# Fractures of the Middle Third of Facial Skeleton (Part 1)

## Introduction

The middle third of the facial skeleton (midface) is a complex anatomical region composed of multiple paired bones connected by strong sutures and supported by the cranial base. It plays an essential role in mastication, respiration, vision, speech, facial aesthetics, and protection of vital structures such as the orbit, nasal cavity, and maxillary sinuses.

The midface is connected superiorly to the frontal bone, sphenoid bone, and temporal bone of the neurocranium. In dentate patients, additional support is provided inferiorly by occlusal contact with the mandible.

Because the midface contains multiple air-filled cavities such as the maxillary sinuses, nasal cavity, and orbital spaces, it is structurally lighter than the lower face. However, it is reinforced by thick bony pillars known as buttresses, which distribute masticatory forces to the skull base.

## Midface Buttress System

The midface can be compared to the framework of a building composed of pillars and supporting beams. These are known as facial buttresses.

The buttress system is divided into:

### 1. Vertical Buttresses

These are the strongest load-bearing structures and transmit occlusal forces superiorly to the cranial base.

They include:

a. Nasomaxillary Buttress

Formed mainly by the frontal process of the maxilla and extends from the canine region to the frontal bone.

b. Zygomaticomaxillary Buttress

Formed by the zygomaticoalveolar crest, body of the zygoma, and frontal process of the zygomatic bone. It is one of the strongest buttresses.

c. Pterygomaxillary Buttress

Formed by the pterygomaxillary junction and pterygoid plates of the sphenoid bone.

2. Horizontal Buttresses

These connect the vertical buttresses and stabilize the facial skeleton.

They include:

- Superior orbital rim
- Inferior orbital rim
- Maxillary alveolus
- Hard palate
- Zygomatic arches
- Greater wings of sphenoid bone

3. Sagittal Buttresses

These are represented mainly by the zygomatic arches. The central midface lacks strong sagittal support, making it more vulnerable to trauma.

## Clinical Importance

The primary objective in treatment of midface fractures is reconstruction of these buttresses using osteosynthetic devices such as plates and screws to restore facial width, height, projection, and occlusion.

## Bones of the Midface

The bones forming the midface include:

- Two maxillae
- Two zygomatic bones
- Two zygomatic processes of temporal bones
- Two palatine bones
- Two nasal bones
- Two lacrimal bones
- Vomer
- Ethmoid bone with nasal conchae
- Two inferior nasal conchae
- Pterygoid plates of sphenoid bone

## Le Fort Classification

The classical classification of maxillary fractures was described by Rene Le Fort in 1901 after experiments on cadaver skulls subjected to blunt trauma. He identified three characteristic fracture lines known as lines of least resistance.

These are:

Le Fort I Fracture

Also called a horizontal fracture.

It occurs when force is applied above the apices of the maxillary teeth.

The fracture line extends:

- Through the pyriform aperture anteriorly
- Along the lateral walls of the maxillary sinus
- Posteriorly through the pterygoid plates

This results in separation of the palate and alveolar process from the rest of the maxilla.

Clinical features:

- Mobility of the upper alveolus
- Malocclusion
- Anterior open bite
- Palatal ecchymosis

Le Fort II Fracture

Also called a pyramidal fracture.

It causes separation of the central midface from the cranial base.

The fracture extends:

- Through pterygoid plates
- Through maxillary sinus walls
- Through infraorbital rims
- Up to the nasofrontal suture

The zygoma remains attached to the skull.

Clinical features:

- Gross facial edema
- Infraorbital nerve paresthesia
- Raccoon eyes
- Epistaxis
- Infraorbital rim step deformity
- Possible CSF rhinorrhea

Le Fort III Fracture

Also called craniofacial dysjunction.

This is the most severe type where the entire midface is separated from the cranial base.

The fracture extends:

- Through nasofrontal suture
- Through medial and lateral orbital walls
- Through zygomaticofrontal sutures
- Through zygomatic arches
- Through pterygoid plates posteriorly

Clinical features:

- Massive facial edema
- Entire midface mobility
- CSF rhinorrhea or otorrhea
- Battle sign
- Severe ocular injuries
- Serious intracranial injuries

Palatal Fractures

Palatal fractures commonly accompany Le Fort fractures.

Hendrickson classified them into six types:

Type I – Alveolar

Type II – Sagittal

Type III – Parasagittal

Type IV – Para-alveolar

Type V – Comminuted or complex

Type VI – Transverse

Type III (parasagittal) is the most common in adults because the parasagittal bone is thinner than the midsagittal buttress.

Diagnosis

Clinical Examination

A systematic facial examination is required.

General findings:

- Facial swelling
- Ecchymosis
- Abrasions
- Lacerations
- Step deformity
- Crepitus
- Bony mobility

Ocular examination includes:

- Visual acuity
- Pupillary reflexes
- Extraocular muscle movement
- Diplopia assessment
- Globe injury assessment

Signs such as monocular diplopia, hyphema, and anisocoria may indicate serious globe injury.

Radiographic Examination

The gold standard investigation is thin-cut CT scan (1–2 mm) with axial and coronal sections.

Advantages:

- Accurate fracture visualization

- Detection of orbital involvement

- Assessment of pterygoid plates

- Surgical planning

3D CT reconstruction is useful in complex fractures.

Treatment Principles

Treatment should ideally be performed within 10–14 days after trauma once the patient is stabilized and edema subsides.

Le Fort I Treatment

- Vestibular incision

- Fracture exposure

- Maxillary mobilization

- Maxillomandibular fixation (MMF)

- Four-point rigid fixation using miniplates

Le Fort II Treatment

- Open reduction and internal fixation
- Exposure may require:
  transconjunctival
  subciliary
  subtarsal
  coronal incisions
- Fixation at infraorbital rim and zygomaticomaxillary buttress

Le Fort III Treatment

- Coronal plus intraoral approach
- Nasofrontal fixation first
- Zygomatic fixation second
- Maxillary buttress fixation third
- Bone grafting may be required

Palatal Fracture Management

Occlusal splints are highly useful.

Routine palatal flap elevation is avoided because:

- blood supply may be compromised
- risk of oral-nasal fistula increases