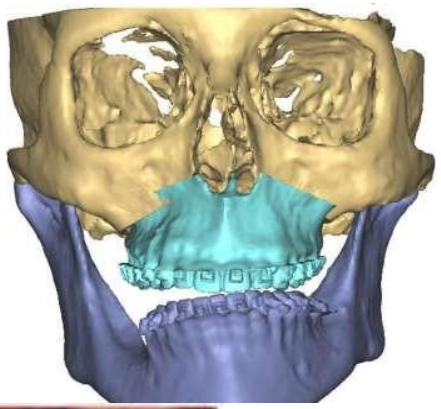
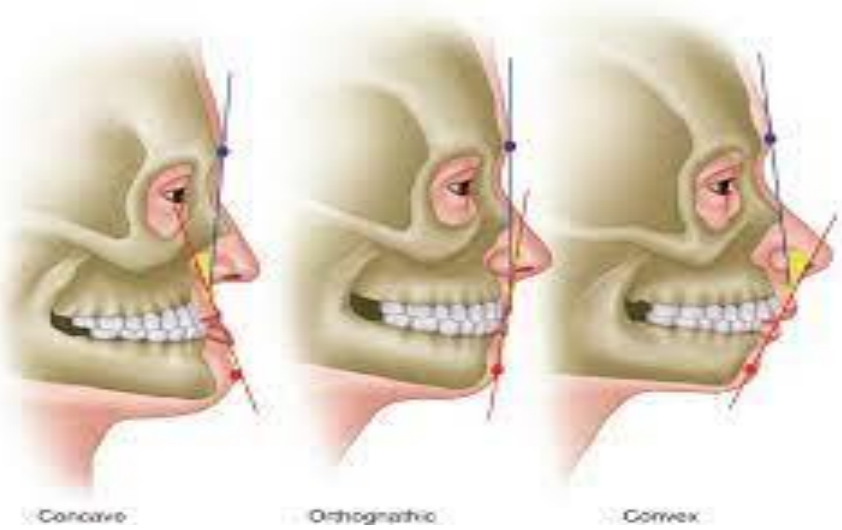
# Orthognathic surgery








PROFESSOR ABBAS AY TAHER

# Orthognathic Surgery:

•The word orthognathic comes from the **Greek word** “ortho”, meaning to straighten, and “gnathic: meaning jaw. Orthognathic surgery thus means to straighten a jaw. Defining a straight jaw versus one that is not requires determining the degree of deviation from a specified population norml.

Face is more than the upper and lower jaw

•when deformities extend to involve the cranio-orbital skeleton, evaluation and management expand the scope of maxillofacial surgery to craniofacial surgery.

**•Thus, orthognathic or maxillofacial surgery is a subset of craniofacial surgery**

•Orthognathic Surgery

**•Correction of maxillofacial deformities requires**

•careful analysis of the soft tissue

•clinical examination

•supporting photographs

•skeletal evaluation with

•standardized radiographs

•dental evaluation with study dental casts.

**Formulation of a treatment plan thus requires close cooperation of the surgeon working with the dentist, the orthodontist, and at times the restorative prosthodontist. Unlike many surgical procedures, outcome depends not only on the surgical procedure but also on a multitude of factors that begin long before the actual surgery as well as on control of the variables long after surgery**

**•Dentofacial deformities requiring Orthognathic surgery**

•Includes a broad population of patients with deformities of

• congenital

•Developmental (1.5-2 million in USA)

•traumatic origin

**Clinical assessment**

- should be directed specifically at evaluating
- the relative position
- size of each of the facial skeletal elements
- the degree of zygomatic projection
- the maxillary and mandibular positions in space relative to each other and to the cranial-orbital regio
- The nasolabial angle
- upper lip length
- lip competency
- labial-mental sulcus
- Any facial asymmetry should be noted along with the relationship of the maxillary dental mid line to the mandibular dental mid line
- the dental mid lines to the facial mid line
- The intraoral examination should focus on the dental alignment within each arch and relationship of the dental arches to each other
- The degree of dental display on repose and smile also should be recorded with the amount of gingival display.

Facial balance typically is assessed by dividing the **face in thirds.**

The upper third is from the **anterior hairline (trichion) to the glabella**, **the middle third from the glabella to the subnasale**, **and the lower third from the subnasale to the mention**.

•**When each of the thirds is equal,** the face is said to be **balanced and of "ideal" proportions.**

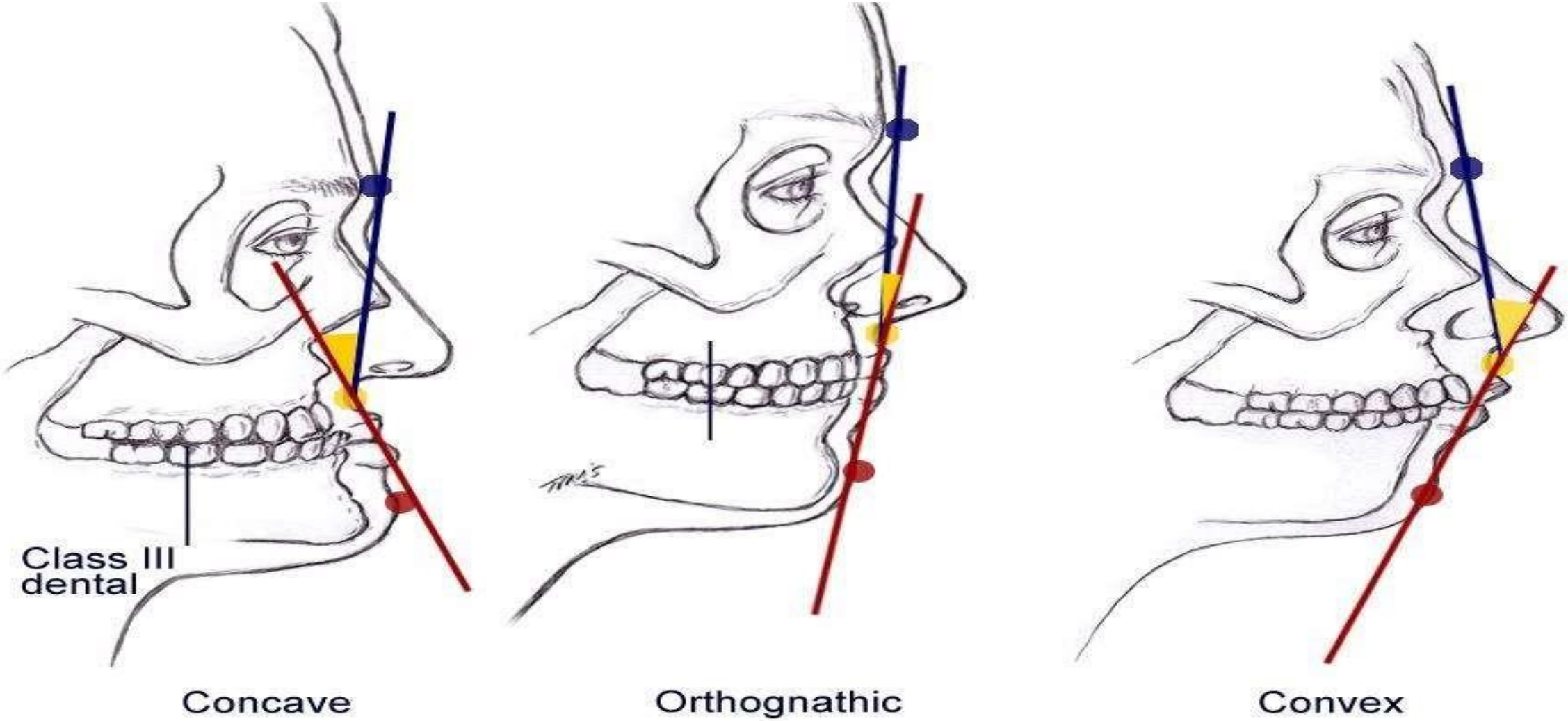
• Additionally, in profile view the face should have a slight degree of convexity as measured from the glabella to the subnasale to the menton.

• Excess facial convexity, flatness, or concavity is felt to be less than ideal

• However, facial proportions are only idealized concepts and have changed over time.


**Maxillofacial deformities**

- can be divided broadly into 3 major categories:
- dental dysplasias
- skeletal dysplasias
- dentoskeletal dysplasias




Profile analysis; angle of convexity

# Dental dysplasias

Dental dysplasias are limited strictly to malocclusions that result from abnormal spatial relationships of the dentition and not from the skeletal position of the upper and lower jaws. These can be corrected with orthodontic treatment

# Skeletal dysplasias

In patients with skeletal dysplasia

- only, the dentition is in good alignment
- but the maxilla and/or mandible are **dysplastic**. **Skeletal dysplasias require correcting the skeletal deformity without altering the occlusion**. An example is a patient with retrogenia without retrognathia or a patient with hemifacial microsomia who has a normal maxillary-mandibular dental relationship but has an occlusal cant because of skeletal asymmetry

# Dentoskeletal dysplasias

In dentoskeletal dysplasias,

•the dentition is malpositioned within each arch and with each other the skeletal relationship of the upper and lower jaws is abnormal

• An example is a patient with a maxillary sagittal and transverse width deficiency from a facial cleft.

•Correction requires aligning the dentition within each arch with orthodontic treatment and restoring the maxillary-mandibular dental relationship with skeletal osteotomies and repositioning

•In addition, dentoskeletal dysplasias can be classified further based on the position in space and on the volume or mass (whether deficient or in excess) of the individual elements. For example, the mandible can be of normal shape and volume but retrognathic in relationship to the maxilla, or it may be both retrognathic

# Indications for orthognathic surgery

- Include facial dysmorphism with and without functional implications
- An osseous genioplasty for a patient with retrogenia but without malocclusion should be considered for facial form
- If the retrogenia is associated with retrognathism resulting in a malocclusion, orthognathic surgery is indicated for restoring the facial form and for functional occlusion
- Airway and speech are other indications when considering the functional need for orthognathic surgery
- Restoration of the normal anatomic relationship between the maxilla and mandible relative to the cranial base reestablishes the functional components (ie, form and function) of the facial skeleton

# Contraindications of orthognathic surgery

Risk factors may alter the treatment plan or preclude surgery including

- underlying medical condition
  - bleeding dyscrasias
  - systemic disease
  - local factors that may affect normal wound healing, compromised vascularity of the surgical region
- a patient with unrealistic expectations
- a non-compliant patient
- patients with poor oral hygiene.

## Diagnosis and preoperative planning :

Any facial asymmetry should be noted along with the relationship of the maxillary dental mid line to the mandibular dental mid line and the dental mid lines to the facial mid line. The degree of dental display on repose and smile also should be recorded with the amount of gingival display. The muscles of mastication and TMJ function should be assessed. The intraoral examination should focus on the dental alignment within each arch and relationship of the dental arches to each other. The periodontal status of the teeth and the patient's hygiene should be evaluated

Among the steps in planning for orthognathic surgery, preoperative cephalometric tracings are noteworthy and should be performed with accuracy. Tracings are usually performed on transparent acetate paper. Tracing may aid in getting the pattern of facial profile changes. Repositioning these patterns may determine the choice of the type of osteotomy and provide an estimate of the amount of bone which must be advanced, recessed or grafted. In addition, cephalometric records are valuable in assessing the postoperative changes and accurately measure resultant relapse. Numerous cephalometric analyses have been proposed, the simplest one is that of Steiner . Steiner used the skull cephalometric landmarks (points) that were proposed by anthropologists and orthodontists. These points are:

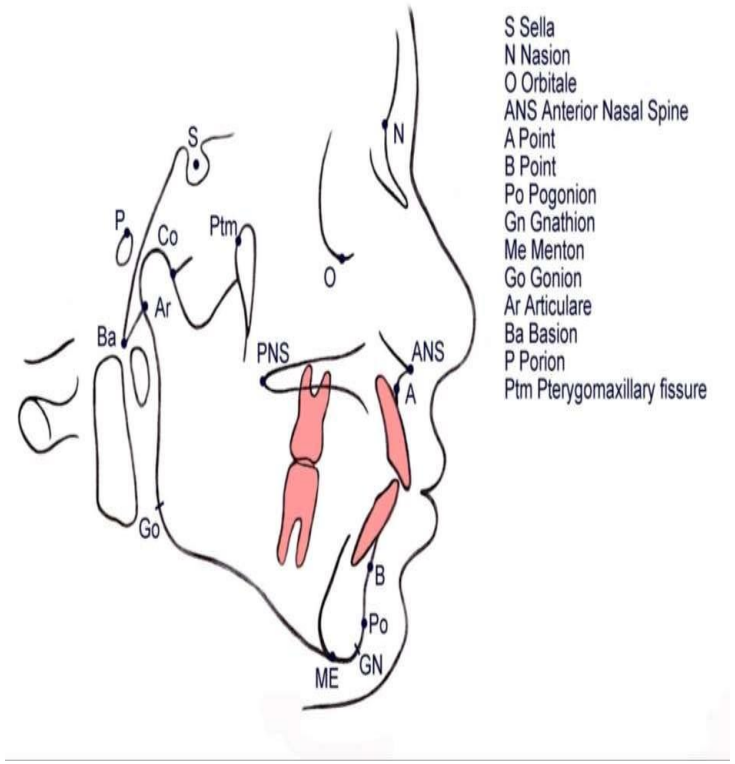
S = Sella turcica center

N = Nasion (the fronto-nasal suture) ANS = Anterior nasal pine

A = Subspinale (the most deepest point on the midline contour of the alveolar processthe maxilla)

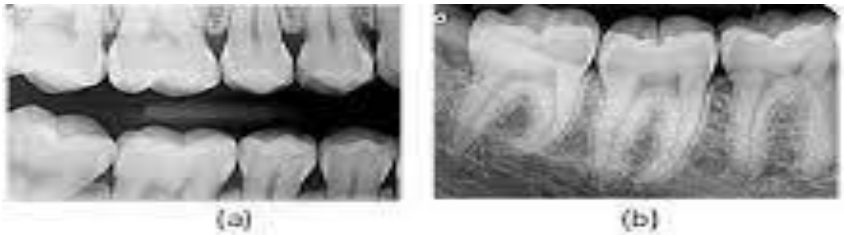
Pg = Pogonion (the most anterior point of the symphysis)

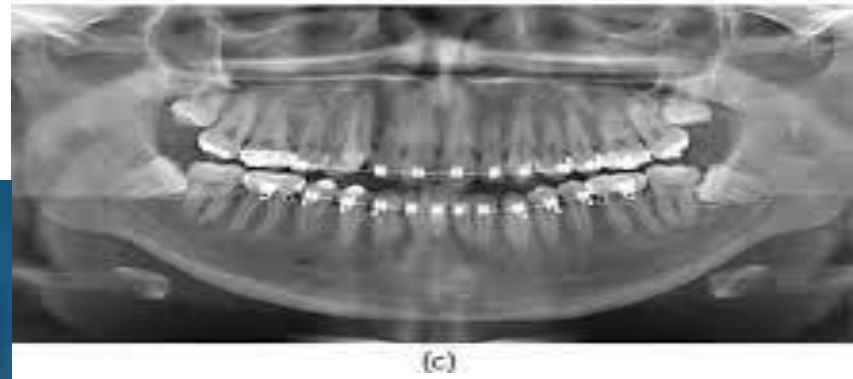
B = Supramentale (the most deepest point on the midline contour of the alveolar process of the mandible)

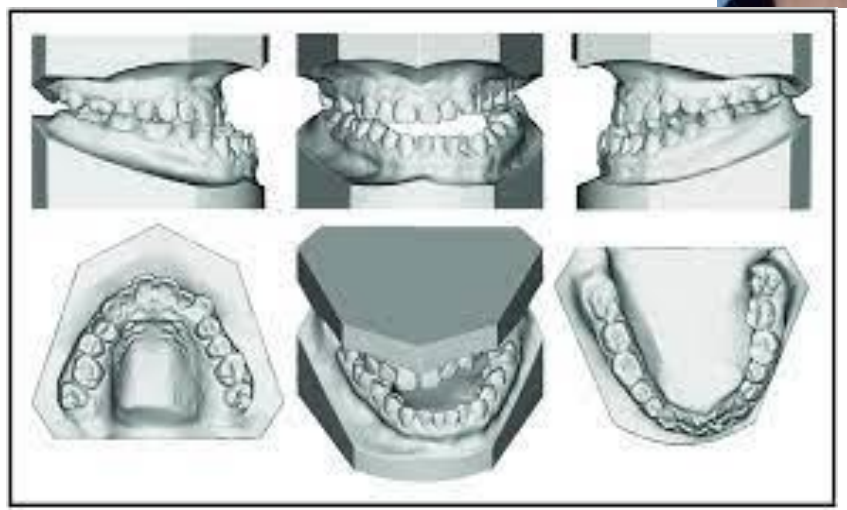


# Radiographical exam

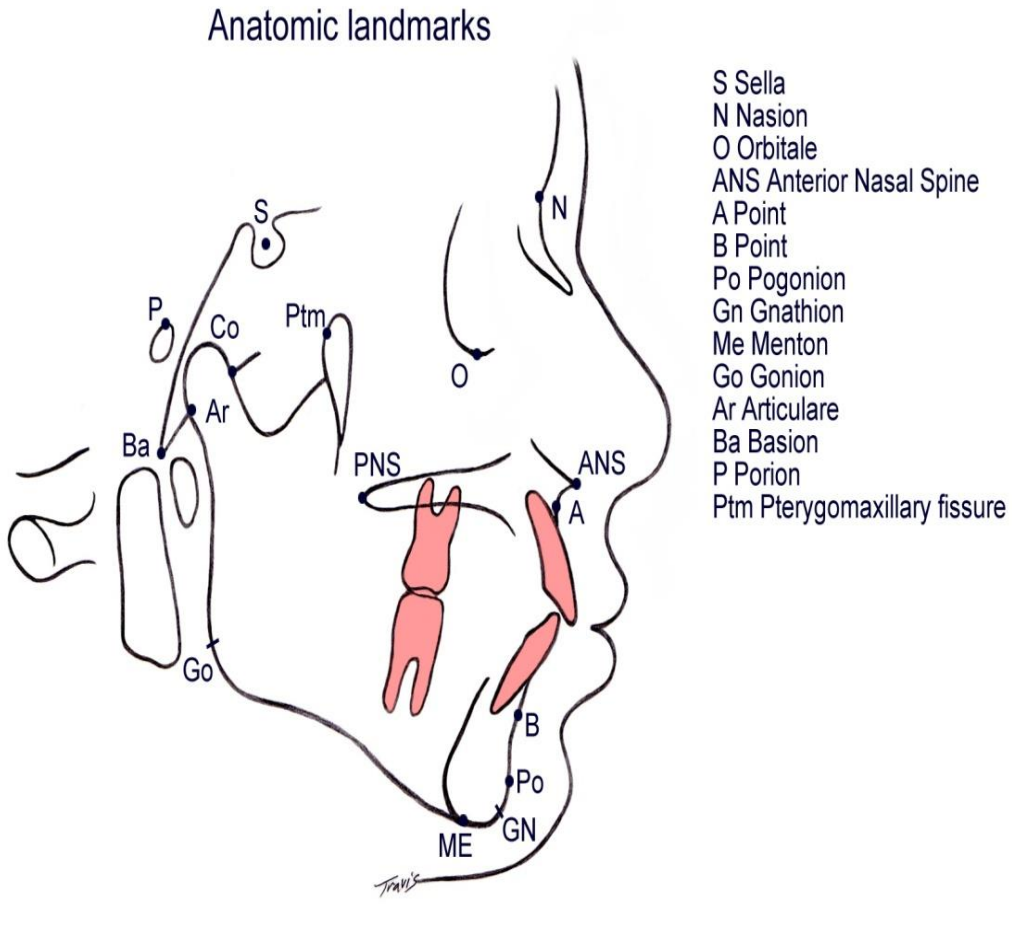
- Cephalometric radiograph
- OPG
- Periapical
- ……..
- ……
- …..
- Photograph
- Upper and lower dental casts

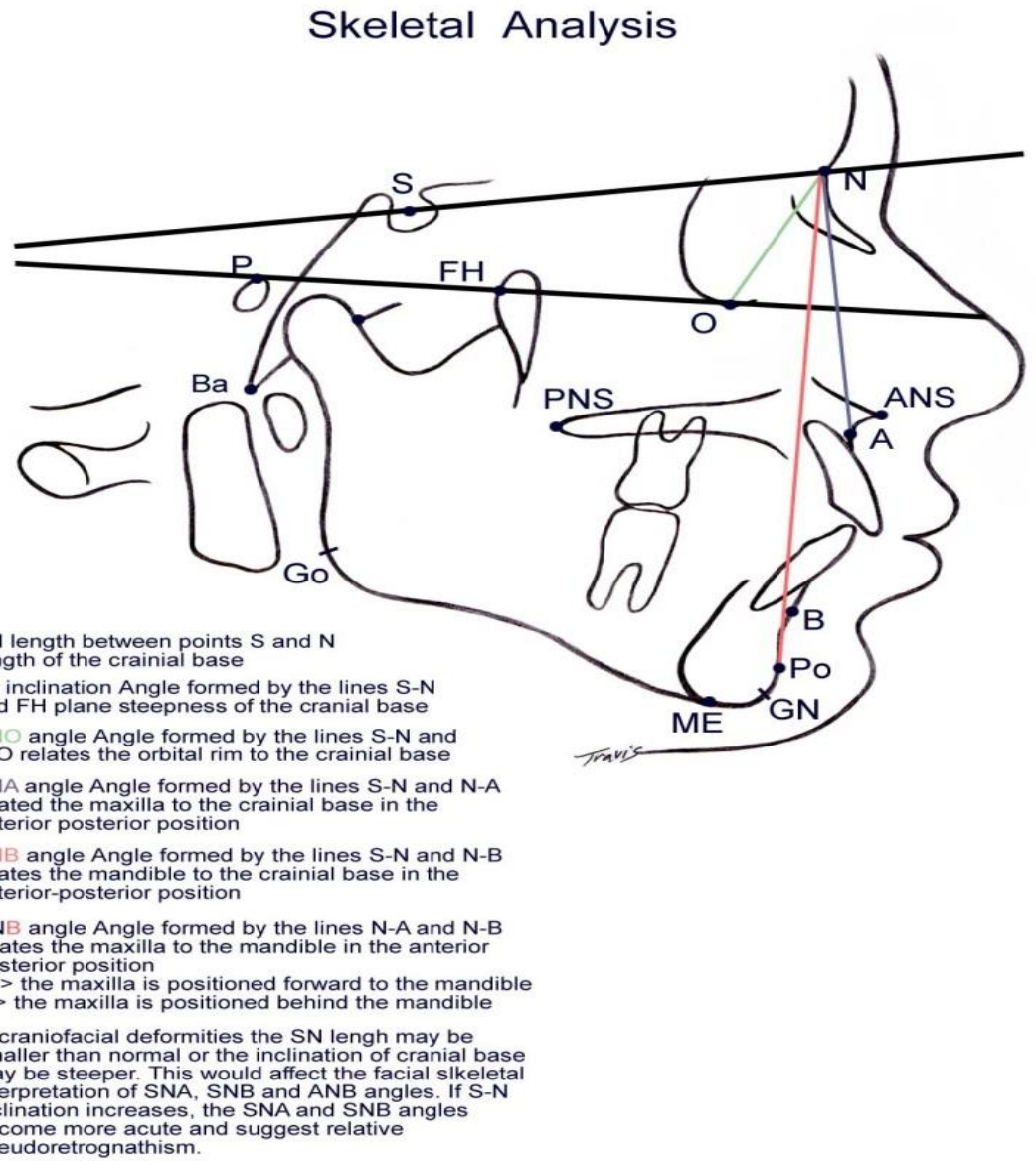


**Analysis of the dentofacial skeleton is based on identifiable radiographic landmarks on a lateral cephalometric x-ray**




**Lateral cephalometric analysis of the facial skeleton based on Steiner analysis.**

**The positions of the maxilla and mandible each are related spatially to the anterior cranial base and to each other. Note that normative values of the facial elements depend on a normal anterior cranial base inclination and length, which typically are altered in craniofacial conditions**

# Treatment phases

- Preorthodontic preparatory phase

- Presurgical orthodontic treatment phase

- Surgical phase

- Postsurgical orthodontic pnase

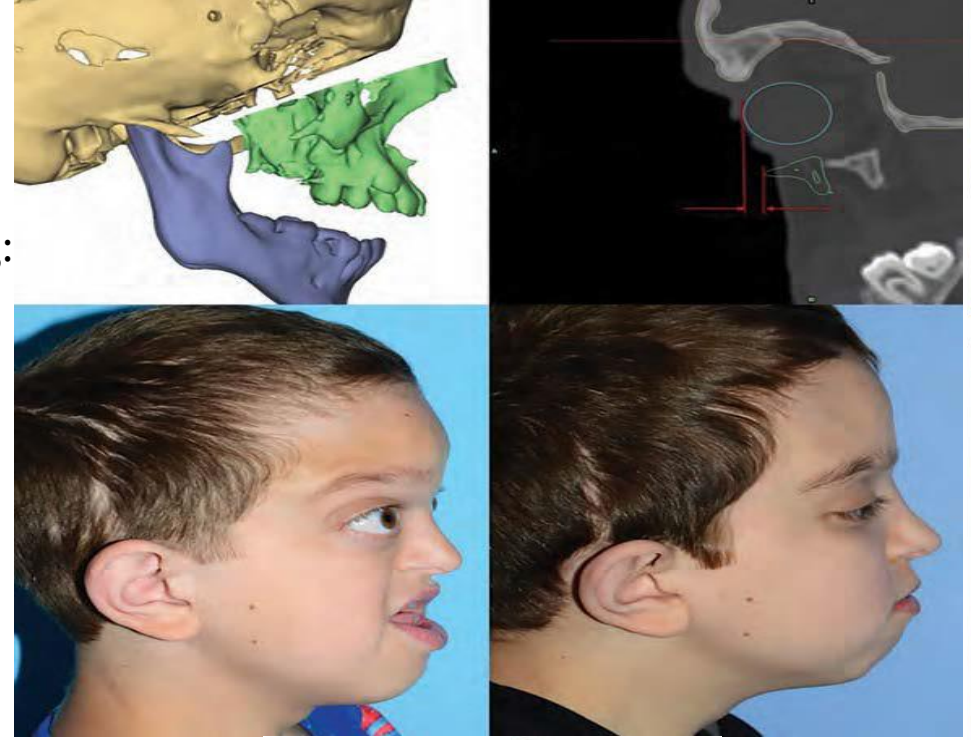

- Prosthodontic treatment phase

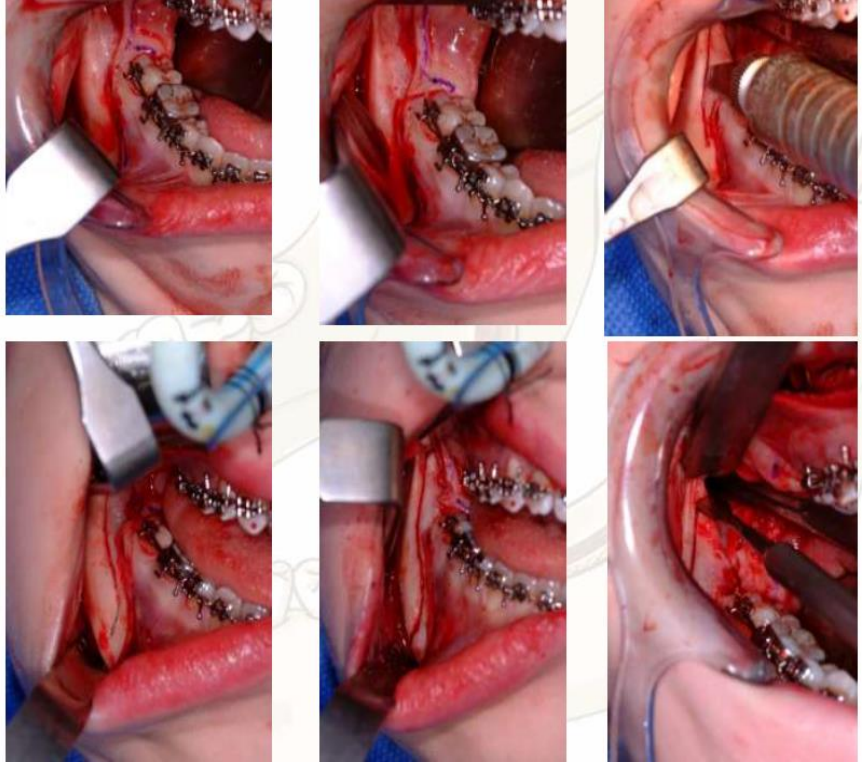
# Surgical corrections

## Mid face

Well-established osteotomies including:

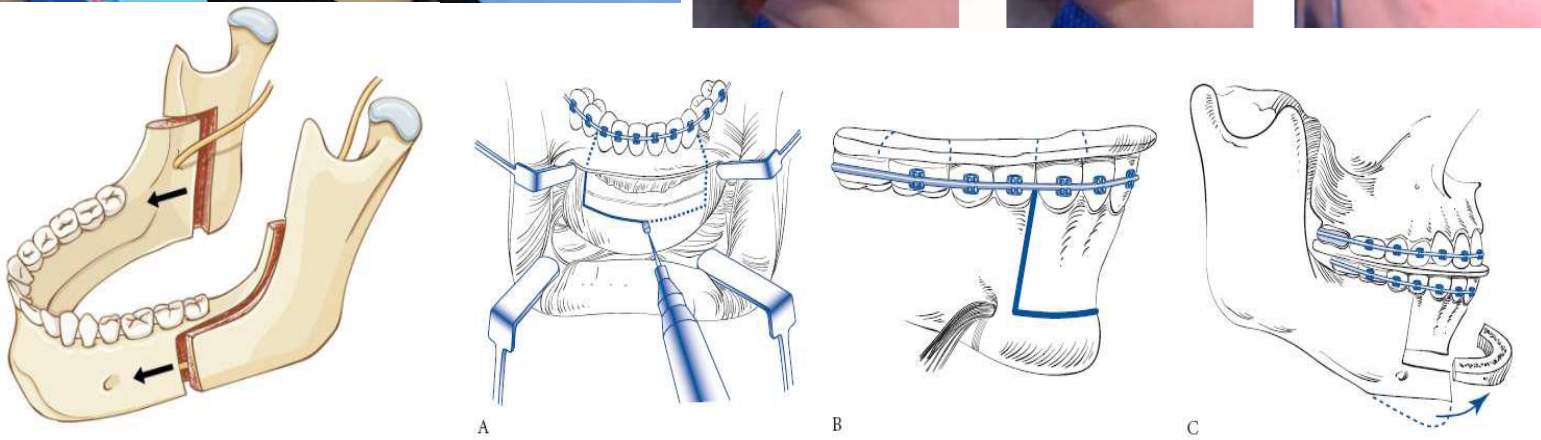
- LeFort I-type osteotomy
- LeFort II-type osteotomy
- LeFort III-type osteotomy
- maxillary segmental osteotomies





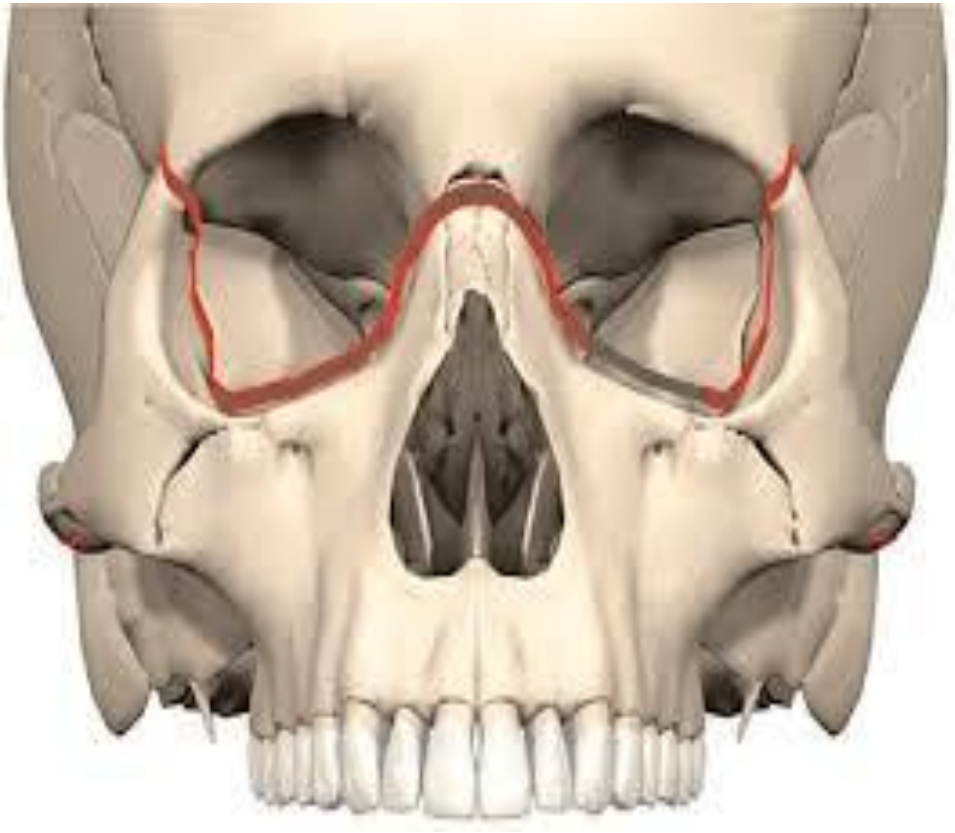
## Lower face

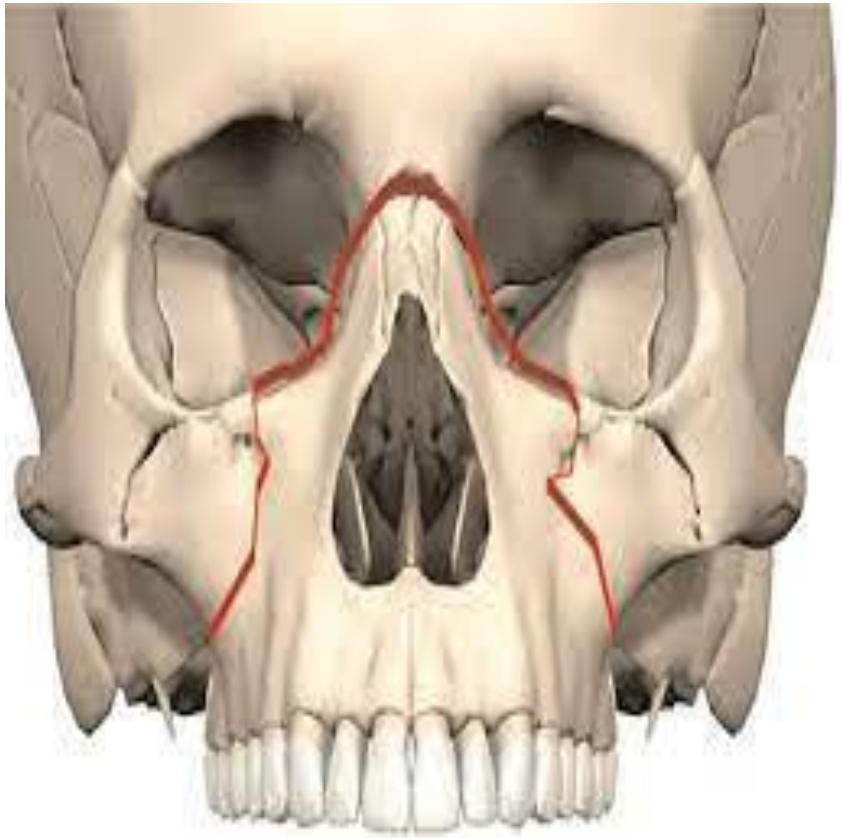
- sagittal split osteotomy of the mandibular ramus
- vertical ramal osteotomy
- inverted L and C osteotomies
- mandibular body segmental osteotomies
- mandibular symphysis osteotomies.

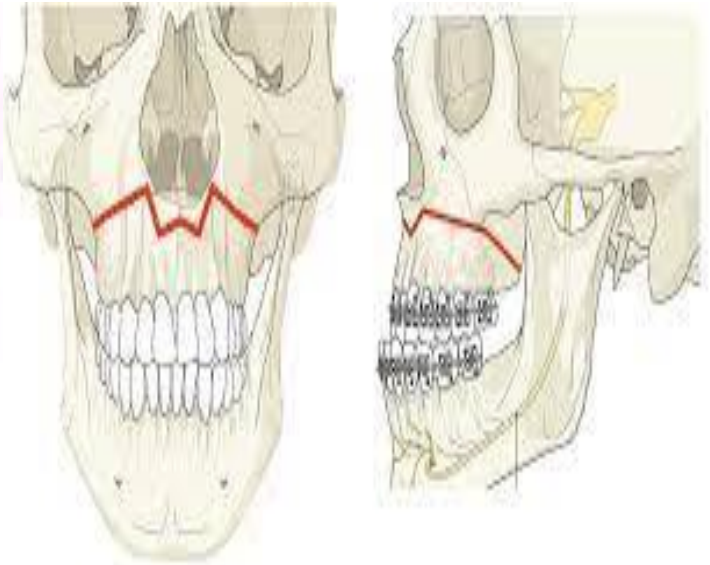



- **Most maxillofacial deformities can be managed with 3 basic osteotomies: the mid face with the LeFort I-type osteotomy, the lower face with the sagittal split ramal osteotomy of the mandible, and the horizontal osteotomy of the symphysis of the chin**
-

- The LeFort osteotomies are named after the **3 classic lines** of weakness of the facial skeleton described by Rene LeFort in 1901.
- Complete craniofacial dysjunction by the **LeFort III osteotomy** allows the surgeon to alter the orbital position and volume, zygomatic projection, position of the nasal root, frontonasal angle, and position of the maxilla and to lengthen the nose.
- **The LeFort II** osteotomy allows the surgeon to alter the nasomaxillary projection without altering the orbital volume and zygomatic projection.
- **The LeFort I** osteotomy allows for correction primarily at the occlusal level affecting the upper lip position, nasal tip and alar base region, and the columella labial angle without altering the orbitozygomatic region.

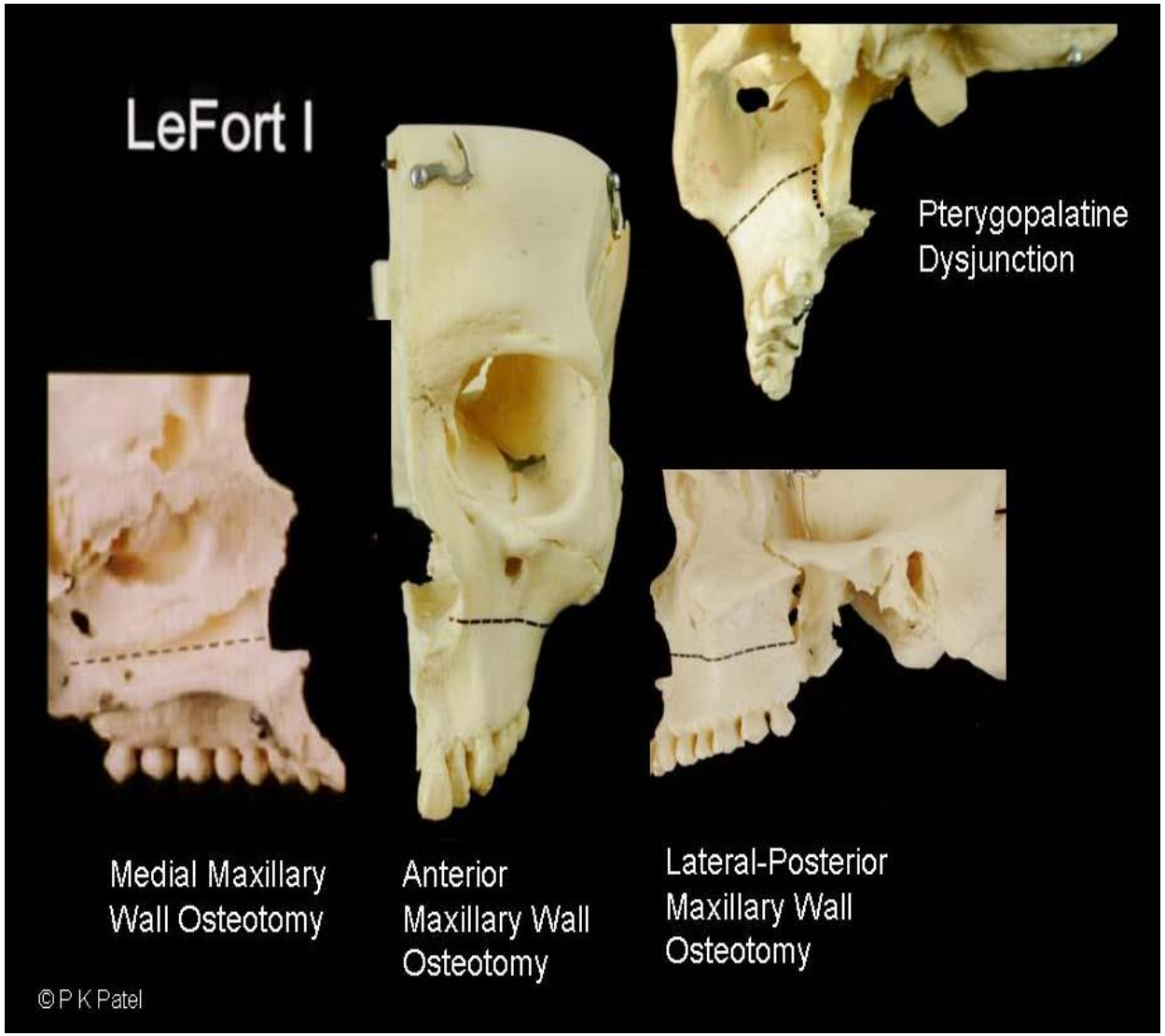






Frontal and lateral view: drawing of the w-shape osteotomy

**Variation of midfacial osteotomies to correct differing degrees of midfacial deformities involving the zygoma**



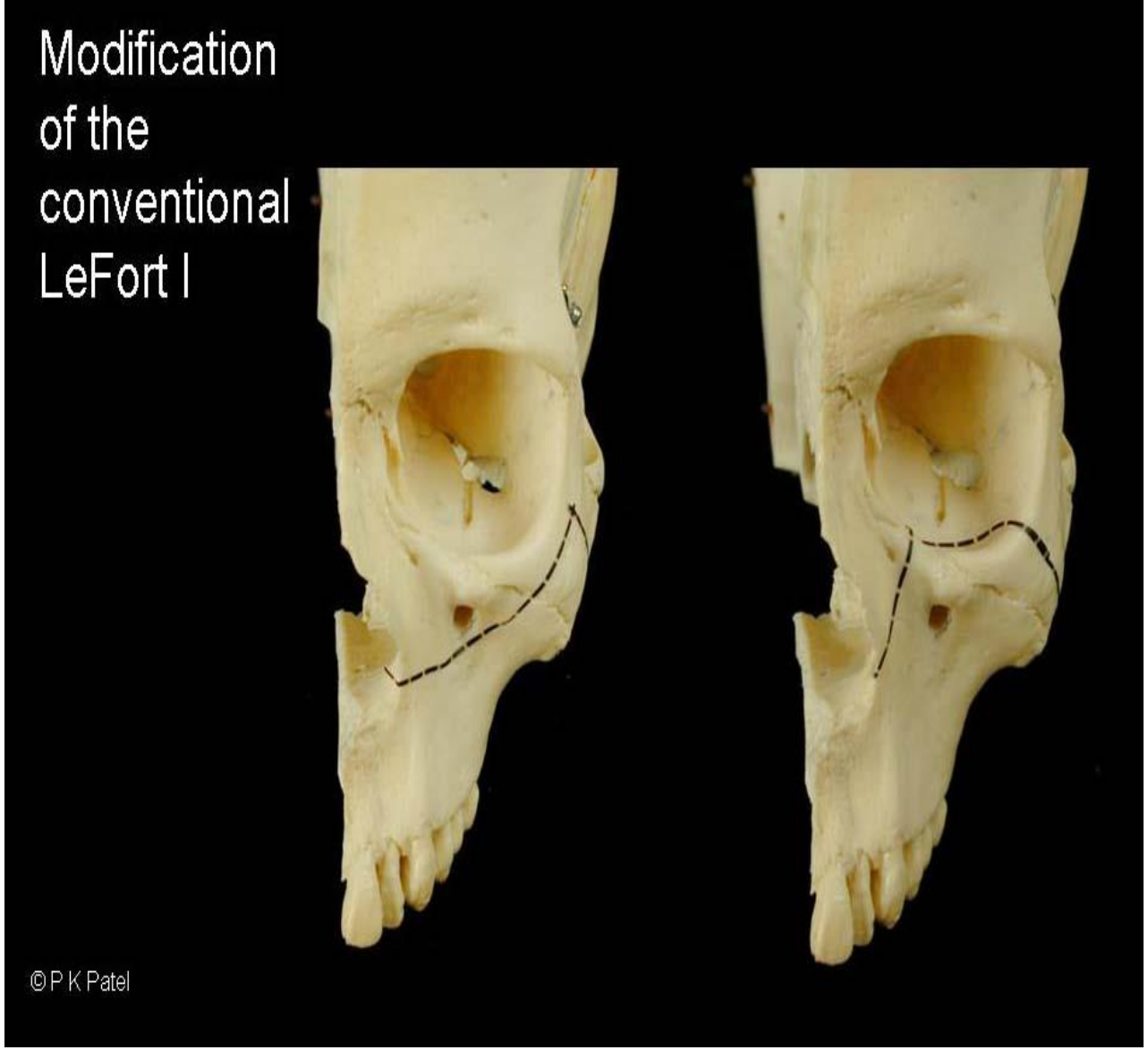




**Illustration of the transverse maxillary LeFort I osteotomy. The osteotomy is made with a reciprocating saw and completed at the pterygopalatine junction with a curved osteotome**

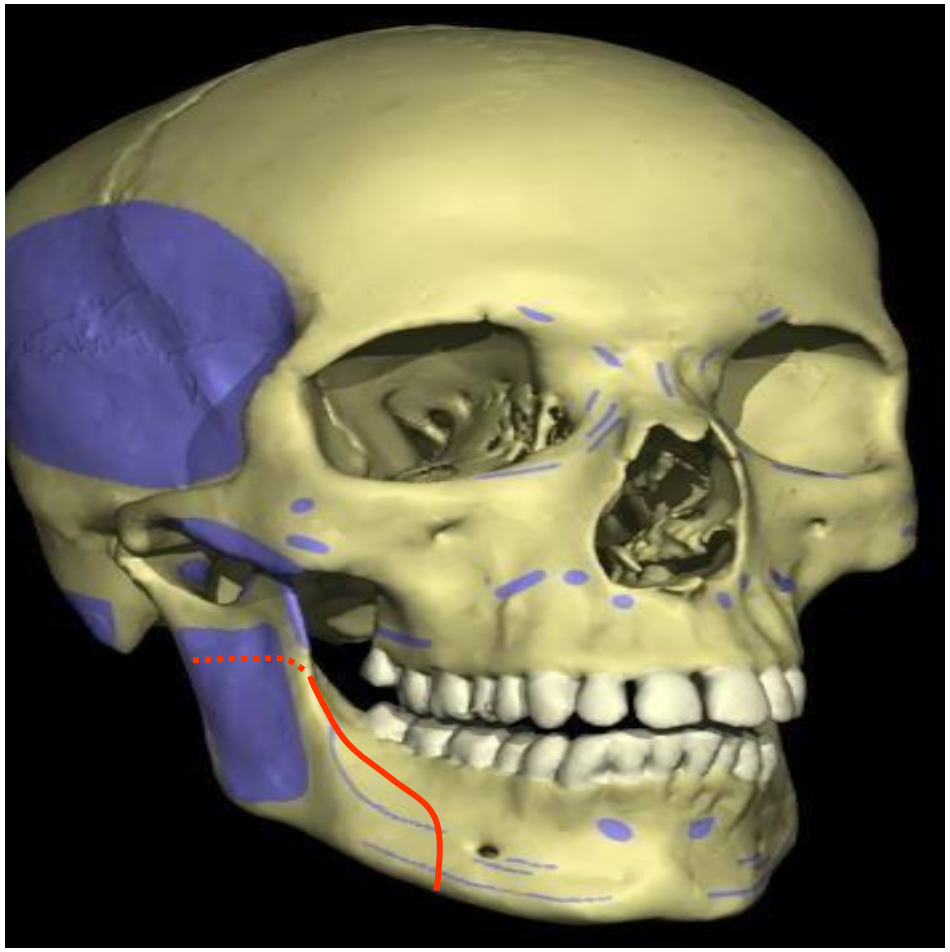
# Surgeries for mandibular deformity

**Sagittal split ramus osteotomy,**

**SSRO** ✓

***Indications:***

- **mandibular excess**
- **mandibular deficiency**
- **mandibular asymmetry**



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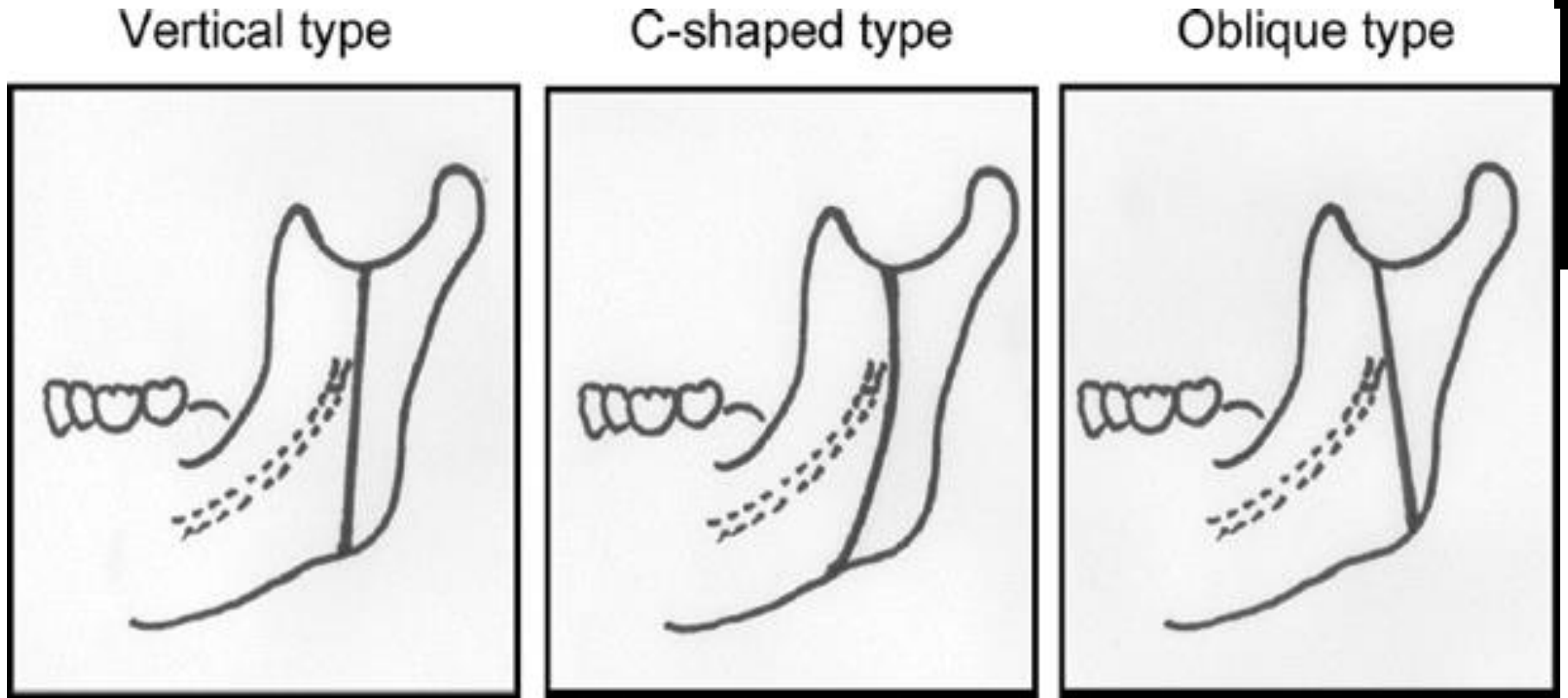
# Surgeries for mandibular deformity

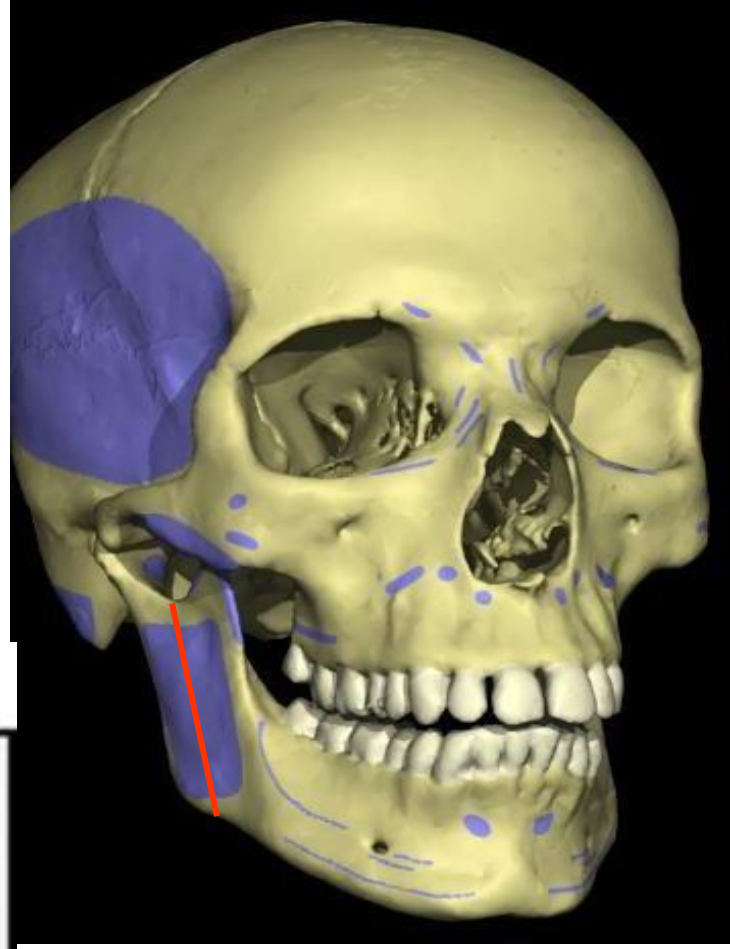
Vertical ramus osteotomy

***Indications:***

- mandibular excess
- mandibular asymmetry

(combined with SSRO)



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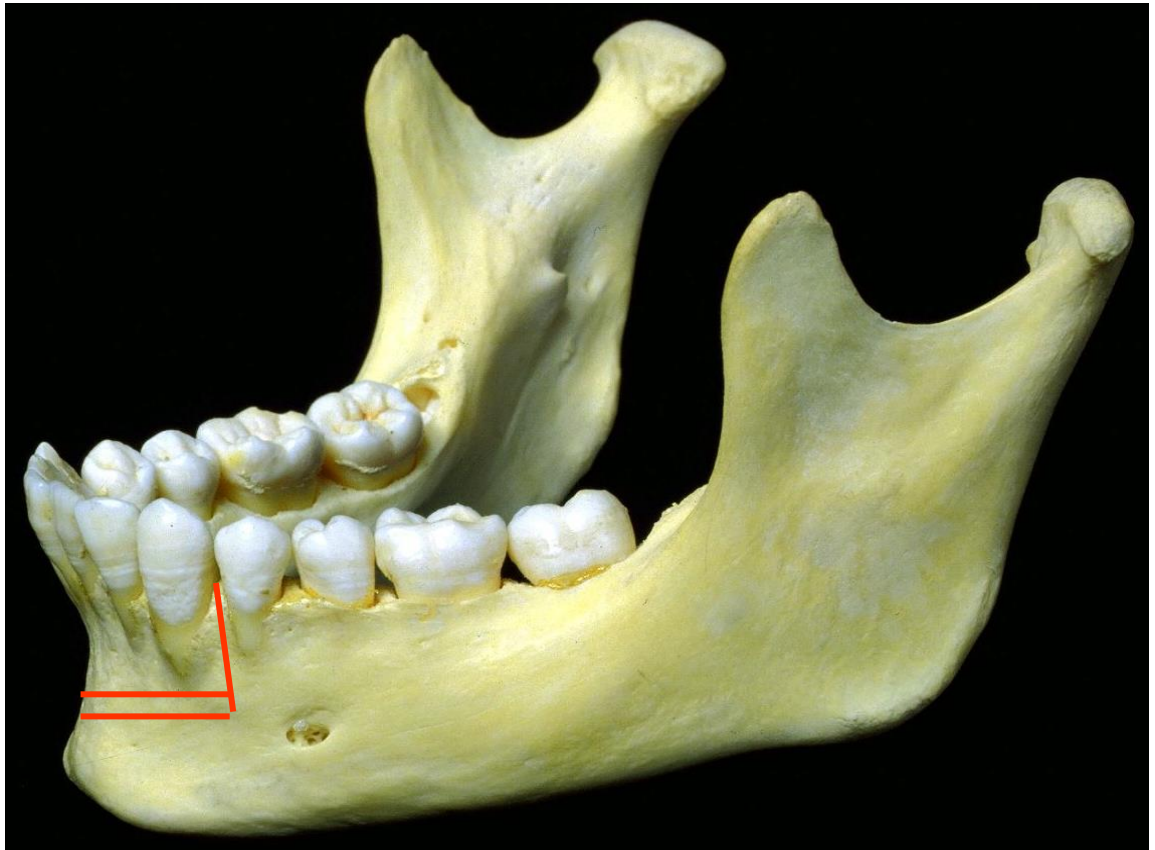
# Surgeries for mandibular deformity

## Subapical osteotomy

*Indications:*

- bimaxillary protrusion / open bite
- leveling the plane of occlusion
- uprighting anterior teeth

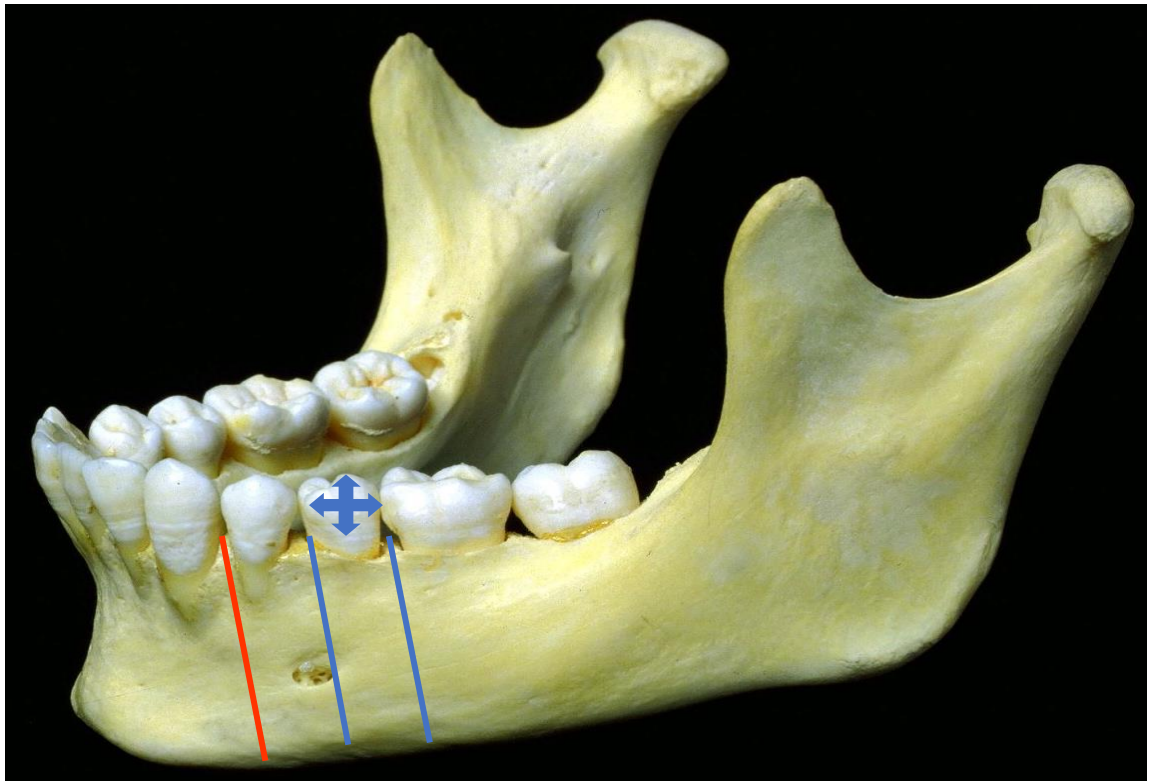


# Surgeries for mandibular deformity

## Body osteotomy

***Indications:***

- mandibular excess (body)
- combined with ramus procedure or not
- open bite / spee's curve reduction

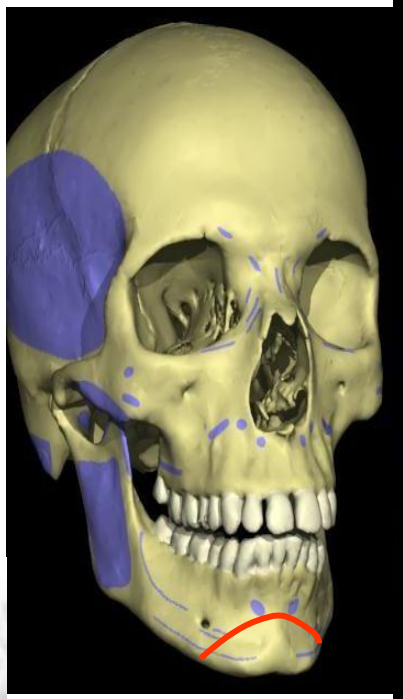


# Surgeries for mandibular deformity

## genioplasty

*Indications:*

- chin deformities

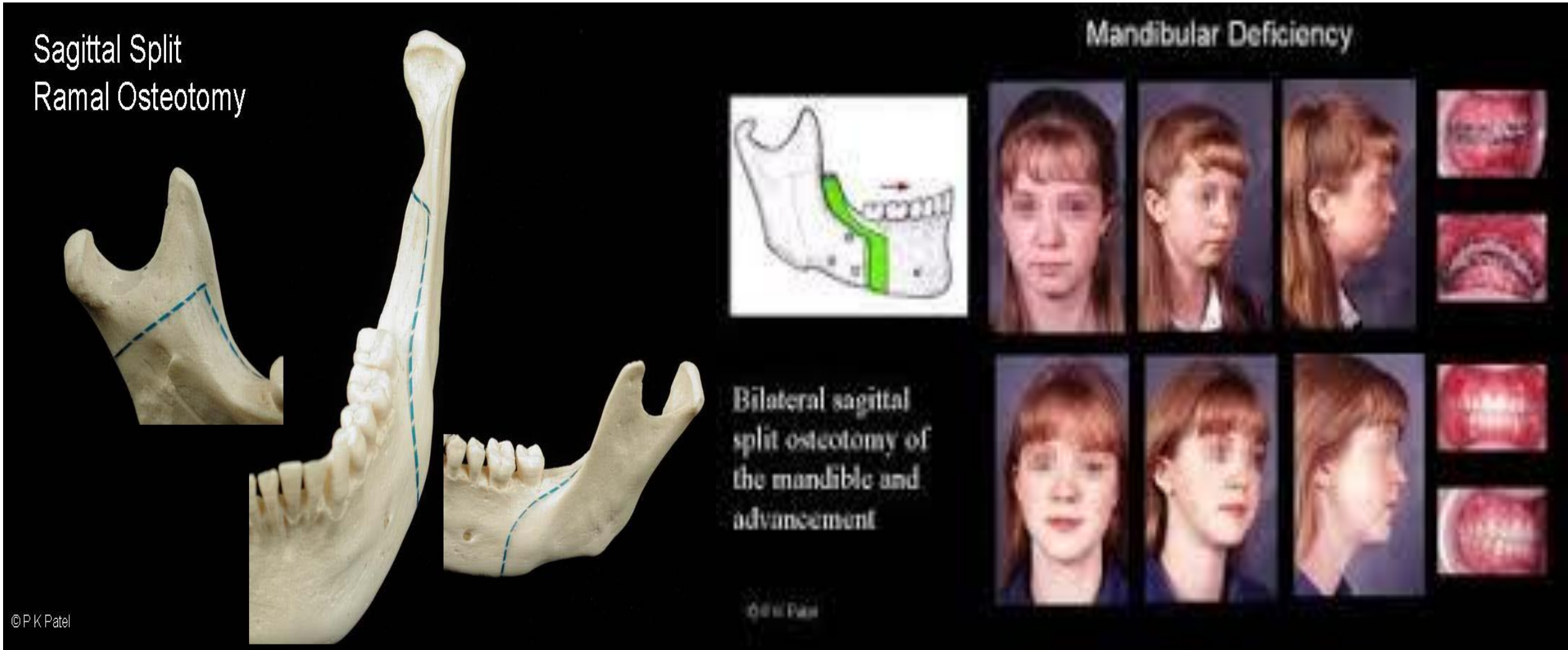


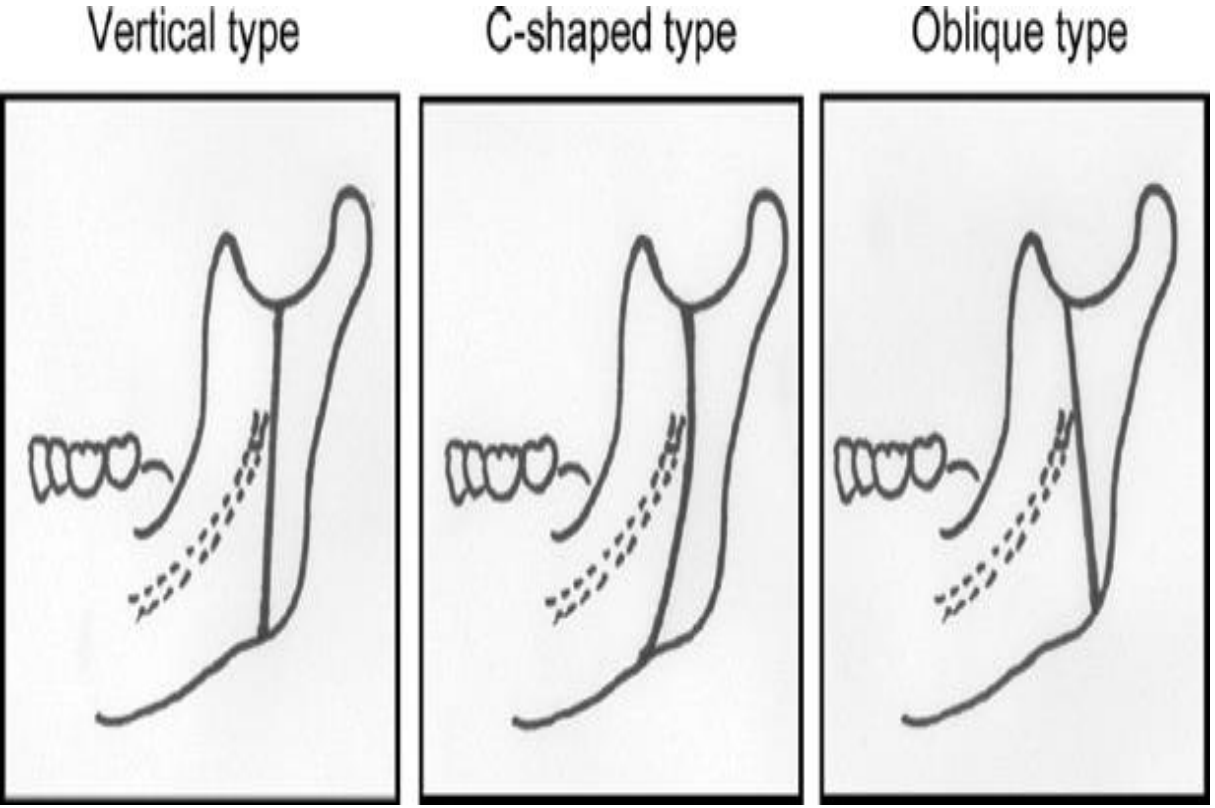
**Pre treatment**

**Post Sagittal Split Ramus Osteotomy**

**Post treatment**

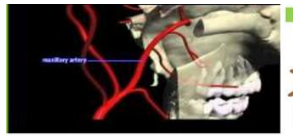
Sagittal split ramal osteotomy. Place the horizontal osteotomy superior to the inferior alveolar nerve foramen and continue partially through the body along the oblique line to the region of the second and first molar to complete the vertical osteotomy. Make the osteotomy through the cortex with a reciprocating saw and complete it with an osteotome along the buccal surface

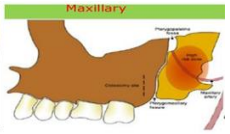


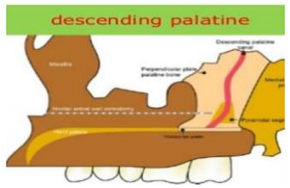

Vertical type
C-shaped type
Oblique type

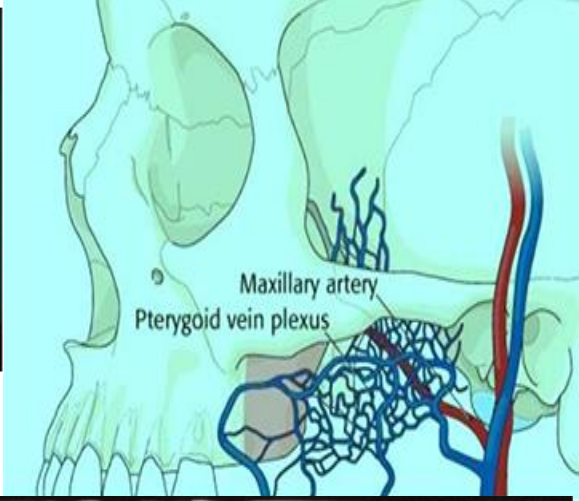
# COMPLICATIONS

## LeFort

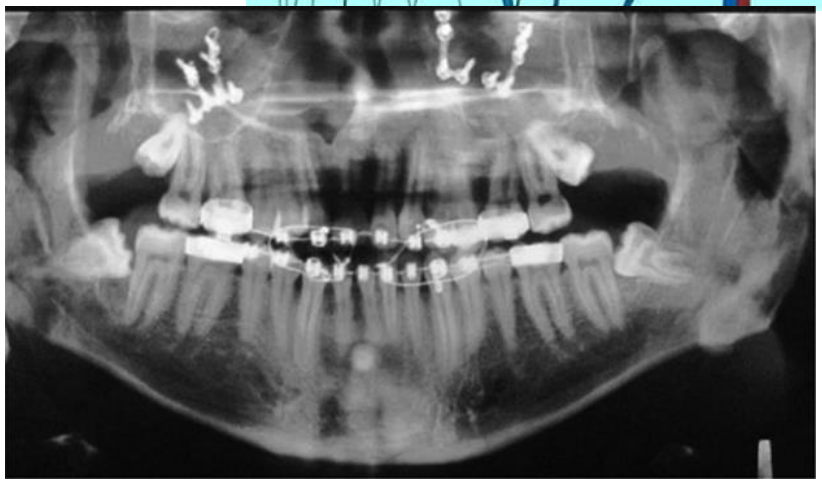


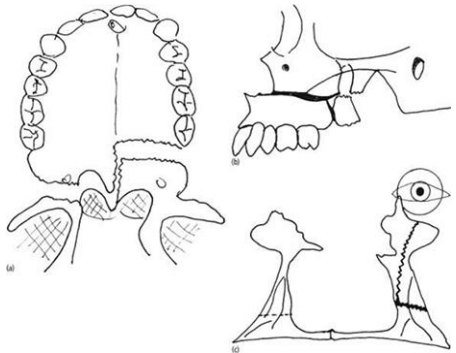



- Injury to Stensen duct
- Infraorbital nerve traction injury
- Unanticipated fractures (pterygoid plate, sphenoid bone, middle cranial fossa)
- Injury to the internal maxillary artery and its branches
- Ophthalmic and lacrimal duct injury
- Avascular necrosis
- Maxillary sinusitis
- Nasal deformity(Nasal septal deviation and buckling )
- Velopharyngeal insufficiency
- Arteriovenous fistulas (carotid-cavernous sinus)
- Improper maxillary repositioning





- Over-correction after maxillary superior repositioning.

- Nasolacrimal duct obstruction

## COMPLICATIONS

### Bilateral sagittal split osteotomy:

**Injury to inferior alveolar nerve:** The risk of injury to the inferior nerve is a significant disadvantage of the sagittal split ramal osteotomy. The incidence of transection is reportedly **2-3.5%.** The long-term neurologic deficit reportedly occurs to some degree in 10-30% of patients, although not all are symptomatic. When the sagittal split osteotomy is combined with an osseous genioplasty, nearly 70% of patients have some degree of neurosensory deficit at 1 year. This is the accepted tradeoff (benefits outweighing risks) that patients must accept in mandibular surgery.

Bleeding (inferior alveolar artery, masseteric artery)

Unanticipated fractures and/or unfavorable split

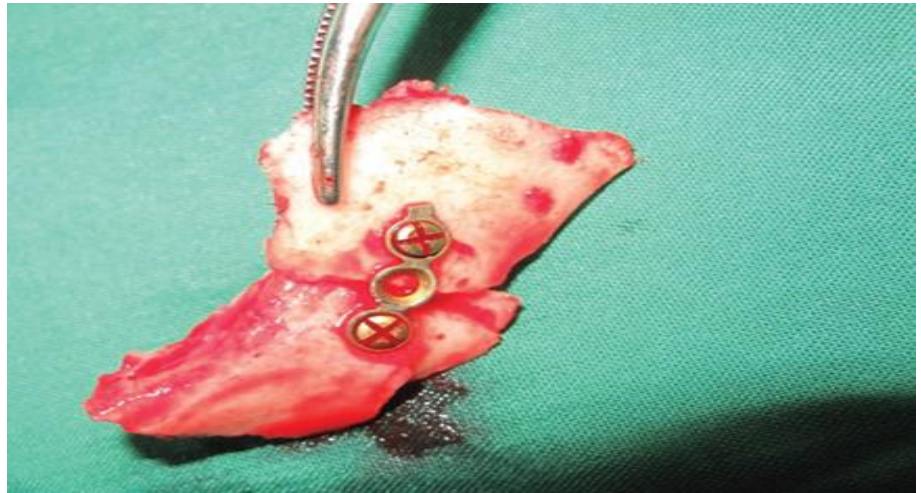
Avascular necrosis

Condylar resorption

Malpositioned proximal segment

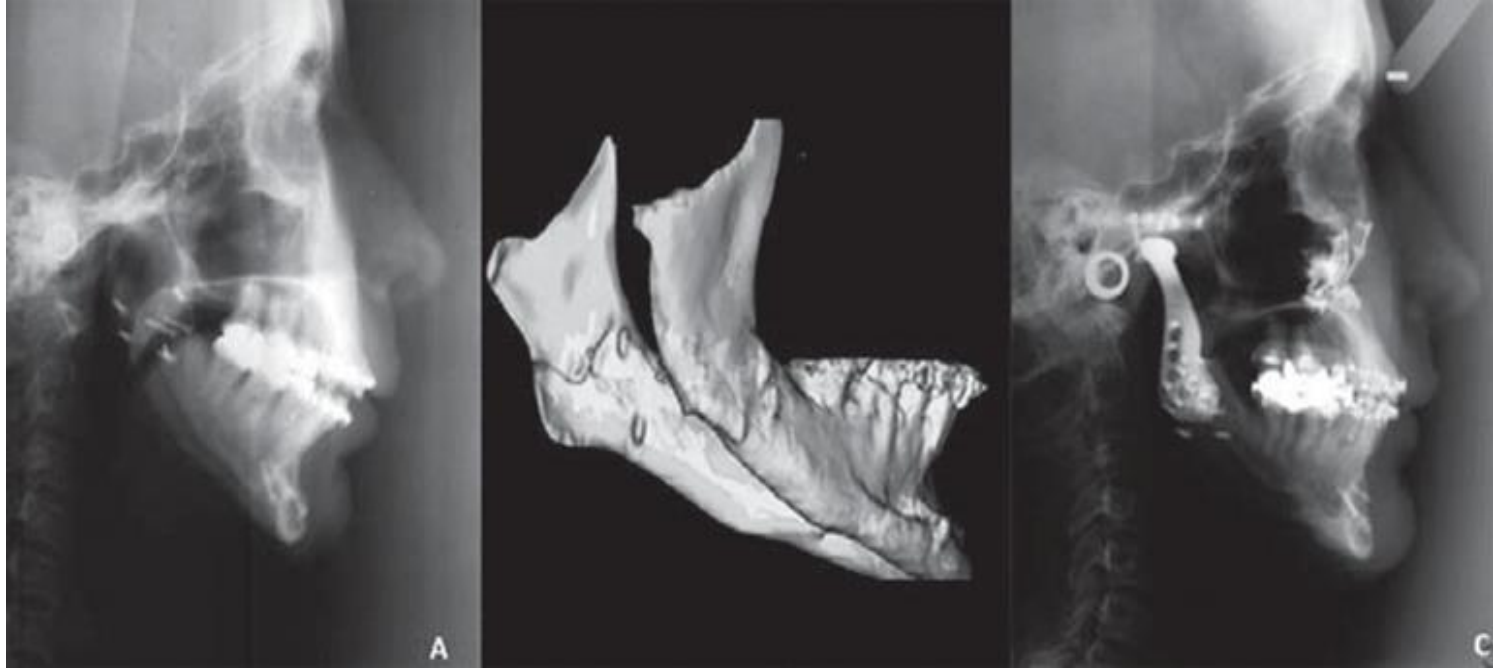
Temporomandibular dysfunction

Postoperative airway problem



(A) Bad split occurred on the right side. (B) Fixation of bone fragment was done and replaced.

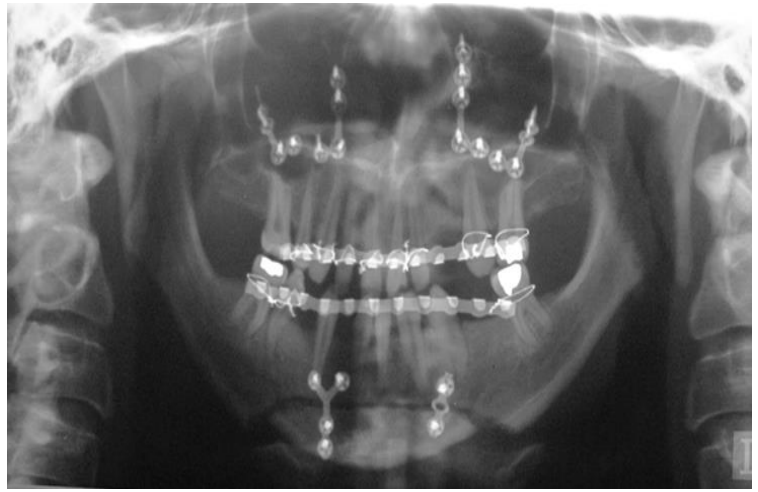
Complete destruction of condyle in a patient, who had undergone orthognathic surgery, was re-treated with the aid of temporomandibular joint prostheses. Before surgery (A), 3D image of the mandible showing bilateral absence of condyles (B), and after surgery (C)




## Complication of Osseous genioplasty

Injury to mental nerve
Inferior mandibular border contour irregularity
Gingival recession

# Common to all procedures




Postoperative infection
Hardware exposure
Unanticipated fractures
Devitalization of teeth
Malunion and/or nonunion
Malocclusion
Relapse
Injury to teeth
Gingival recession and/or periodontal complications
Respiratory decompensation
Bleeding

# THANK YOU