MAXILLARY ORTHOGNATHIC SURGERY

CONTENTS

Orthognathic surgery is the art and science of diagnosis, treatment planning and execution of treatment by combining orthodontic and OMFS to correct musculoskeletal, dento-osseous and soft tissue deformities of the jaws and associated structures.

- Orthognathic surgery gives an opportunity to obtain better occlusal , skeletal and cosmetic results.
- Many psychosocial studies have shown that cosmetic motives for seeking treatment seem to be quite common, but there may be socio-cultural differences in this respect.

- *Patient satisfaction - 87%*

Finlay et al, Br J Oral Maxillofac Surg 95; 33: 9-14.

- *Patient satisfaction - 68%*

Siow et al, journal of oral science. 2003; 44:165-71.

- *Patient satisfaction - 84%*

Cheng et al. Br J Oral Maxillofac Surg 98; 36:261-63.

- *Patient satisfaction - 92%*

Zhou et al. Int J Adult Orthod Orthognath Surg 2001;16(2):99-107.

History

- Von Langenback had performed the first orthognathic surgery.
- Hullihen 1849 performed an anterior subapical osteotomy.
- David Cheever 1867 – maxillary osteotomy for the treatment of complete nasal obstruction.
- V. Blair 1897 – *St. louis operation*
- Cohn-Stock 1921 introduced the anterior maxillary osteotomy.
- Wassmund 1927 introduced his Lefort I or total maxillary osteotomy.

- Axhausen 1934 used similar technique for healed maxillary fracture.
- Schuchardlt 1959 – posterior maxillary osteotomy to correct dentofacial deformities.
- Obwegesser 1965 suggested complete mobilization of maxilla, so that repositioning could be accomplished without tension.

Basic Therapeutic goals

- **Function:** Normal mastication, speech, respiratory function
- **Esthetic:** Establish facial Harmony & balance.
- **Stability:** Avoid short & long term relapses.
- **Minimization of treatment time:** Provision of efficient and effective treatment
- Improve psychosocial impairment
- Correct inability to open or close the jaw

MAXILLARY OSTEOTOMY

LE FORT I OSTEOTOMY

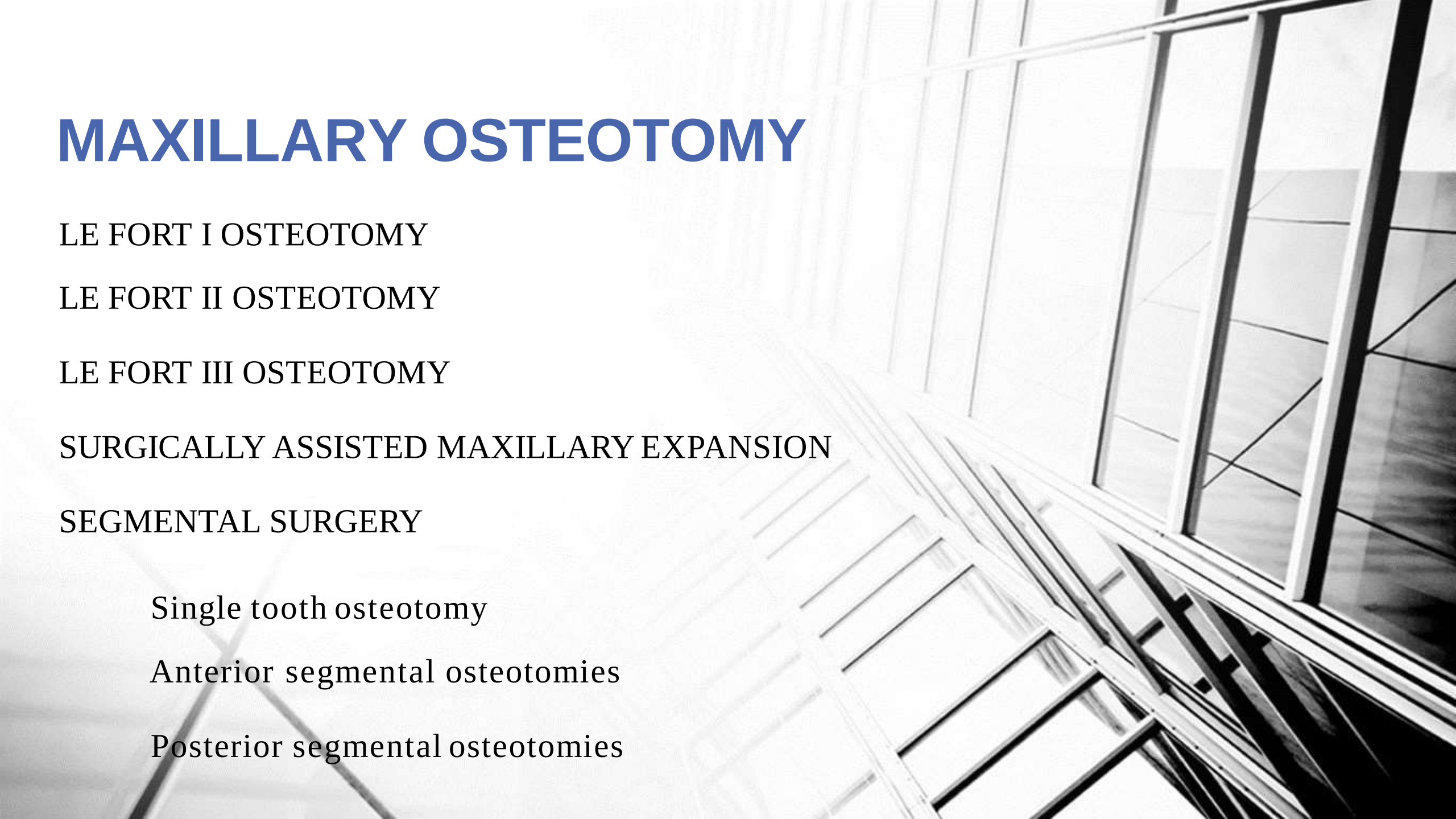
LE FORT II OSTEOTOMY

LE FORT III OSTEOTOMY

SURGICALLY ASSISTED MAXILLARY EXPANSION

SEGMENTAL SURGERY

- Single tooth osteotomy
- Anterior segmental osteotomies
- Posterior segmental osteotomies



LEFORT 1 OSTEOTOMY

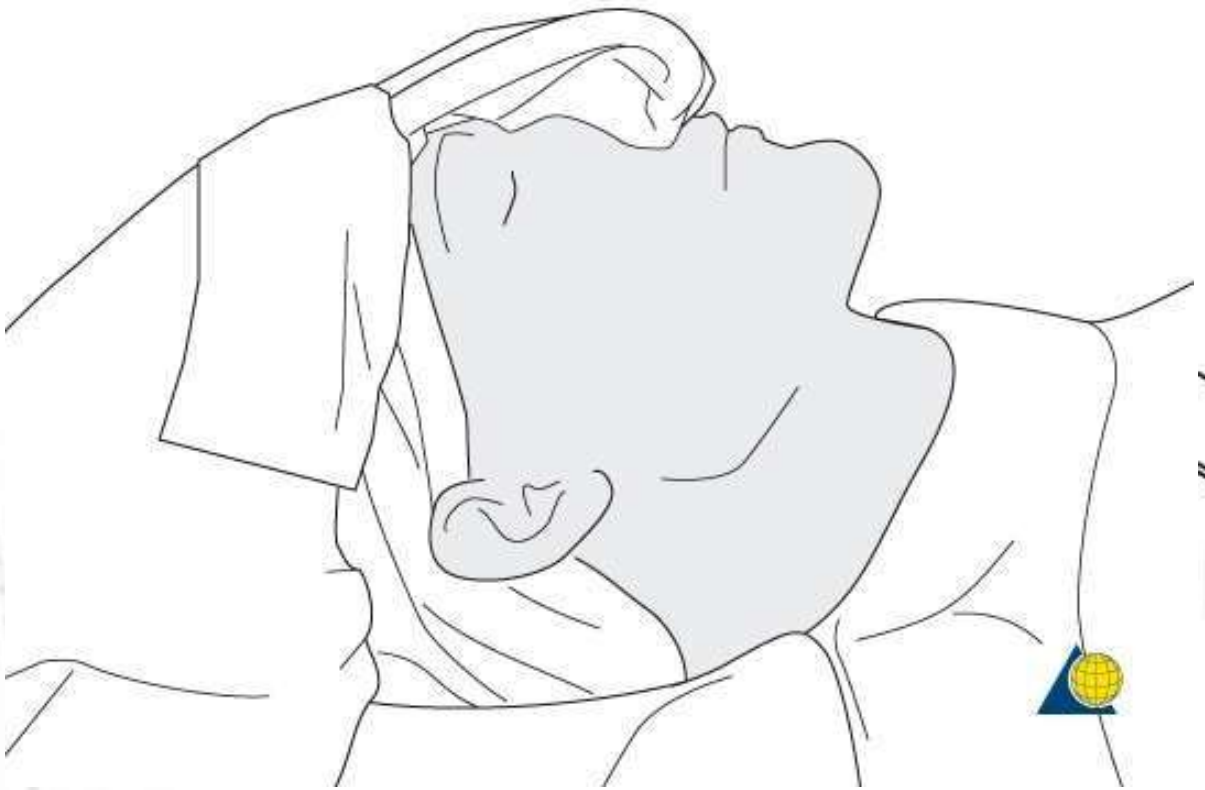
- Work horse of the orthognathic surgical procedures.
- Broad application to resolve many functional and aesthetic problems.

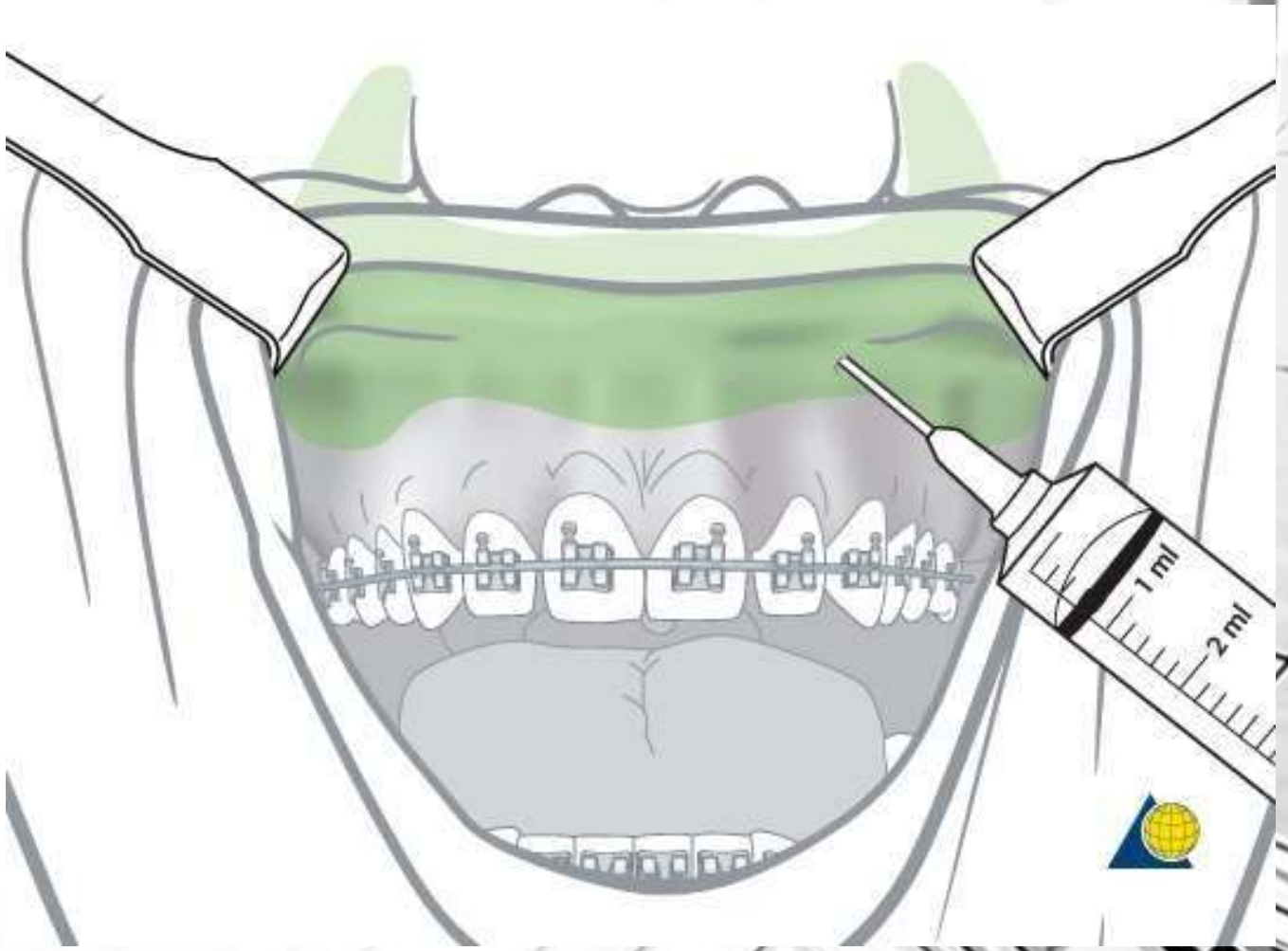
Biologic basis:

- Rich anastamosing vasculature of the face.
- Maxilla is clothed by wide soft tissue.
- Osteotomised segment should remain attached to soft tissue pedicle.

Indications:

- Vertical maxillary excess in bimax protrusion.
- Superior re positioning of the maxilla to correct vertical excess.
- To advance maxilla in cleft palate and post traumatic patients.
- To correct open bites when combined with mandibular procedures.
- Correction of cants.
- Advancement of the maxilla in class III patients.

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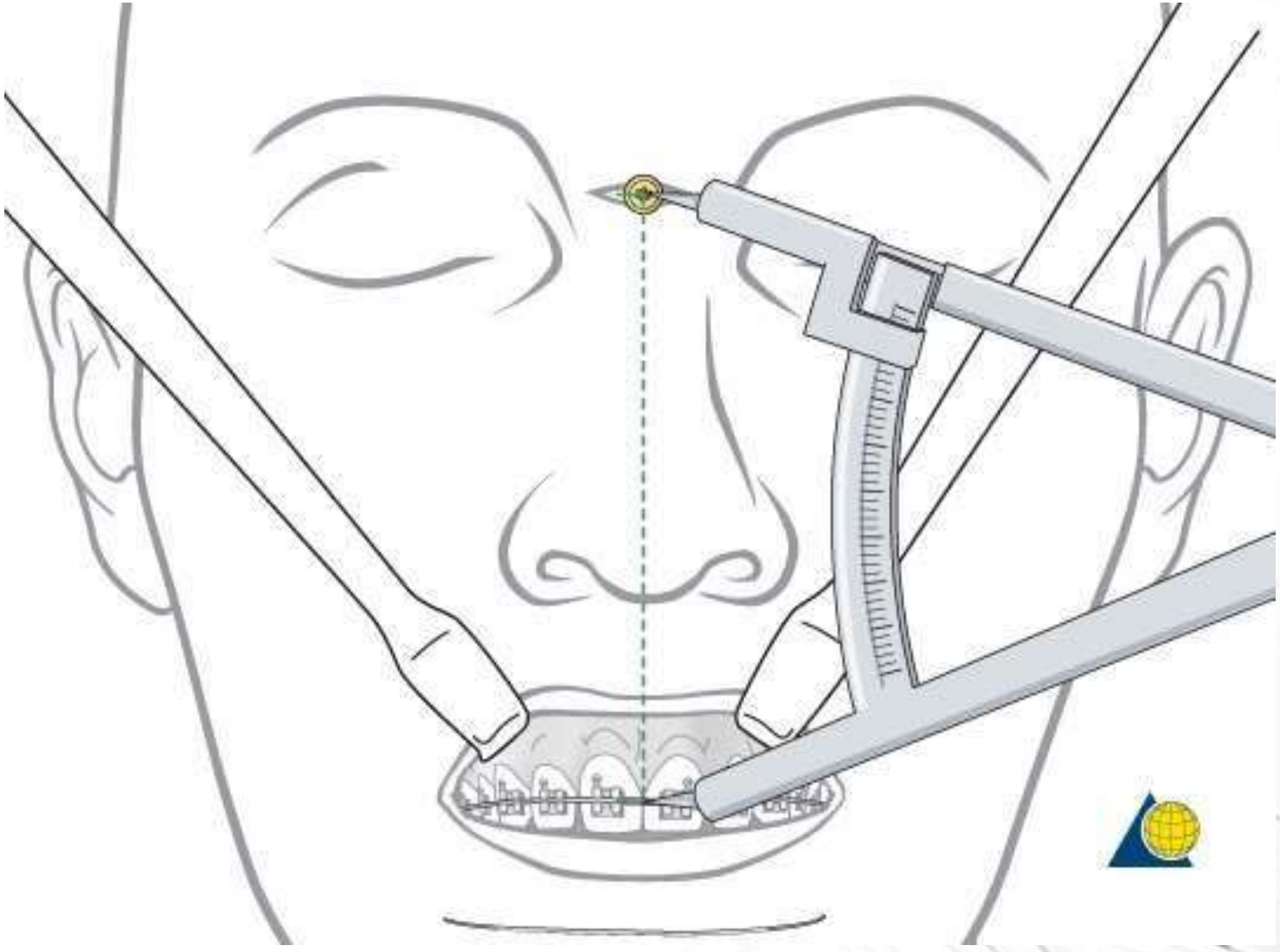
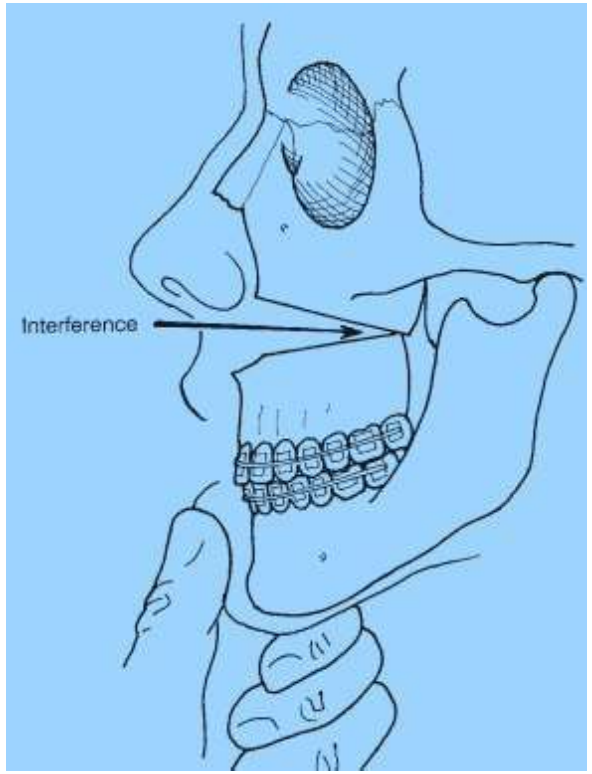
Vertical reference

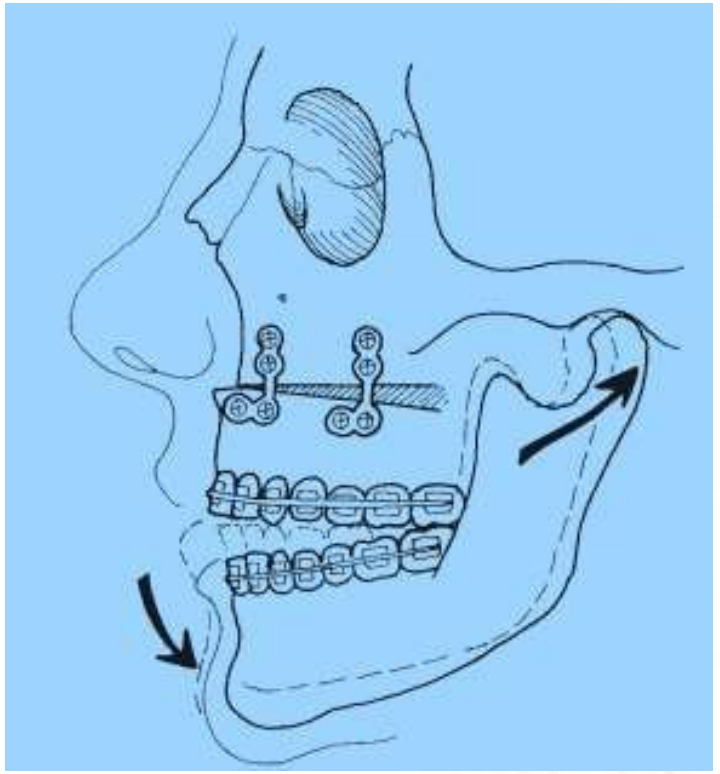
- Insertion of a 12-14 mm long screw with a cruciform head into a 6-8 mm hole drilled into the glabella.
- The distance between the middle of the cruciform head and the arch wire is measured with a caliper and recorded.
- All vertical changes are then measured against this reference distance.



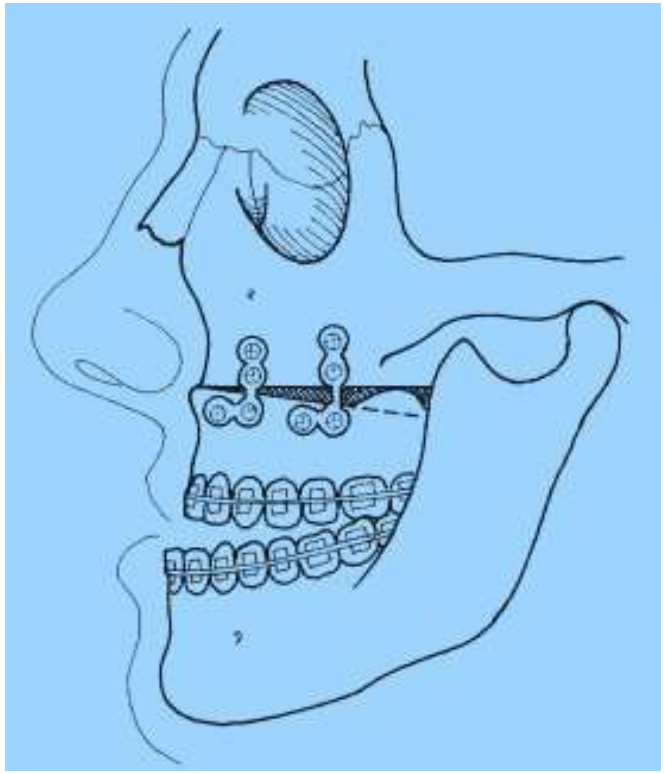
Causes of failure



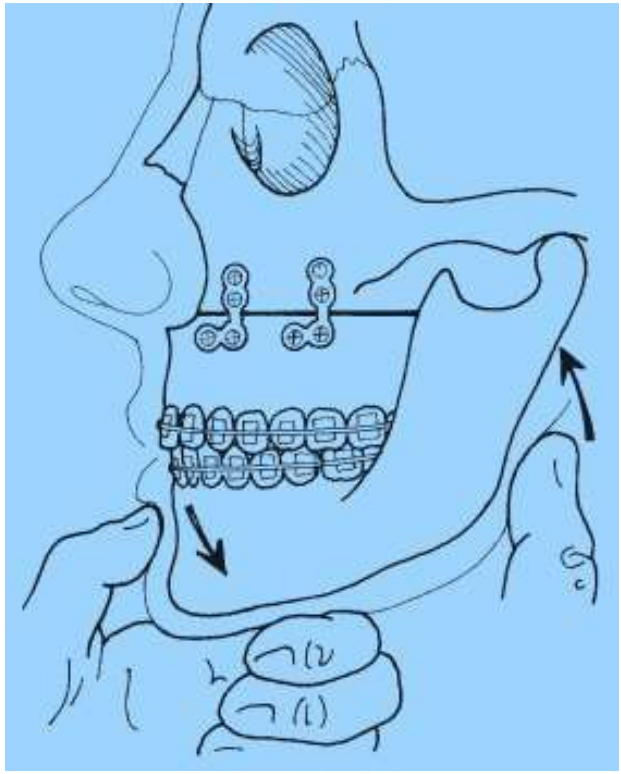
Mobilized maxilla in maxillomandibular fixation with manual manipulation demonstrating posterior **bony interferences** preventing desired positioning



Inadequate seating with maxilla placed too forward despite proper bone trimming because of **improper condylar positioning during fixation,** with immediate relapse following appropriate condylar seating (Condylar sag)



Incomplete posterior bone trimming with unsatisfactory maxillary positoning and resultant posterior **occlusal premature contacts.**



Appropriately positioned maxilla through proper bone trimming and bimanual mandibular positioning with downward and posterior pressure on chin and upward forward pressure on the ramus

Le Fort II Osteotomy

Described by **henderson and jackson(1973)**

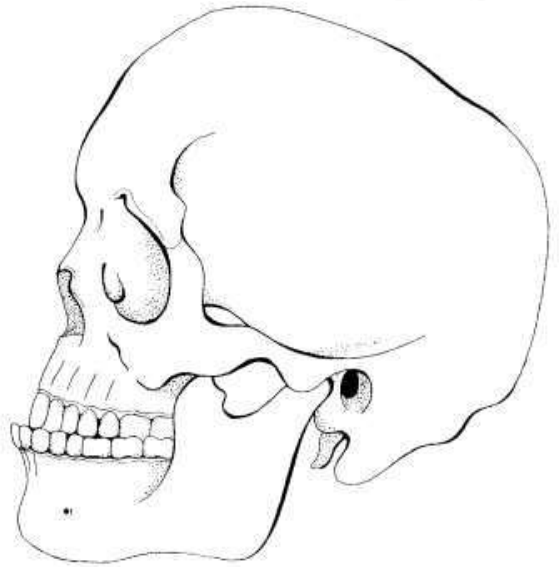
Allows the central midface to be moved anteriorly (or inferiorly) with the maxillary dental arch

If midface hypoplasia affecting lateral part of the central midface – advancement of infraorbital margins.

INDICATIONS

- Patient with:
  - Short nose
  - Nasomaxillary retrusion
  - Skeletal class III occlusion
- Posttraumatic defects
- Maxillonasal dysplasia in which a class I occlusion exists (Binders'syndrome)
- Secondary correction of cleft deformity

Midface deformity



Exposure is gained through

- **Bicoronal incision:** more extensive procedure, possibly entailing medial canthal disruption
- **Bilateral Paranasal (inner canthus) skin incision:** results in potentially visible external scar.
- **Intraoral access** was also described for Le Fort II osteotomy.

Paranasal access incision

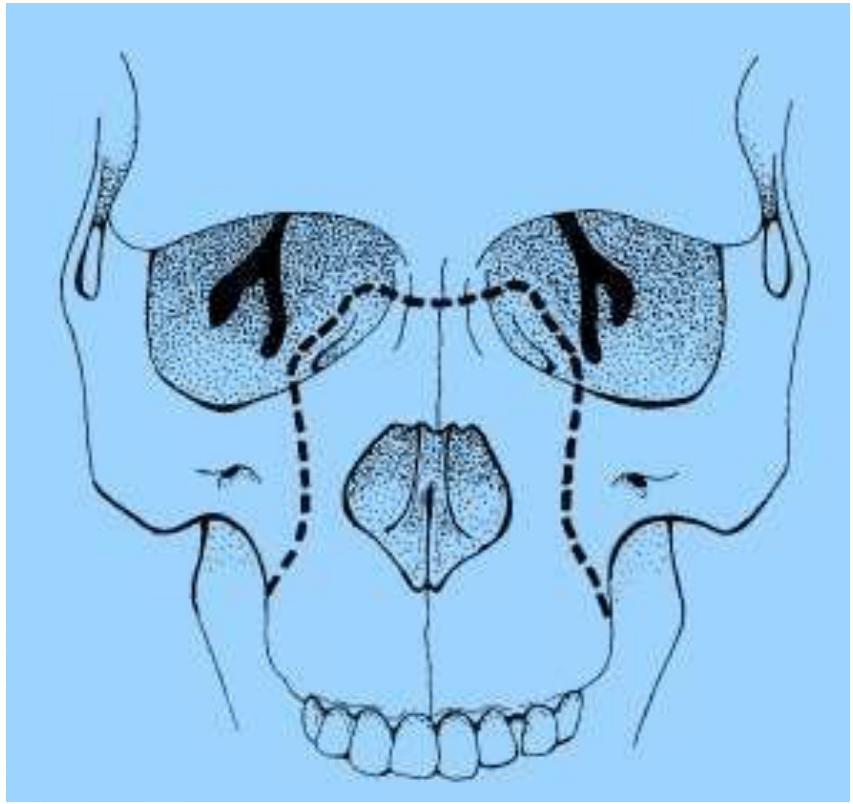
Dorsal nasal access incisions

- **Exposure of the nasofrontal region**
- **Exposure of** :
  - Medial orbital floor
  - Infraorbital rim
  - Medial orbital wall
  - Lacrimal sac
- **Elevation of the nasal periosteum** with a fine Obwegeser periosteal elevator
- **Horizontal glabella osteotomy** : below the level of the frontonasal suture
- **Osteotomy extended**:

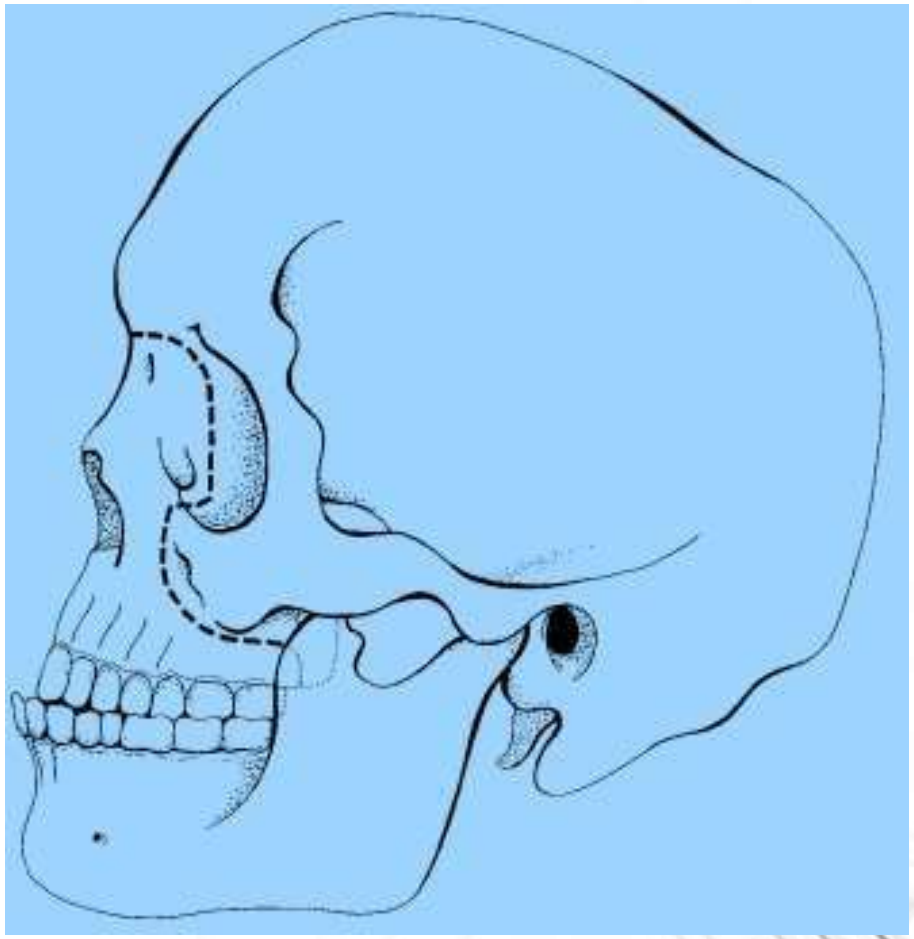
- Orbital rim osteotomy continued downwards and posteriorly
- Medial wall osteotomy sparing the lacrimal sac

  - Anteriorly: detachment of the anterior and superior arms of the medial canthal tendon,
  - Posteriorly into the ethmoid bone and inferiorly behind the lacrimal sac by detachment of the complete medial canthal area

OSTEOTOMY



Le Fort II osteotomy cuts

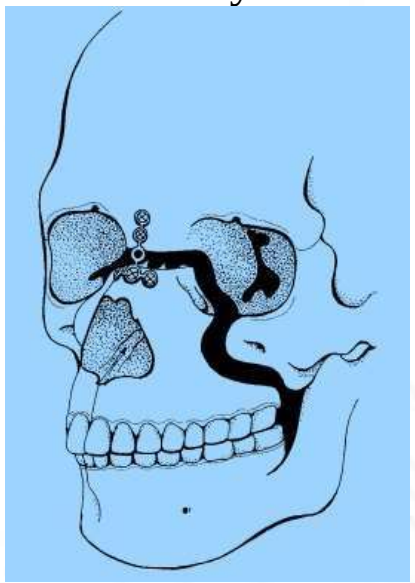


- Extended through the infraorbital margin between the nasolacrimal duct and the infraorbital nerve
- Completion of the cut through the infraorbital rim toward the anterior maxillary wall
- **Intraoral incisions**: osteotomy extended around and inferior to the zygomatic buttress and posteroinferiorly toward the pterygoid plates
- **If marked deficiency in infraorbital region**: osteotomy extended laterally along the orbital floor
- **In pterygomaxillary region:** disjunction between tuberosity and pterygoid plates with curved osteotome

- **Nasal septum and vomer**: divided via the nasofrontal osteotomy using a curved Tessier chisel directed downward and backward
- **Mobilization of the maxilla**: with maxillary mobilization forceps, Smith spreader & Tessier mobilizers
- **Intermaxillary fixation**
- **Bone grafting:**
  - **If paranasal access incisions used:** iliac crest graft
  - **If coronal incision used:** calvarial graft

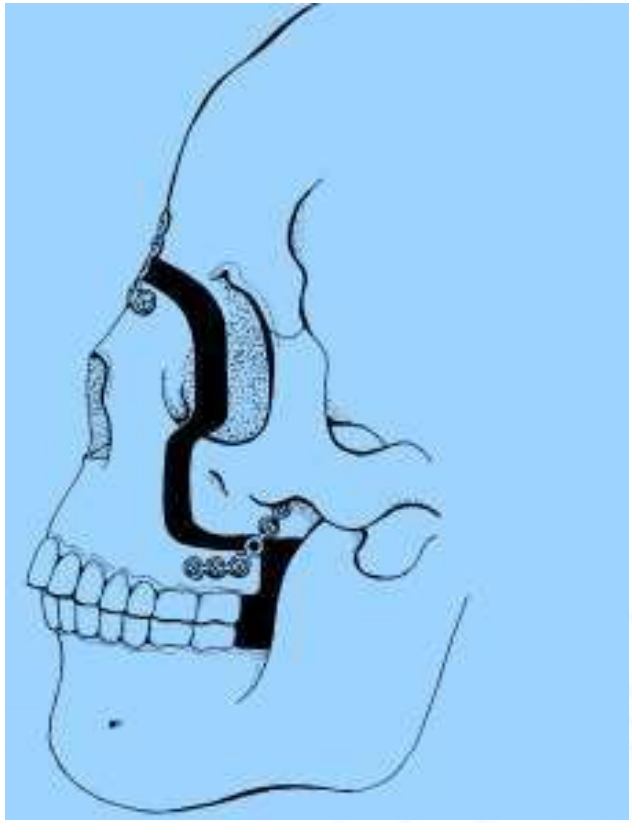
FIXATION

- **In the nasofrontal region**
  - H- shaped 1.5-mm titanium miniplate
  - Inverted T-shaped 1.5-mm titanium miniplate
  - two short, straight 1.5-mm plates extending from the glabella onto the lateral aspect of the nasal complex bilaterally
  - 6mm screws



Fixation at frontonasal osteotomy

- **In maxillary buttress region**:
  - Long L-shaped 2-0 titanium plate and 6-mm screws
  - Calvarial graft can be secured with lag screws



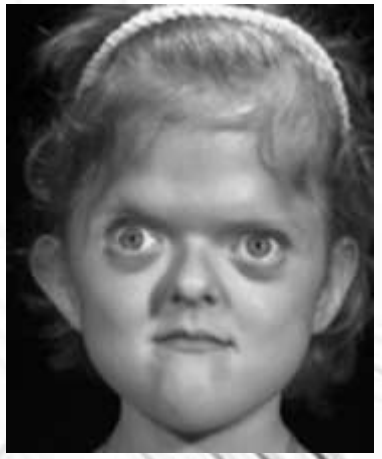
Fixation at posterior maxilla

LE FORT III ADVANCEMENT OSTEOTOMY

- Proposed by **Gillies and Harrison (1950-51)**
- Used for the correction of total midface hypoplasia affecting the maxilla and zygomatic complexes **Tessier** : bony separation of the complete facial skeleton from the skull base
- **Modifications:** Isolated advancement of the nasozygomatic and zygomaticomaxillary components of the midface

INDICATION

- In patients with:
  - Retrusion of the nose, maxilla, and ZMCs
  - Shortened nose
  - Skeletal class III occlusion
- For correction of true retrusion of the complete facial skeleton, that is, the nasal complex, the zygomatic maxillary complexes, and the maxilla
- Posttraumatic deformity
- Midface hypoplasia
- Craniosynostoses, that is, the Crouzon, Apert, and Pfeiffer syndromes



Surgical approach

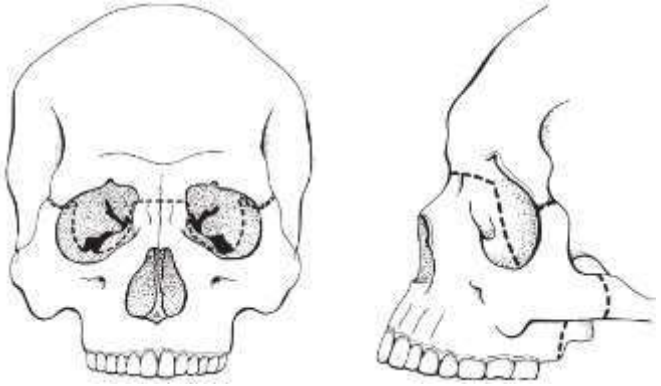
- Subcranial (extracranial) approach
- Transcranial procedure: when a major correction of the upper facial skeleton or hypertelorism is required
- The classical Le Fort III type procedure was originally described via a series of small incisions in the facial soft tissues:
  - The medial canthal region
  - The lateral orbital region
  - The lower eyelid incision
  - Intraoral vestibular incision
- The coronal incision
- Intraoral sulcular incisions bilaterally

- Nasoendotracheal intubation and hypotensive anaesthesia
- **Coronal incision**: made through the pericranium 2 to 3 cm above the supraorbital ridge
- Exposure of :
  - Nasal bones
  - Medial canthal tendons
  - Superior aspect of the lacrimal fossa
  - Lateral orbital rims
  - Inferior orbital margins
- Circumferential **dissection around the orbit** - mobilization of the periorbita - osteotomy cuts located approximately 10 mm inside the orbital margin
- Division of the temporal fascia and reflection of the temporalis muscle – **exposure of zygomatic arch** and temporal fossa

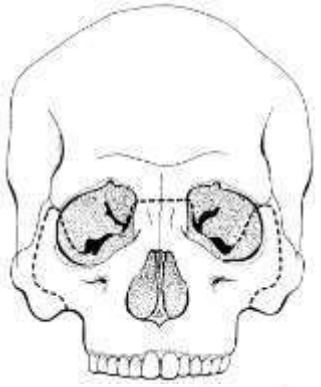
- Medial & lateral canthal tendon detached with the periorbital dissection - marked for subsequent reattachment – otherwise canthal drift seen
- Osteotomy:
  - Horizontal cut made inferior to the frontonasal suture
  - Extended posteriorly into the orbit behind the nasolacrimal duct
  - Extended inferiorly and laterally toward the region of the infraorbital nerve
  - Orbital floor osteotomy directed laterally toward the inferior orbital fissure

Osteotomy through the zygomatic complex:

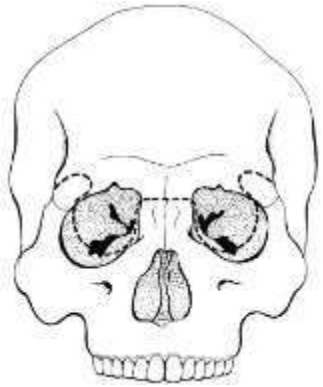
- Total advancement of the zygomatic complex
- Sagittal splitting of the zygomatic complex or
- Total advancement with frontozygomatic extension



Le Fort III osteotomy cuts for total advancement of zygomatic complex

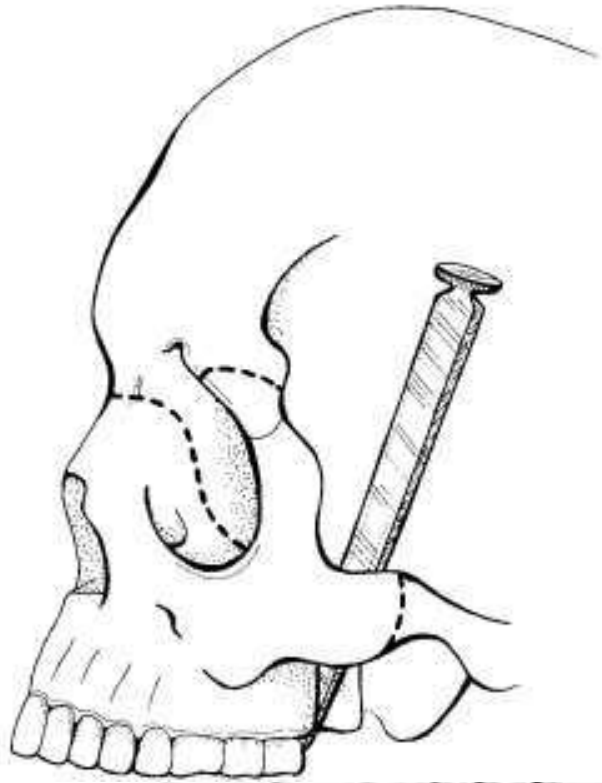


Le Fort III osteotomy cuts with sagittal splitting of the zygomatic complex



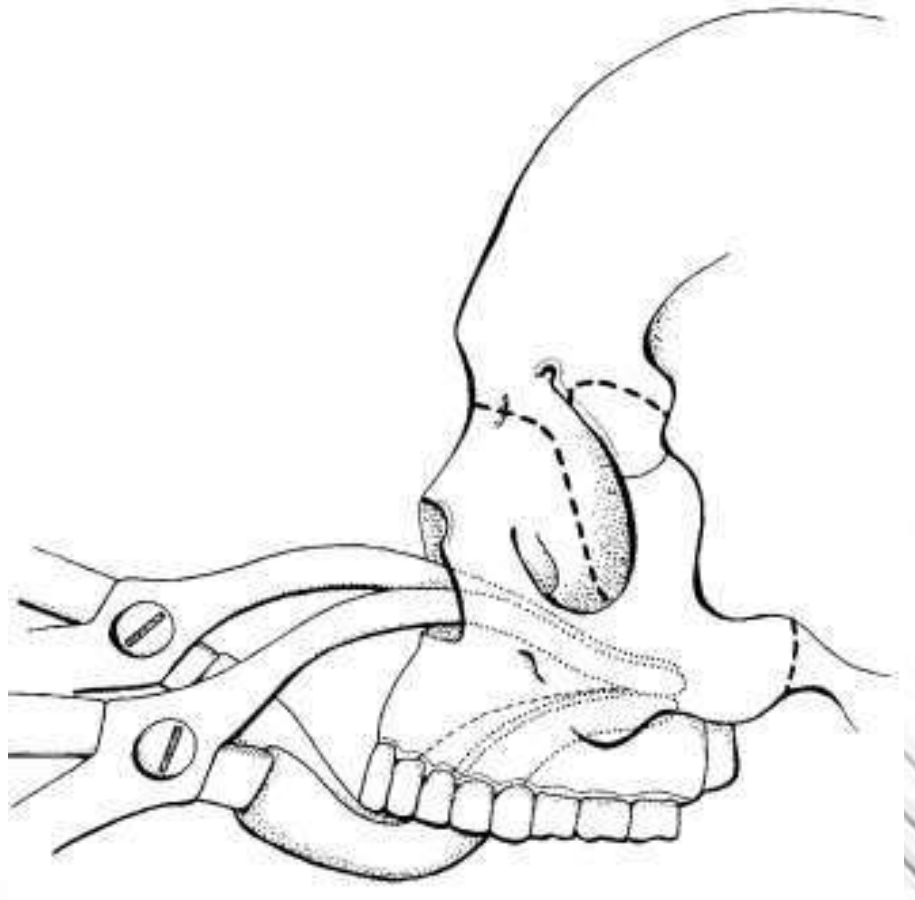
Le Fort III osteotomy cuts to include zygomaticofrontal advancement

- Through the lateral margin of the orbit and then inferiorly through the middle of the bony lateral orbital wall
- Extended back into the pterygopalatine fissure
- **Inside the orbit**: cut extended inferiorly toward the inferior orbital fissure & the medial & lateral cuts joined using a fine osteotome
- **Pterygomaxillary dysjunction**: by curved osteotome

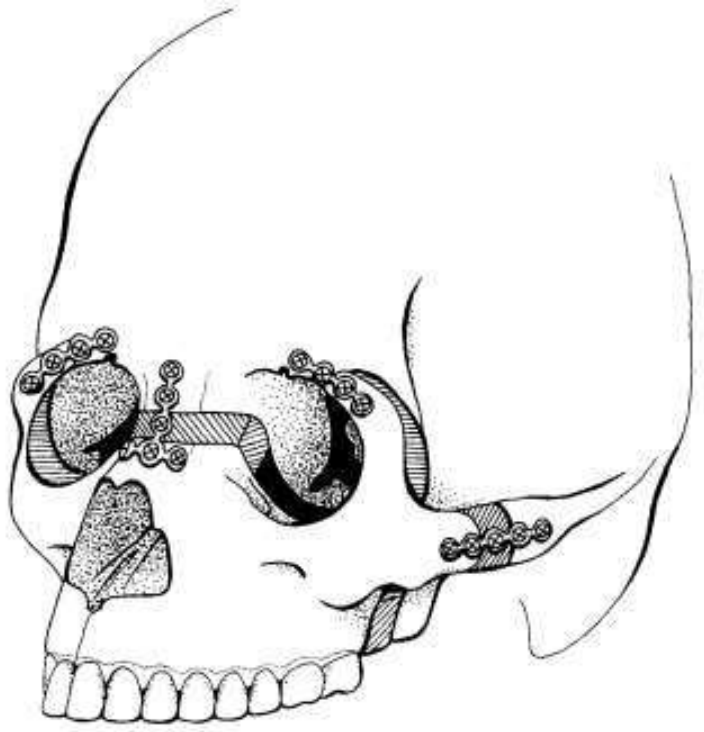


Use of osteotome to divide pterygoid region via coronal incision

- Division of nasal septum & vomer
- Mobilization of maxilla: with maxillary disimpaction forceps



- IMF
- Bone graft:
  - From parietal skull in split thickness / iliac crest
  - Inserted into the nasofrontal, lateral orbital rim, and pterygomaxillary region
  - In floor of orbit: calvarial graft
- Fixation
  - In nasofrontal region, lateral orbital rims, and zygomatic arches
  - In nasofrontal region: H- or inverted T-shaped plate
  - Lateral orbital wall: orbital plate
  - Zygomatic arch: straight plate
  - If needed, Buttress region: L plate



Modifications of Le Fort III

- **Simultaneous Le Fort I Osteotomy**
- **Advantages** – option to correct unequal maxillary hypoplasia
- Possibility of rotational movements

Surgically Assisted Maxillary Expansion

- Assists to correct deformities in transverse dimension.
- First described by Angell in 1860
- This procedure is in essence combination of distraction osteogenisis and controlled soft tissue expansion.

Diagnosis and clinical evaluation:

- paranasal hallowing
- narrowed alar base
- deepening of nasolabial folds
- zygomatic difficiancy

Treatment options: based on skeletal maturity

- Slow dentoalveolar expansion
- Orthopedic rapid maxillary expansion
- SAME
- Segmental maxillary osteotomy

Advantages of SAME

- improved stability
- non extraction alignment of dentition
- elimination of negative space
- improved periodontal health and nasal respiration

S A M E :

Indications of S A M E :

- Skeletal maxillomandibular transverse discrepancy greater than 5mm
- Significant TMD asstd with a narrow maxilla and wide mandible
- Failed or orthodontic expansion
- Necessity for a large amount more than 7mm of expansion
- Extremely thin and delicate gingival tissues with buccal gingival recession
- Significant nasal stenosis

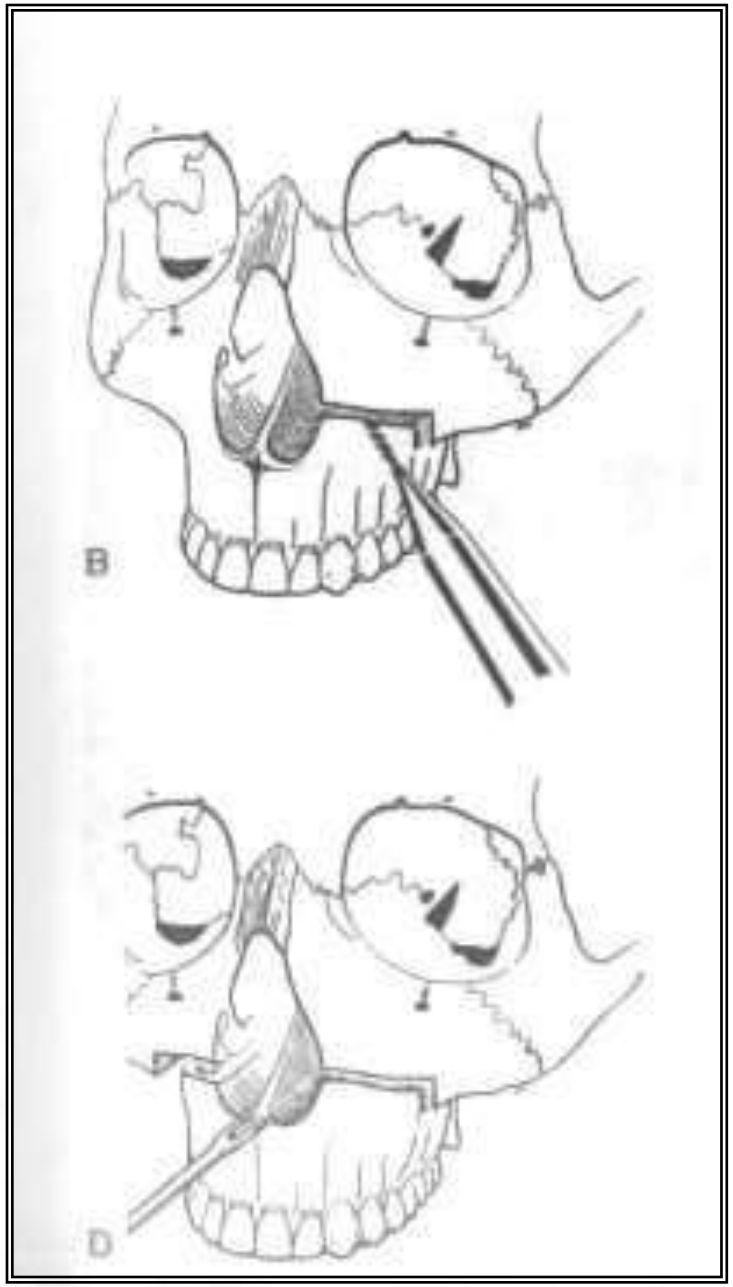
S A M E :

Technique of S A M E :

- Subtotal Le Fort 1 osteotomy
- Mandibular dentition should be decompensated
- Maxillary expansion appliance – preoperatively

Surgical technique :

- **B/L** maxillary osteotomy
- Release of nasal septum
- Midline palatal osteotomy
- Lateral nasal wall osteotomy
- B/L release of the pterygoid plates
- Activation of the appliance : 1-1.5 mm
- Soft tissue closure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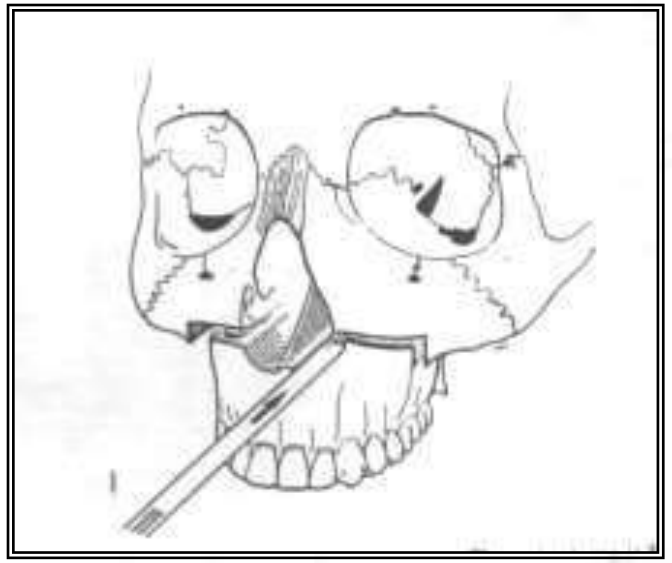

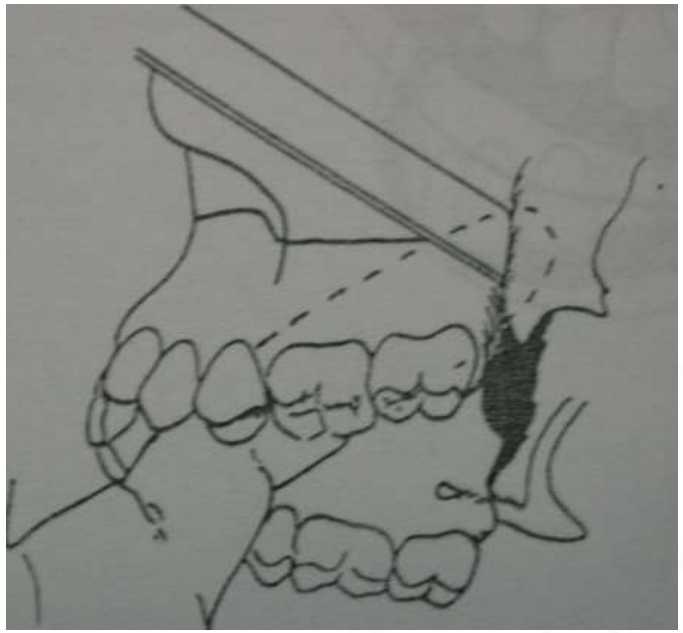

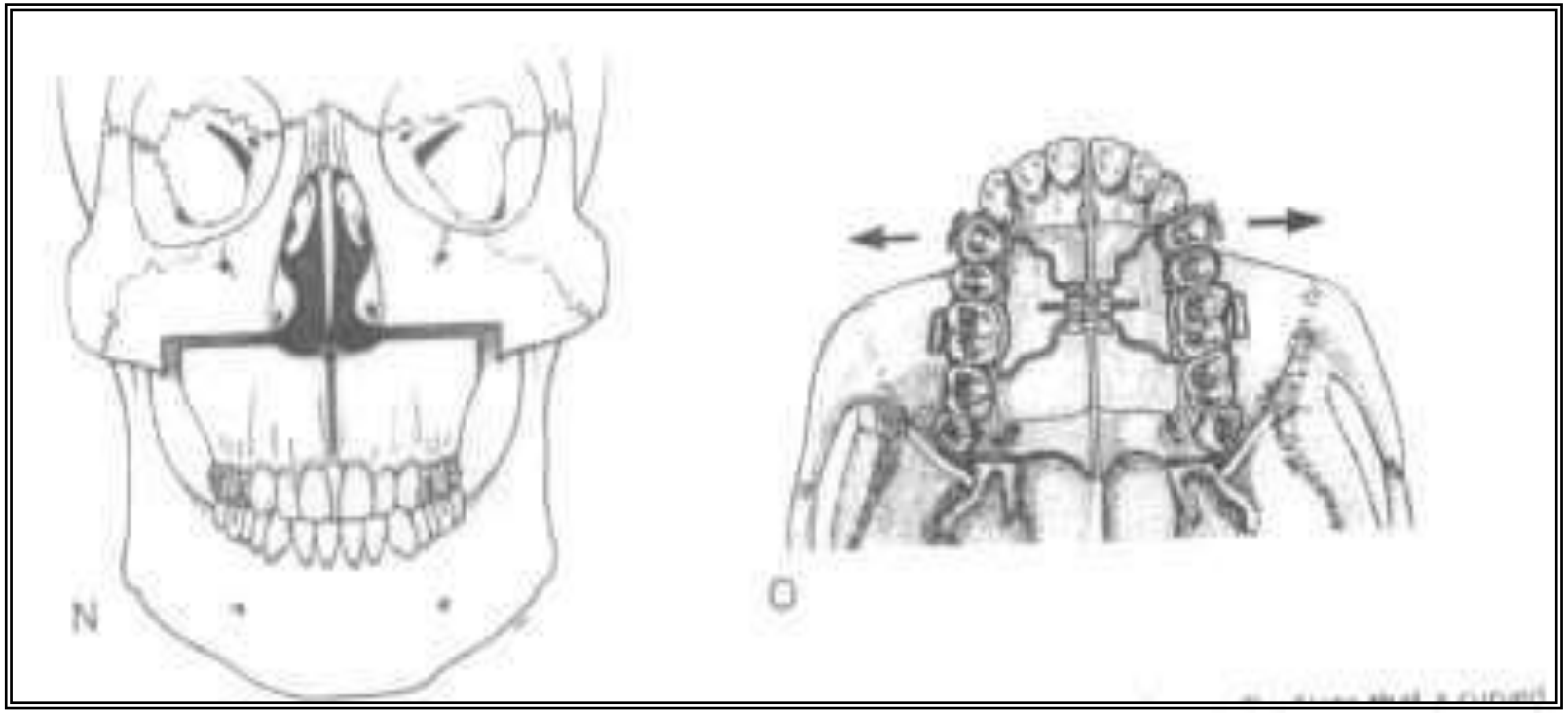
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- Maxilla should remain stationary for 5 days postoperatively.
- Pt should feel discomfort while activation.
- Expansion at a rate of 0.5 mm/day
- Over correction is not recommended.

<u>Retention:</u>

- 6 to 12 months after expansion

Complications:

Those due to inadequate surgery:

- pain
- dental tipping
- periodontal breakdown
- post orthodontic relapse

Those due to expansion

- lack of appliance expansion
- deformation of the appliance due to processing errors
- stripping or loosening of midpalatal screw

Complications of Maxillary Osteotomies :

- **Malpositioning**
- **Bleeding**
- **Perfusion deficiencies**
- **Periodontal defects**
- **Devitalized tooth**
- **Nerve injury**
- **Unfavorable fracture**
- **Nasolacrimal injuries**
- **Oronasal and oroantral fistulas**
- **Nasal septal deviation**
- **Maxillary sinusitis**
- **Unaesthetic soft tissue changes**
- **Non union**

Segmental Osteotomies

- *Single tooth osteotomy:*
- Indicated in tooth mal position.
- Dental ankylosis.
- closure of diastema.
- *Advantages:*
- Reduction in the treatment time.
- Lower incidence of relapse.
- *Disadvantages:*
- Injury to teeth
- Periodontal compromise
- Devitalization of teeth.

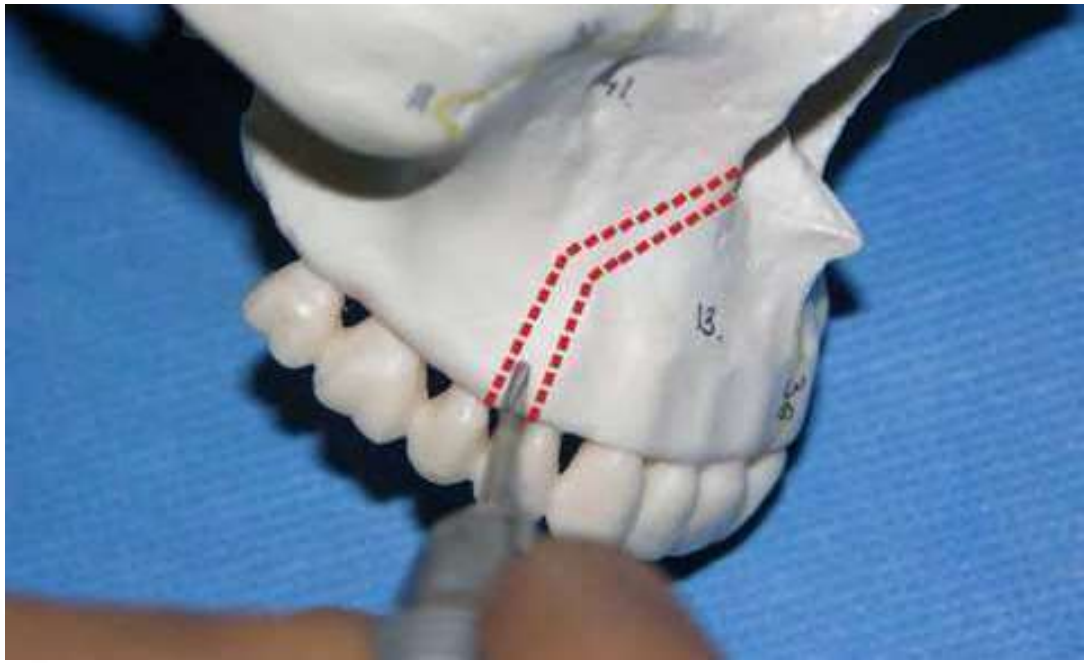
Anterior maxillary osteotomy

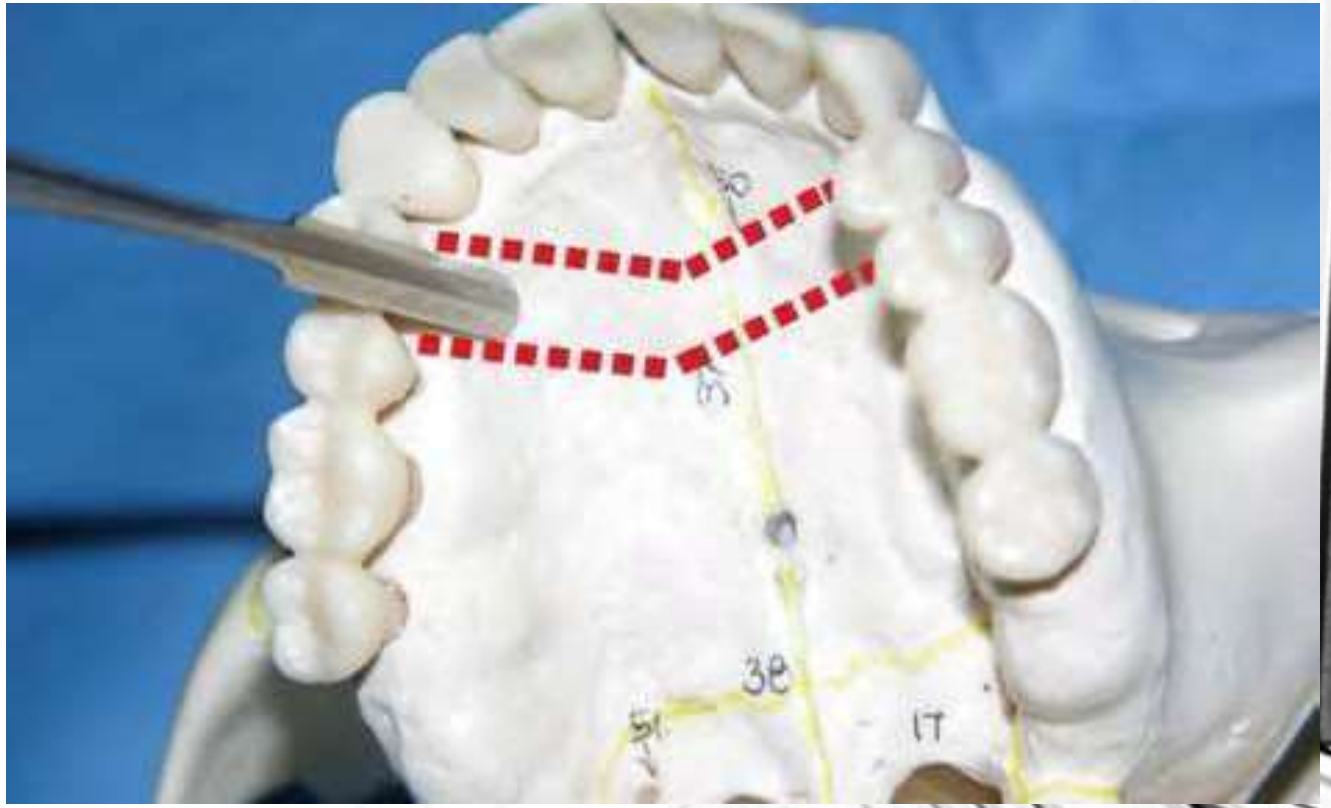
- Cohn Stock 1921- first report
- **Indications:**
- Bimaxillary protrusion
- Protruded maxillary teeth with normal inclination to alveolar bone.
- Anterior open bite.
- When orthodontic teeth movement not possible.
- To reduce the prominence of the upper lip.

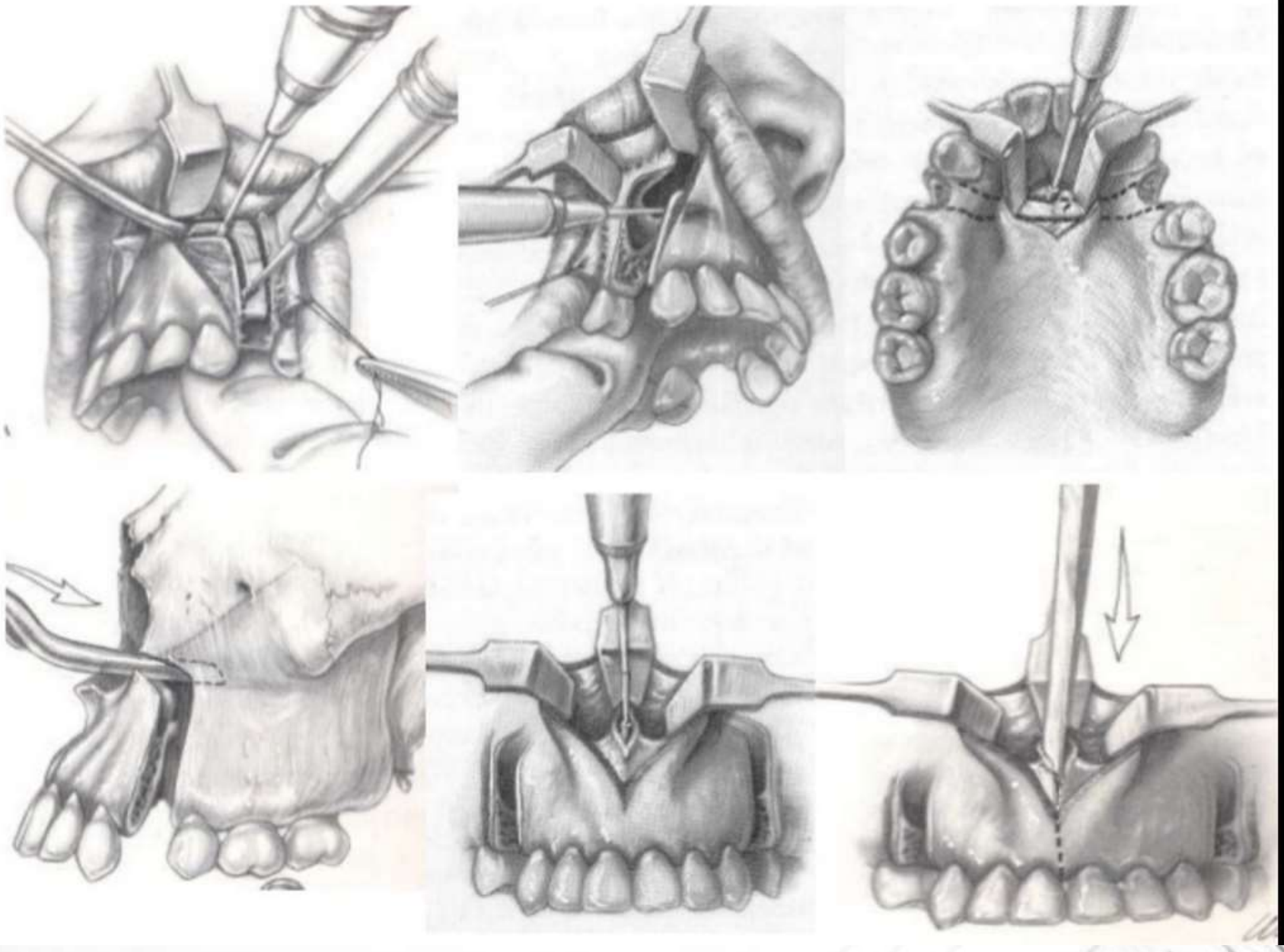
- ***Wunderer method:***
- Relies on intact buccal pedicle.
- Transpalatal incision combined with buccal verticle incision.

Modification:

- Midline vertical incision combined with buccal vertical incision.





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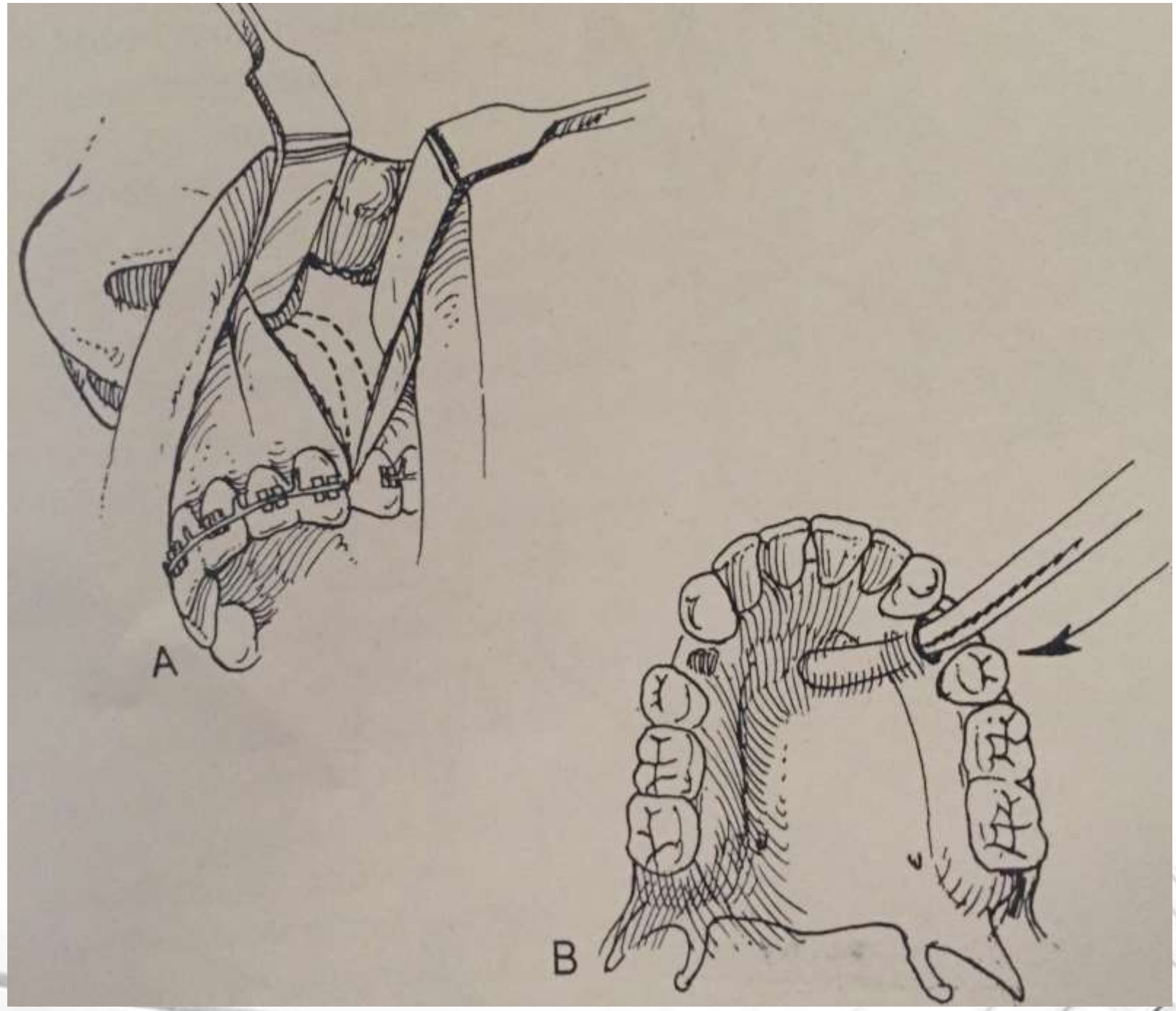
Wassmund technique;

- Preserves both buccal and palatal pedicle.
- Buccal as well as anterior vertical incision
- Tunneling between anterior and buccal incisions
- Trans palatal osteotomy through buccal vertical osteotomy.
- Occasional mid palatal sagittal incision.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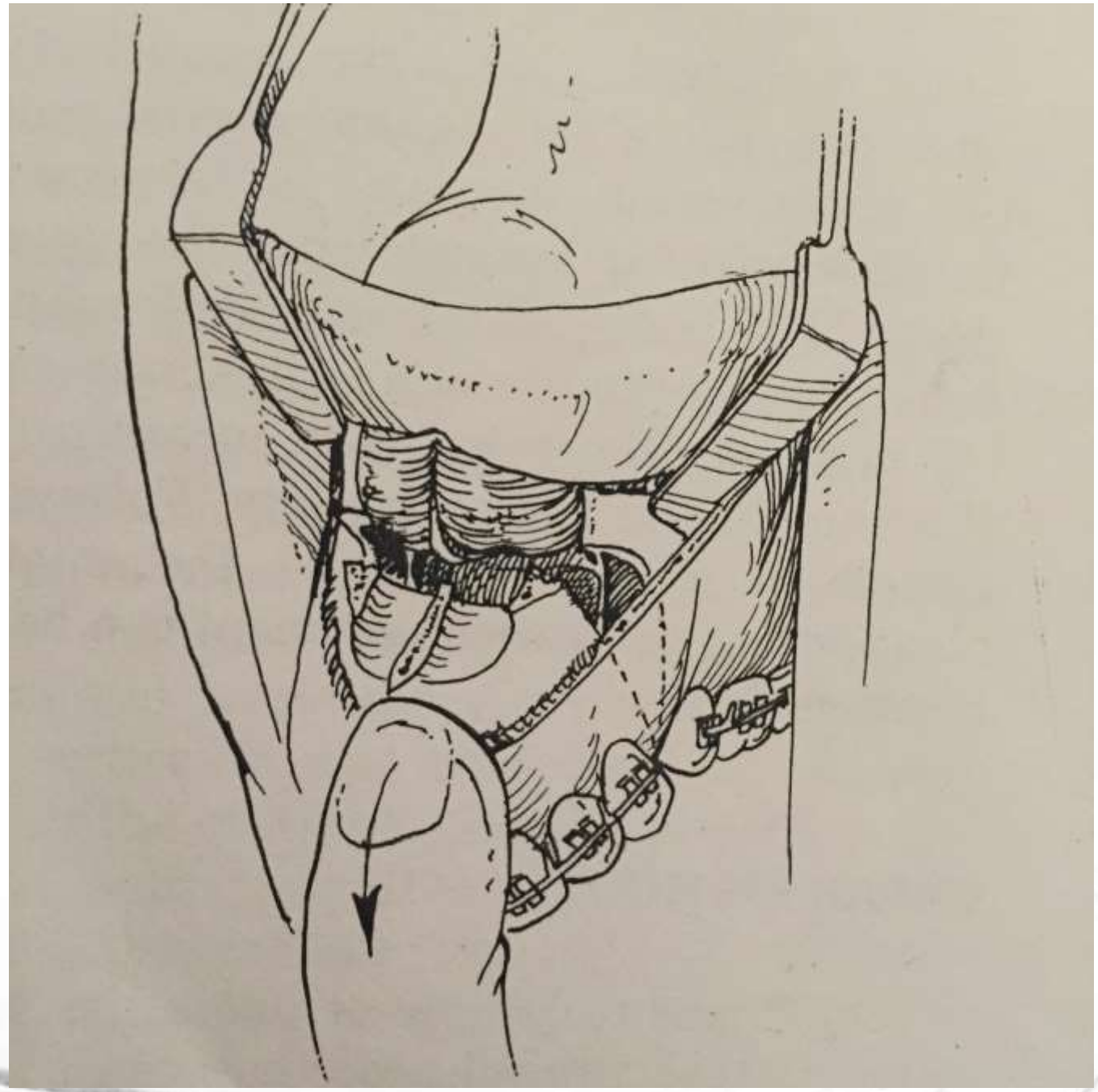
Cupar method:

- Buccal vestibular incision
- Nasal septum is firstreleased
- Horizontal osteotomy followed by vertical buccal osteotomy.
- Trans palatal osteotomy underdirect vision.

Advantages:

- Direct access to the nasal structures and superior maxilla
- Preservation of the palatal pedicle for good blood supply.
- Ease of placement of rigid fixation
- Ability to remove bone from palate.

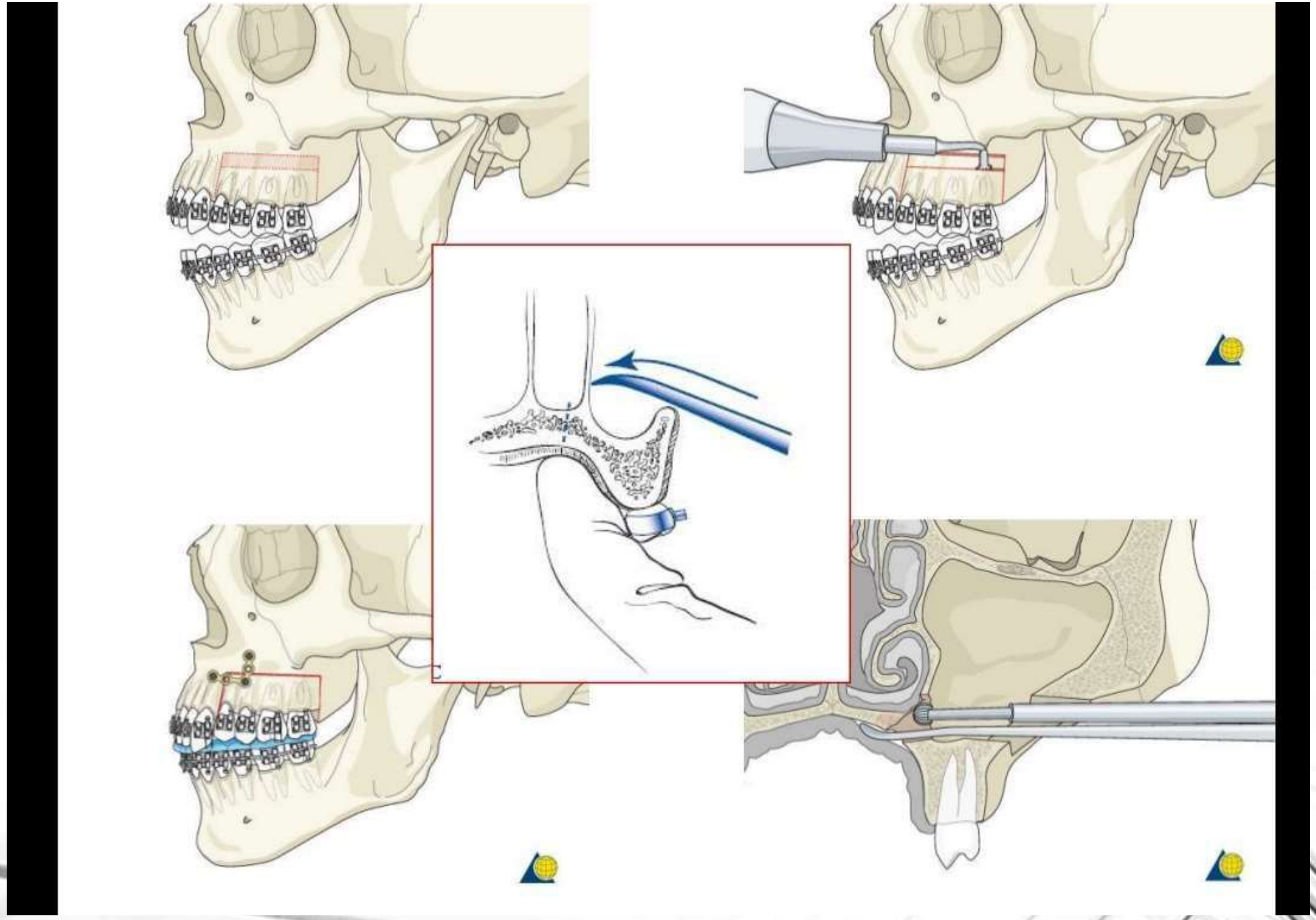


Posterior maxillary osteotomy

- Schuchardt 1959 first report
- **Indications:**
- Posterior maxillary hyperplasia.
- Distal repositioning of the posterior segment.
- Posterior open bite.
- Transverse excess or deficiency
- Spacing in the dentition.

Surgical technique:

- Buccal vestibular incision below the buttress.
- Palatal osteotomy through the buccal osteotomy site.
- Occasional palatal incision.
- Principles are same as for the total maxillary osteotomies.




THANK YOU

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