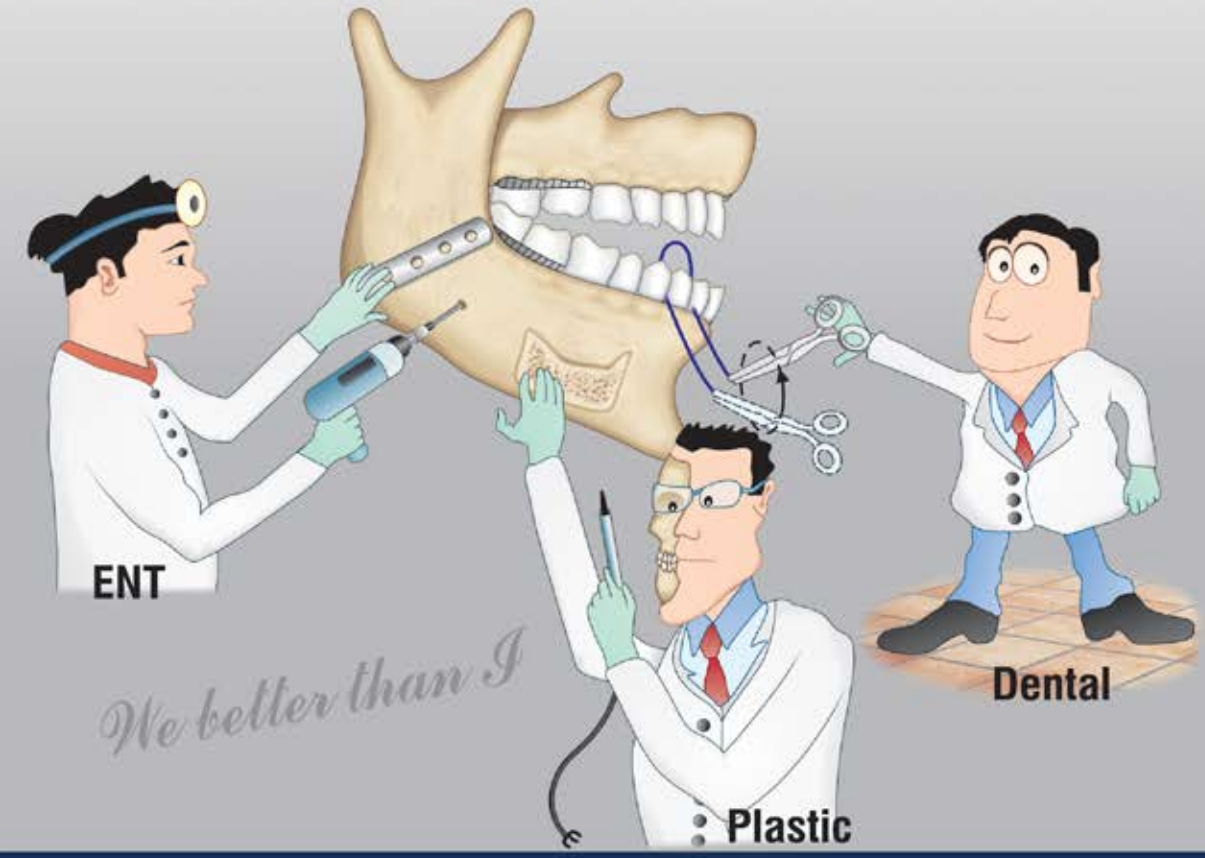
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A Handbook for Surgical Approaches to Maxillofacial Trauma



Rajesh Yadav

Co-authors
Rashu Mittal
Prakash V Dhond

Forewords
KP Morwani
Parag Kerkar

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3

CHAPTER

Occlusion and Buttress

One of the basic principles of any oral-maxillofacial surgery is to restore a normal occlusion or preexisting occlusion.

WHAT IS OCCLUSION?

Occlusion is a mixture of two words; "clusion" means "closing" and the prefix "oc" means "up", and thus it means "closing up".

Basically, occlusion is referred to a relationship of maxillary and mandibular tooth when they are in functional contact during the activities of mandible.

Since, occlusal relationship of tooth is an important determinant, hence we need to know the basics of dental anatomy.

The dental arch is divided into two arches, i.e. upper and lower dental arches (maxillary and mandibular arch). Each arch is then further subdivided into right and left quadrant by an arbitrary vertical line. The vertical line passes through maxillary and mandibular central incisiors. Thus, dental arch is divided into four quadrants:

1. 1st right upper (maxillary arch)
2. 2nd left upper (maxillary arch)
3. 3rd left lower (mandibular arch)
4. 4th right lower (mandibular arch).

Types of Teeth

Teeth are divided into anterior and posterior teeth.

- Anterior teeth—their function is cutting and tearing of food
- Posterior teeth—they help in grinding and chewing of food.

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Identification of Teeth

To understand occlusion, it is very much important for us to identify individual tooth. Basically, we have four types of tooth:

1. Incisor
2. Canine
3. Premolar
4. Molar

Incisors and canines are considered as anterior teeth whereas premolars and molars are included into posterior teeth.

1. *Incisors:* There are four incisors in each arch, i.e. central and lateral incisors. They look like a chisel and are used for cutting or incising the food (Fig. 1).



Fig. 1: Incisor

2. *Canine:* There are two canines in each arch. They are wedge-shaped and help in cutting and tearing the food (Fig. 2).



Fig. 2: Canine

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3. *Premolars:* There are four premolars in each arch (in adults). They have got atleast two cusps (projections) and helps in tearing and grinding of food (Fig. 3).

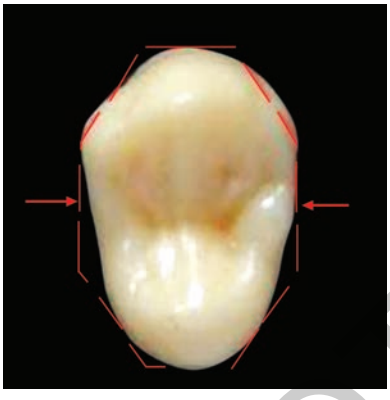


Fig. 3: Premolar

4. *Molars:* There are six molars in each arch (in adults). They have got multiple cusps (projections) and helps mainly in grinding of food (Fig. 4).



Fig. 4: Molar

Tooth Identification System

There are various tooth numbering systems for designation of each tooth:

1. Palmer notation system
2. Universal system
3. International FDI system (two digit system)

In India, the most commonly used system is Federation Dentaire International (FDI) system. In FDI system, teeth are designated by two-digit.

a. The **first digit** of the code is located at the left side of the number and indicates the **quadrant** (Fig. 5).

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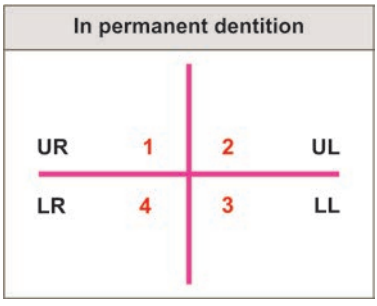


Fig. 5: FDI notation system. numbers indicating the respective quadrant (UR, upper right; UL, upper left; LL, left lower; LR, left right)

b. The **second digit** is located at the right side of the number and indicates the number of the tooth in the **quadrant** (Fig. 6).

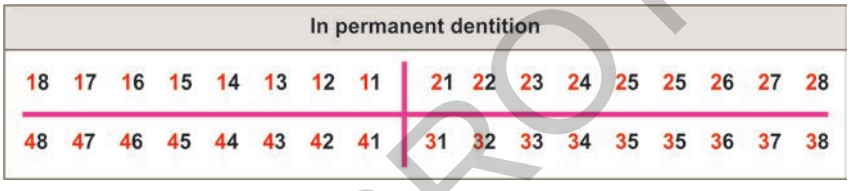


Fig. 6: FDI notation system. Numbers on right indicate the respective tooth in each quadrant

The two digits should be pronounced separately.

Surfaces of Teeth

Surfaces of teeth are identified by their relationship to surrounding orofacial structures.

Each Tooth has Five Surfaces

1. *Facial:* Further subdivided into labial and buccal (Figs 7 and 8).
   - surface facing towards the lips is labial (for incisors and canines) and those facing towards buccal cavity are buccal (for premolars and molars)



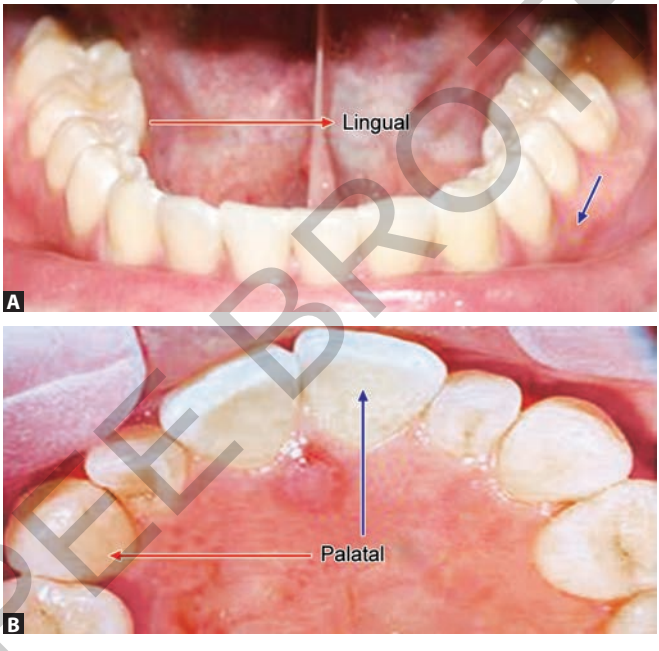
Fig. 7: Labial surface

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Fig. 8: Buccal surface

2. *Lingual/Palatal:* Surface facing toward the tongue is lingual surface (mandibular teeth) and those facing towards the palate are known as palatal (maxillary teeth) (Figs 9A and B).



Figs 9A and B: (A) Lingual surface; (B) Palatal surface

3. *Mesial:* Surface facing toward the midline is mesial surface (Fig. 10).

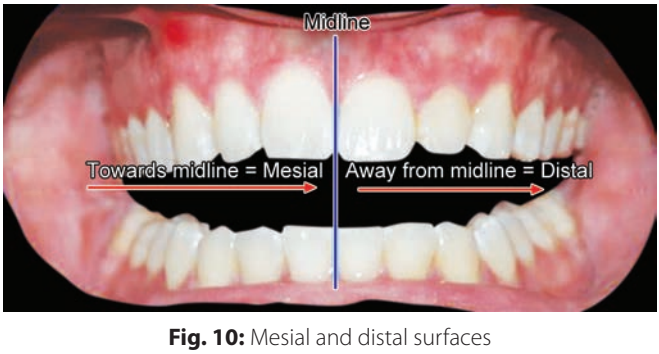


Fig. 10: Mesial and distal surfaces

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4. *Distal:* Surface facing away from midline is distal surface (Fig. 11).
5. *Occlusal/Incisal:* Surface involved in biting or making occlusion is occlusal surface.
   - **Incisal** is used for anterior teeth, whereas occlusal are used for posterior teeth.

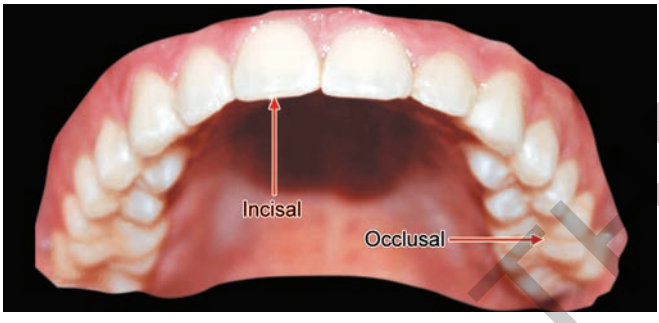


Fig. 11: Incisal and occlusal surfaces

NORMAL OCCLUSION

The mesiobuccal cusp of the maxillary first molar is aligned with the mesiobuccal groove of the mandibular first molar. There is slight overriding of maxillary incisors over mandibular incisors.

Malocclusion

Malocclusion is classified into three classes:

- *Class I:* A class I (neutral) occlusion is one in which the mesial buccal cusp of the upper first molar occludes with the mesial buccal groove of the mandibular first molar, means a normal molar relationship exists but there is crowding, misalignment of the teeth, cross bites, etc. (Fig. 12).

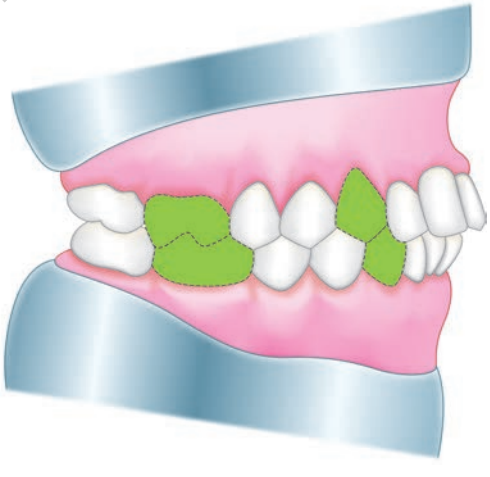


Fig. 12: Class I malocclusion

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- *Class II:* A malocclusion where the molar relationship shows the buccal groove of the mandibular first molar distally positioned when in occlusion with the distobuccal cusp of the maxillary first molar (Fig. 13). This means mesiobuccal cusp of upper molar lies anterior to the mesiobuccal groove of the lower molar.

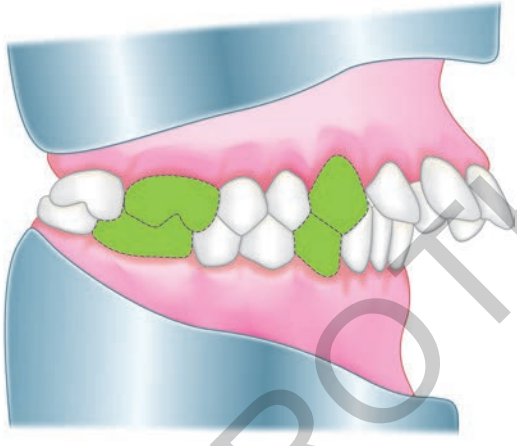


Fig. 13: Class II malocclusion

- *Class III:* A malocclusion where the molar relationship shows the mesiobuccal cusp of maxillary first molar occludes in the interdental space between the mandibular first and second molar means mesiobuccal cusp of upper molar comes posterior to the mesiobuccal groove of the lower molar when the teeth are in occlusion (Fig. 14).

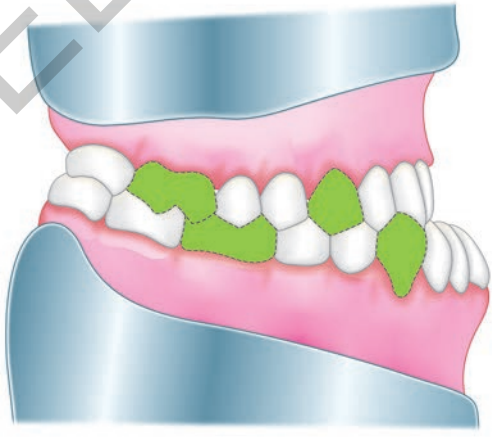


Fig. 14: Class III malocclusion

Identification of Preexisting Occlusion

The first step in identifying abnormal occlusal patterns is to count the teeth and identifying those that are missing and those that are present. Missing

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teeth in the partially dentulous patients can produce changes in dental relationship.

***Note:** A patient with class III occlusion before injury would be impossible to treat by attempting to force teeth into a neutral occlusion.

Guide to Proper Occlusion

Generally, molar relationship is used to achieve normal occlusion, but cases in which molars are missing we can use central incisors and canine teeth as the guiding tooth.

WEAR FACETS

- The preexisting occlusion can often easily be recognized by the wear facet
- Wear facets are the worn surface caused by repeated contact of maxillary and mandibular tooth
  - **Class I** often shows more wear surfaces on the outer (labial) edges of the mandibular anterior and on the under (lingual) surfaces of the maxillary anterior teeth
  - **Class II** usually has no wear facets on the incisor edges of the lower anterior teeth
  - **Class III** wear facet on the outer anterior edge of the maxillary teeth.

Malocclusions

Open Bite

An open bite is when there is no vertical overlap between maxillary and mandibular teeth (Fig. 15).

a. Anterior open bite:

- Conditions in which anterior open bite is encountered:
  - Bilateral condylar fracture (Fig. 16)
  - Bilateral angle fracture
  - Le Fort fracture (Fig. 17)



Fig. 15: Anterior open bite

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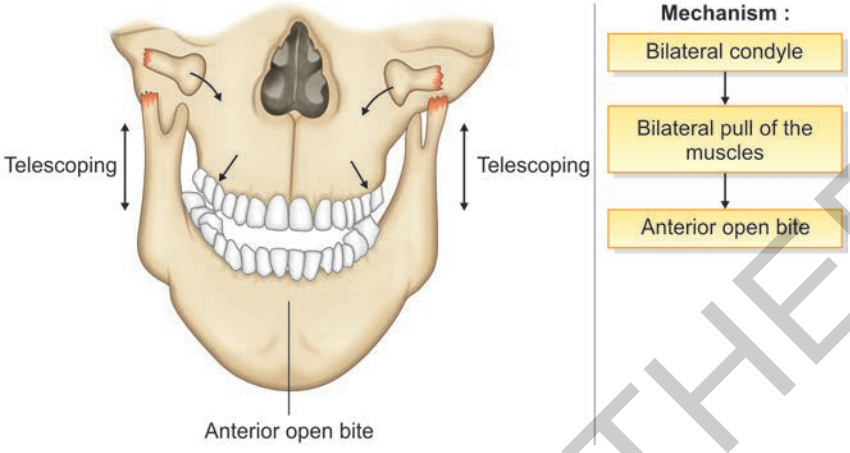


Fig. 16: Bilateral condylar fracture (below the attachment of lateral pterygoid)

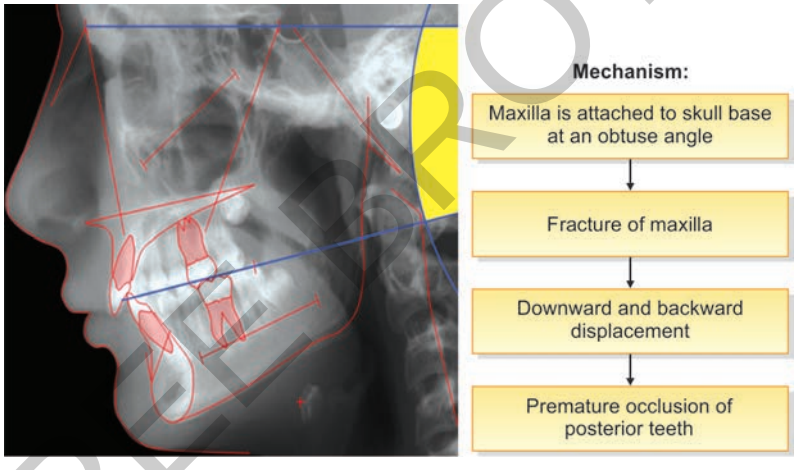


Fig. 17: Le Fort fracture

b. Posterior open bite (Fig. 18):



Fig. 18: Posterior open bite

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- Condition in which posterior open bite are encountered:
  - Contralateral condylar fracture (Figs 19 and 20)
  - Ipsilateral angle fracture

A. Mechanism of condylar fracture (below the attachment of lateral pterygoid)

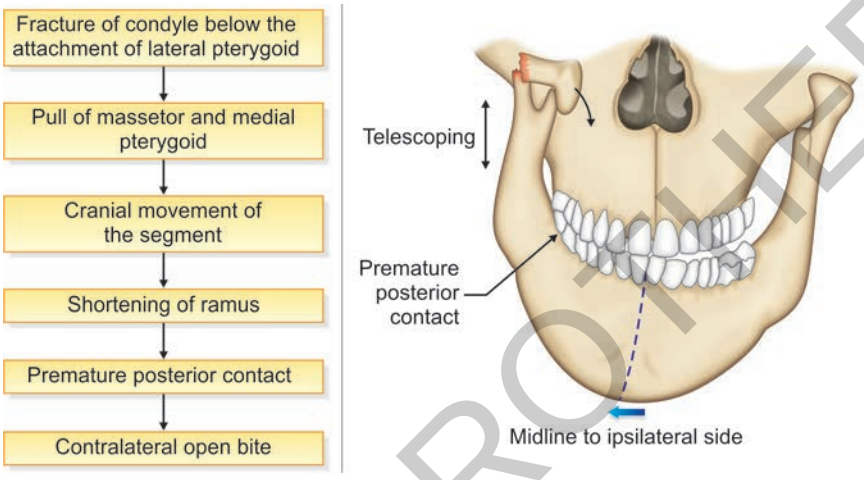


Fig. 19: Unilateral condylar fracture

B. Mechanism of condylar fracture (above the attachment of lateral pterygoid)

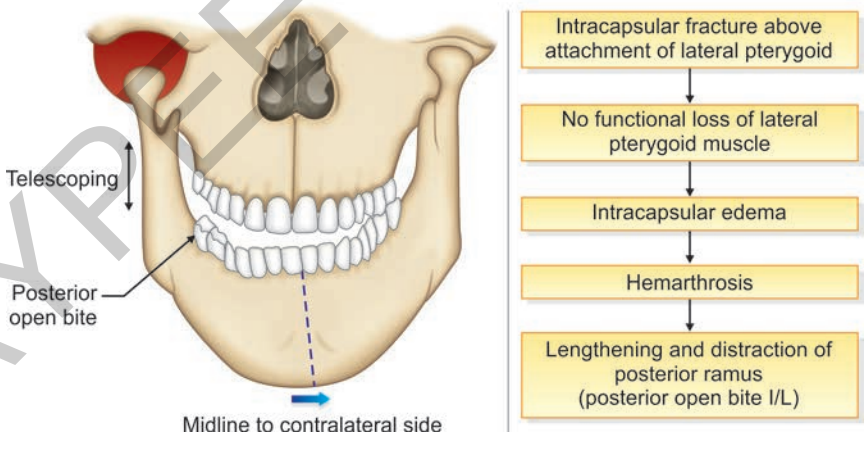


Fig. 20: Effusion hemarthrosis

Cross Bite

It is a form of malocclusion where a tooth (or teeth) has a more buccal or lingual position (i.e. the tooth is either closer to the cheek or to the tongue) than its corresponding antagonist tooth in the upper or lower dental arch.

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a. Anterior cross-bite (Fig. 21):

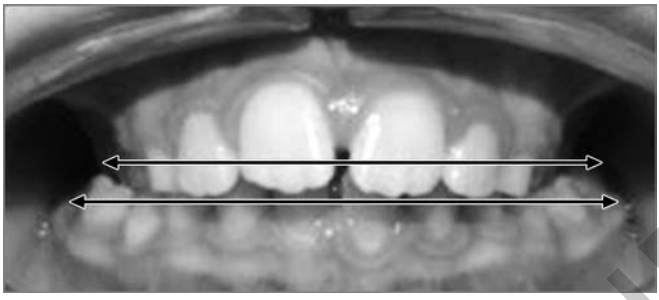


Fig. 21: Anterior cross-bite

b. Posterior cross-bite (Fig. 22):



Fig. 22: Posterior cross-bite

Buttresses

A buttress is an architectural structure built against or projecting from a wall which serves to support or reinforce the wall.

The facial skeleton receives support and stability from a series of transverse and vertical facial buttresses. Facial buttresses represent areas of thick bone that support the surrounding thinner facial bones, sustain masticatory forces, and protect vital structures. Restoration of facial width, height, and projection is achieved by reducing and reconstructing the facial buttresses.

Buttresses of the face are generally divided into vertical and horizontal planes.

Vertical Buttresses

The vertical buttresses include:

a. Nasomaxillary buttress
b. Zygomaticomaxillary buttress
c. Pterygomaxillary buttress

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a. *Nasomaxillary buttress:* This includes the maxillary process of the frontal bone and the frontal process of the maxilla, extending lateral to the piriform rim (Fig. 23).

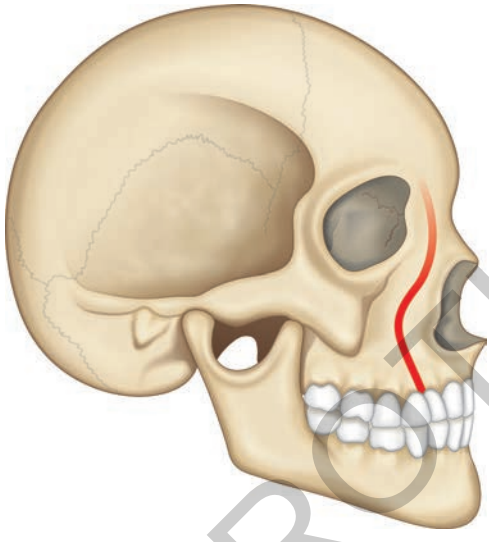


Fig. 23: Red mark showing nasomaxillary buttress

b. *Zygomaticomaxillary buttress:* This is composed of the zygomatic process of the frontal bone, lateral orbital rim, lateral zygomatic body, and zygomatic process of the maxilla (Fig. 24).

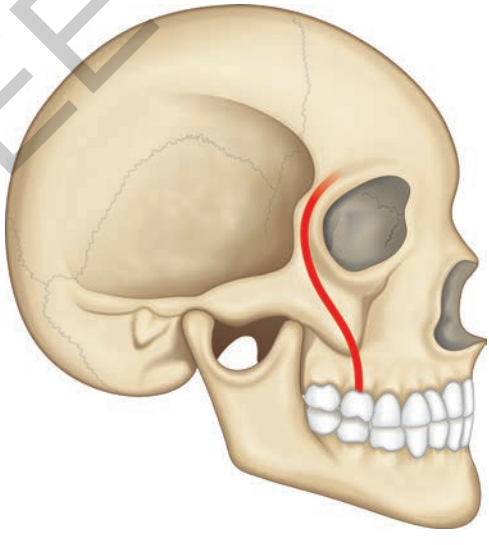


Fig. 24: Red mark showing zygomaticomaxillary buttress

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c. *Pterygomaxillary buttress:* This includes the pterygoid plates of the sphenoid and maxillary tuberosities (Fig. 25).

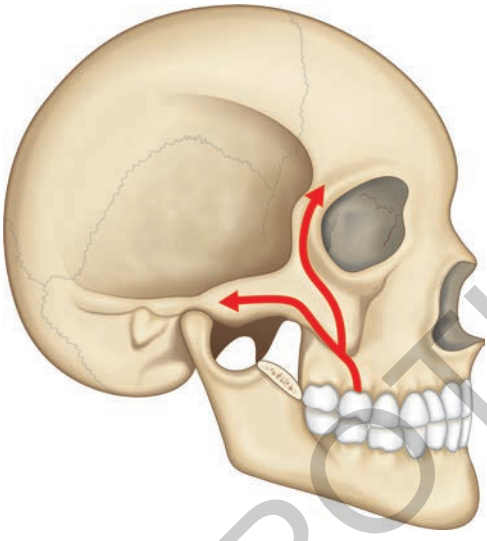


Fig. 25: Arrow mark depecting pterygomaxillary buttress

Usually, the nasomaxillary and zygomaticomaxillary buttresses are reconstructed, but the pterygomaxillary buttress is not because of inaccessibility.

The condyle and posterior mandibular ramus make up yet another buttress establishing posterior facial height.

Horizontal Buttresses

The horizontal buttresses are also described as *anterior-posterior buttresses* (Fig. 26).

These include:

a. Frontal buttress
b. Zygomatic buttress
c. Maxillary buttress
d. Mandibular buttress.
   - The frontal buttress is composed of the supraorbital rims and the glabellar region
   - The zygomatic buttress consists of the zygomatic arch, zygomatic body, and infraorbital rim
   - The maxillary and mandibular buttresses are composed of the basal bone of the maxilla and mandiblar arches.

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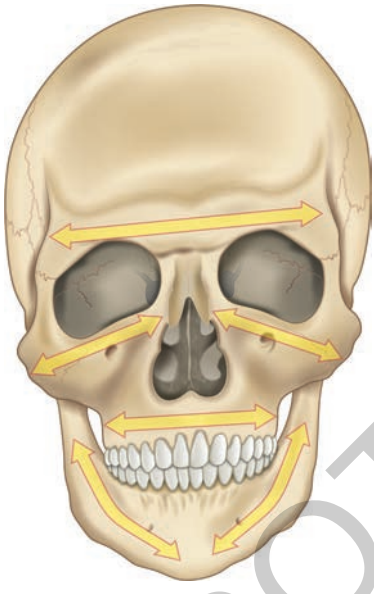


Fig. 26: Showing all the horizontal buttresses with yellow markings

Together, they give the facial skeleton its structural integrity. The bone is generally thicker over these described areas to neutralize the forces of mastication or impact. With the proper reduction of these buttresses, we are able to reconstruct the height, width, and projection of the face.

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Rajesh Yadav MS DORL FCPS is Assistant Professor of Otolaryngology and Head & Neck Surgery at Bhagwati Hospital, Mumbai, Maharashtra, India. He obtained his MS degree from prestigious Grant Medical College and Sir JJ Group of Hospitals, Mumbai. To his credit are many papers in indexed journals including his book *Fracture Mandible*.



Rashu Mittal MS (ENT) is Senior Resident of Otolaryngology and Head & Neck Surgery at Shatabdi Hospital, Mumbai, Maharashtra, India. He obtained his MS degree from RNT Medical College and MB Government Hospital, Udaipur, Rajasthan.



Prakash V Dhond MS (ENT) is a leading ENT practitioner of Otolaryngology in Mumbai, Maharashtra, India. An Ex-alumnus of KEM Hospital, Mumbai. He had been Hon. Surgeon in ENT Department, Bhagwati Hospital for decades. He has trained many postgraduate students under his guidance and shaped them to be the best ENT surgeons. His contribution to mankind is hard to be expressed in words.

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