

## Role of CT scan in facial pillar fractures- What Radiologist needs to see and surgeon needs to know?

Dr. Naveen Kumar Rathod<sup>1</sup>, Dr. Meenakshi Parthasarathy<sup>2</sup>,  
Dr. Parthasarathy. K. R<sup>3</sup>, Dr. Vijay<sup>4</sup>, Dr. Gowri<sup>5</sup>,

<sup>1</sup>Postgraduate, Dept of Radiology. SSIMS & RC Davangere.

<sup>2</sup>MD Prof, Dept of anatomy, Bangalore medical college and research institute. Bangalore.

<sup>3</sup>MD, DMRD, Prof & Head, Dept of radiology, SSIMS and RC Davangere.

<sup>4</sup>Postgraduate, Dept of Radiology. SSIMS & RC Davangere.

<sup>5</sup>Postgraduate, Dept of Radiology. SSIMS & RC Davangere.

Corresponding Author: Dr. Naveen Kumar Rathod

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### Objective:

Describe the buttresses of the mid facial skeleton and accurate description of facial fractures

Information about the involvement of specific facial buttresses and its complications.

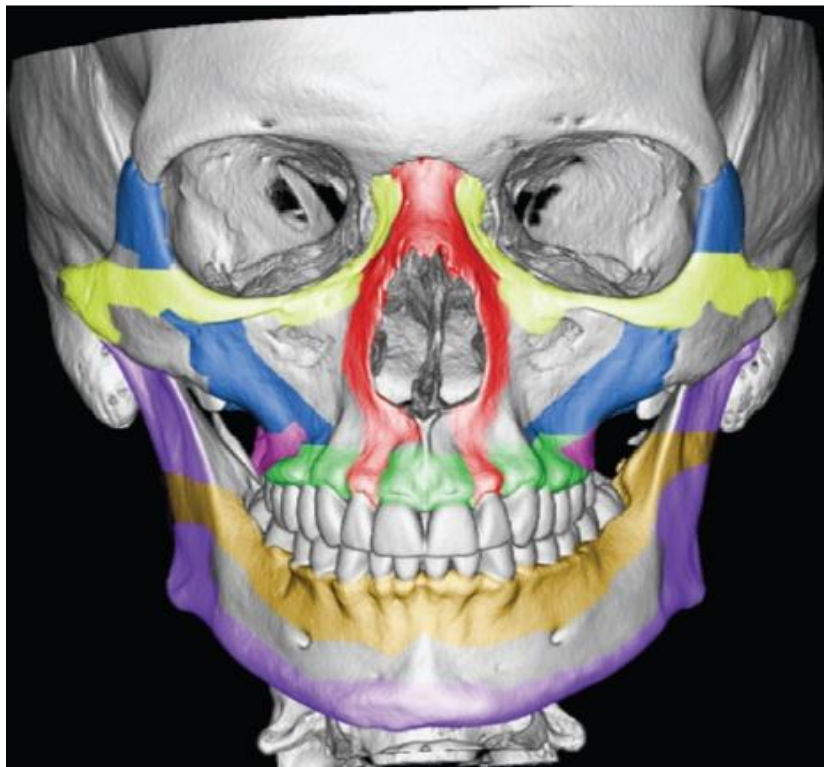
Identify surgically relevant and emergent patterns of mid-face fractures.

### I. Introduction:

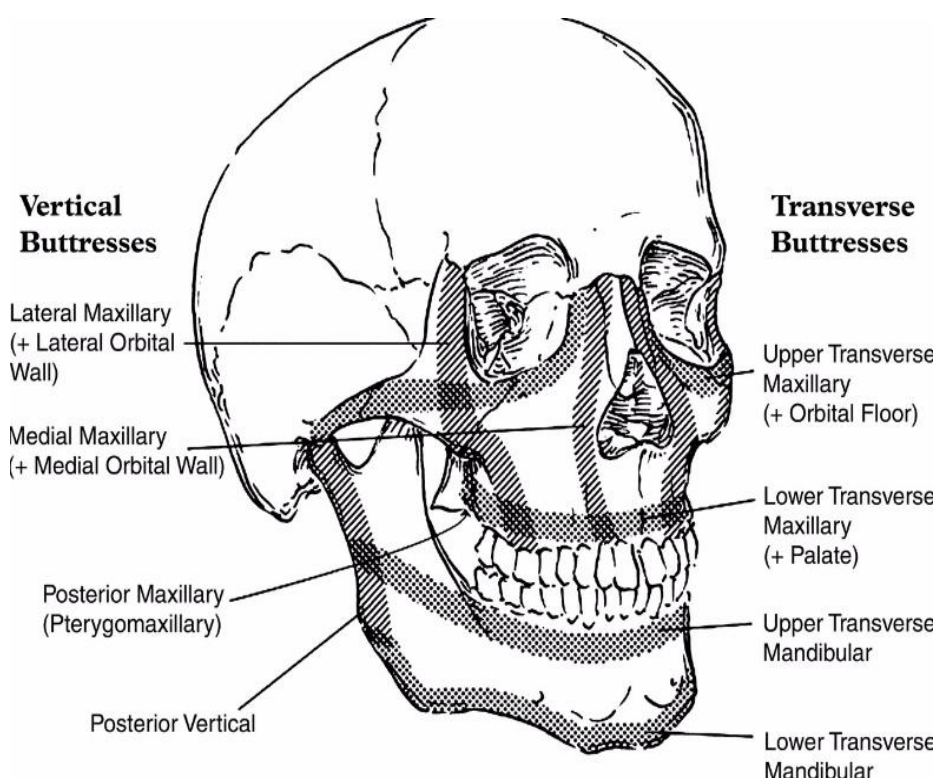
Face has five paired bones and four unpaired bones.

Four pairs each of horizontally and vertically oriented struts.

### FACIAL PILLARS -Anterior view<sup>2</sup>:



**FACIAL PILLARS: Oblique view<sup>2</sup>:**



**Facial fractures classification:**

1. Sinus wall fractures (Frontal and sphenoid).
2. Central mid face- Le fort, Wassmund, Naso-orbitoethmoid.
3. Lateral mid face, Tripod, Zygomatic arch, Zy-max, Zy-mand, Orbital floor

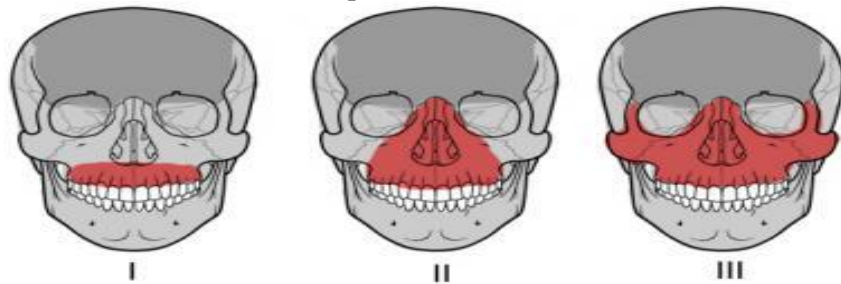
Facial Buttresses	Fracture line Involves...	Complications of such fractures <sup>1</sup>
<b>Upper transverse maxillary</b>	Orbital floor Zygoma	SOF and Orbital apex syndrome Globe ruptures (FLAT TIRE SIGN) Inferior rectus muscle entrapment.
<b>Lower transverse maxillary</b>	Hard palate Alveolus	Dental fracture, avulsion and malocclusion.
<b>Upper transverse mandibular</b>	Ramus Alveolar margin	Inferior alveolar nerve injury Secondary infection
<b>Lower transverse mandibular</b>	Inferior margin	Inferior alveolar nerve injury
<b>Medial maxillary</b>	Medial walls of orbit and maxillary sinus	Sinus obstruction, CSF rhinorrhea, Medial canthal tendon injury, Epistaxis and Lacrimal sac injury
<b>Lateral maxillary</b>	Lateral walls of orbit and sinuses	SOF and Orbital apex syndrome Lateral canthal ligament injury
<b>Posterior maxillary</b>	Sphenoid bone	Carotid artery injury, CCF, Skull base foraminal injury, malocclusion and trismus
<b>Posterior mandibular</b>	Angle , ramus and condyle of mandible	Skull base foraminal injury, malocclusion and trismus

Central midface fractures	Lefort I Floating palate	Lefort II Floating maxilla	Lefort III
<b>Clinical features</b>	Gingival crepitation No orbital ecchymosis	Orbital ecchymosis Infraorbital parasthesia	Orbital ecchymosis CSF rhinorrhea

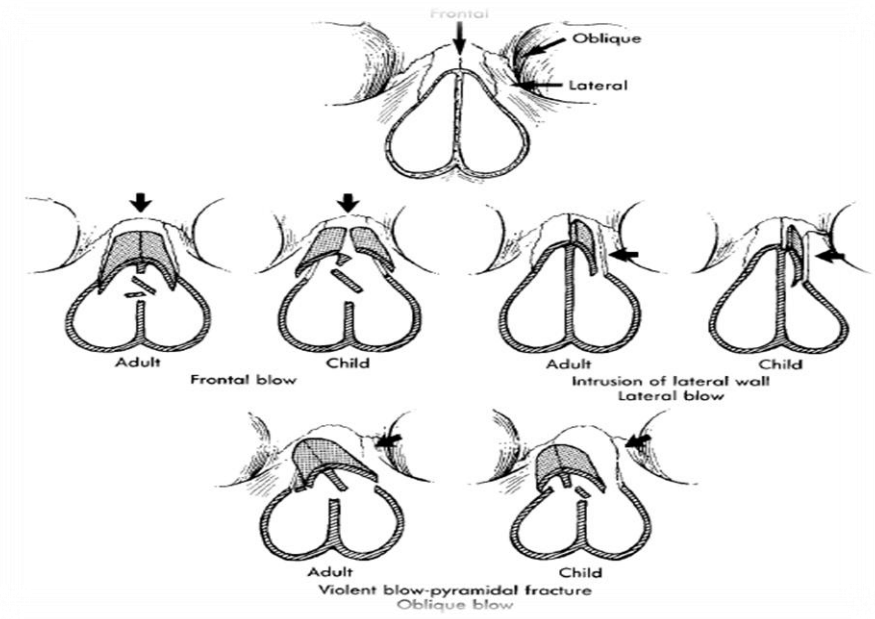
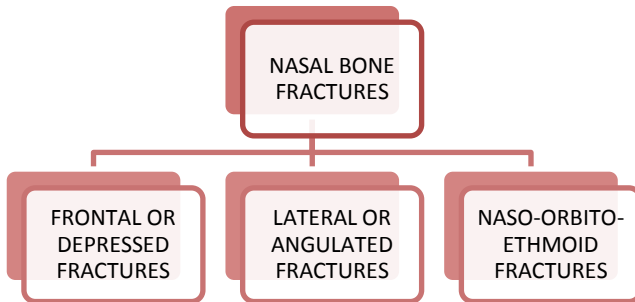
*Role of CT scan in facial pillar fractures- What Radiologist needs to see and surgeon needs to know?*

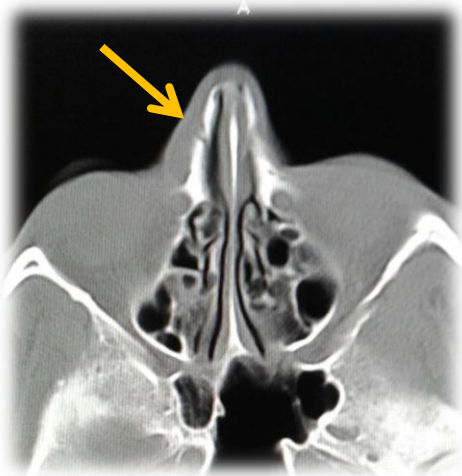
	Movement at lower maxilla , not at nasal root	Movement at nasal root , with infraorbital step	Movement at nasal root with lateral orbital rim movement
<b>Involved facial buttress</b>	Lower transverse maxillary buttress and posterior maxillary buttresses.	Superior medial ,inferior lateral ,upper transverse and posterior maxillary buttresses	Superior portions of the medial&lateral ,upper transverse and posterior maxillary buttresses
<b>Fracture lines runs through</b>	Nasal septum All walls of maxillary sinus Pterygoid plates of sphenoid	Nasal bone and nasal septum, Medial orbital wall ,Floor of orbit, walls of maxillary sinus , Pterygoid plates of sphenoid	Nasal bone and septum Medial and lateral wall of orbit, Zygomatic arch Pterygoid plates of sphenoid

Drawings show the common Le Fort fracture pattern<sup>4</sup>.

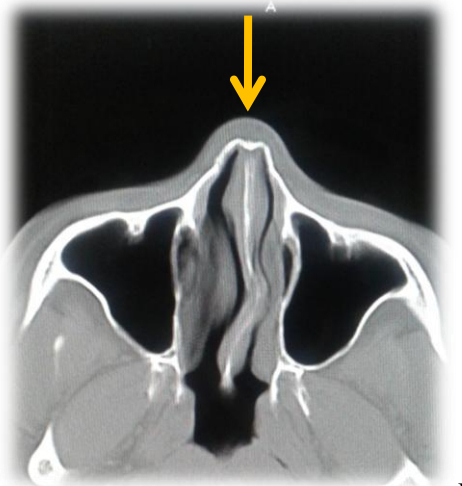


**Nasal bone fractures:**





Right nasal bone fracture.



Depressed fracture of nasal bone.



Displaced fracture of right nasal bone.

**Naso-Orbito-Ethmoid (NOE) complex fracture<sup>3,4</sup>**

Bilateral medial maxillary buttresses involvement.

**Markowitz and Manson classification:**

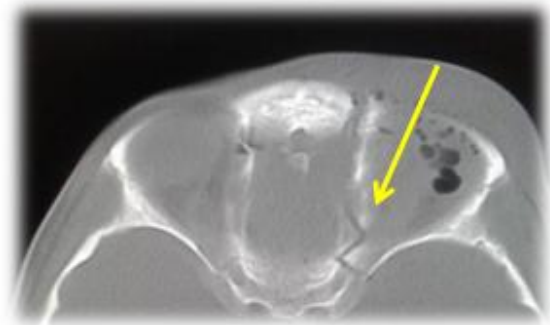
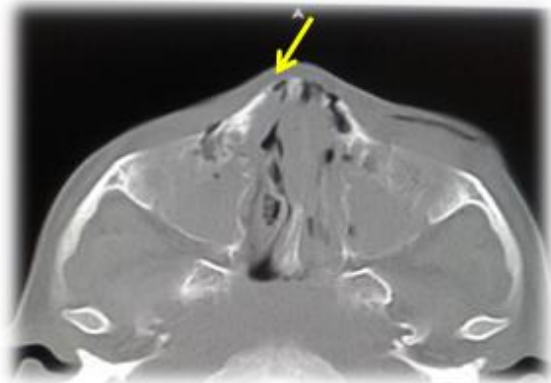
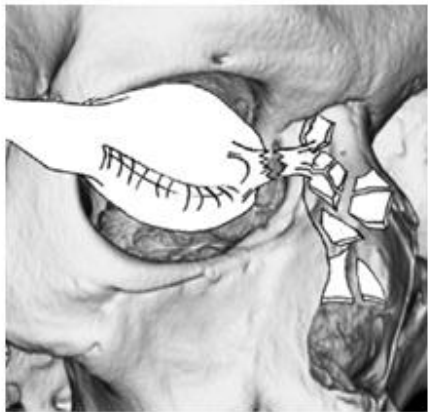
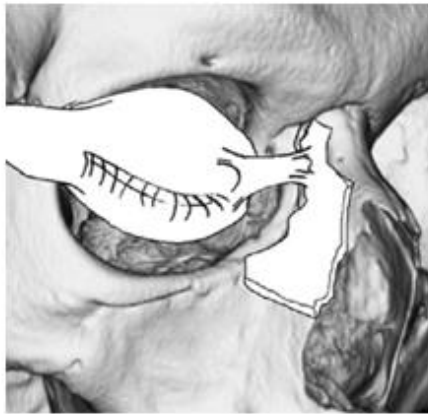
**I** - Intact medial canthal tendon, connected to a single large fracture fragment

**II** - Comminuted # with medial canthal tendon attachment to a single bone fragment

**III** - Comminution extension to the medial canthal tendon insertion site (anterior medial orbital wall at lacrimal fossa level) with resultant avulsion of the tendon.

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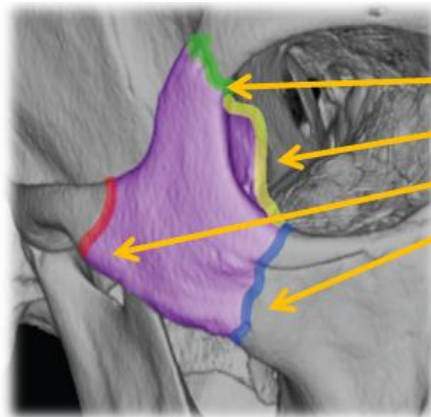
Degree of comminution of medial orbital wall at lacrimal fossa level may be helpful for surgical planning of medial canthal tendon repair.





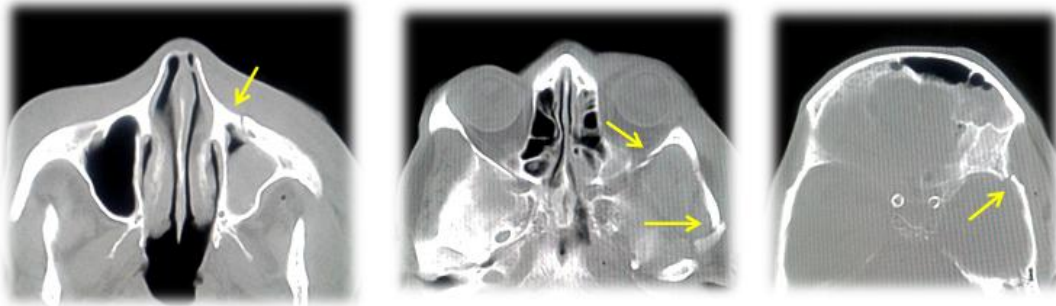
**Tetrapod or Quadripod fracture (Tripod / Malar fracture):**

**Disruption of both the lateral maxillary and upper transverse maxillary buttresses**

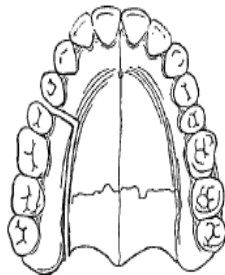


**Sutures involved:**

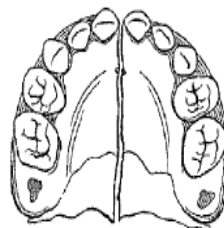
- Zy-frt
- Zy-sph
- Zy-Tmp
- Zee-Max



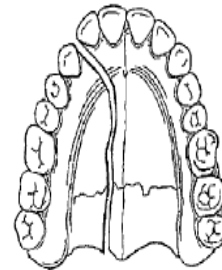
**Hendrickson types of Palatal fracture<sup>5</sup>:**



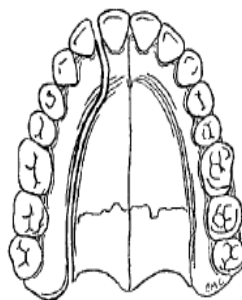
Type 1



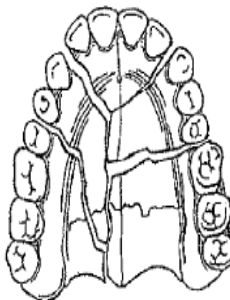
Type 2



Type 3



Type 4



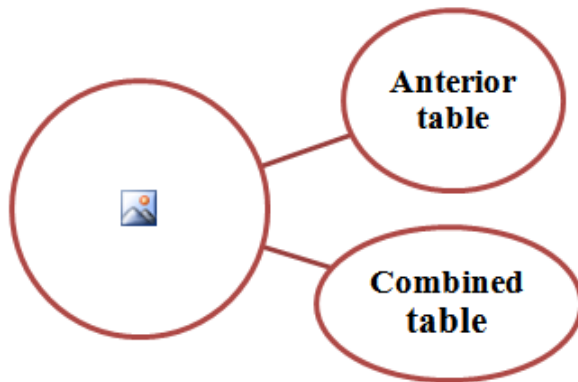
Type 5



Type 6

- I Anterior and posterolateral alveolar.**
- II – Sagittal.**
- III – Parasagittal.**
- IV - Para alveolar.**
- V – Complex.**
- VI – Transverse.**

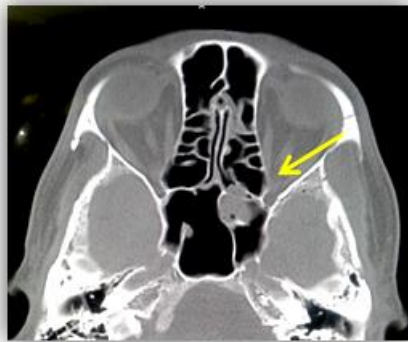
**Sinus Wall Fractures (Frontal and sphenoid):**



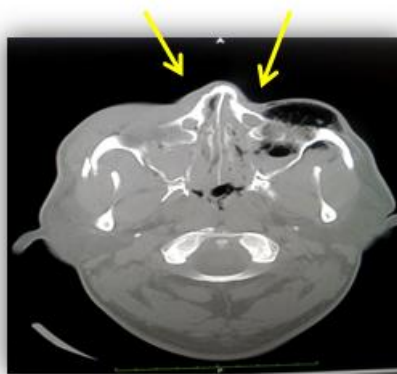
<b>COMPLICATIONS - TREATMENT</b>	
Nasofrontal duct Obstruction	– Sinus obliteration
CSF leak	– Canalization of sinus

**Complications of facial fractures:**

Left Optic strut fracture:



Bilateral nasolacrimal duct injury



**II. Conclusion:**

- Accurate classification of facial fractures and identification of related complications by the radiologist permit prompt surgical management and improved clinical outcome of these common traumatic injuries.
- Surgical management of fractures and their associated complications is according to the specific facial buttress involved.
- Severe haemorrhage from massive facial injuries may result in death. Airway obstruction, if not properly treated or detected, is associated with high mortality.

**III. Summary:**

Facial buttress is supporting structure of the face. Anatomy of the facial buttress is very important for classification of facial fractures and associated complications.

Trauma to the maxillofacial region needs special attention as it contains important special sensory systems are contained within the face. (e.g. vision, auditory, somatic sensation, gustatory, olfaction and vestibular). Also, vital structures in the head and neck region are intimately associated (airway, blood vessels, nerves and gastrointestinal tracts). Lastly, the psychological impact of disfigurement can be devastating.

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CT scan is the gold standard imaging technique to diagnose maxillofacial fractures. The sensitivity of a routine non enhanced head CT scan for fracture surveillance was found to be 100% [6].

### References:

- [1]. Thorén H, Snäll J, Salo J, et al. Occurrence and types of associated injuries in patients with fractures of the facial bones. *J Oral Maxillofac Surg* 2010;68 (4):805–810.
- [2]. Allareddy V, Allareddy V, Nalliah RP. Epidemiology of facial fracture injuries. *J Oral Maxillofac Surg* 2011;69(10):2613–2618.
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- [6]. Lewandowski RJ, Rhodes CA, McCarroll K, Hefner L. Role of routine nonenhanced head computed tomography scan in excluding orbital, maxillary, or zygomatic fractures secondary to blunt head trauma. *Emerg Radiol*. 2004 Feb. 10(4):173-5

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