

Palatal Fracture, Definition, Classification, Management, and Complications :A Literature Review

Malik Adji Arrasyid Bochari¹, Agus Santoso Budi², Imam Subadi³

¹ Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia

² Department of Reconstructive and Aesthetic Plastic Surgery, Faculty of Medicine/Dr. Soetomo General Academic Hospital, Airlangga University, Surabaya, Indonesia

³ Department of Physical Medicine and Rehabilitation, Faculty of Medicine/Dr. Soetomo General Academic Hospital, Airlangga University, Surabaya, Indonesia

Abstract

Palatal fracture is the loss of continuity of bone, joint, cartilage epiphyseal cartilage both total and partial in the palate of the cavum oris. It classified into three types based on the location and shape of the fracture such as type I (sagittal, parasagittal, paraalveolar), type II (transverse fracture), and type III (complex/comminuted). Several studies revealed kinds of treatment that used depends on the classification. This literature study aims to describe the definition, classification, treatment used based on the classification of palatal fracture, and complications that may occur after palatal fracture management.

Keywords: Palatal Fracture, Definition, Classification, Management, Complication

1. Definition

Fracture is the loss or interruption of the continuity of the body's hard tissue. The face or maxillofacial anatomy is divided into three parts: the upper third of the face, the middle third of the face, and the lower third of the face. Rene Le Fort presented the first description of palatal fractures in a 1901 journal article on maxillary fractures. Midfacial or panfacial fractures are frequently reported in conjunction with these injuries [11]. Le Fort fractures and maxillofacial fractures frequently coexist with palatal fractures. Palatal fractures are frequently associated with maxillofacial fractures and Le Fort fractures. Fracture of the palate is the loss of continuity of bone, joint cartilage, epiphyseal cartilage, both total and partial in the palate of the cavum oris. Palatal fractures are often associated with severe maxillofacial trauma, such as trauma from vehicle accidents [1].

2. Classification

In 1983, Manson classified palatal fractures according to sagittal, transverse, or comminuted fracture paths with or without dental organ involvement. In 1998, Hendrickson et al. described six different types of palatal fractures according to their location on radiographs [10]. Based on the location and nature of the fracture, Moss and his team divided palatal fractures into three types in 2016, such as: Sagittal, parasagittal, and para-alveolar are included in type I, while type II is transverse and type III is comminuted [13].

3. Management

Using an acrylic brace-supported acrylic splint, Manson detailed the conservative treatment of this issue in 1983 and showed how the splint prevent the lingual rotation of the palate that may occurs with interdentomaxillary fixation (IMF) [12]. Later, in 1988, Mintz detailed surgical therapy with open reduction and rigid bone fixation. This method increases stability while lowering the danger of palate rotation. Between the maxillary and mandibular molars, Chen described the intermolar wiring approach, whereas the Kumaravelu method used eight wires [1]. Waldrop et al. mentioned the use of copyable resin splints for repair of palatal fractures [15]. Later, Cienfuegos conducted a study of 45 patients treated with fixation using miniplates with supramucosal screws for 12 weeks, and withdrawal after controlled tomographic evaluation [2].

Then, an algorithm according to Park and Ock has been used in evaluating palatal fracture to determine which treatment should be used. According to Park and Ock's algorithm, there are three algorithms that must be evaluated to establish a treatment plan:

- 1) If the palatal fracture involves only the anterior alveolar process and the displacement is minimal, the fracture can be treated with archbar and intermaxillary fixation with immobilization for four to six weeks.
- 2) If the palatal fracture need to be stabilized. The broken alveolar segment is suitable for rigid fixation if the fracture line is in the alveolar or para-alveolar region. Only fixation on the anterior alveolar surface and vertical segments can treat fractures. If the sagittal fracture of the palate occurs in the median or para-median region and the slatted segments are long enough for screw fixation in the palatal dome, its possible to do transpalatal perforation which will cause reduction of the width of the face and precisely and greatly improves the stability.

- 3) If the fixation wasn't stable enough, Maxillomandibular fixation could be done in any possible fracture site to immobilize the fracture. [14].

Consideration must be given to every potential factor preventing a rigid, accurate, and stable fixation. Fixation of a hard palate is challenging due to fractures of the damaged palate and difficulty accessing the palate surface, necessitating extended splint immobilization and intermaxillary fixation. In general, intermaxillary fixation is advised for two to three weeks since few palatal reductions are suitable or stable enough to allow rapid fixing. However, this period of immobilization can be extended in comminuted or closed reduction fractures by 6 to 8 weeks [10].

Fractures are divided into 2 types, namely simple and complex/comminuted fractures. Simple palatoalveolar fractures are fractures that contain only one or possibly two palatoalveolar fragments. Meanwhile, complex palatoalveolar fractures are fractures that have many palatoalveolar fragments [3].

3.1. Simple Fracture Treatment

3.1.1. Observation

Observations were done on patient complaints where there was no displacement of the fracture line, the fracture considered stable and the occlusion was normal [8].

3.1.2. Closed Treatment

Management of closed reduction internal fixation is carried out on complaints of patients where there is no visible widening at the fracture line but has the possibility of fracture instability. In some cases, the surgeon may consider creating a tooth model, and constructing a palatal splint from the model. Then, the palatal splint is connected to the tooth using a curved rod. Then the patient was left in MMF until bone regeneration completed [7].

3.1.3. Open Reduction Internal Fixation

The treatment approach known as open reduction internal fixation (ORIF) is debatable. The surgeon must plan the archbar appliance and employ the MMF with the majority of therapy alternatives. The surgeon may decide to keep the patient in the MMF for the postoperative period depending on the kind of fracture.

First, one can fix one or more plates to the palate using a palatal approach while doing ORIF on palatal fractures. Palatal lacerations frequently occur here when

there is substantial dilatation. The plate can also be positioned on the mucosal surface or submucosally in the palatal region. The epimucosal bone plate can be applied thanks to the screw/locking plate mechanism. On the anterior alveolar segment, the second plate is positioned.

The second alternative is to use a palatal splint to lessen the fracture.

The third method combines the first two, involving ORIF with the addition of a palatal splint for increased stability.

Most surgeons opt for the first or third option if there is a sizable fracture crack and palate instability. According to some surgeons, the first option alone will offer sufficient stability. Others believe that the possibility of the teeth being lingually splayed when the patient is placed on MMF exists if the first method is not paired with a palatal splint.

Rebuilding the maxillomandibular unit early in the case should be the surgeons first goal in panfacial trauma, which is a common circumstance in which palatal fractures are encountered. The first stage in this operation should be the reduction and repair of palatal fractures.

- **Manual Reduction**

Reduction is done by applying pressure, such as buttresses, laterally on the two sides of the maxilla to reduce the space made by the fracture. The surgeon chooses whether to begin with an archbars device or a plate appliance depending on the stability of the reduction and the amount of assistance present in the operating room. Transmolar wires that stretch the molars and apply pressure to the fracture's decreased area can help with reduction.

- **MMF Application**

Following a review of the occlusion and the appliance of the archbar, mandibulomaxillary fixation was used to secure the occlusion (MMF). Additionally, it would be advantageous to employ forceps to secure the MMF while maintaining reduction.

- **Plate Application**

Fixation must be considered in order to keep the fracture's fragments together. The positioning of plates on the palate and the anterior alveolar arches are

examples of this. It is initiated by plating the palate first while complete reduction of the previously stretched palate is visualized. Fixation can be accomplished using transmucosal screws or straight plates put on the bone or on the mucosa in the shape of an "X."

- Applying Second Plate

When applying the second plate to an anterior alveolar fracture, take into consideration where the additional plate will be positioned for fixation.

- Splint Application

In some cases, the surgeon might think about creating a dental model and using it to create a palatal splint. The soft tissues of the palate will mend with the assistance of the splint. Then, the appliance of the palatal splint also possibly using archbar. The surgeon may decide to keep the postoperative patient in MMF depending on the stability of the palatal unit, as well as any complicating issues with midface fractures and the postoperative airway. The dental model's maxillary part was cut along the palatal fracture line in cases where the crack was widening, and the maxillary model was then repositioned to establish the premorbid contour of the maxillary arch. After the maxillary model was adjusted according to the premorbid form, palatal splints were fabricated using the maxillary model [9].

3.2. Complex Fracture Treatment

3.2.1. Observation

With normal stability and occlusion, complex palatal fractures are unlikely to occur without displacement. Fistula development carries a considerable danger. Due to this, complex palatoalveolar injuries may occasionally be seen [5].

3.2.2. Closed Treatment

A decision has to be made whether or not palatal fracture reduction will be accomplished using palatal splints. If the tooth-bone unit segment is largely intact, a palatal splint is advised. Palatal splints by themselves might not be sufficient if the dental-bony unit has been extensively injured or abraded. Most surgeons believe it is essential to use a palatal splint in complex (comminuted) palatal fractures where the dental-bony unit is still mostly intact. In this instance, a dental cast must be used to create a tooth model, which must then be used to create a palatal splint.

To ascertain the premorbid contour of the maxillary arch in these intricate situations, portions of the maxillary dental model must be removed. A mandibular model is used to do this. The maxillary impression model was transformed into its premorbid state before being used to create palatal splints. The palatal splint is then fastened to the palate using peridental wires and a curved rod as well. The surgeon may decide to keep the patient in MMF after surgery, depending on the stability of the palatal unit, the patient's postoperative airway, and any midface fracture issues. Complex palatoalveolar injuries that are treated in a closed manner maintain the segment's blood supply.

To narrow spreading fractures, do reduction by exerting pressure lateral to both sides of the maxilla. This procedure should be carried out with the palatal splint on since it provides the most reliable indication of whether an appropriate reduction has been made. Applying the arch bar while maintaining this pressure can be necessary. Applying the cable from the splint to the arch rod may have benefits. In some circumstances, it could be required to place an arch bar and a splint on the tooth independently. A person might not be able to employ a palatal splint depending on the severity of the dentoalveolar injuries. Rebuilding occlusion and transverse bone dimensions should be prioritized [4].

3.2.3. Open Reduction Internal Fixation

The typical maxillary route was used for this procedure. Lacerations, on the other hand, can be exploited to gain direct access to the fracture site for fracture therapy if they are present.

- MMF Application

Archbar applied and occlusion checked. Following that, mandibulomaxillary (MMF) fixation was used to maintain the occlusion. To sustain reduction while securing the MMF, forceps could be useful.

- Fiksasi

The closed procedure is the name given to this approach to treating difficult (comminuted) palatal fractures. In order to reach the alveolar fracture connected to the palatal fracture, ORIF is typically performed by inserting a longer plate or a smaller plate. Although ORIF can be used on the anterior alveolar bone, open

reduction of the palate has not been done, hence we refer to this procedure as closed [6].

4. Complication

The complexity of the procedure and whether the patient has any postoperative issues will determine the length of the clinical follow-up. Issues to consider when dealing with patients who have a pattern of fractures, including periorbital trauma, include the following: Position of the eyes, double vision, and other vision issues. Facial deformities (including asymmetry), sensory nerve impairments, and difficulty with scar formation are further concerns. Consider dental issues and tooth sensation, occlusion issues, and temporomandibular joint issues while dealing with Le Fort fractures, palatal fractures, and alveolar ridge fractures (lack of range of motion, and feeling of pain) [3].

5. Conclusions

Based on the classification of palatal fractures, it can be inferred from the literature that palatal fracture care is generally practiced. Although the difficulty of the procedure and whether the patient has any postoperative issues determine whether clinical follow-up is necessary.

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