Case Report

Management of Maxillofacial Injuries with Palatal Fracture

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Abstract

Maxillofacial injuries, especially palatal fractures, often result from high-energy trauma, posing a challenging treatment. Achieving good occlusion is crucial, particularly when palatal fractures are associated with Le Fort fractures. While tracheostomy has traditionally been the airway management option, submental intubation serves as an alternative. The objective of this report is to illustrate a case of palatal fractures associated with Le Fort fractures in a 12-year-old female following a motorbike accident. She was admitted to dr. Cipto Mangunkusumo Hospital with Le Fort I and II fractures and palatal fractures. The treatment plan included submental intubation, the application of wire and arch bars, and the use of plates and screws. The patient experienced a good recovery without complications. Compared to submental intubation, tracheostomy requires a significantly longer time and often necessitates scar revision. No significant difference was observed in post-operative occlusal stability between intra-arch wire and mini-plate. In conclusion, limited direct comparisons exist between submental intubation, tracheostomy, intra-arch wire, and miniplate for palatal stabilization. Submental intubation is a faster and less complication-prone alternative to tracheostomy in maxillofacial surgical procedures. However, evidence regarding the superiority of intra-arch wire or mini plate for palate stabilization remains inconclusive.
Keywords: *submental intubation, maxillofacial injuries, mini-plate, palate.*

Tatalaksana Cedera Maksilofasial dengan Fraktur Palatum

Abstrak

Fraktur palatum pada cedera maksilofasial, sering kali disebabkan oleh benturan berkekuatan tinggi, dan menjadi tantangan dalam tindak rekonstruksi. Agar mendapatkan oklusi yang baik merupakan hal yang sangat penting, terutama ketika terjadi fraktur palatum yang berkaitan dengan fraktur Le Fort. Meskipun trakeostomi awalnya merupakan pilihan manajemen saluran udara, namun intubasi submental dapat menjadi pilihan alternatif. Tujuan laporan ini adalah menggambarkan sebuah kasus fraktur palatum yang berkaitan dengan fraktur Le Fort pada anak perempuan berusia 12 tahun yang mengalami kecelakaan motor. Pasien dirawat di RS dr. Cipto Mangunkusumo dengan fraktur Le Fort I-II dan fraktur palatum. Pasien dilakukan intubasi submental, pemasangan kawat dan arch-bar, serta dental plat dan skrup. Pasien mengalami pemulihan yang baik tanpa komplikasi. Dibandingkan dengan intubasi submental, trakeostomi membutuhkan waktu yang jauh lebih lama dan seringkali memerlukan revisi bekas luka. Tidak ada perbedaan signifikan pada pengamatan dalam stabilitas oklusi pascaoperasi antara menggunaan intra-arch wire, dan miniplate. Pada kesimpulannya, terdapat perbandingan langsung yang terbatas antara intubasi submental, trakeostomi, intra-arch wire, dan miniplate untuk stabilisasi palatum. Intubasi submental merupakan alternatif yang lebih cepat dan sedikit komplikasi dibandingkan dengan trakeostomi dalam prosedur bedah maksilofasial. Namun, bukti mengenai keunggulan intra-arch wire atau miniplate untuk stabilisasi palatum masih belum jelas.
Kata kunci*: intubasi submental, cedera maksilofasial, mini-plate, palatum.*

Introduction

High-energy trauma often leads to facial injuries, with causes including motorbike accidents, interpersonal violence, falls, and sports incidents. Facial fracture patterns are complex and vary between individuals. The most common maxillofacial fractures are nasal fractures, followed by mandibular, midface, orbital floor, and frontal sinus fractures. Managing severe facial fractures poses significant challenges. Craniofacial fractures often lead to considering tracheostomy as the standard solution for airway management, especially when postoperative ventilator support is required. However, tracheostomy carries potential complications, including hemorrhage, pneumothorax, pneumo-mediastinum, wound infection, and scarring. Intraoperative intermaxillary fixation is crucial for proper reduction during maxillofacial surgery. Hernandez Altemir (1986) introduced a route for intubation to avoid interference with oral and maxillofacial surgery, which is submental, providing an alternative to tracheostomy.[1–5]

The maxilla is one of the most complex structures within the craniofacial skeleton. Serving as the central facial pillar, it articulates with a majority of facial bones. Notably, the palatine process of the maxilla, known as the hard palate, stands out due to its robust and sturdy bone structure. Isolated palatal fractures are rare and often associated with maxillary fractures. Its management is a matter of debate. Historically, repair methods for palate fractures have shown variability and encompass open and closed approaches (wiring, plating, and splinting).[6,7]

The main objective of this paper is to show a case of palatal fractures coupled with Le Fort fractures in a 12-year-old female after a motorbike accident. This study aims to compare submental intubation with tracheostomy, as well as to compare intra-arch wire with mini-plate techniques.

Case Report

A 12-year-old female was involved in a motorbike accident two days prior to admission. Her primary complaint was nasal obstruction in both nostrils following trauma. The patient did not report any loss of consciousness, seizures, or fainting. She experienced vomiting four times, and nasal bleeding was evident. Despite gross facial edema and left eye ecchymosis (Figure 1), the patient remained conscious, cooperative, and well-oriented, with a Glasgow Coma Scale score of 15. Upon clinical examination, the patient's right eye demonstrated orthophoria with good eyeball movement in all directions, and visual acuity was 3/60. However, her left eye movement was restricted to the superotemporal, temporal, and infratemporal directions, with visual acuity at 1/300 (Figure 2). The left pupil exhibited edema, superior palpebral hematomas and crepitation in the superonasal and inferior orbital rim. Oral examination revealed a limited mouth opening of 1 cm, classified as Angle's Class II.

Figure 1. A 12-year-old woman was involved in motor vehicle crashed (above). Pre-operative dental occlusion (below)

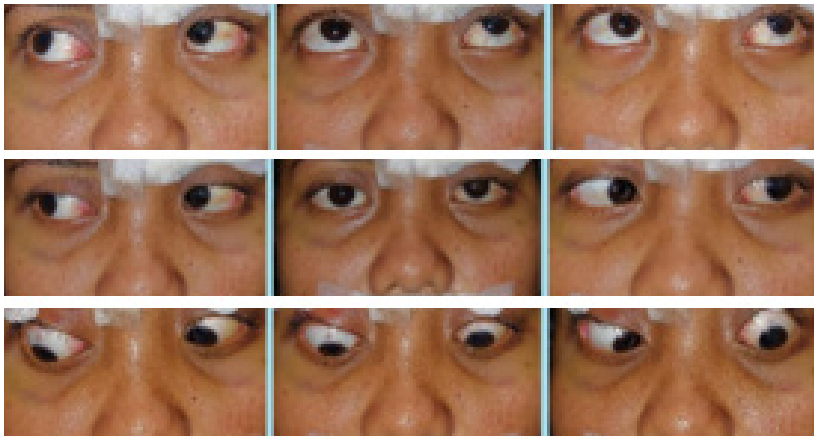

Figure 2. Eyeball Movement Examination

Pre-operative CT scan revealed bilateral Le Fort type I and II, complete sagittal palatal fracture, and medial and inferior rim of the orbit (Figure 3). The treatment involved palatal wire for palate reduction and the application of arch bars (Figure 4a). The palatal wire used a gauge stainless steel wire that passed between the maxillary first and second molar teeth. Maxilla was mobilized using Rowe's disimpaction forceps for passive positioning (Figure 4b), followed by maxilla-mandibular fixation (MMF) for occlusion. After conventional orotracheal intubation, a 1.5 cm incision was made submentally, with subcutaneous local anesthetic injection. Submandibular fat tissue and muscle were dissected, guided by intraoral palpation. The endotracheal tube was passed, reconnected to the ventilator, and secured on the floor of the mouth with sutures (Figure 4c).

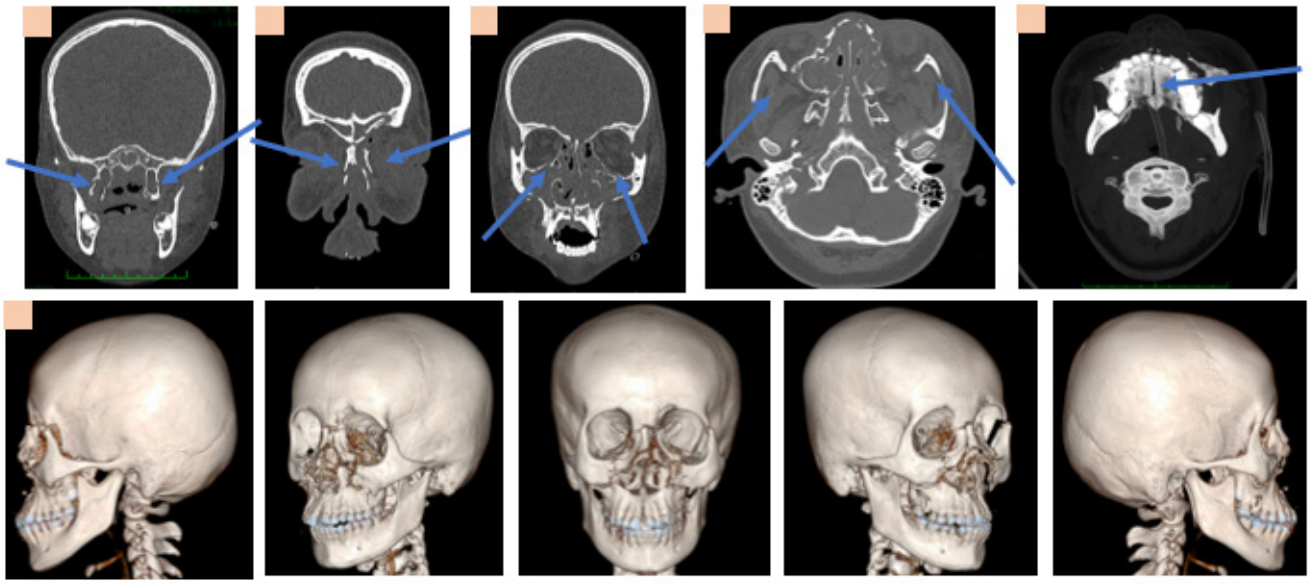

Figure 3. Pre-Operative CT Scan Showed Bilateral Le Fort Type I and II and Complete Sagittal Palatal Fracture. A) Fracture of pterygoid bones (arrows). B) Comminuted fracture of nasal bone (arrows). C) Displaced fracture of the medial & and inferior rim of the bilateral orbit (arrow). D) Axial CT image, reveals both zygomatic arches were intact (arrows). E) Complete sagittal palatal fracture; F) Three-dimensional image

The surgery was done using a midface degloving approach for reduction and fixation with plates and screws (Figure 4d). Subcilliary approaches were performed to access the infraorbital and lateral orbital wall fractures, followed by fixation with titanium plates and screws as well as resorbable plates (Figure 4e).

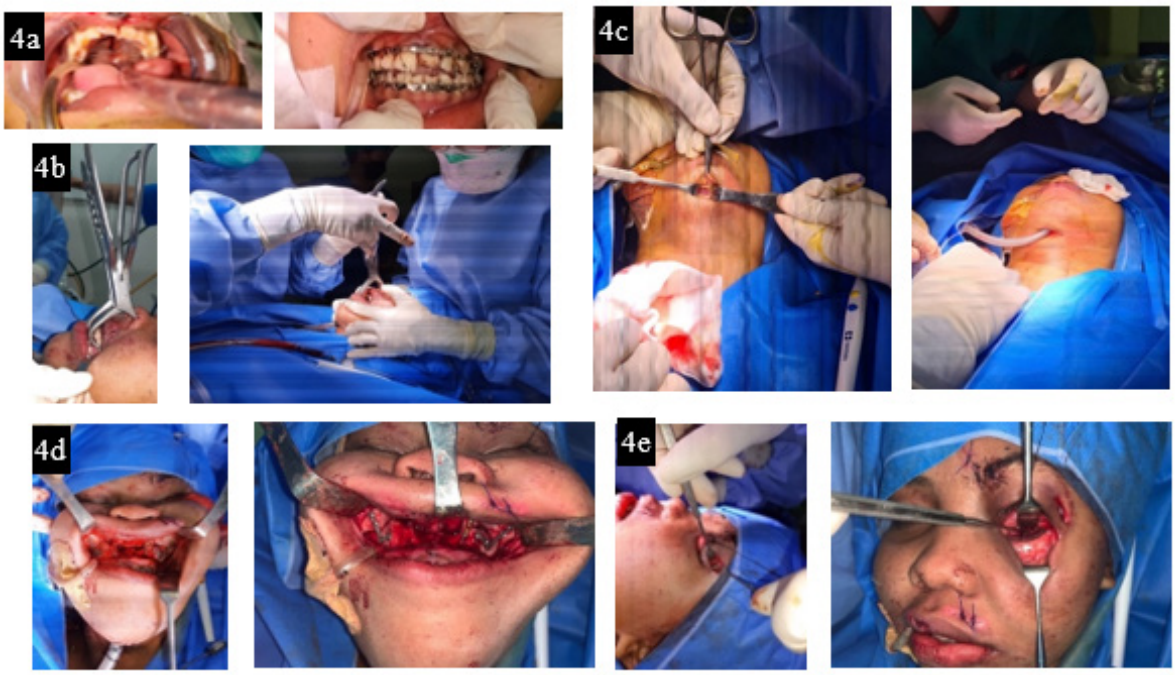

Figure 4. Intra-Operative View

After the surgery, there was no complication or scarring when the submental was removed. In the follow-up, the patient was examined for fistula, swelling, or infection of the salivary glands. One month post-surgery follow-up, the face was symmetrical, with no facial edema or malocclusion. Both eyes were orthophoria with good eyeball movement (Figure 5).

Figure 5. One Month After Surgery Follow-Up

Discussion

Fractures of the palate are relatively rare compared to other types of craniofacial fractures. Achieving optimal reduction of bone fragments in cases of multiple facial fractures requiring perioperative maxillomandibular fixation (MMF) concurrently with Le Fort fractures pose challenges for standard orotracheal or nasotracheal intubation. Many alternative methods include changing the tube from nose to mouth at specific stages of the surgery, submental intubation, or finally performing surgical treatment in two or more steps. However, each alternative has limitations and technical difficulties, which may result in greater morbidity and may have a higher cost.

This case report presents a patient with Le Fort types I and II fractures accompanied by a palatal fracture. Oral intubation was not an option because it does not provide space for MMF to achieve ideal functional occlusion, which is vital to facial fracture management. Nasal intubation was also contraindicated due to the nasal fracture.

There is no consensus on managing the airway when orotracheal or transtracheal intubation is contraindicated.

Only one study (Tarek et al.[2]) fit the first clinical question from the literature obtained. It revealed that the submental scar resulting from submental intubation was deemed acceptable. In contrast, the tracheostomy scar necessitated scar revision. No complication was reported in the submental intubation group. However, in the tracheostomy group, there were two patients with surgical emphysema.[2]

This study also demonstrated the benefit of submental intubation, which takes less time to perform (8.35 min versus 30.75 min to do tracheostomy with a significant difference, $p < 0.0001$).[2] This is in line with previous literature by Kumar et al,[9] which showed the time from incision until the submental airway was established ranged from 8-20 minutes, with an average of 11.46 minutes.[2] The study from Singaram et al.[10] and Huijun et al.[11] also showed that the submental procedure was around 8-12 minutes long.[10,11] This shows how short the procedure is compared to the tracheostomy procedure.

Tarek et al.[2] reported tube kinking in one patient (10%) following submental intubation. However, no significant bleeding, infection, fistula, nerve injury, or hematoma was observed following this procedure. Another study by Kumar et al.[9] involving 41 submental intubation patients demonstrated no significant complications. There was a lingual hematoma in one case, which resolved spontaneously. Additionally, the extraoral scars healed with an acceptable aesthetic result.[2]

For the second clinical question regarding palate stabilization, this case used intra-arch or trans-palatal wire to stabilize the palate. Two studies compared intra-arch wire and mini-plate fixation. The study by Bhargava et al.[8] showed that half of the intra-arch wire group had no good clinical outcome. This may be due to the hard palate's lack of rigid fixation. Despite all the patients in the miniplate group achieving stable occlusion postoperatively, the statistical analysis did not yield a significant result, with a relative risk of 2 for postoperative occlusal stability. Additionally, the study by Moss et al.[6] provided insights into the outcomes and complications of closed reduction using wires compared to rigid internal fixation. The study indicated a higher rate of wound complications in plated patients ($p<0.05$). Postoperative malocclusion incidence was higher in wired patients, though not statistically significant. Other reported complications encompassed exposed hardware, oronasal fistula necessitating bone grafting, routine gingival loss requiring local flap closure, and one case of epistaxis post palatal vault plate fixation, requiring endoscopic cauterization and packing.[6]

Conclusion

Limited direct comparisons exist between submental intubation, tracheostomy, intra-arch wire, and miniplate for palatal stabilization. Submental intubation is a faster and less complication-prone alternative to tracheostomy in maxillofacial surgical procedures. However, evidence regarding the superiority of intra-arch wire or mini plate for palate stabilization remains inconclusive.

Conflict of Interest

The authors have no conflicts of interest to declare. All co-authors have seen and agreed with the contents of the manuscript, and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

Consent Form

The patient has consented to the submission of the case report for submission to the journal.

Acknowledgment

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