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Mandibulo - Maxillary Fixation Screws - For Maxillofacial Fractures

Sristi Jha

1. Introduction

Maxillofacial fractures involve the mid-face injuries. They are usually the resultof road accidents, violence, animal bites, industrial accidents, or injuries due to sports. If it is not properly managed it can negatively influence both thepsychosocial and functional activities of the patient. The intimate relationshipbetween maxillofacial structures with the oral cavity, nasal cavity, orbits andadjacent cranial structures make it a functionally and cosmetically an important structure. Hence, to restore the normal contour of the facial skeleton and to ensure the normal functionality of the jaw many techniques have been evolved.

The maxillofacial fractures are classified into two types:

(i) The mid face fracture (Le Fort Fracture): the region between the maxillary teeth and the infraorbital margin, and

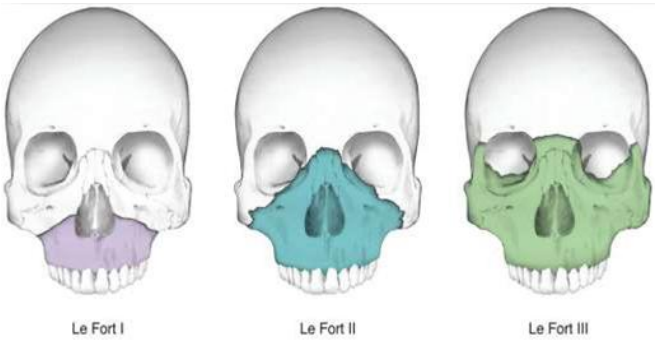

Figure 1: Le Fort Fractures

(ii) The mandible fracture: this includes the lower jaw.

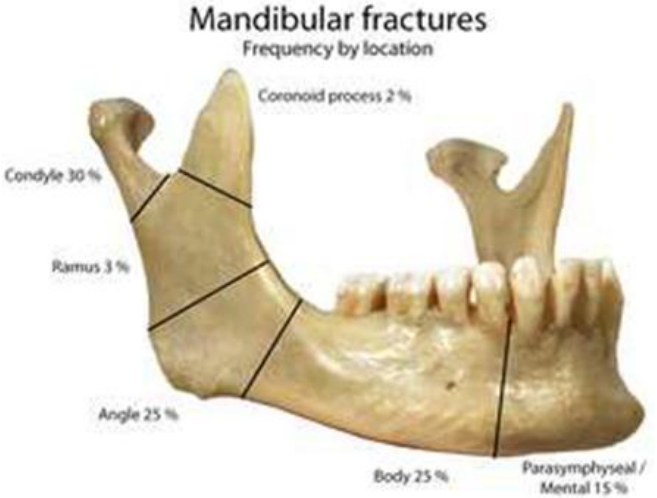

Figure 2: Mandible fracture

2. Management of fracture

The principle of reduction and fixation is applicable to treat maxillofacial fracture. The pathway to achieve this principle is depended on many other factors like on the degree of injury, type of fracture and the available technology.

Before we look forward on mandibulo-maxillary fracture repair it is important to know some basic principles of bone healing and internal fixation. Bone healing occurs either indirect by callus formation, which occurs in conditions of relative stability or by direct healing which requires the fragments to be opposed in a condition of absolute stability.

Intermaxillary fixation

Intermaxillary fixation (IMF) is an age old method used for the treatment of fractures. In this technique fractured fragments are fixed and immobilized in their anatomical position by means of wires that are placed around the teeth known as interdental wiring. Traditional methods like arch bars, interdental chain linked wiring, metallic and non-metallic splints are used to achieve intermaxillary fixation.

Direct interdental wiring provides a simple and rapid method of immobilization. Another method, arch bars provides an effective and quick fixation. It is used in the case when teeth are insufficient to allow wiring and in dentoalveolar fractures where multiple tooth bearing fragments are required to be reduced into an arch form. Splints are used in the cases when the wiring of teeth does not provide adequate fixation, when both jaws are edentulous or in case of growing children where mixed dentition is present and the anchorage are not sufficient.In dentate patients, mostly metallic framework is attached to the teeth to provide support for fixation of the jaws with interconnecting elastics or wires between the dental arches. In partially or completely edentulous jaws ‘‘gunning’’ type splints equipped with hooks were either attached to residual teeth or circumferentially wired or directly screwed to the alveolar processes to create an ‘‘occlusal platform’’ prior to the application of mandibulo-maxillary ligatures.

However, many issues are incorporated with these tooth borne devices like loss of tooth vitality, ulcers, poor oral hygiene, infection due to perforation of gloves during operation and needle stick injury to the operator. In addition, these procedures are time consuming and are not suitable in the patients withmultiple missing teeth or periodontal weakened teeth.

Nowadays, these traditional techniques are challenged by cortical bone screws inserted into the alveolar process of the mandible and maxilla, providing anchor points for MMF linkage with specialized screw heads.

Mandibulo-maxillary fixation screws

In comparison to these tooth borne devices MMF screws facilitate and shorten the way to achieve intermaxillary fixation. In addition, MMF screws help to reduce the hazard of glove perforation and wire stick injuries. However, on the downside MMF screws is accompanied with the risk of tooth root damage if not operated carefully.

MMF screws can be inserted under either local or general anesthesia. Prior to insertion, the anatomical site for the placement of MMF screws is chosen with respect to a given fracture location, the dentition, the extent of surgical exposure, the availability and the quality of bone in the direct proximity of the fracture line. Soft tissue conditions, the dentition and the pre-traumatic occlusal relationships are also considered to choose a cerclage pattern that is compatible with the individual circumstances. Screw placement within the confines of theupper or lower alveolar process is suggested to increase the hazards of harming the tooth roots.

MMF screws can then be inserted in various ways:

- Through a perforation of the closed mucosa or after an open approach exposing the bone.
- Self-tapping after drilling full thickness pilot holes throughout all bony layers orafter predrilling just the outer cortex, respectively.
- Completely self-drilling.

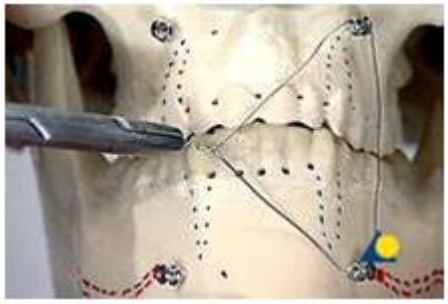

Figure 3: MMF screws

In a **transmucous procedure** the soft tissues (gingiva, vestibular mucosa) is punctured with an electrocautery needle and the screws are passed through anexcessive amount of moveable mucosa. Holes for **self-tapping** MMF screws can be drilled with a slow-speed hand-piece directly through the thin mucoperiosteallayer. The mucogingival junction is the most appropriate site for this procedure. The s**elf-drilling** MMF screws are commonly driven into the bone by hand without any preparation. The thicknessof the outer cortex determines the insertion force of the drive tool.

For a secure grip of the screws, satisfactory holding power is usually achieved ifat least two-thirds of the screw shaft has entered the bone, provided there is good quality bone of substantial thickness. After the insertion of the screws the occlusal relationships are precisely adjusted by improving the bony reduction. The ends of the cerclage wire are passed through the ligature holes in the screw heads and twisted under a constant pull with intermediate tugging motions until the wire loop is straight and fully tightened. Removal of MMF screws after completion of therapy is simply done by a screwdriver.

3. Contradictions

MMF screws can provide bone anchors while establishing and maintaining theocclusion in a wide variety of fracture patterns involving the maxilla and mandible. However the most important requirement for the use of MMF screws is the existence of stable occlusal platform when wire cerclages are placed across the screw heads and tightened for fixation.

The MMF screws cannot be used in the cases:

- Where the alveolar fragments are freely movable in such cases the bones
- re not stable enough for the fixation of screws.
- Severe bone atrophy as pencil thin mandibles or in osteopenic maxillae
- are not suitable for MMF screws, because the remaining bone will fail to
- provide proper support for the screws.
- The injured tooth buds a dental follicle as it may cause infection.
- In children with deciduous or early mixed dentition.

Common problems related to fracture of MMF screws are:

- Risk of injurying tooth roots
- Soft tissue burying of screw heads
- Interference of wire loops with the upper incisor edges canine facettes

Figure 4: MMF screw fixation

4. Conclusion

The insertion of MMF screws is a strong, reliable and elegant technique. It not only improves the safety procedure but is also time-saving technique as compared to the traditional techniques. The applicability of the MMF screws is related to the occlusal matching of the counterparts left in the jaws. Only large uninterrupted bone portions are suitable for MMF screw insertion. The risk of the dental root injuries can be taken care by better planning and examination of radiological reports.