediate open reduction. The comminuted mandibular fractures were exposed by both intra-oral buccal sulcus incisions, and skin wound on the mental protuberance. Following intermaxillary fixation using arch-bars, osteosynthesis of the mandibular fracture and reduction of the fragment of the lingual cortical plate and fixation with long lag screw and wires (Figure 2d). Post-operative CT showed that the fragment of the lingual cortical plate was attached to the menton (Figure 2e). Intermaxillary fixation was removed 2 weeks after surgery. The postoperative diet and swallowing functions were satisfactory.

Discussion and Conclusion

Mandibular fractures are common facial injuries [3-7]. They almost occur along with symphyseal, parasymphyseal, body, angle,



Figure (2b): Case 2: Sagittal slice CT showed that the fragment (arrow) was displaced, and the upper airway was obstructed.



Figure (2e): Sagittal slice CT 2 weeks after surgery showed favorable reconstruction of the broken fragment (arrow), and opening of the airway.



Figure (2c): Case 2: Axial slice CT showed that the fragment (arrow) was displaced, and the upper airway was obstructed.

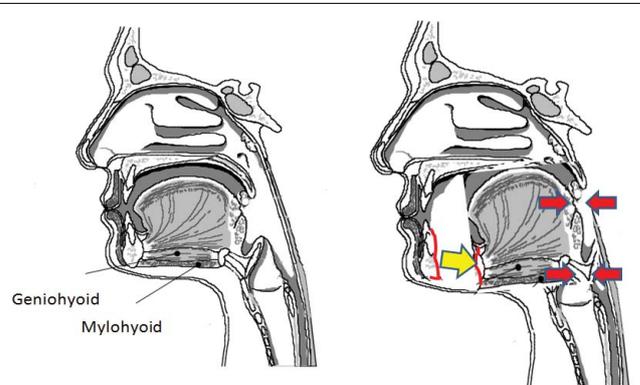


Figure 3: The figure shows that displacement of the symphyseal lingual cortical plate due to split fracture results in airway obstruction.

may press and obstruct the upper respiratory tract, and so, patients often require immediate intra-tracheal intubation to relieve the airway obstruction [2]. Among these mandibular fractures, bilateral mandibular fracture is known as a “flail mandible”, which results in obstruction of the airway [8]. Bilateral parasymphiseal fracture has a significant influence on the oropharyngeal and laryngopharyngeal airway spaces, and causes a severely restricted the ventilator function [9]. The same phenomenon can occur with a split fracture of the symphyseal lingual cortical plate. This bony fragment is pedicled to the geniohyoid and genioglossus muscles, being the most likely to displace the hyoid in an anterior direction. Thus, displacement of symphyseal lingual cortical plate results in a serious airway obstruction (Figure 3) [10].

Furthermore, superior and anterior hyoid movements are important events in pharyngeal deglutition. The geniohyoid originates from the symphyseal lingual side of the mandible. The geniohyoid and thyrohyoid muscles have a greater structural potential to displace the hyoid anteriorly and superiorly, and are primarily responsible for opening the upper esophageal sphincter, which is essential for bolus entry into the esophagus (Figure 4) [10-13]. If a posteriorly displaced fragment of the lingual cortical plate is not fixed appropriately, anterior and superior movements of the hyoid may be insufficient and, consequently, impaired opening of the upper esophagus may cause suffocation.

In conclusion, we suggest that precise reduction and fixation of a fragment of the symphyseal lingual cortical plate are indispensable for both relieving airway obstruction in the acute phase, and preventing disturbance of deglutition later.

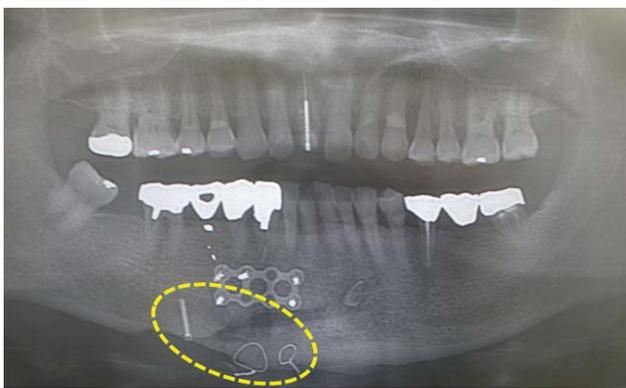
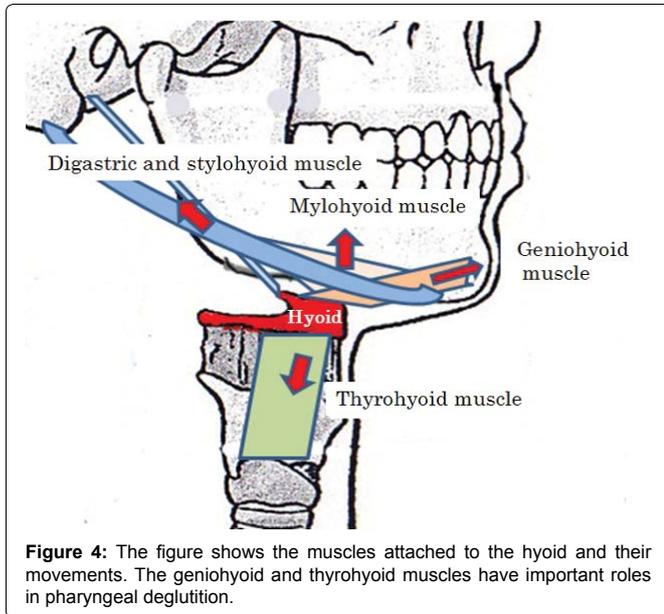


Figure (2d): Panorama tomography 3 weeks after surgery showed a lag screw and 2 wires which fixed fragment (dotted circle).

vertical ramus, coronoid process, and condylar fractures [7]. In the oral cavity, displaced fragments, a sublingual hematoma, and swelling



Disclosures

This manuscript has not benefited from any source of funding support or grants, and the author has no conflicting financial interest.

Ethical Considerations

This study was approved by the IRB of National Hospital organization Nagasaki Medical Center (27021, May 5th 2015), and all participants signed an informed consent agreement.

The content of the manuscript is original and it has not been published or accepted for publication, either in whole or in part, in any form. No part of the manuscript is currently under consideration for publication elsewhere.

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