

Mandibular orthognathic procedures

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Introduction

- Orthognathic in Greek Orthos- straight ;
Gnathos- jaw
- Orthognathic surgery refers to surgical procedures designed to correct jaw deformities.
- Orthognathic surgery is an art and science of diagnosis, treatment planning, and execution of treatment by combining orthodontics and oral and maxillofacial surgery to correct musculoskeletal, dentoosseous, and soft tissue deformities

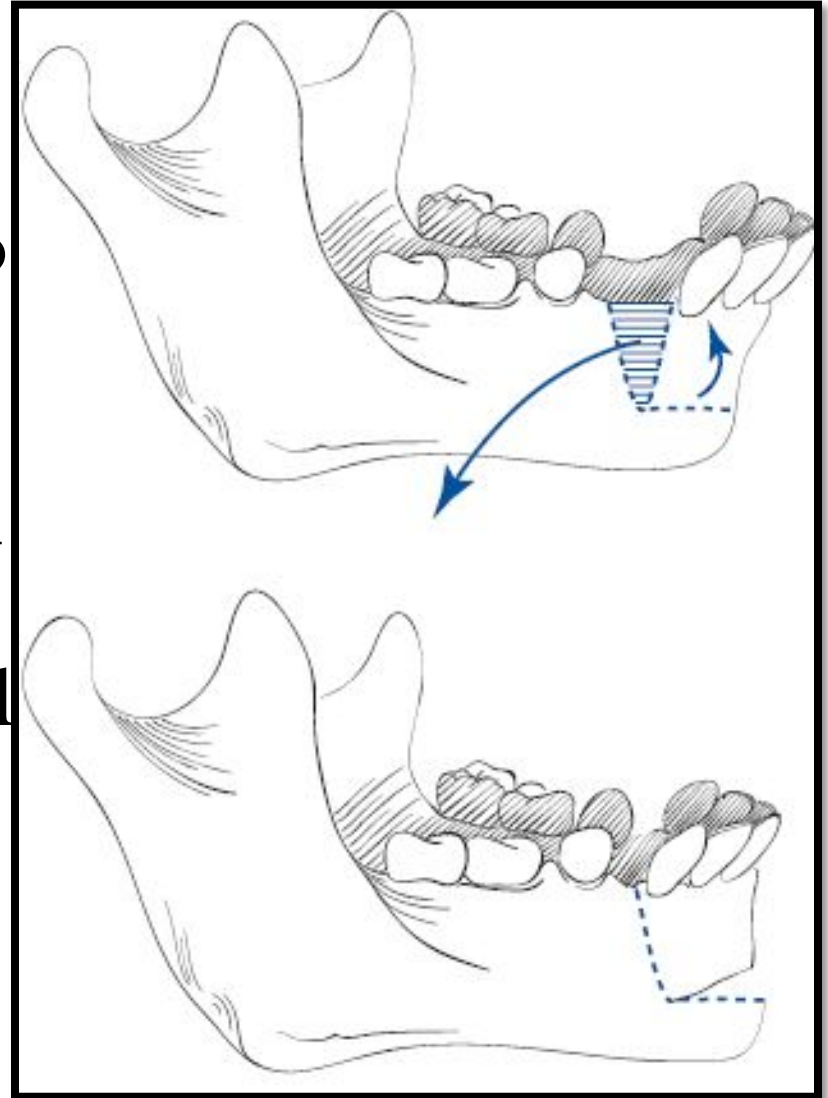
Basic Therapeutic Goals For Orthognathic Surgery

- To establish proper function (normal mastication, speech, respiratory function)
- To establish aesthetics (Establishment of facial harmony)
- Provide stability (Prevention of short and long term relapse)
- Minimizing of treatment time

- Orthognathic procedures are divided into three categories:
 1. Maxillary surgical procedures
 2. Mandibular procedures
 3. Bijaw surgery

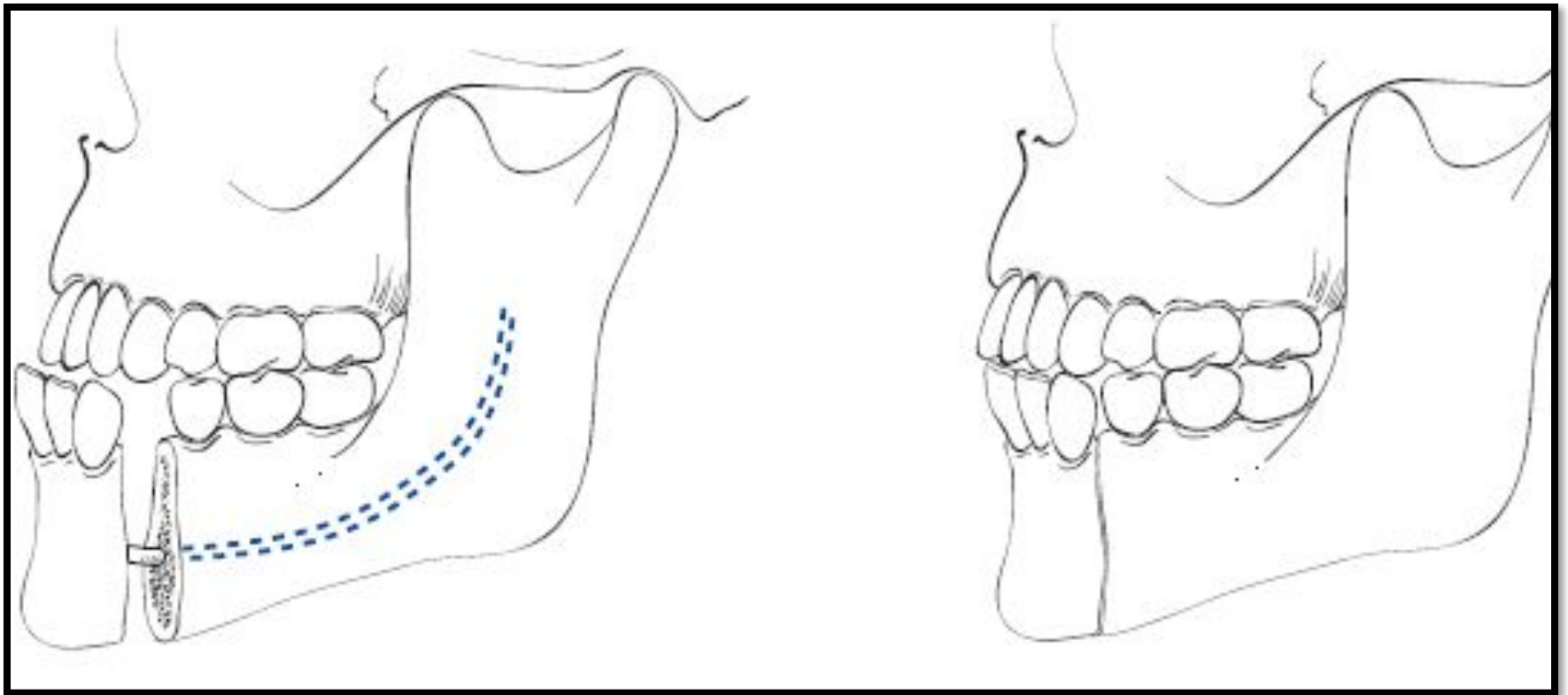
History

- **Hullihen -1849**
 - anterior subapical osteotomy in mandible
 - corrected a patient with anterior open bite and mandibular dentoalveolar protrusion with an intraoral osteotomy



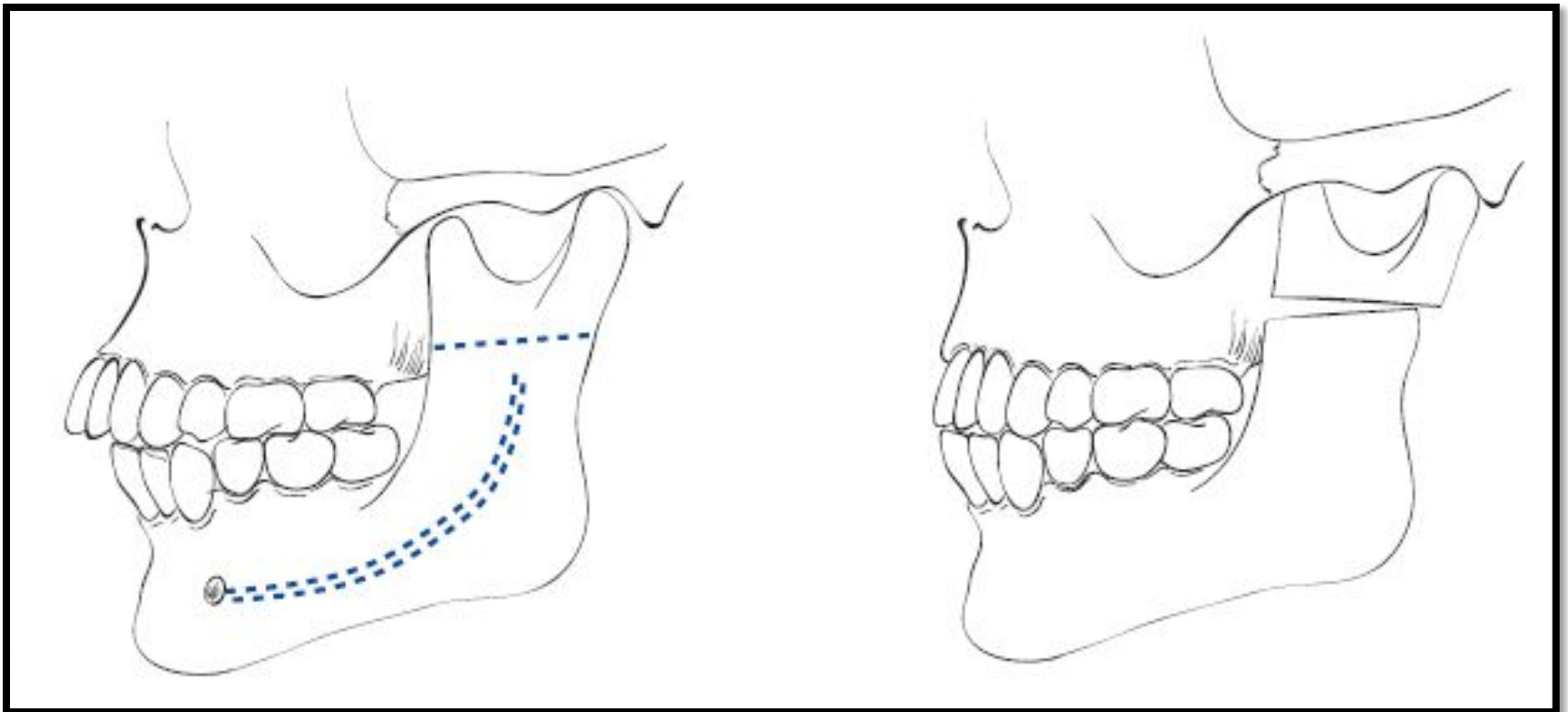
History

- 50 years later, **Angle** described a body osteotomy done by **V.P. Blair** for a patient with mandibular horizontal excess



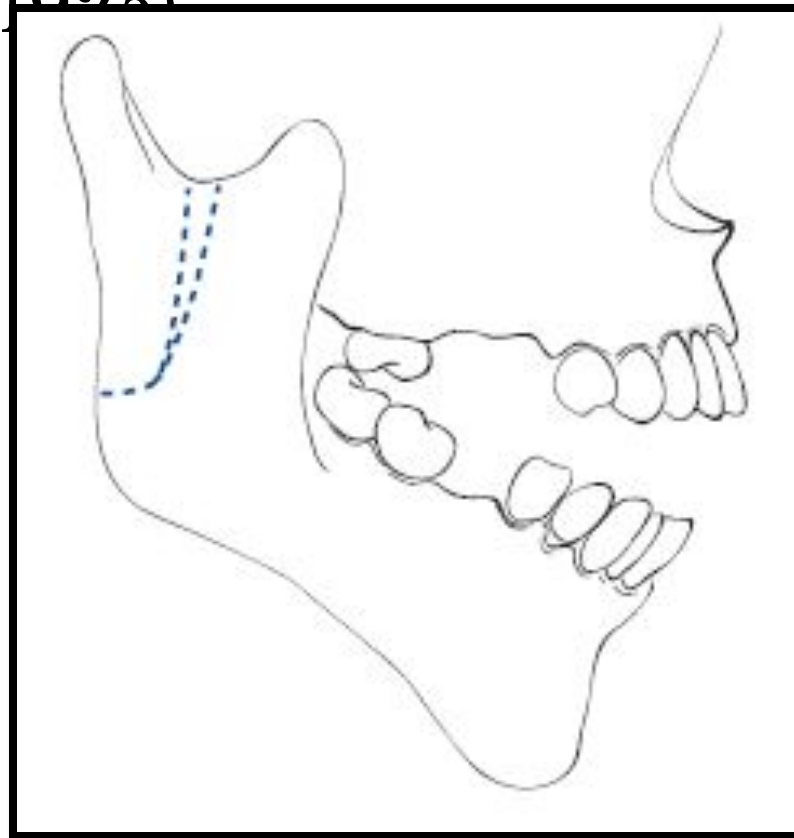
History

- **Blair's ramus osteotomy**, accomplished through E/O route in 1907



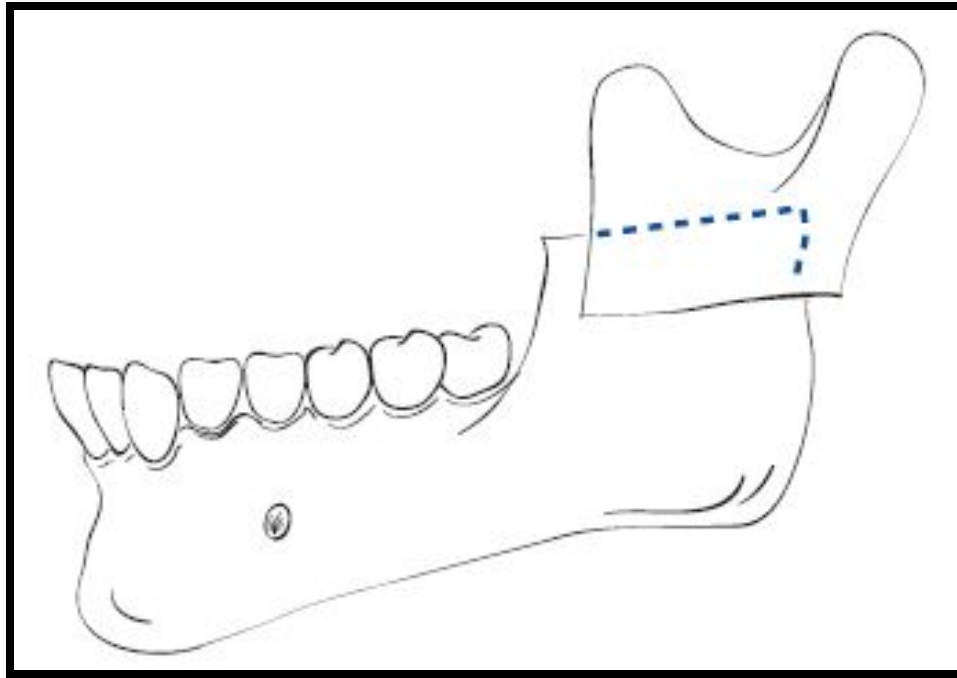
History

- **Limberg's** oblique osteotomy of ramus of mandible (subcondylar osteotomy by E/O app. In 1995)



History

- Lane's osteotomy, a form of the sagittal osteotomy with parallel horizontal bone cuts made through the medial & lateral cortices of vertical ramus (1937)



History

- **Caldwell and Letterman- 1954** – developed a vertical ramus osteotomy technique, which had the advantage of minimizing trauma to the inferior alveolar neurovascular bundle
- The greatest development in osteotomies of the vertical ramus is the sagittal split osteotomy credited to **obwegeser** in 1955.

Aim of mandibular osteotomies



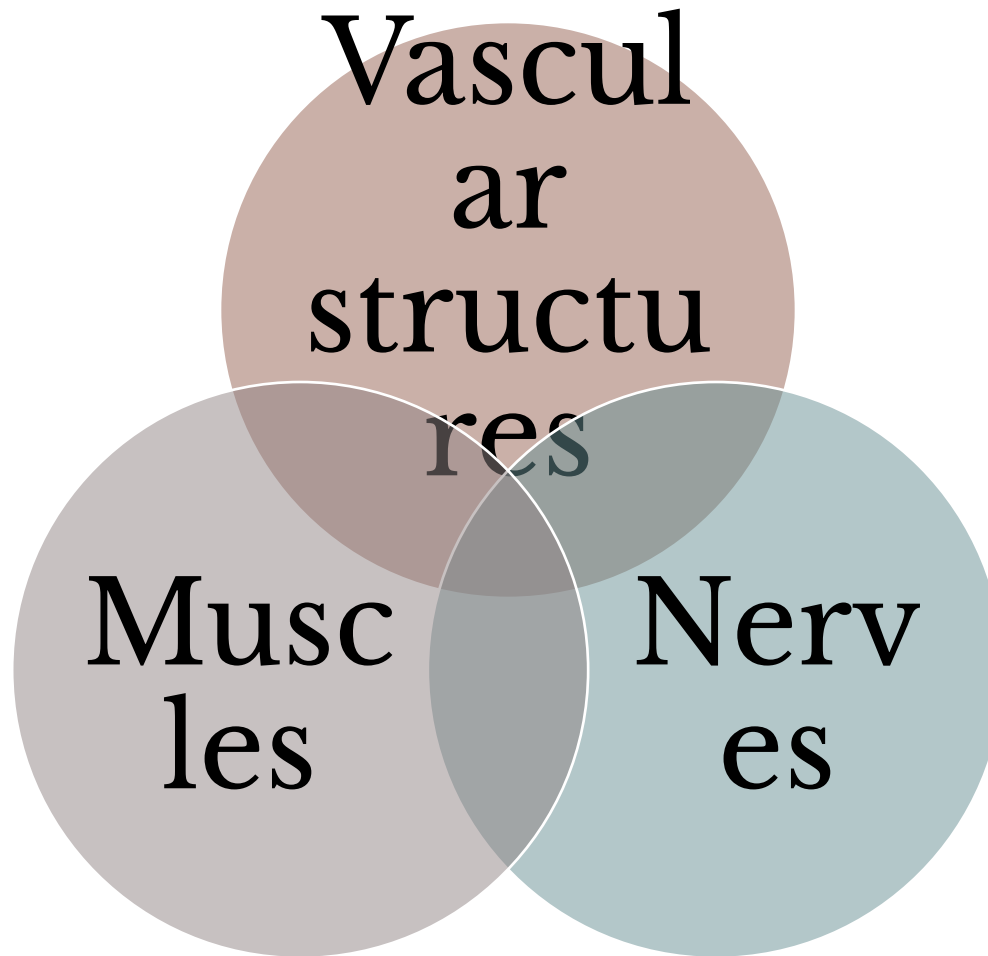
Aestheti
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Functio
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Stability

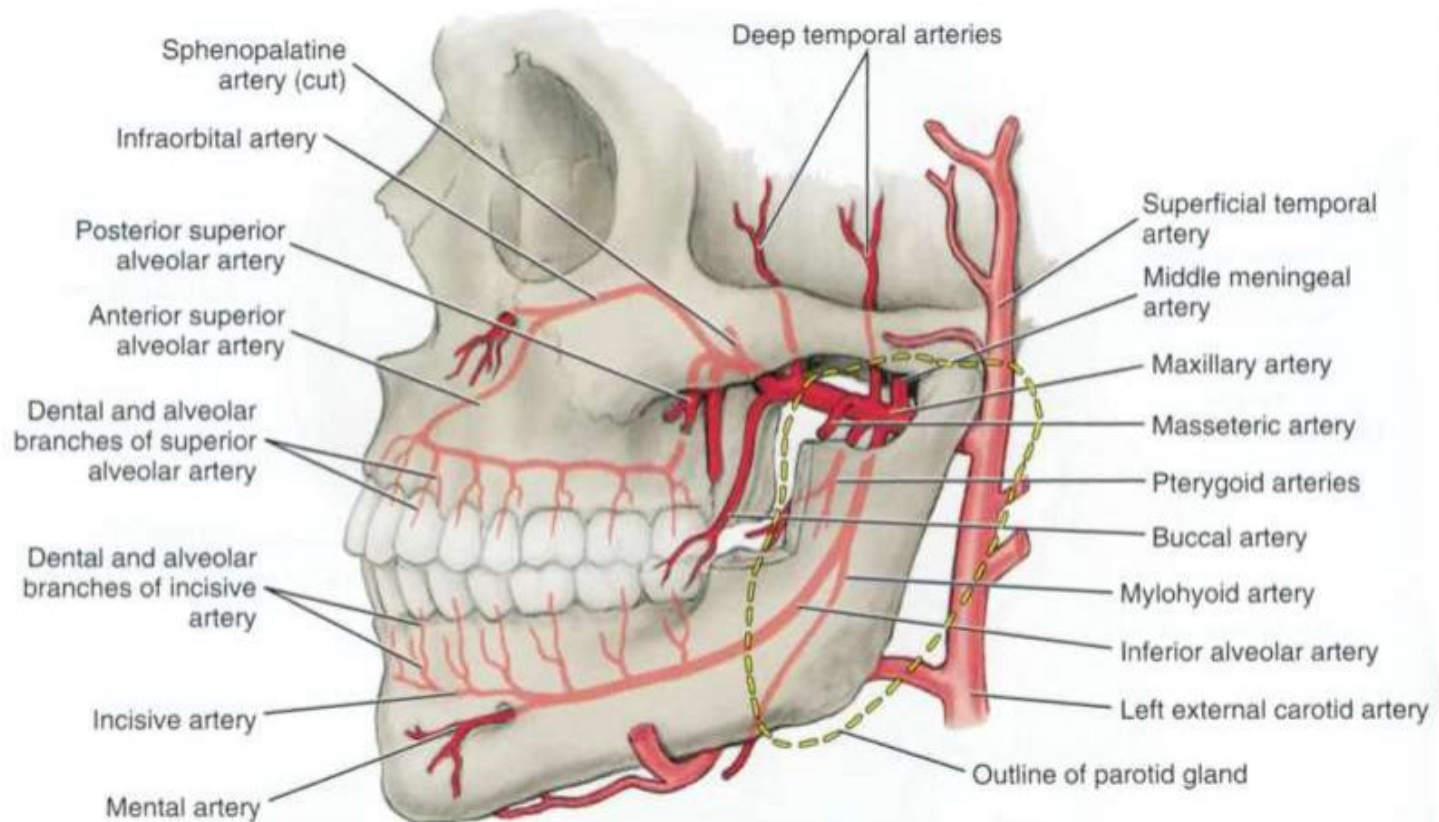
Surgical anatomy

Anatomical & physiological
considerations of mandibular
osteotomies



Vascular structures

- Bell and Levy's work {1970} demonstrated that blood flow through the mandibular periosteum could easily maintain a sufficient blood supply to the teeth of a



Vascular structures- surgical anatomy

- The proximal segment of VRO maintains its blood supply through TMJ & capsule and attachment of lateral pterygoid muscle.
- But inferior tip of this segment undergoes avascular necrosis.
- Determination of safe distance away from the apex of teeth is vital factor to be considered
- If the vascularity of the segments and teeth are to be preserved. The safer distance is 5

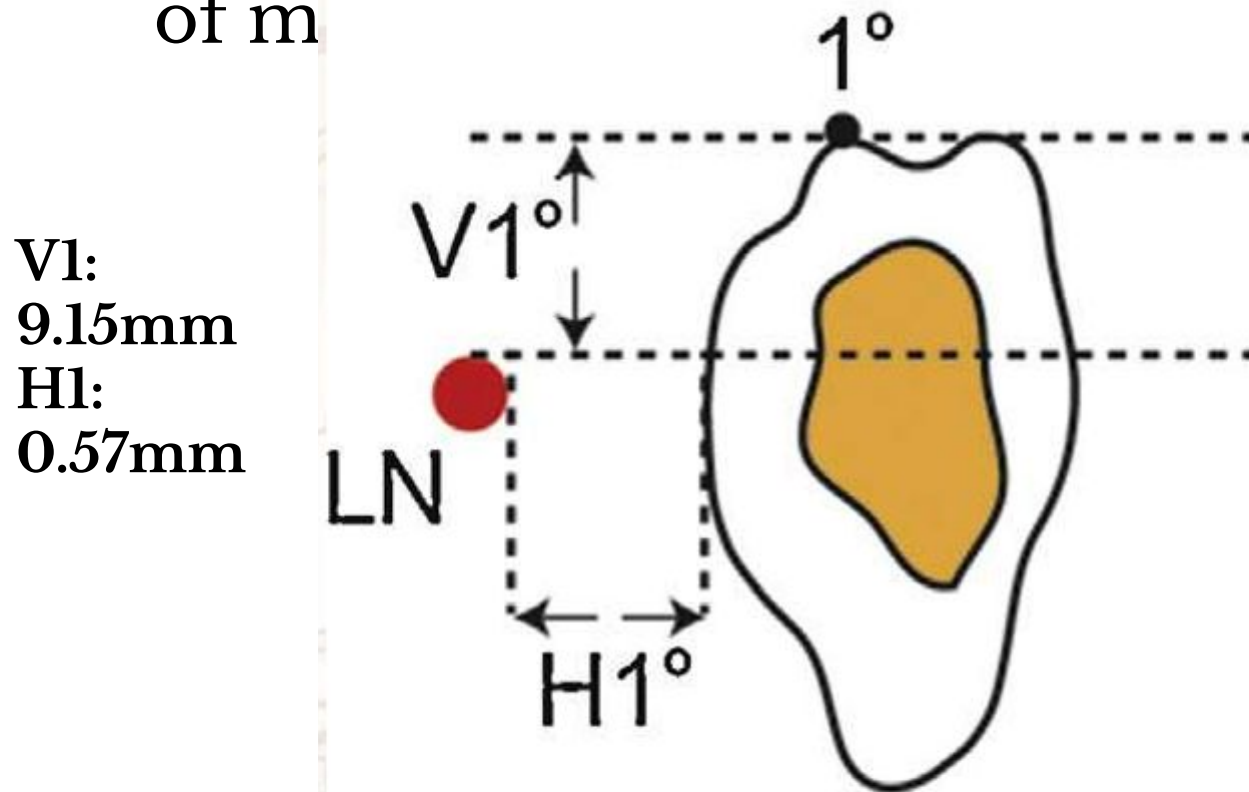
Nerve supply- Anatomic consideration

- The position of the lingula is posterior-inferior relative to the position of the antilingula
- Any osteotomies performed at a measurement of 5 mm posterior to the antilingula (1 cm posterior to the lingula)- no risk of vascular bundle



Nerve supply

- Relation of lingual nerve to medial cortex of m



Dias GJ, de Silva RK, Shah T, Sim E, Song N, Colombage S, Cornwall J. Multivariate assessment of site of lingual nerve. *British Journal of Oral and Maxillofacial Surgery*. 2015 Apr 30;53(4):347-51

Muscles- Anatomic consideration

- Orthognathic surgery affects muscles in primarily two ways:
 - It changes the length of a muscle or
 - It changes the direction of muscle function.
- The muscles commonly involved in orthognathic surgery of the mandible: muscles of mastication and the suprahyoid group of muscles .
- Altering these muscles have effect on skeletal changes especially relapse

Anatomic & Physiologic Considerations – muscles

Recommendations for stability of mandibular osteotomies :

- Minimize the change in muscle position & length
- Osteotomized segments should be held rigidly for a long enough time for muscle & their attachments to adapt fairly



Oral Surgery, Oral Medicine, Oral Pathology,
Oral Radiology, and Endodontology

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Oral and maxillofacial surgery

Condylar luxation following bilateral intraoral vertical ramus
osteotomy

Kensuke Yamauchi, DDS^a,  , Toshihiko Takenobu, DDS, DMSc^b, Tetsu Takahashi, DDS, PhD^c

- Removal of masseter & medial pterygoid attachment



Condylar luxation

(lateral pterygoid muscle pulling the condyle forward)

Classification of mandibular osteotomies

RAMAL OSTEOTOMIES

- Condylotomy
- Condylectomy
- Sagittal split osteotomy
- Vertical ramus osteotomy
- Inverted 'L' osteotomy
- 'C' osteotomy

BODY OSTEOTOMIES

- Anterior body osteotomy
- Posterior body osteotomy
- Anterior subapical osteotomy
- Posterior subapical osteotomy
- Total subapical osteotomy

HORIZONTAL OSTEOTOMIES OF CHIN

- Horizontal osteotomy with advancement
- Horizontal osteotomy with A-P reduction
- Tenon technique
- Double sliding horizontal osteotomy
- Vertical reduction genioplasty
- Vertical augmentation
- Alloplastic

Ramus procedures - condylotomy

- **Indications –**

- ❑ Occasionally to correct TMJ ID
- ❑ Correct mild mandibular prognathism
- ❑ Prevent, reduce degenerative arthritis in late stage joints

- **Approaches**

- ❑ E/O - preauricular, retromandibular, submandibular
- ❑ I/O - most common
- ❑ Blind – gigli saw

Ramus procedures – condylotomy (Jaboulay, Berard & Kosteka)



Ramus procedures - condylectomy

- **Indications**
 - Ankylosis
 - Tumours, eg. Osteochondroma
 - Condylar hyperplasia
 - Mandibular asymmetry

BSSO of ramus

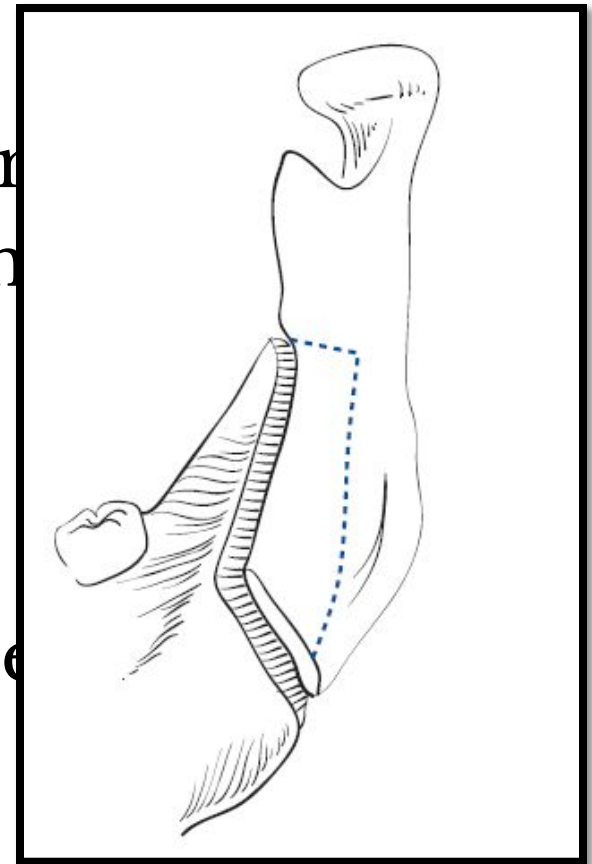
- BSSO of mandible is one of the most frequently performed surgical procedures for the correction of lower jaw deformities
- 1942 – Schuchardt, performed a surgical procedure similar to sagittal split called as step osteotomy of vertical ramus

BSSO of ramus

- 1957 – Trauner & Obwegeser, described a sagittal split of vertical ramus
 - 1st surgical procedure performed to lengthen the mandible
 - Technique permitted I/O access to operating site

BSSO of ramus

- 1961 – Dal Pont modification of Obwegeser
 - Extended primary osteotomy in the direction of horizontal part of mandible b/w 1st & 2nd molars
 - Vertical buccal cut increase bony overlap



BSSO of ramus

- 1968 – **Hunsunk**, shorter horizontal medial cut just past the lingula to minimize soft tissue dissection
- **Bell & Epker et al** – late 1970's described completing osteotomy through inferior border of mandible
- 1976 – **Spiessel**, advocated RIF to promote healing, restore early function & attenuate relapse

BSSO of ramus

- 1977 – **Epker**, suggested several modifications
 - Minimizing periosteal stripping & blunt dissection of PMS
 - Intraosseous wiring to control proximal segment
- 1984 – **Jetter & colleagues**, described 3 bicortical positional screw placement to fix proximal – distal segment
- 1997 – **Bloomqvist**, showed no significant difference in terms of relapse b/w

BSSO of ramus

- **Indications of BSSO**
 - Mandibular deficiency, procedure of choice for mandibular advancement upto 10 mm
 - Mandibular prognathism, excellent setback of small to moderate magnitude upto 7-8 mm
 - Mandibular asymmetry

BSSO of ramus

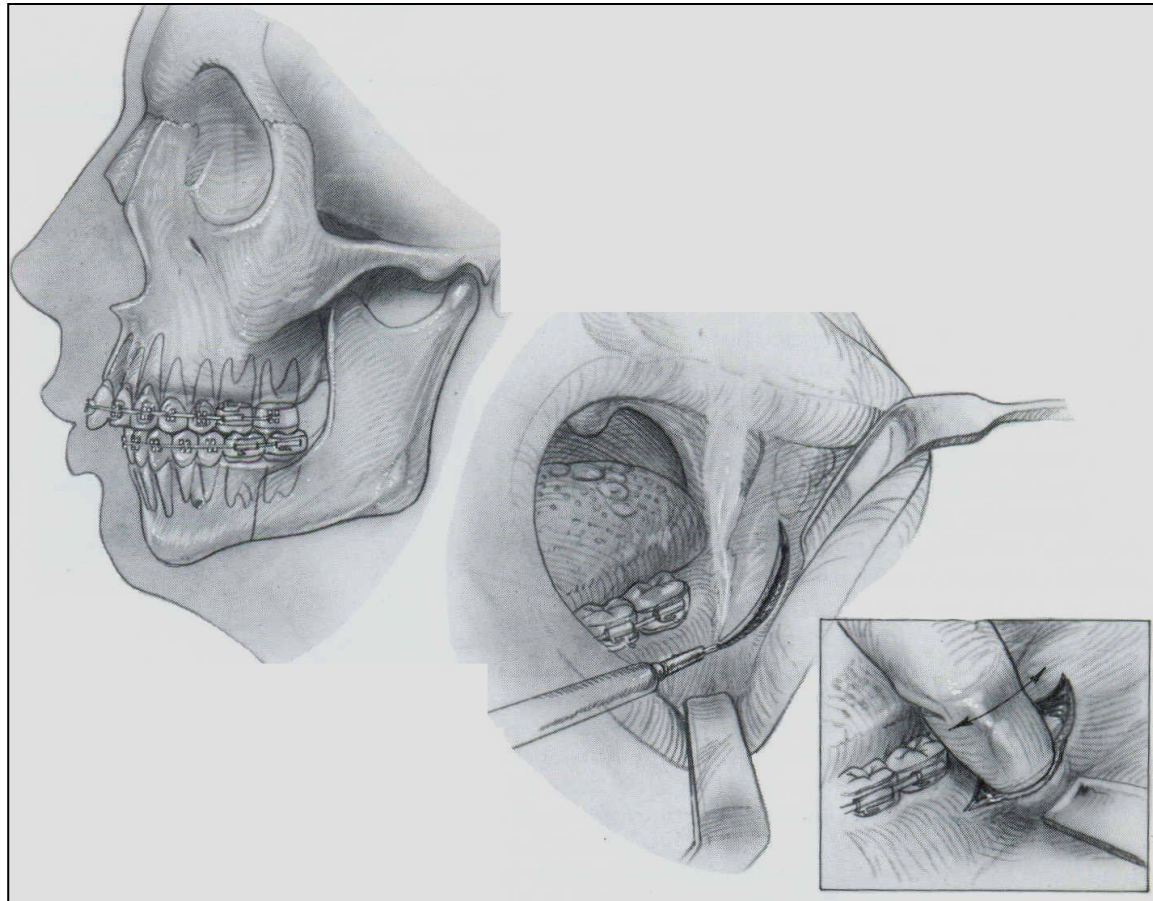
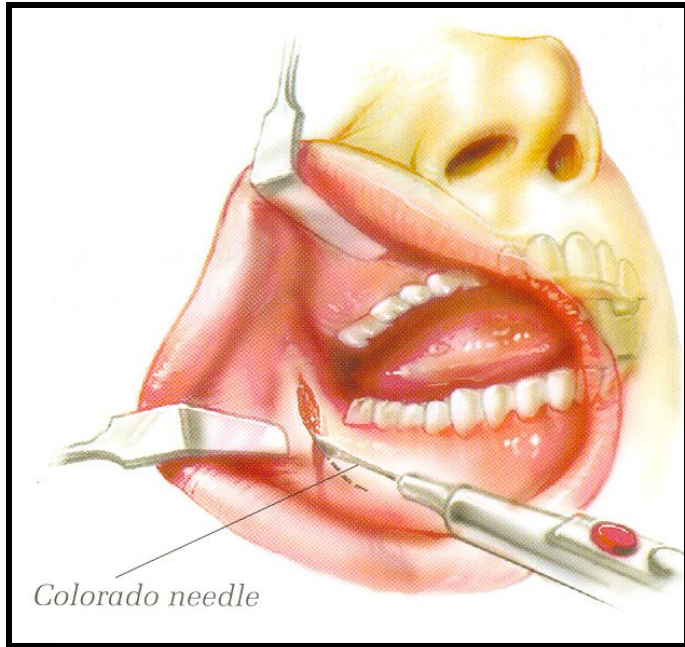
Advantages of BSSO

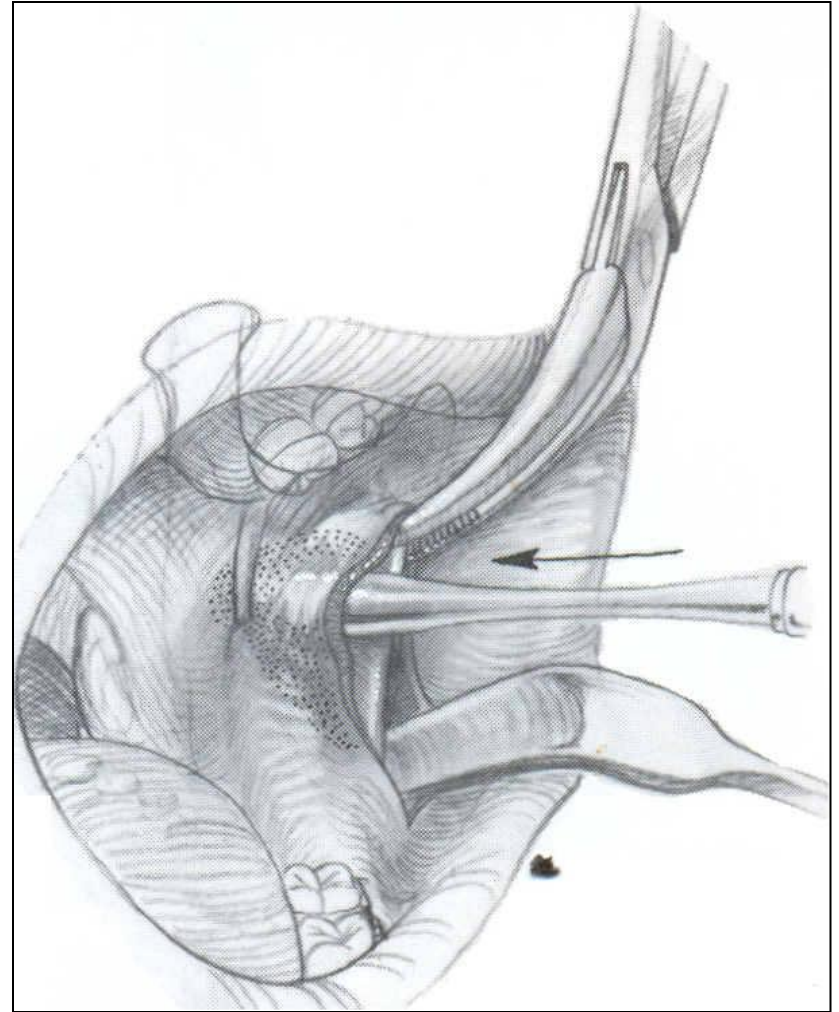
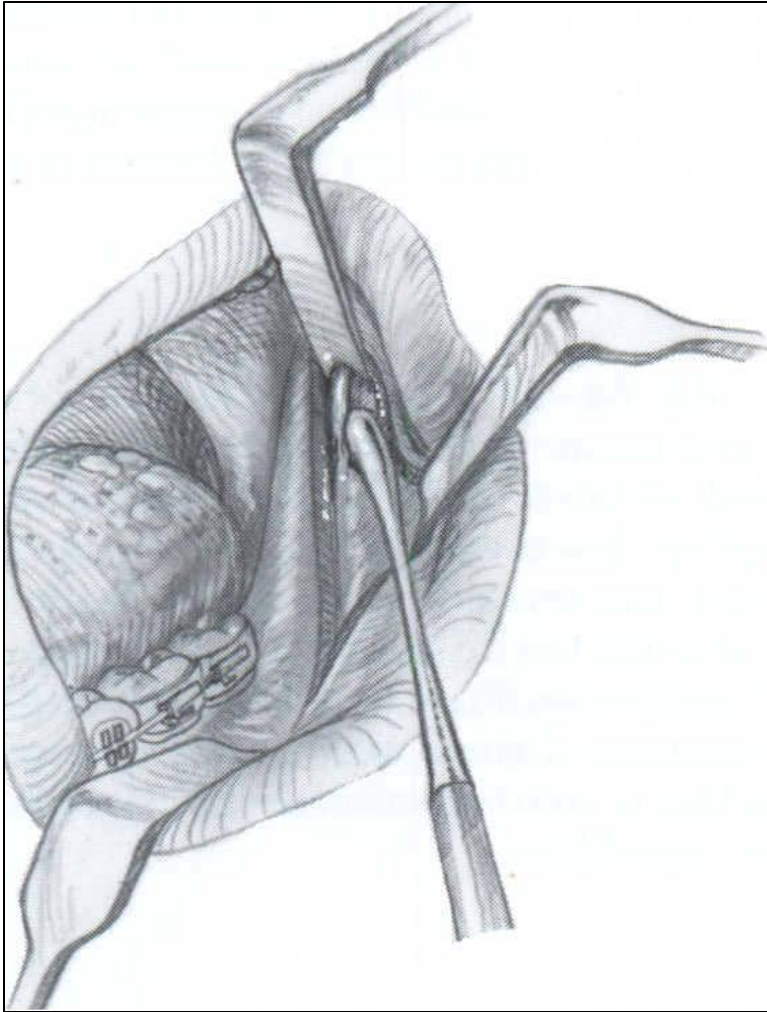
- Great 3-D flexibility in repositioning the distal fragments
- Broad bony overlap of osteotomized segments
- Minimal alteration of the natural position of muscles of mastication which prevents relapse from muscular traction
- Minimal alteration of original position of TMJ

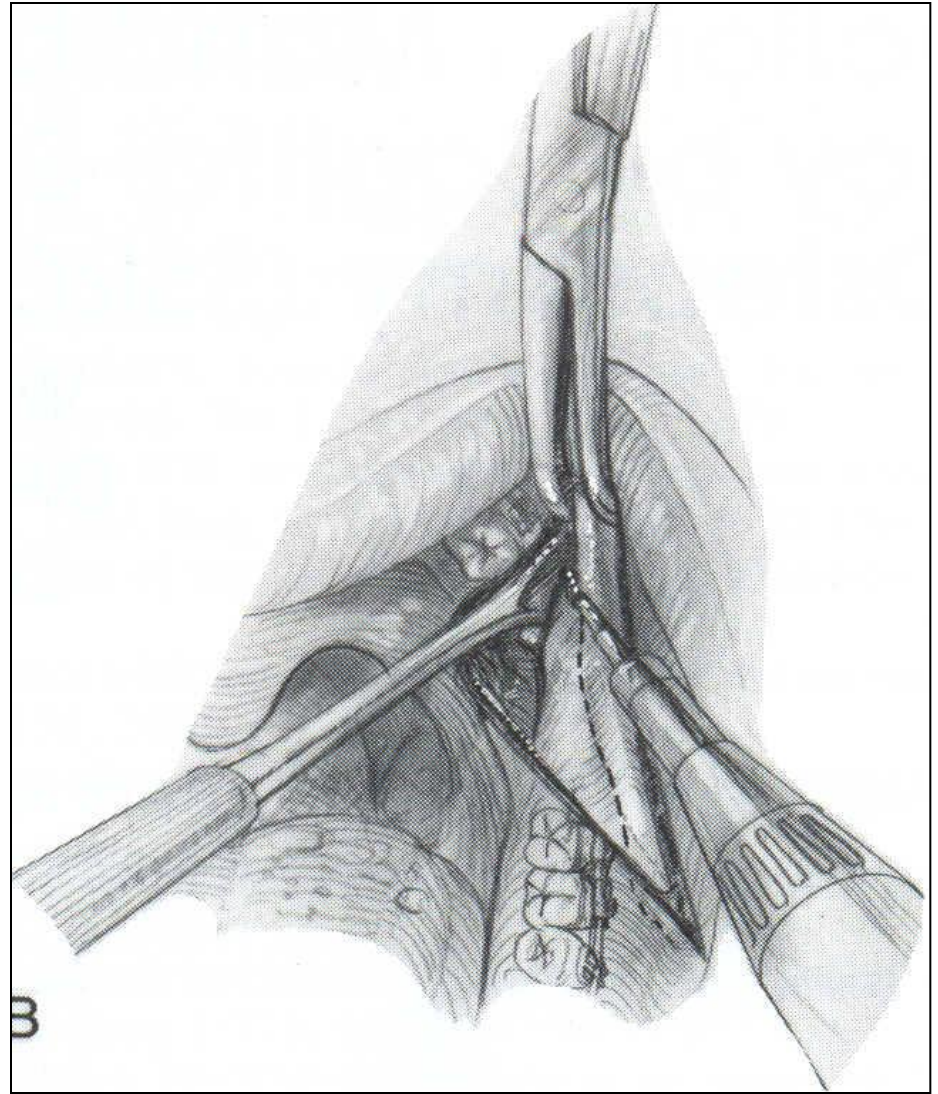
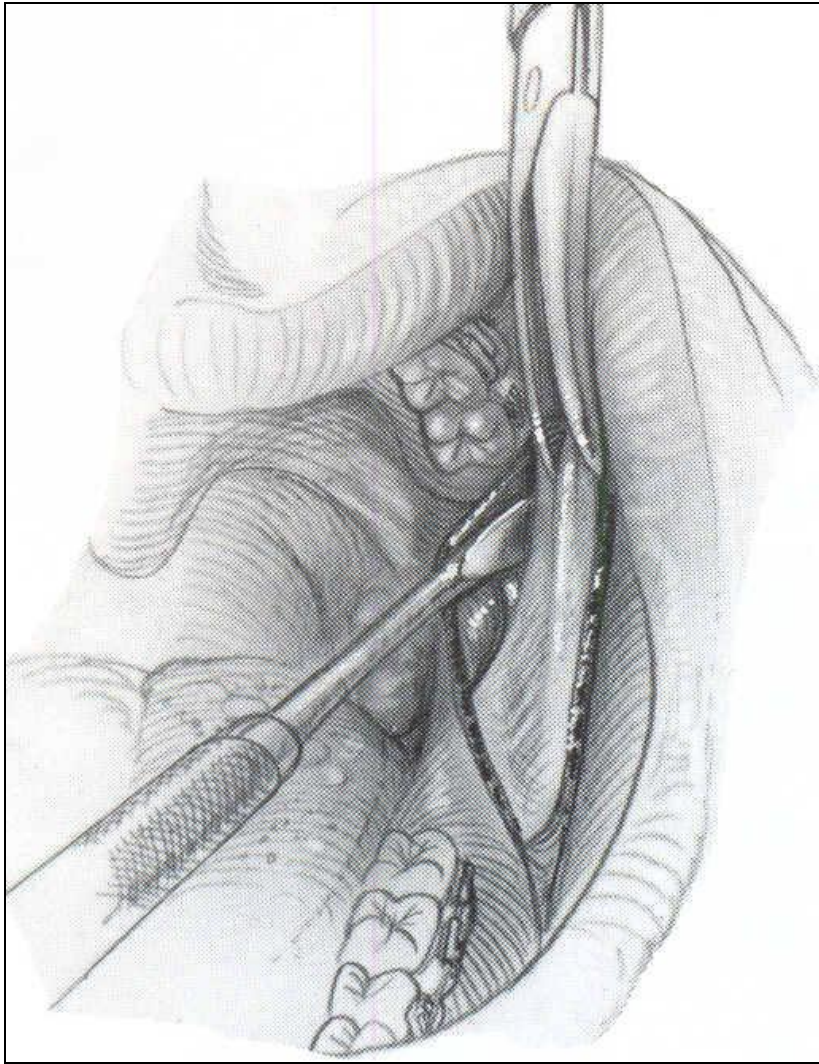
BSSO of ramus

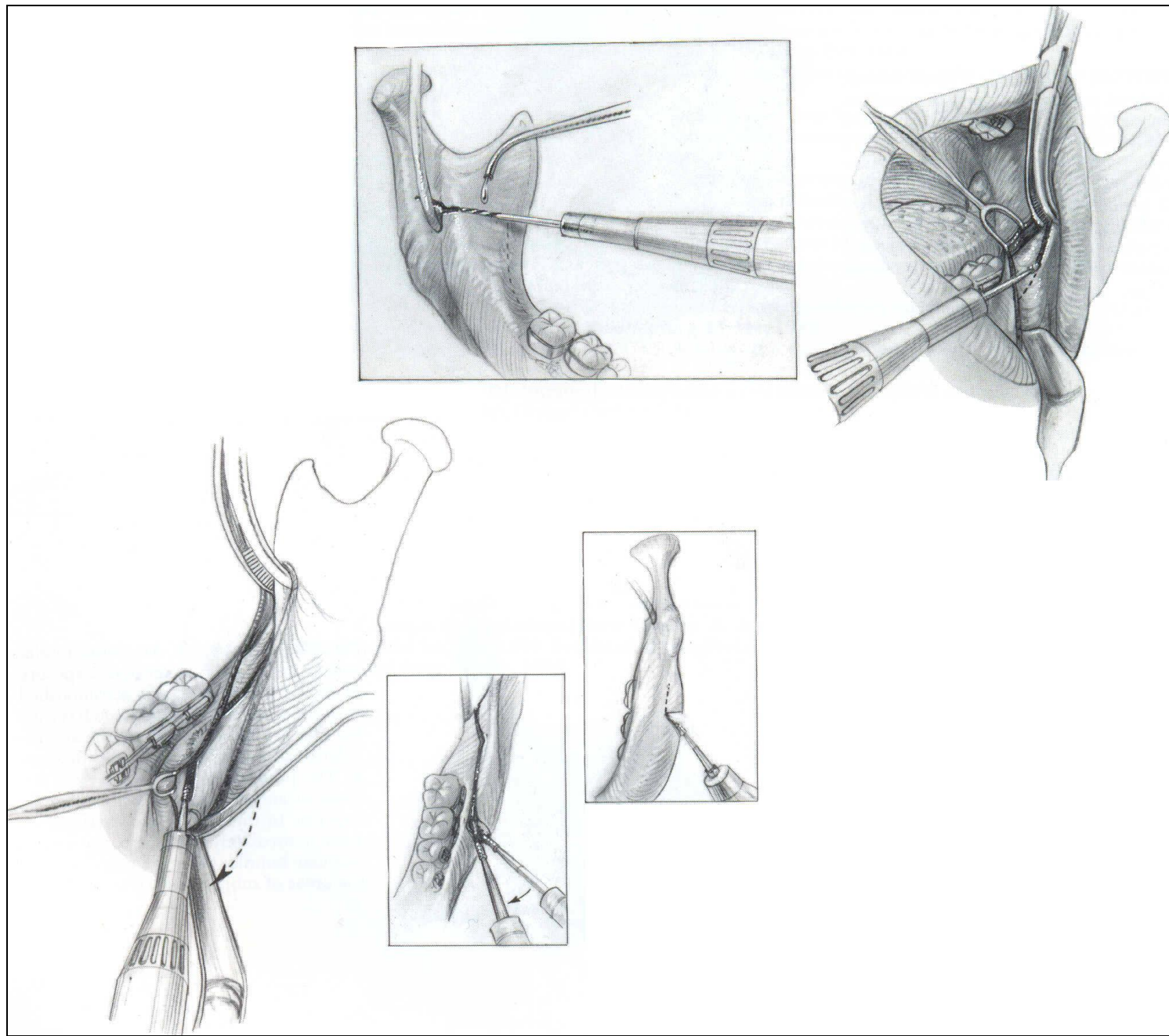
- **Limitations of BSSO**
 - Requires additional maxillary surgery for most dentofacial deformities

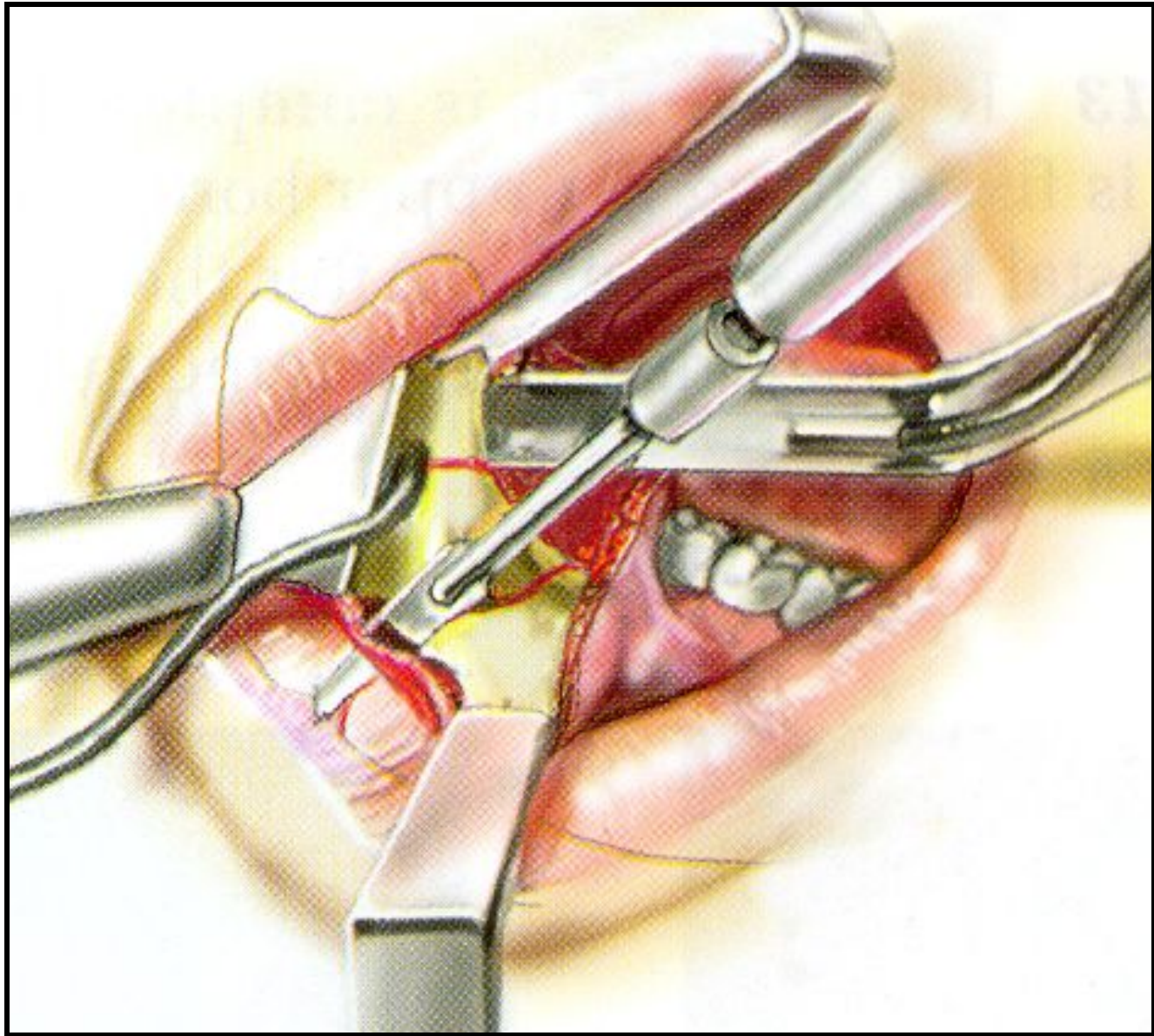
Technique- Mandibular advancement

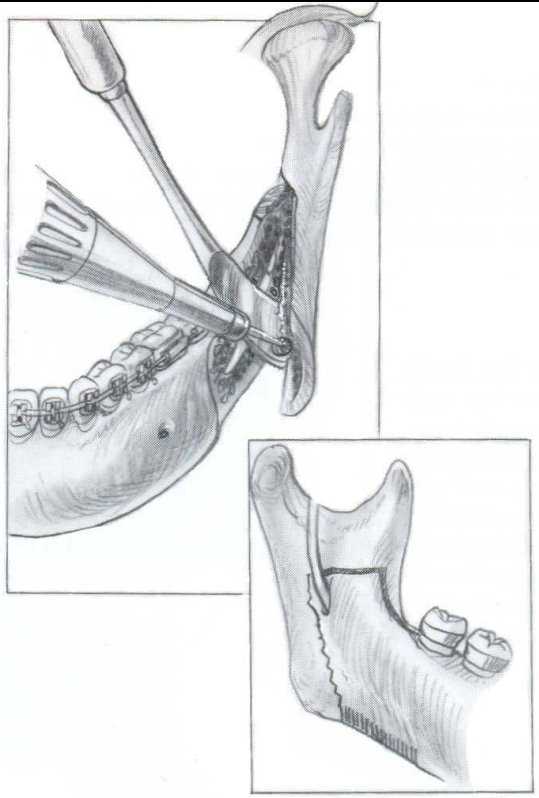
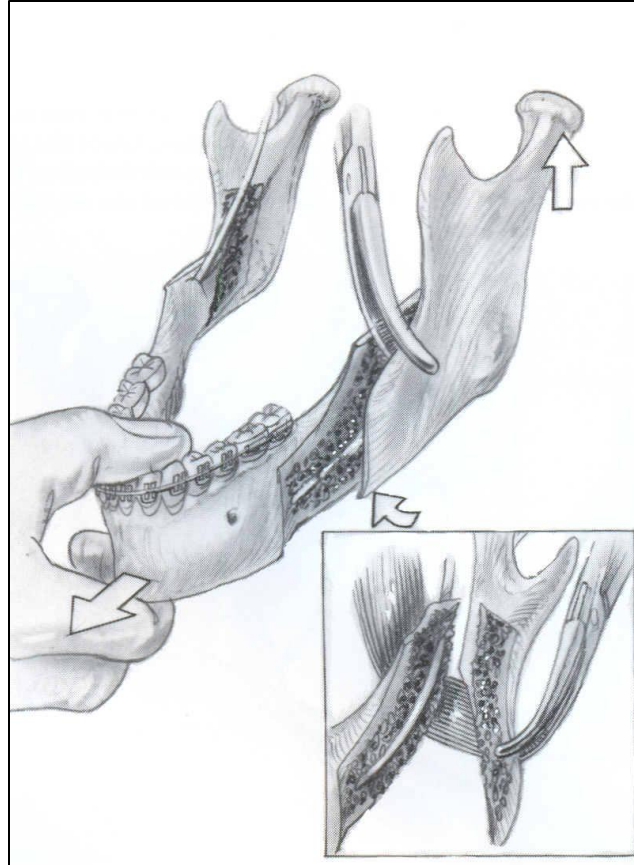
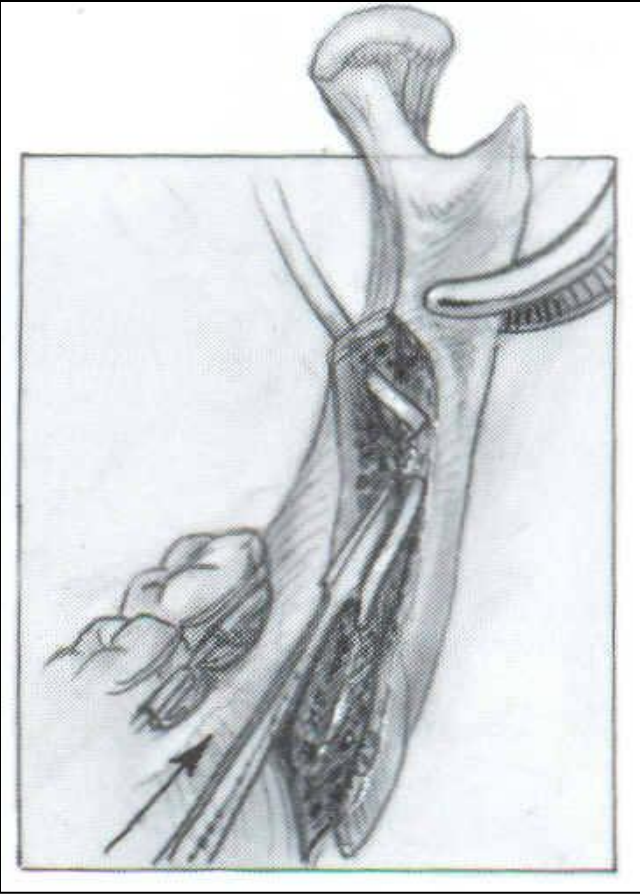




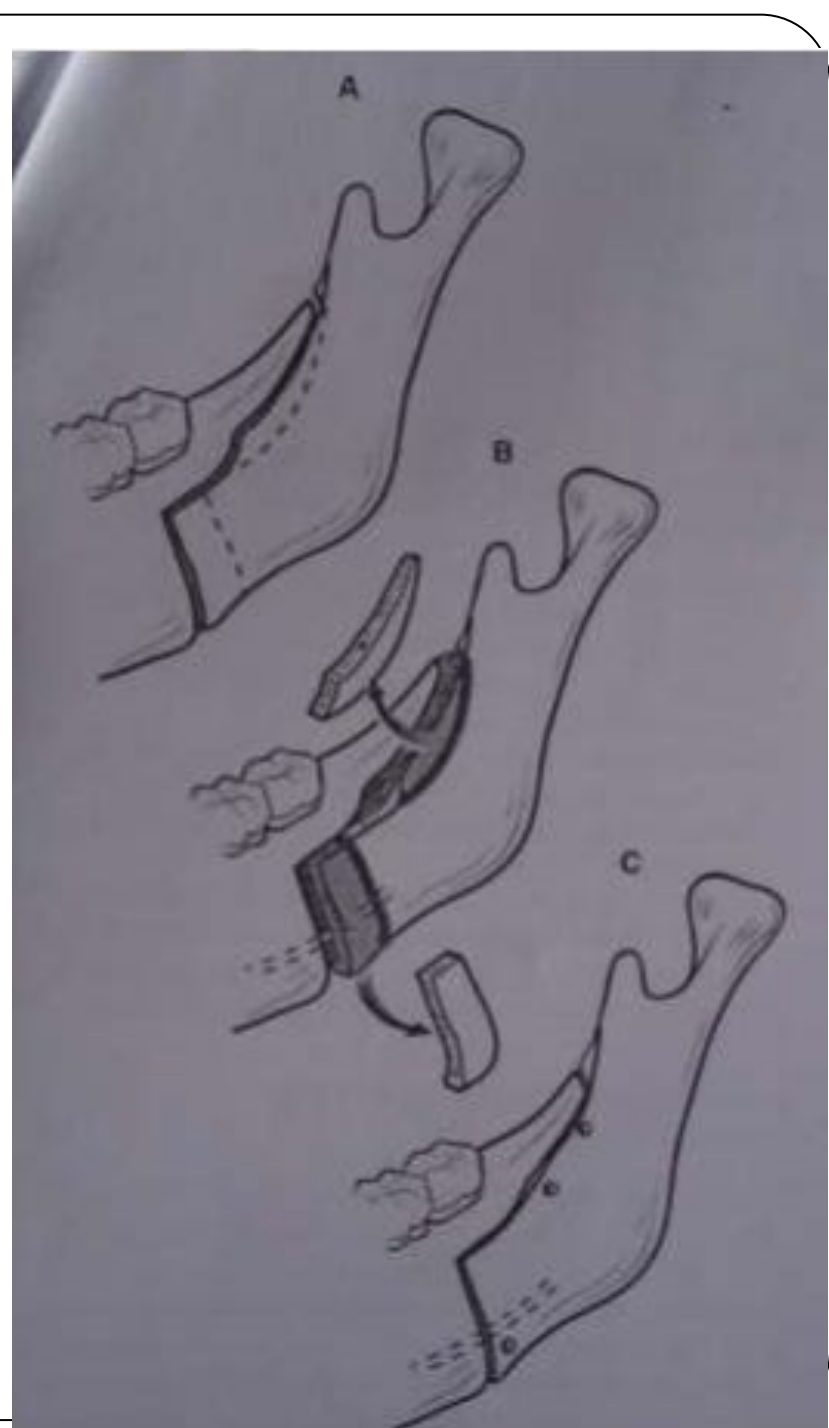
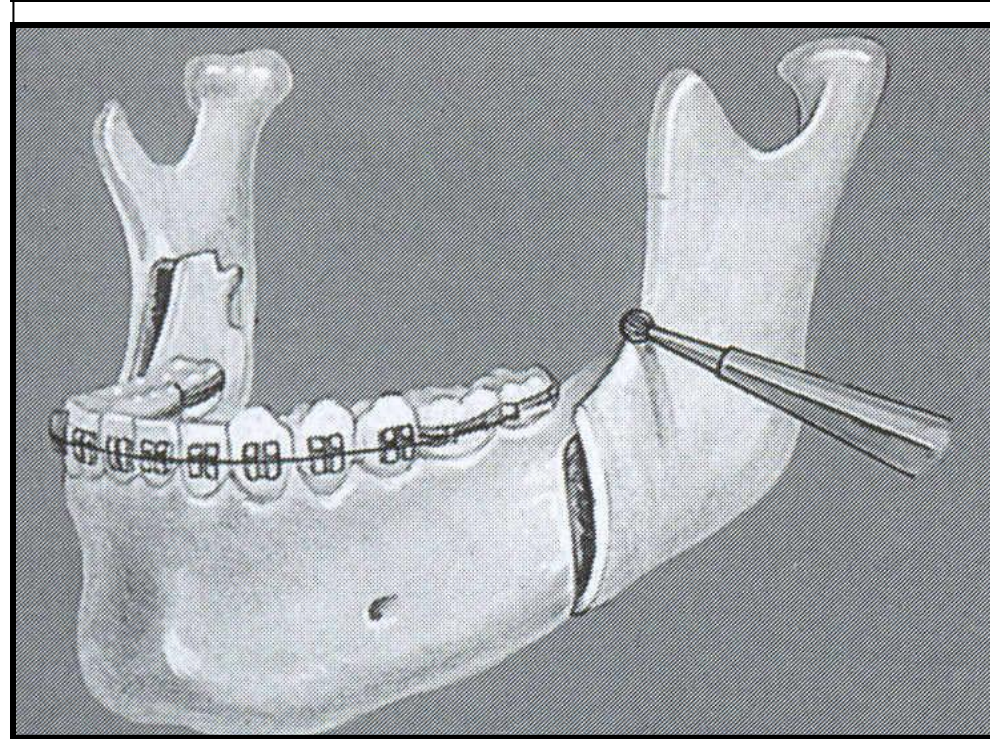
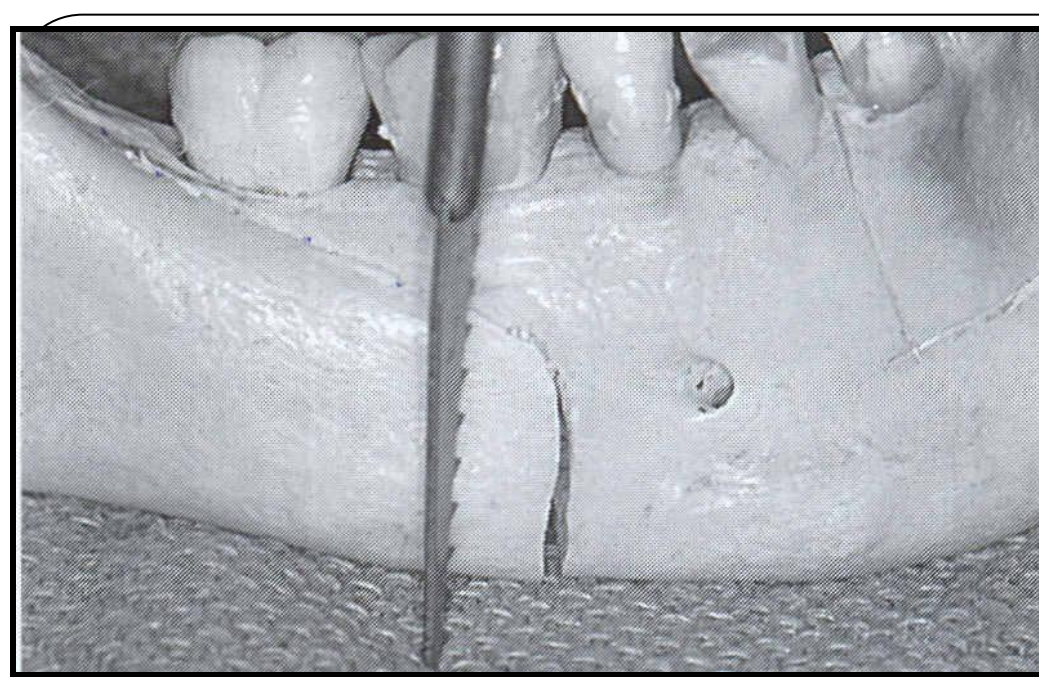












Fixation techniques

Fixation for osteomized segments:

- Positional screws – intraoral app, percutaneous app
- Monocortical screws and plates
- Resorbable fixation implants

Fujioka M, Fujii T, Hirano A. Comparative study of mandibular stability after sagittal split osteotomies: bicortical versus monocortical osteosynthesis. Cleft palate craniofacial journal 2000; 37:551.

BSSO of ramus

Complications –

- Post operative sequel
- Injury to IAN, LN
- Condylar position
- Malocclusion
- TMJ problems
- Unfavorable bony cuts
- Relapse
- Hemorrhage
- Vascular compromise
- Infection (Chow et al 2007 recommended preop & at least 2 days post op antibiotics)

BSSO of ramus

- **Nerve injuries :**
 - Long term IAN injury range from 0 to 20%(Karas et al & Nishioka et al)
 - Risk of sensory deficit further increases when genioplasty is combined with SSO (Posnick et al)
 - Incidence of temporary disturbance of LN varies from 1-19% (Jacks et al)

BSSO of ramus

- **Condylar position**
 - Failure to seat proximal segment properly can result in –
 - ❖ Rotation of proximal segment
 - ❖ Condylar sag
 - ❖ Condylar torque
 - These malpositions of condyle can result in –
 - ❖ Skeletal relapse
 - ❖ Malocclusion
 - ❖ Hypomobility
 - ❖ Remodelling of condylar head

TMJ problems :

- Temporomandibular dysfunction (TMD): common finding, incidence between 20% -25%
- In a study of 280 orthognathic surgery patients undergoing a BSSO, Karabouta and Martis reported a 40.8% incidence of TMD preoperatively
- The most frequent symptoms were pain and clicking of the TMJ.
- Hypomobility following a BSSO is a common postoperative problem

- The incidence of hypomobility following a BSSO has declined with the use of rigid fixation, as prolonged periods of MMF are not necessary
- All patients should have a program for physical rehabilitation of the masticatory system following surgery
- With active rehabilitation, most patients return to preoperative interincisal opening within 3 months.
- Other possible causes for hypo mobility are intraarticular hemorrhage, fibrosis, and preexisting temporomandibular joint disorders.

Condylar Sag

Defined as immediate or late change in position of condyle in the glenoid fossa after surgical establishment of preplanned occlusion and rigid fixation of bone fragments, leading to change in occlusion.

Central

Peripheral

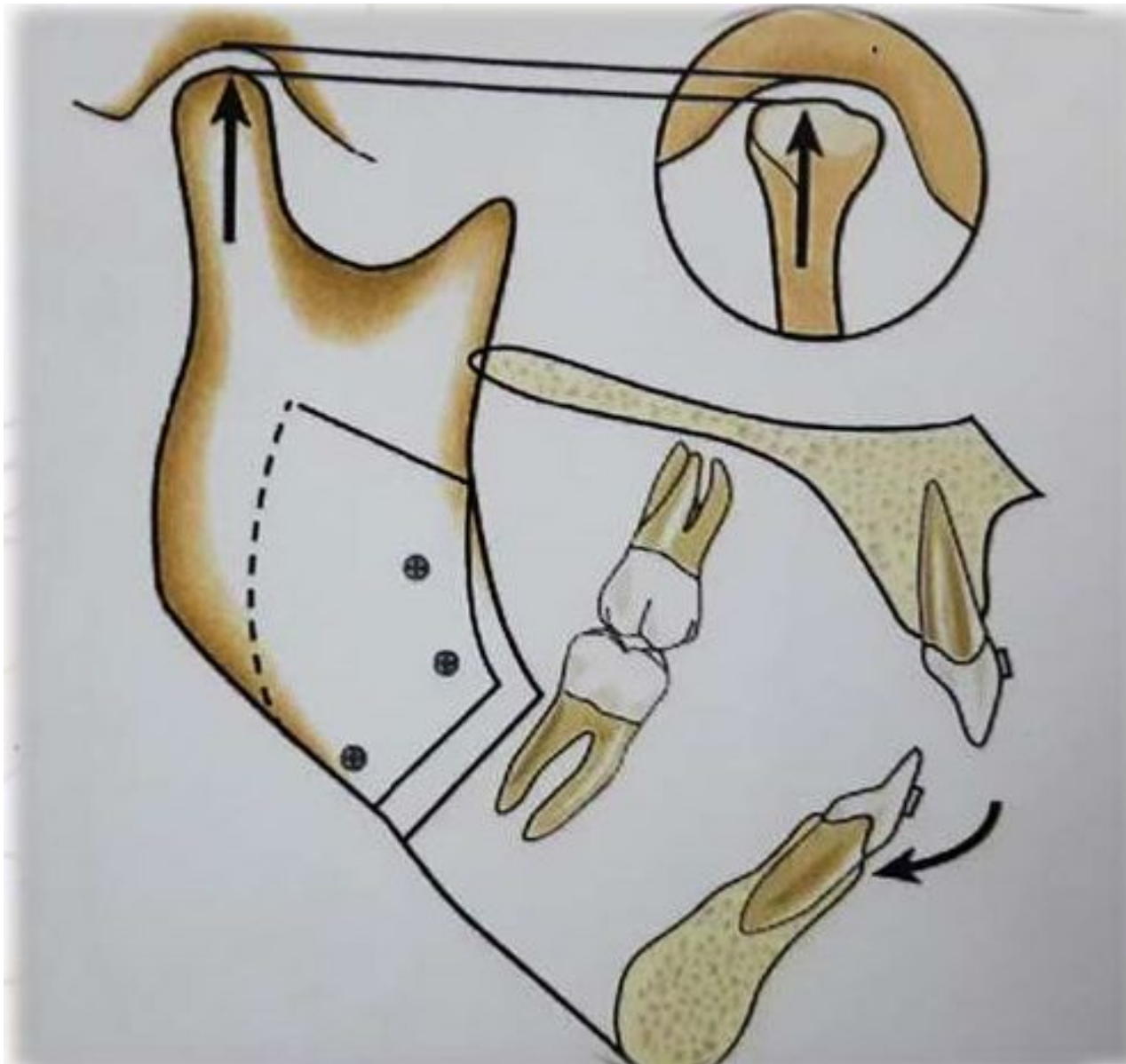
Unilateral

Bilateral

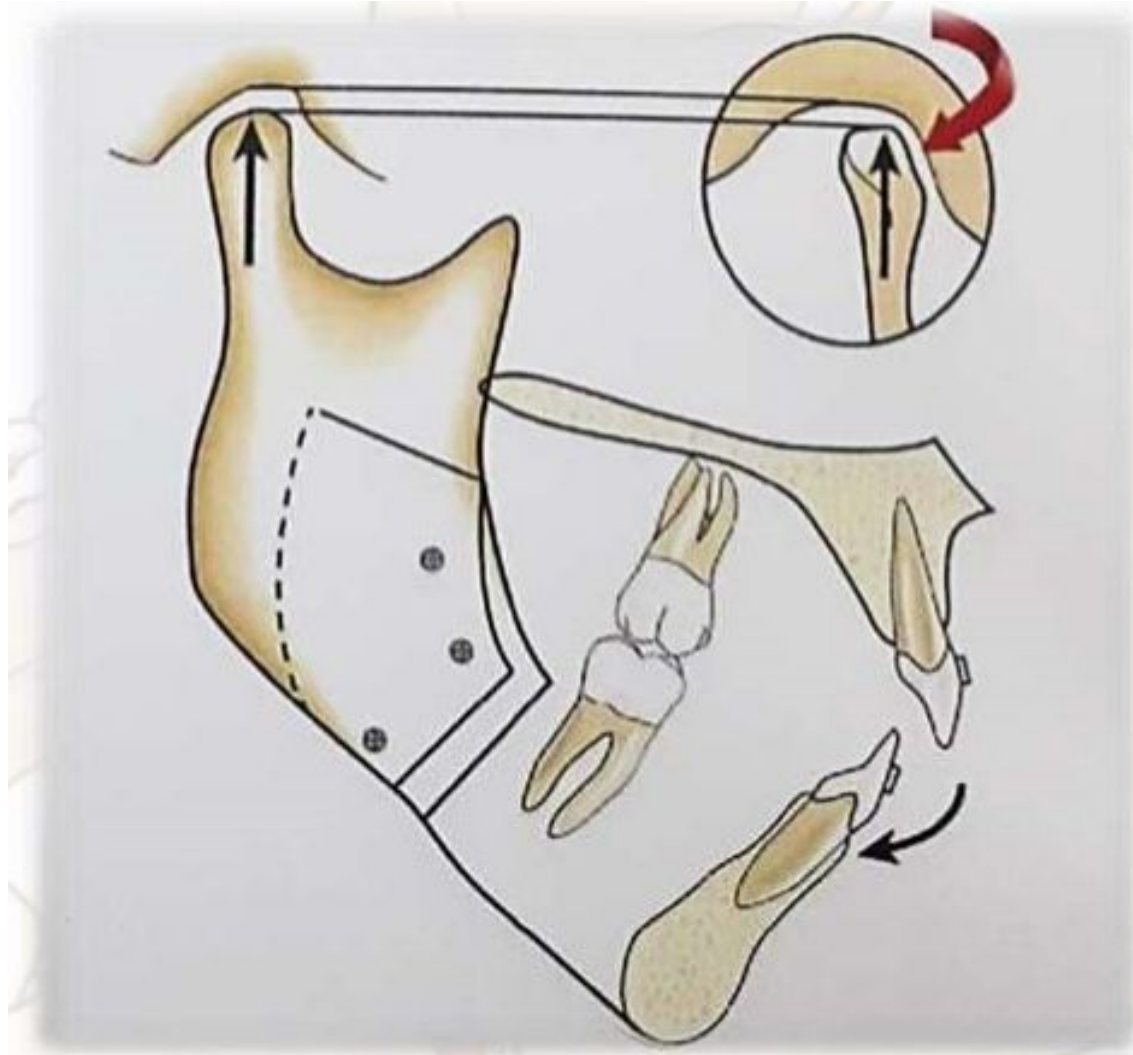
Type I

Type II

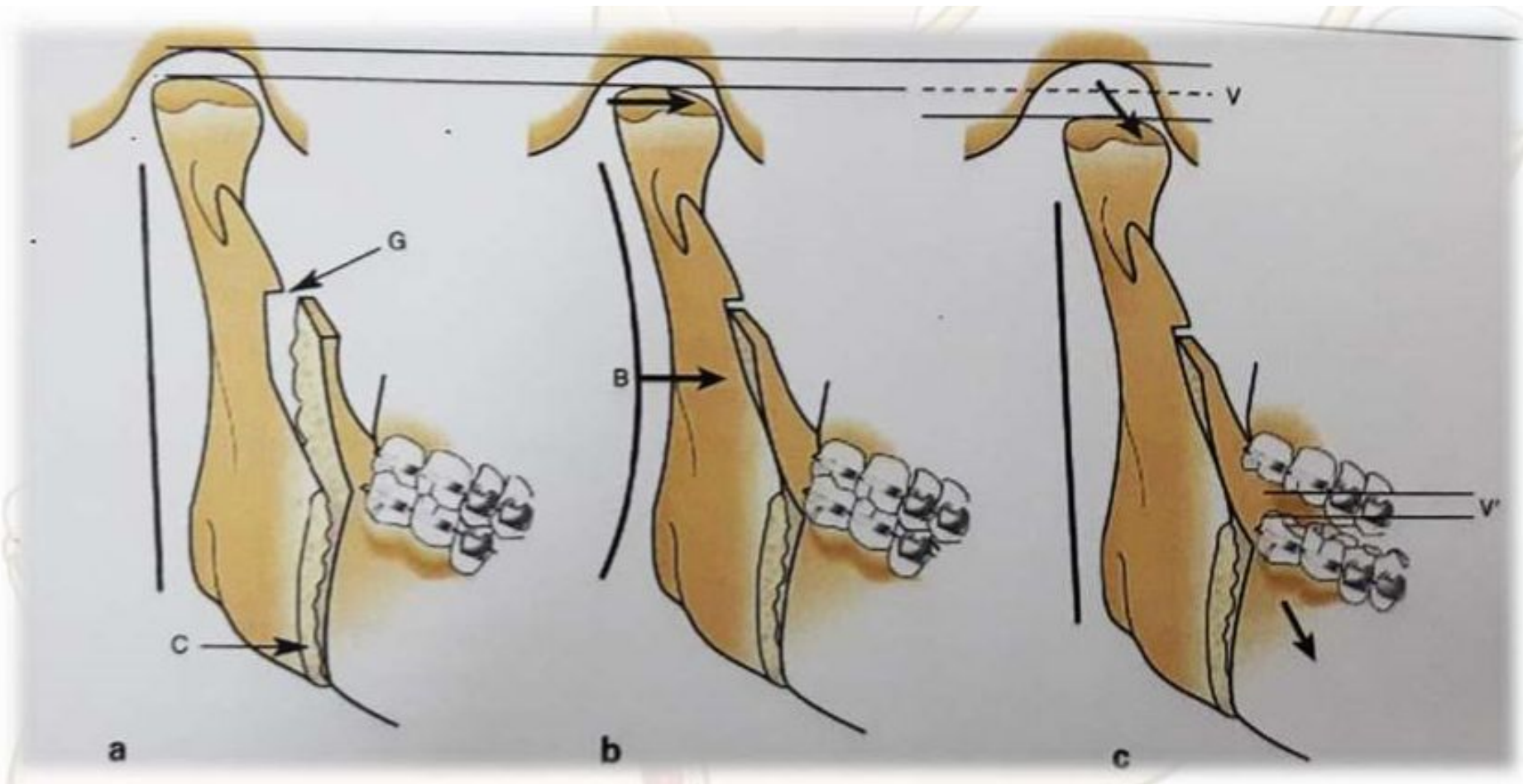
Central condylar sag



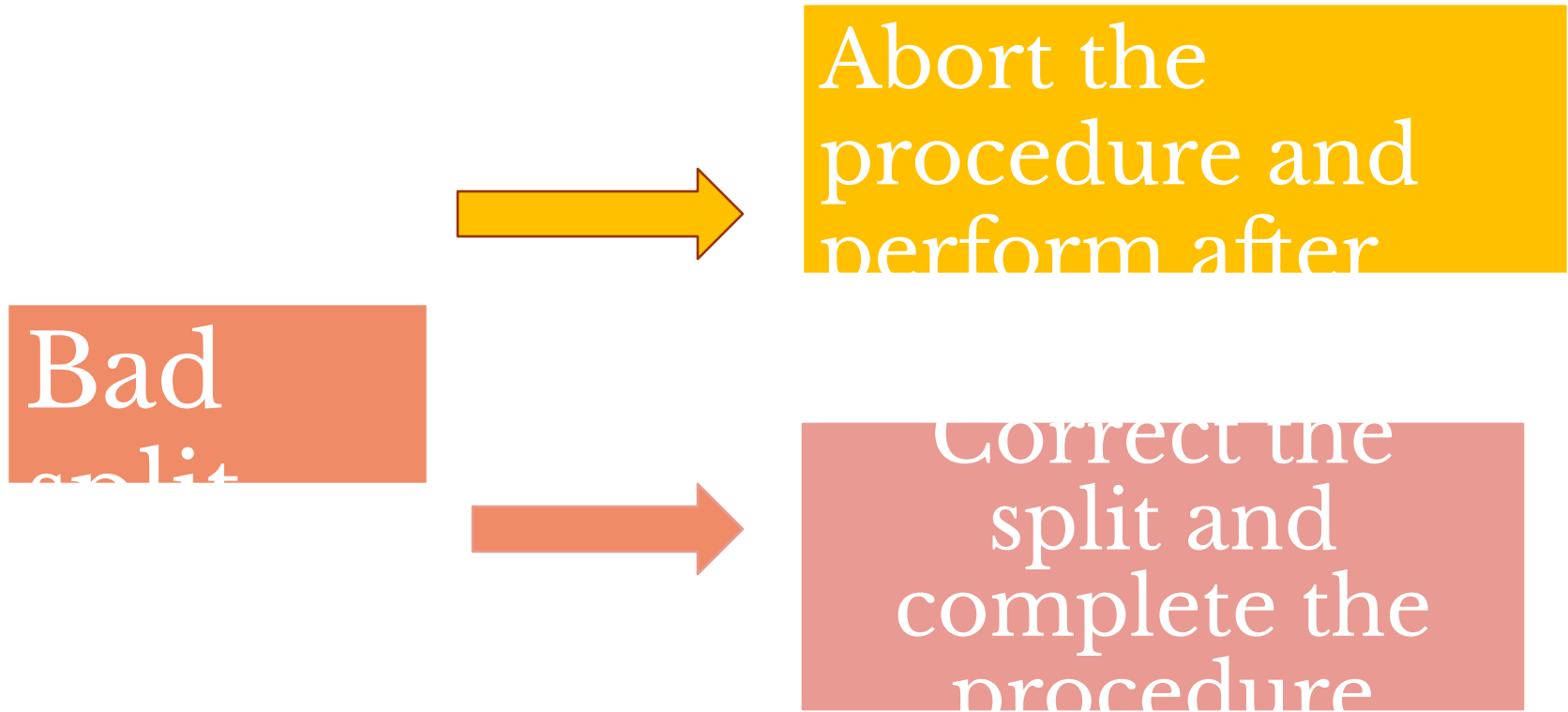
Peripheral condylar sag I



Peripheral condylar sag II



Bad Spilt



The incidence of unfavorable splits after a BSSO is between 3% and 20%.

Unfavourable splits

Proximal segment fractures

1. Small proximal fragment
2. Large proximal fragment

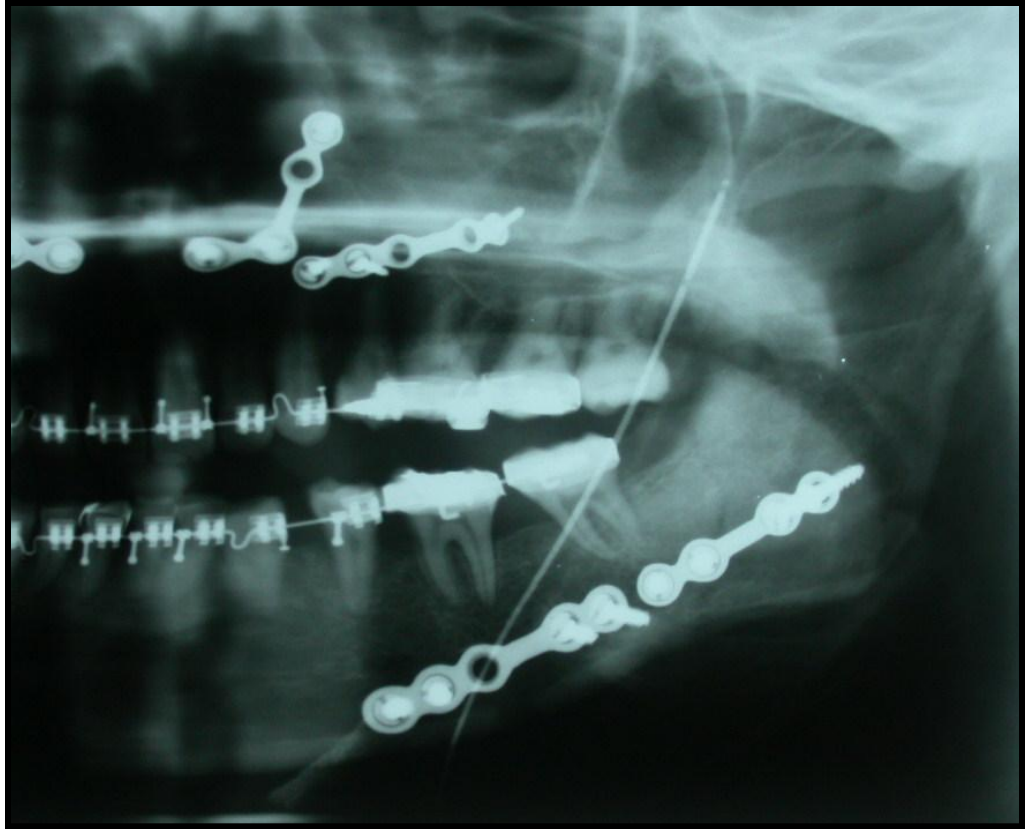
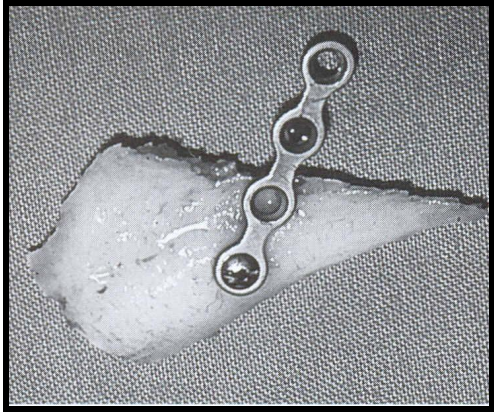
Distal segment fractures

1. Splits short of the lingula
2. Medial splits up the condyle
3. Distal segment splits (Behind the second molar)

Fractures on the proximal portion

Proximal segment fractures with adequate bony overlap

- *The most common factor is failure to cut the inferior border prior to applying chisels to the osteotomy*
- Impacted third molars can cause adverse proximal segment and distal segment fractures
- Ideally, the third molars should be removed **6 months to 1 year** prior to the BSSO
- Whenever a proximal segment fracture occurs, one needs to assess the residual portion of the mandible and the free fragments to determine the geometry of the split.
- Bicortical Screws



Fractures on distal portion

Splits Short of the Lingula

Caused by failure to ensure that the bone cut dips into the fossa behind the lingula

Medial splits up the condyle

Caused by starting the medial bone cut several millimeters superior to the lingula or angling the cut in an oblique fashion toward the condylar neck

Distal segment splits (Behind the second molar)

This fracture is most frequently associated with retained third molars
Caused because of excessive prying of the segments along the ascending ramus before the lateral cut is ensured

A fracture behind the second molar is **difficult to manage**

Relapse

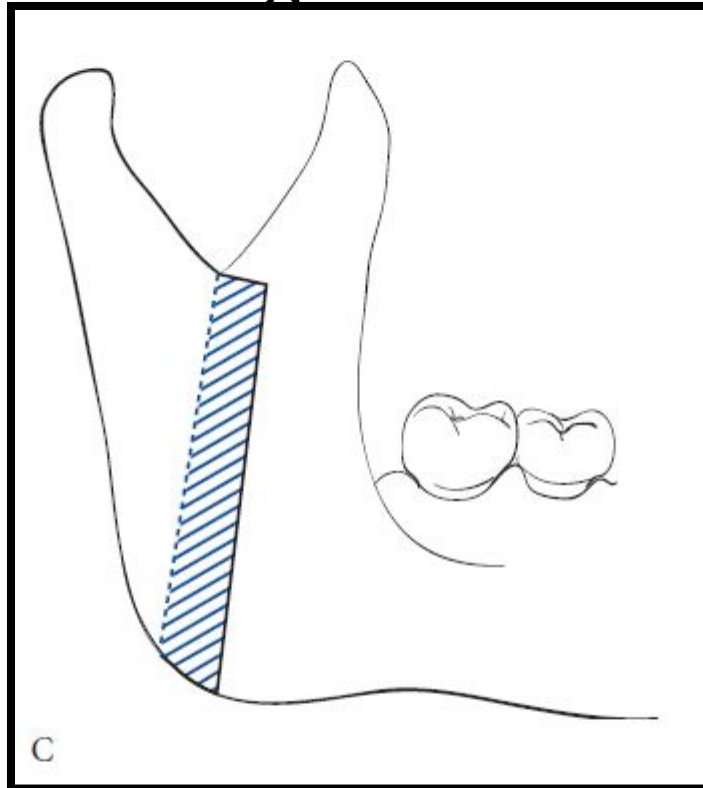
- Relapse is to be expected with mandibular advancements **greater than 7 mm**
- Van Sickels demonstrated a decrease in skeletal relapse when a 1-2 week period of skeletal fixation was used with patients who had advancements of 7mm or more.
- Other methods to prevent or correct for skeletal relapse include **suprahyoid myotomies** and **orthodontic overcorrection**.
- Suprahyoid myotomies : patients **undergoing large mandibular advancements** and whose mandibular advancement is accompanied by a large **counterclockwise rotational movement** (i.e., patients with a steep mandibular plane angle).

Hemorrhage

- Preventive measures to avoid intraop bleeding
- Bleeding from facial artery
- Bleeding from IA artery

Intraoral vertical ramus osteotomies (IVRO)

- Osteotomies extending from the sigmoid notch vertically behind the inferior alveolar nerve foramen to the inferior border or angle



Vertical ramus osteotomies

- First described by **Caldwell & Letterman** in 1954 by E/O app
- **Moose** in 1964 performed VRO from I/O approach
- RIF is not recommended & rather early release of MMF accompanying active PT is recommended
- After VRO condylar head goes through immediate anterior & forward sagging, but it ultimately returns to its inherent position

Vertical ramus osteotomies

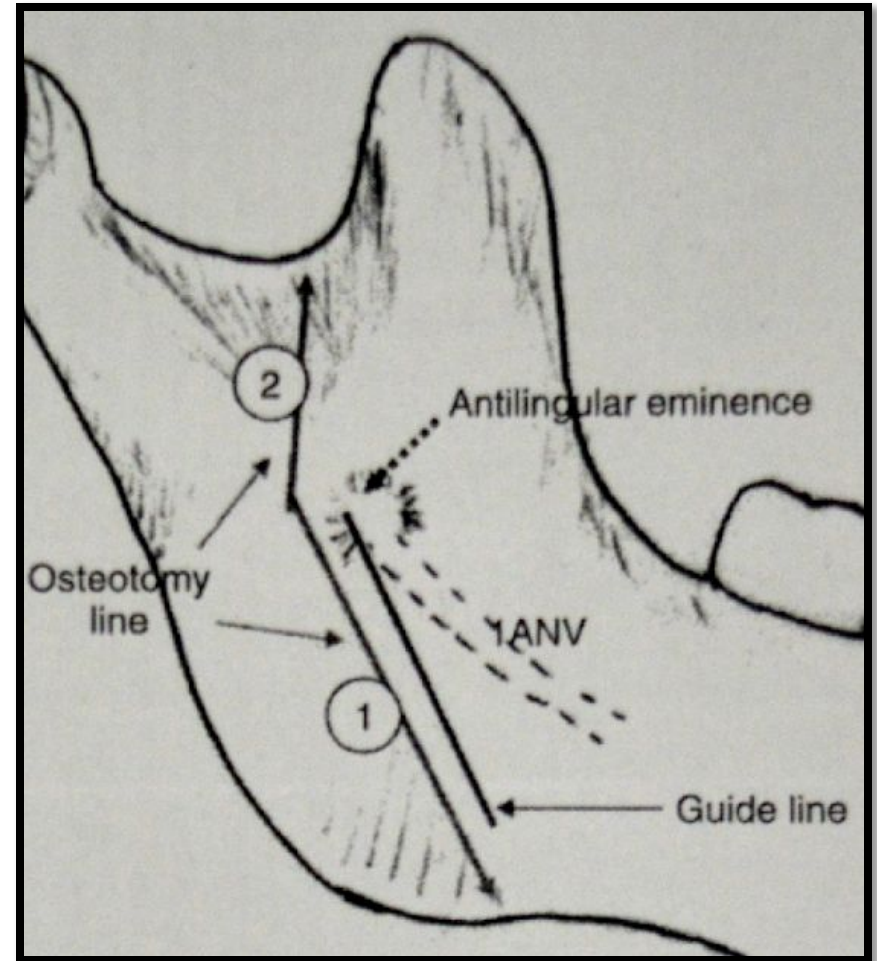
- **Indications –**
 - Horizontal mandibular excess
 - Mandibular asymmetry
 - Occlusal disparity resulted after isolated Lefort I osteotomy
 - Significant TMJ complaints

Vertical ramus osteotomies

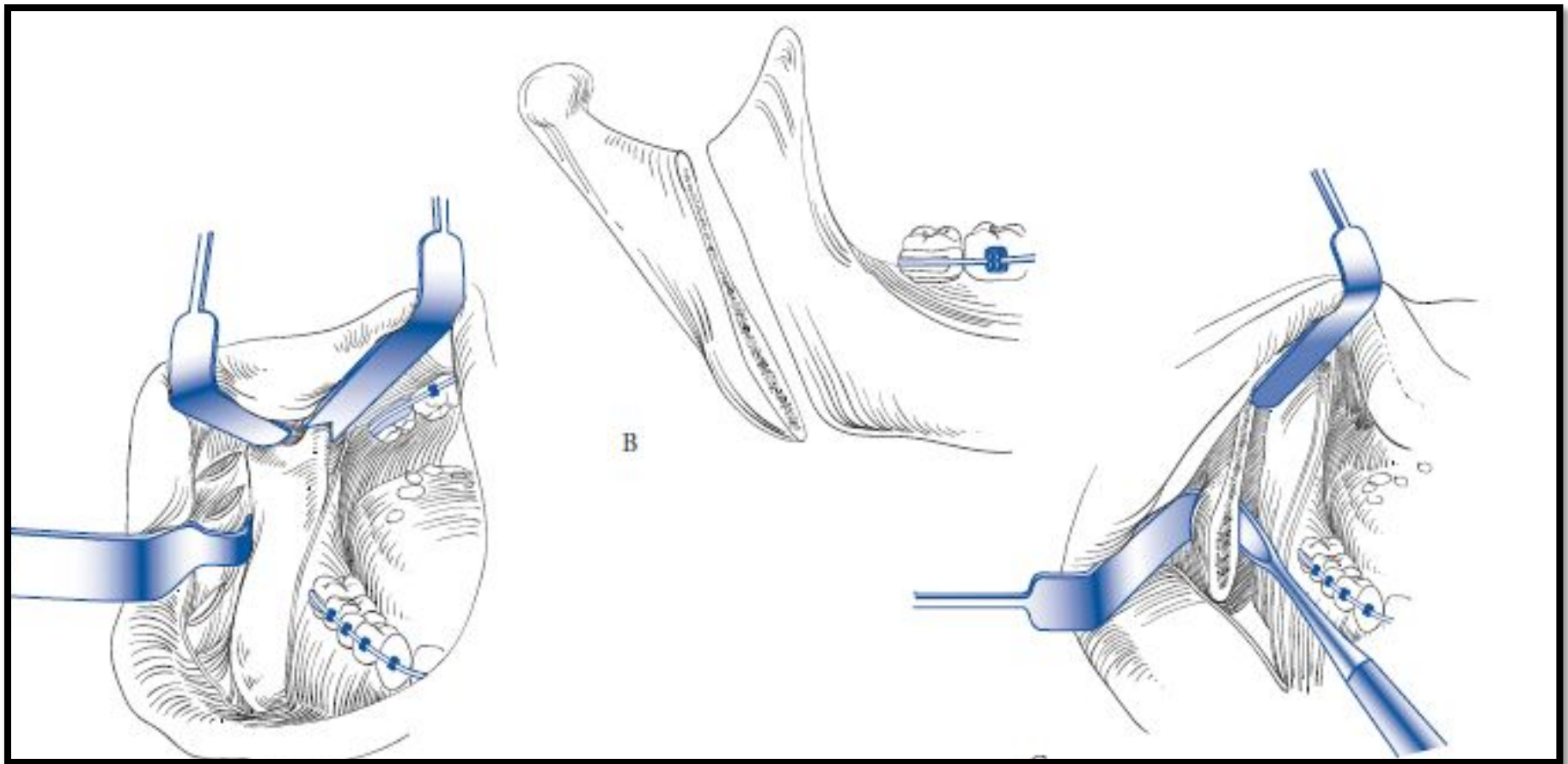
- **Contraindications –**
 - Advancement of distal, tooth bearing mandibular segment
 - Recent condylar fracture
 - Aesthetic assessment of soft tissue of neck reveal unfavorable result after TVRO-
resulting in rounding effect on
cervicomental soft tissue.

Intraoral vertical ramus osteotomy

- Vertical line drawn from antilingual eminence to mid point of antigonial notch (guide line)
- Osteotomy line is parallel & 2mm posterior to guide line
- Bicortical osteotomy is done
- Inferior osteotomy completed



Intraoral vertical ramus osteotomy



Intraoral vertical ramus osteotomy

- **Limitations –**
 - Medial flaring of mandible
 - Unfavorable thickness of proximal part of ramus
 - TMJ disorders comprising of disk perforation or TMJ arthritis
 - Correction of anterior open bite

Intraoral vertical ramus osteotomy

- **Advantages** – surgical simplicity, speed & lower rate of postop neurosensory disturbance
- Little interference on to the cut surface of VRO osteotomy site during mandibular set back
- Less chance of damaging IAN
- Preferred in TMD patients
- Rapid recovery of mandibular functions

Intraoral vertical ramus osteotomy

- **Disadvantages –**
 - Need for MMF (7-10 days after osteotomy)
 - Surgeons prefer SSRO over TVRO

Vertical ramus osteotomies - EVRO

- EVRO is accomplished through a submandibular approach
- **Relative indications –**
 - Major setback of mandible (>10mm)
 - Asymmetric mandibular set back
 - Vertical shortening of mandibular ramus
 - Reoperation of previously corrected prognathism
 - Reoperation of malunion or non-union of

Vertical ramus osteotomies - EVRO

Advantages of E/O approach –

- Better visibility & access to both lateral & medial aspects of ramus
- More accurate sectioning of ramus
- Easier removal of areas of bony interferences

Disadvantages –

- Extraoral scar
- Risk of injury to MMN

Vertical ramus osteotomies

- **Complications –**
 - Stability
 - Neural damage
 - TMJ dysfunction
 - Avascular necrosis of proximal segment
 - Bleeding
 - Unfavorable osteotomy

BSSO vs IVRO

	BSSO	IVRO
OSTEOTOMY	PA Saggital split	Latero medial cut
	Open procedure	Blind procedure
	Along IAN	Rear to IAN
	Frequent exposure of IAN	No exposure of IAN
BONE HEALING	Contact on marrow to marrow	Contact on cortex to cortex
BONE FIXATION	Rigid internal fixation	No fixation
CONDYLAR HEAD	Original position	New equilibrated position
POST OP IMF prognosis	None or shorter period weakly dependent on pt	Required 7-10 day Strongly dependent on pt

Inverted L and C Ramus Osteotomies

- Inverted L osteotomy is a versatile procedure that can be adopted to treat a number of severe mandibular deformities
- This procedure was originally described by **Trauner & Obwegeser** in 1957 as an intraoral procedure, but it can also be accomplished by extraoral approach

Inverted L and C Ramus Osteotomies

- **Indications –**
 - For large advancements ≥ 12 mm :
 - For mandibular setback of ≥ 10 mm it bypasses the need for coronoidectomy
 - Well suited to secondary correction of proximal segment malrotation following SSRO
 - For simultaneous advancement & lengthening of ramus in cases of severe ramus underdevelopment (Treacher Collins

Inverted L and C Ramus Osteotomies

- **Advantages –**
 - Low risk of condylar sag as compared to IVRO
 - With I/O procedure improved cosmesis & no risk of injury to MMN
 - Also greatly decreases risk to IAN as all cuts are made under direct vision superoposteriorly to lingula
 - Placement of osteotomy cuts obviates the need to remove the wisdom teeth preoperatively since all cuts are distal to teeth
 - Condyles are maintained in passive

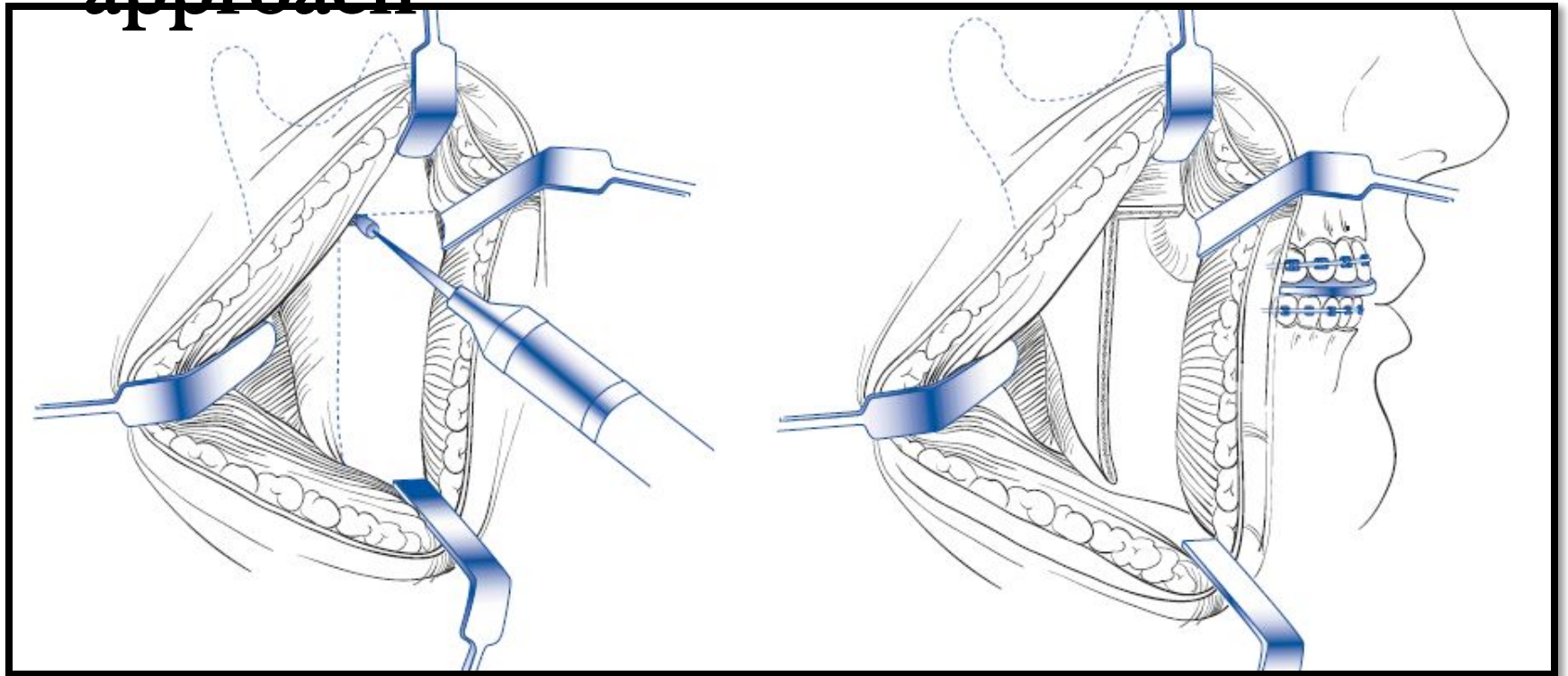
Inverted L and C Ramus Osteotomies

- **Disadvantages –**

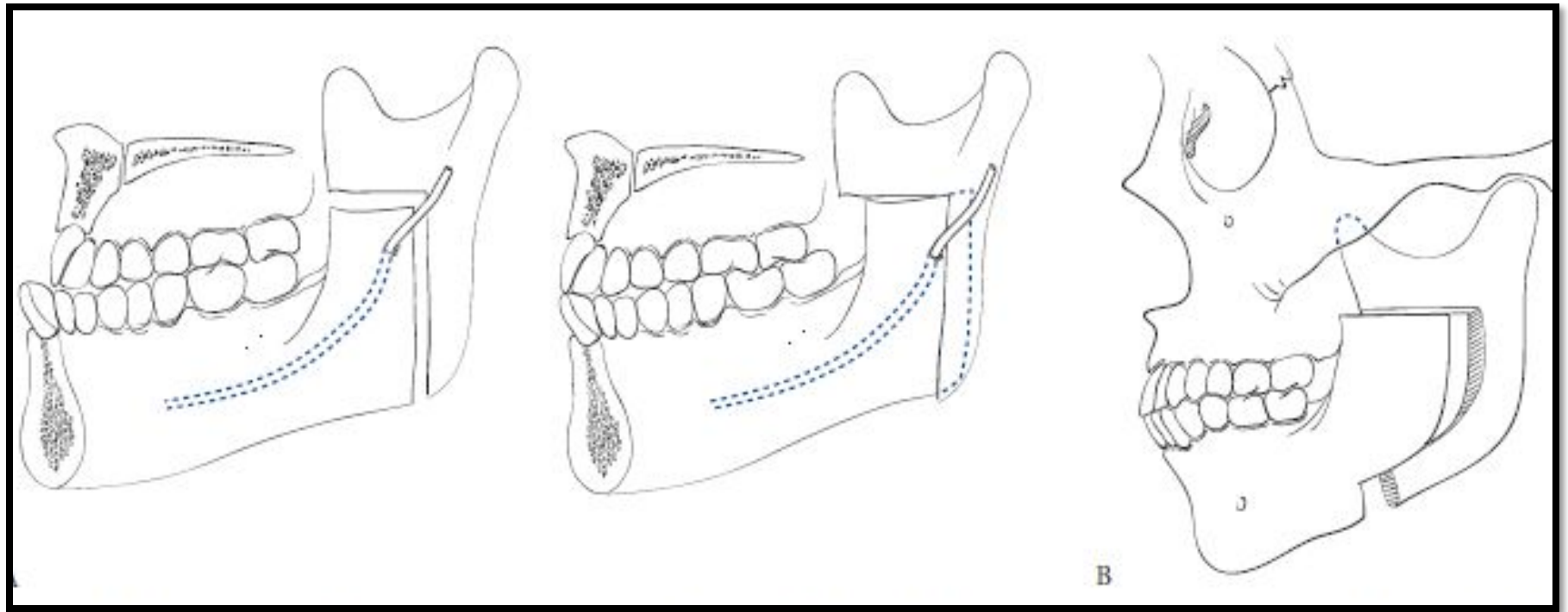
- Need for a bone graft in order to reconstruct the defect creating a second surgical site with the potential complications
- Duration of surgery is longer than BSSO

Inverted L and C Ramus Osteotomies

Extraoral approach



Inverted L and C Ramus Osteotomies



Inverted L and C Ramus Osteotomies

- **Intraoral approach-** (Greaney et al, IJOMS, 2015)
 - Intraoral incision along EO ridge & mucoperiosteal flap raised
 - Combination of Linderman bur & right angled saw is used to perform inverted 'L' osteotomy
 - Plating is accomplished using right angled drill & screw driver or via transbuccal trochar and conventional instruments

Inverted L and C Ramus Osteotomies

- **Complications –**
 - Skeletal relapse
 - Injury to MMN, IAN
 - Unsightly scars with E/O approach

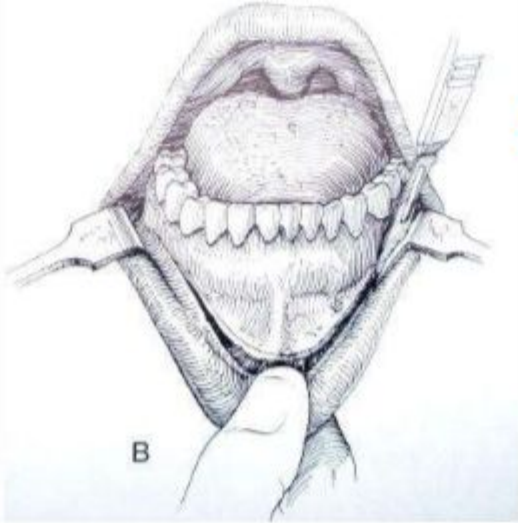
Vertical body osteotomy

- Blair -1907-as an extra oral procedure
- Dingman –combination of extra-oral and intra oral access with preservation of IAN and bone grafting-assist bony union.
- Now contemplated only as an intraoral procedure.

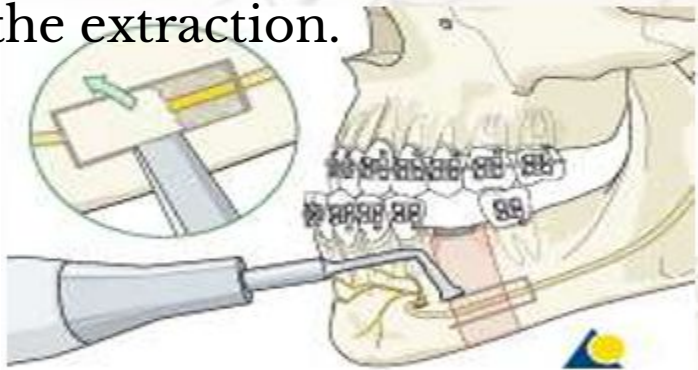
Indications

- Mandibular setback
 - In Mandibular prognathism with ramus procedure.
 - In Mandibular prognathism where long body in relation to ramus
- Anterior open bite closure-superior repositioning
- Curve of spee reduction
- Progenia jaw correction
 - In class III-anterior body osteotomy –wedge of bone removed and set back

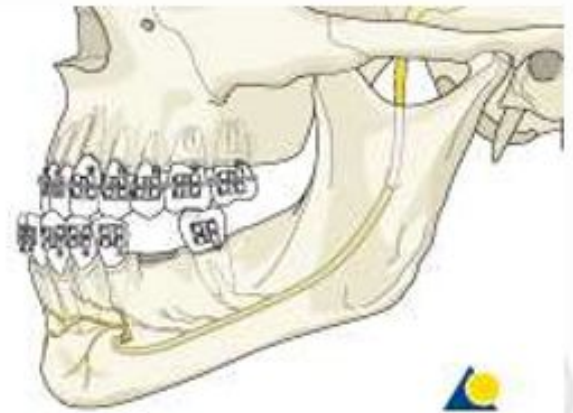
Anterior body osteotomy



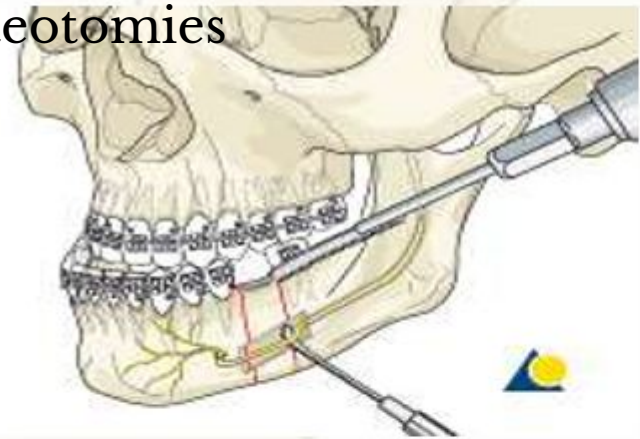
Bilaterally small vestibular incisions are taken leaving attached gingiva intact, into first or second premolar regions, depending on the extraction.



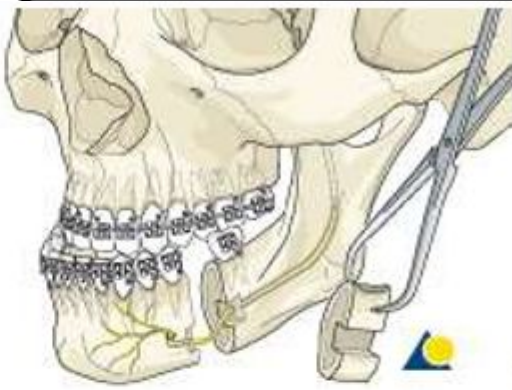
The inferior alveolar nerve can be identified and mobilized after removing the lateral cortical bone overlying the



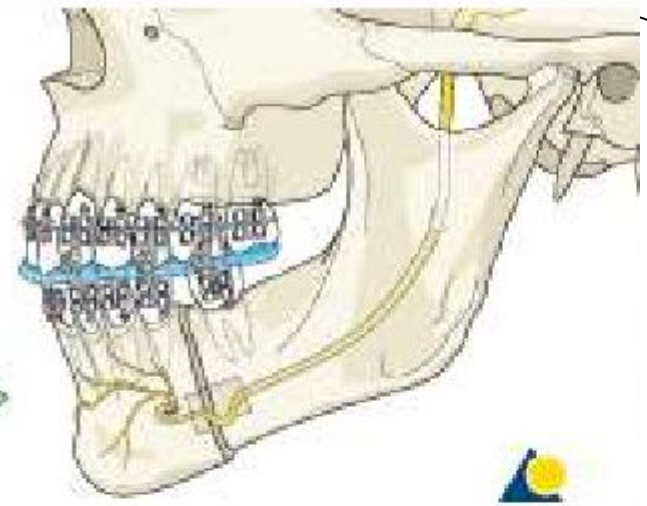
Extract the tooth in the segment which is going to be resected before performing the osteotomies



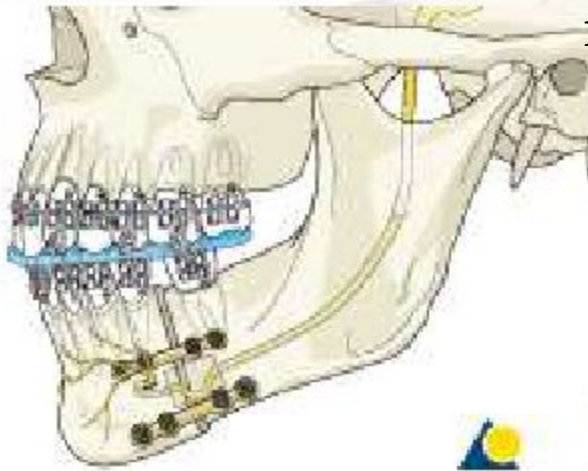
After the alveolar nerve is identified and mobilized, two parallel vertical osteotomy lines are marked with a pen or drill on the bone surface. The lingual mucoperiosteal layer is detached from the bone with a



After completion of both osteotomies the segment of bone is removed

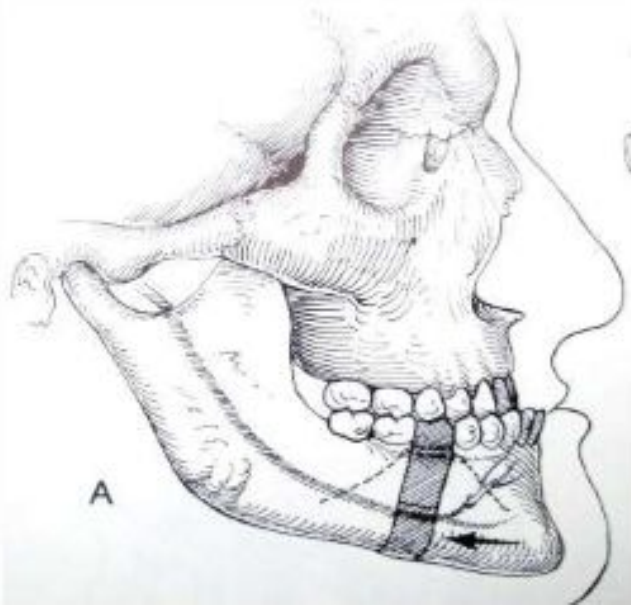


After bilateral resection, the anterior segment of the mandible is moved posteriorly into the preplanned position. Mandibulo-maxillary fixation is performed to position the mandibular segments to the desired relationship with the maxilla. A prefabricated surgical splint (or wafer) may be used to facilitate this.

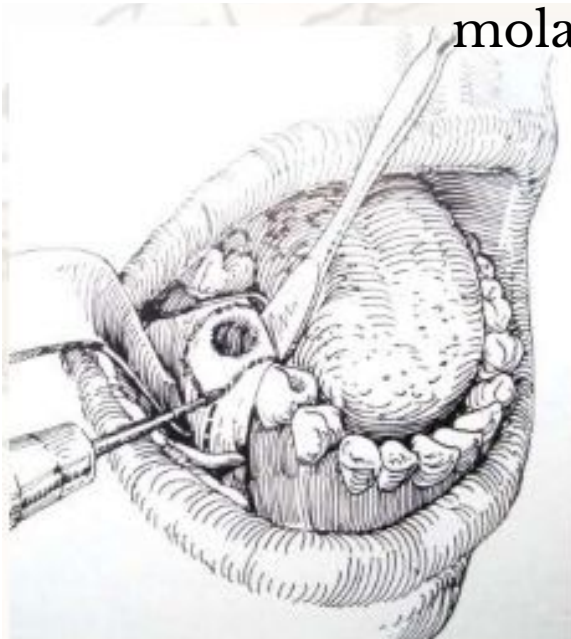


Internal fixation is usually performed with two straight miniplates one above and one below the inferior alveolar nerve. The plate placement and drilling is usually performed from the transoral route

Posterior body osteotomy



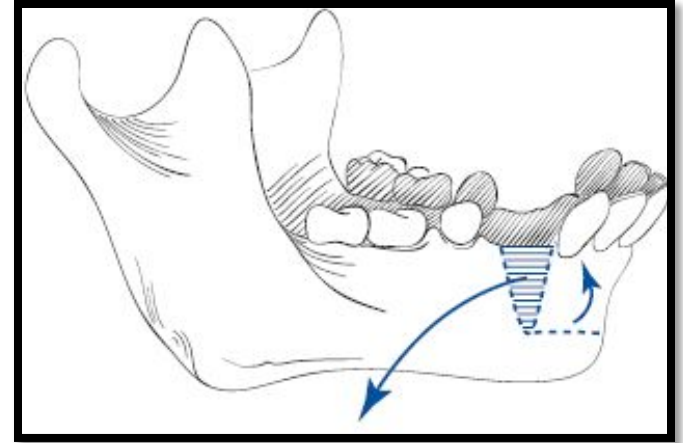
Planned osteotomies in 1st molar region



Diverging vertical incisions in buccal vestibule adjacent to area of planned osteotomy; horizontal osteotomy is made superior to level of inferior alveolar nerve to intersect with vertical bone incisions

Subapical osteotomies

- Mandibular subapical osteotomy was originally described by **Hullihan &** popularised by **Hofer & Kole**



- Modification of Hofer's original procedure:

- Kent & Hinds initially presented the use of single tooth osteotomies of mandible in 1971

- McIntosh described total mandibular osteotomy

Subapical osteotomies

- There are essentially three types of mandibular subapical osteotomies:
 - The anterior subapical,
 - The posterior subapical, and
 - The total subapical alveolar osteotomy

Subapical osteotomies – anterior

- **Indications –**

- In combination with anterior maxillary subapical osteotomy is used to correct a non-skeletal open bite or Bimaxillary protrusion as long as there is not excessive lip incompetence or incisor exposure
- To level the plane of occlusion by inferiorly repositioning anterior dentoalveolar segment
- Up righting of mandibular anterior teeth with positioning over basal bone

Subapical osteotomies – anterior

Advantages –

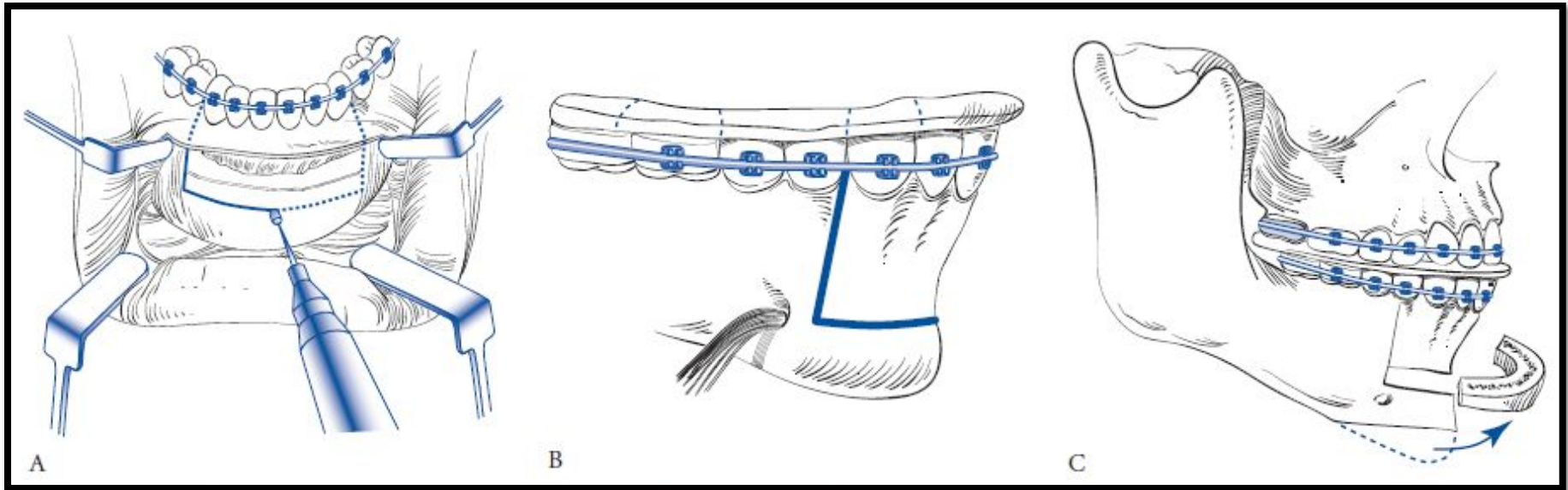
- Popular because of its versatility

Disadvantages -

- potential of damaging teeth, therefore space must be present or made to permit a safe vertical cut in the dental alveolus.

Subapical osteotomies – Anterior

Operative procedure



Subapical osteotomies – posterior

- **Indications –**

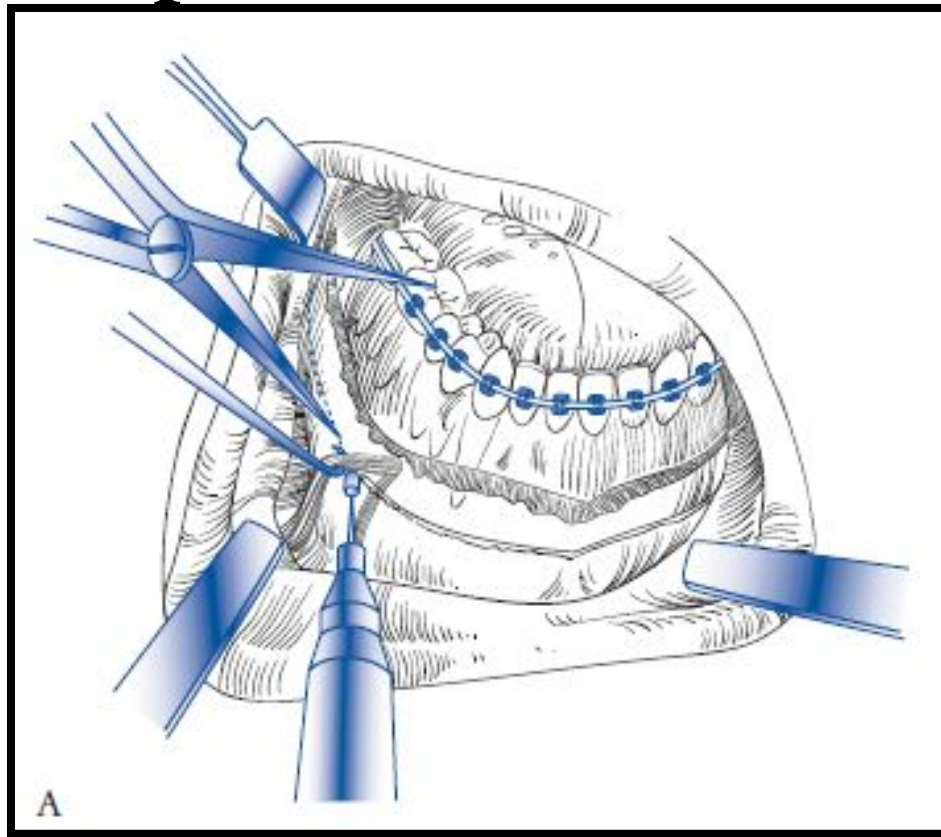
- Primarily it can be used as a correction of supereruption of posterior mandibular teeth or ankylosis of one or more posterior teeth.
- Abnormal buccal or lingual position of these teeth can also be improved on when orthodontics is not feasible

Subapical osteotomies – Total Alveolar Osteotomy

- First described by MacIntosh and Carlotti
- **Indications –**
 - Class II malocclusion with excessive chin projection & exaggerated labiomental fold
 - Vertical & transverse dental arch discrepancies

Subapical osteotomies – Total Alveolar Osteotomy

Operative procedure



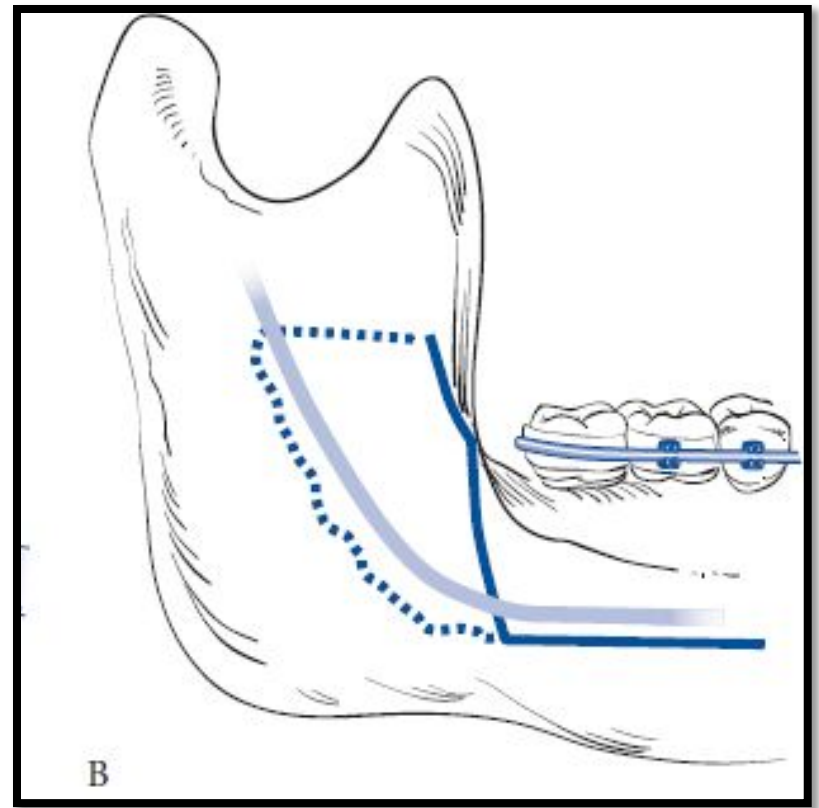
Subapical osteotomies – Total Alveolar Osteotomy

Modification by Booth & colleagues

Combines SSRO & total mandibular alveolar osteotomy

Advantages –

- Osteotomy is made below IAN, thereby decreasing risk of damaging IAN & apices of teeth, also vascular supply
- Sagittal part of osteotomy allows a larger bone contact area to assist in healing

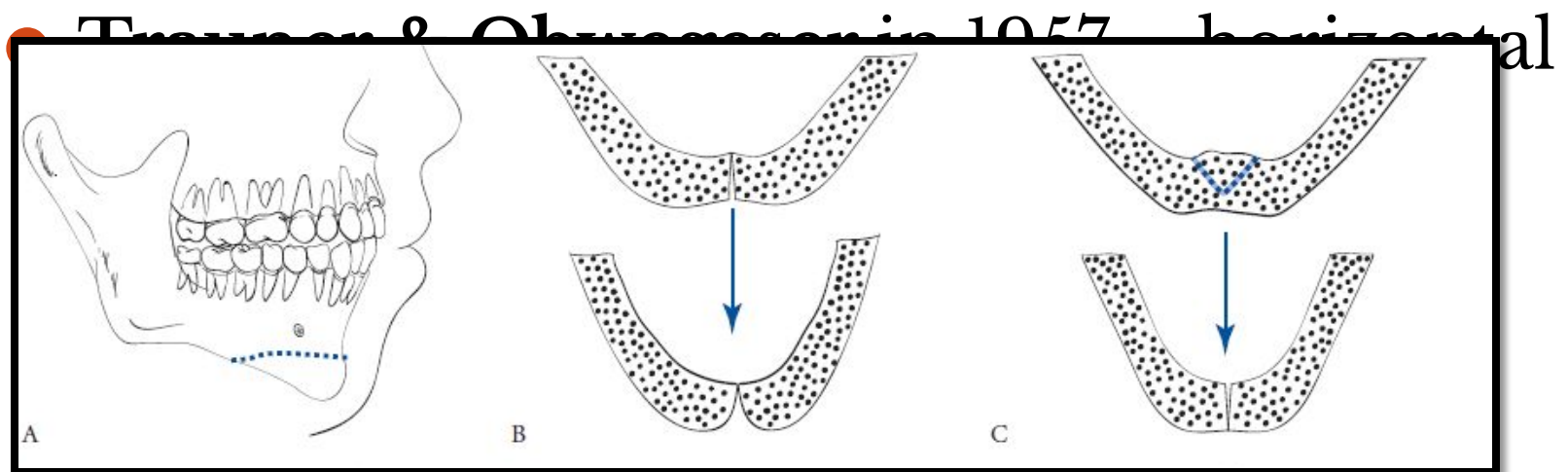


Horizontal osteotomies of symphysis

- Chin deformities can manifest in 3 dimensions
- Genioplasties can augment, reduce, straighten or lengthen the external chin
- 2 procedures are frequently employed :
 - Osteotomy/osteotomy
 - Augmentation with chin implant

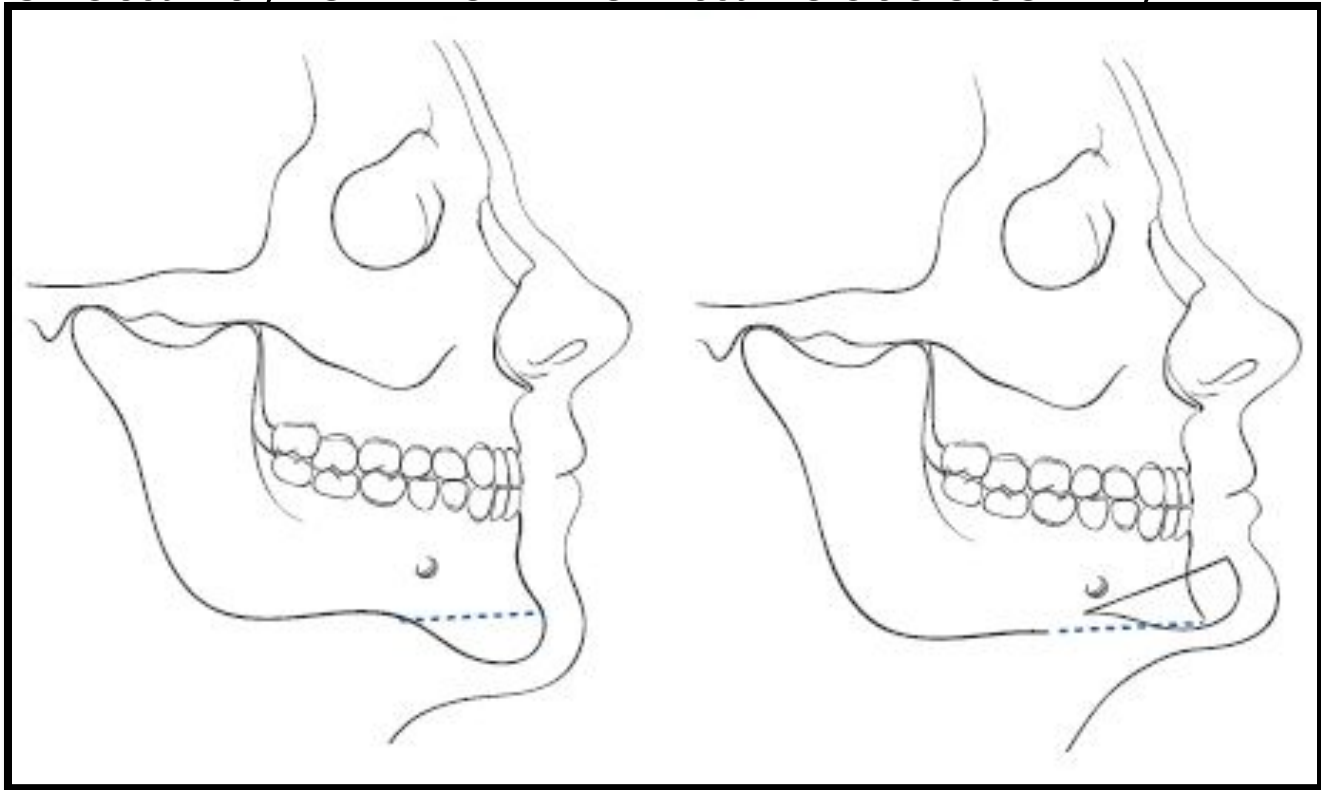
Horizontal osteotomies of symphysis

- **Hofer** in 1942 – horizontal sliding osteotomy, E/O app.
- **Converse** in 1950 – feasibility of bone grafts, I/O app.



Horizontal osteotomies of symphysis

- **Converse & Woodsmith** in 1964 – described various applications as well as versatility of horizontal osteotomy

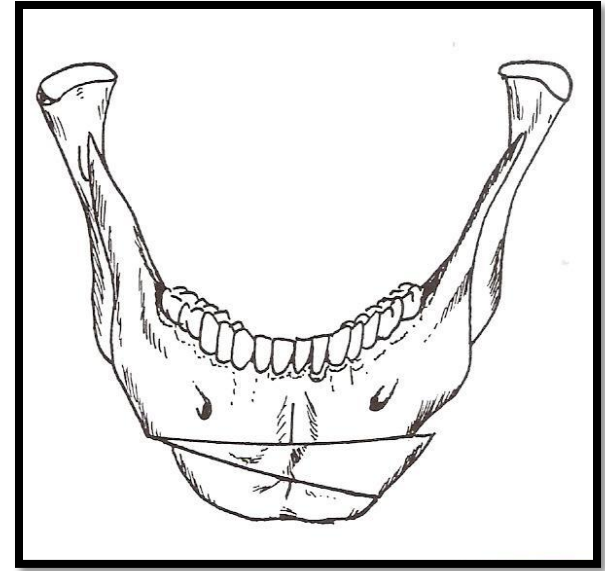
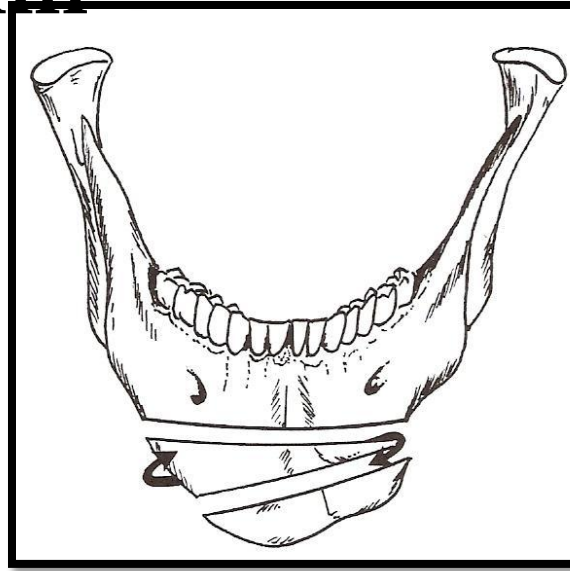
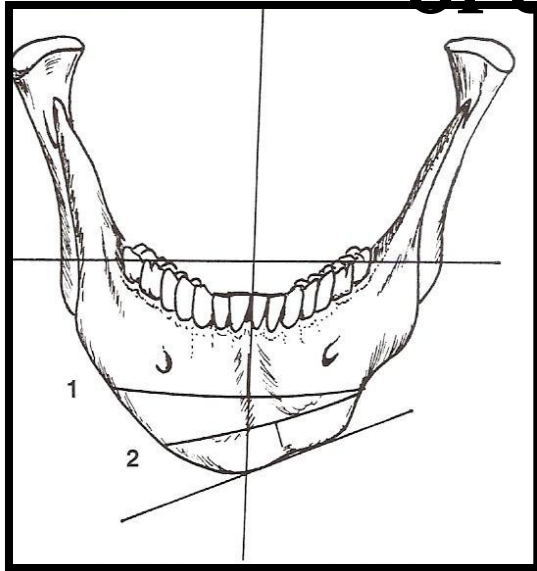


Horizontal osteotomies of symphysis

- Reichenbach & coll. in 1965 – proposed wedge osteotomy & vertical shortening of chin
- Hinds & Kent in 1969 – first to realise & discuss importance of maintaining soft tissue attachment along inferior segment

Horizontal osteotomies of symphysis – propellar genioplasty

Correction of asymmetry of chin



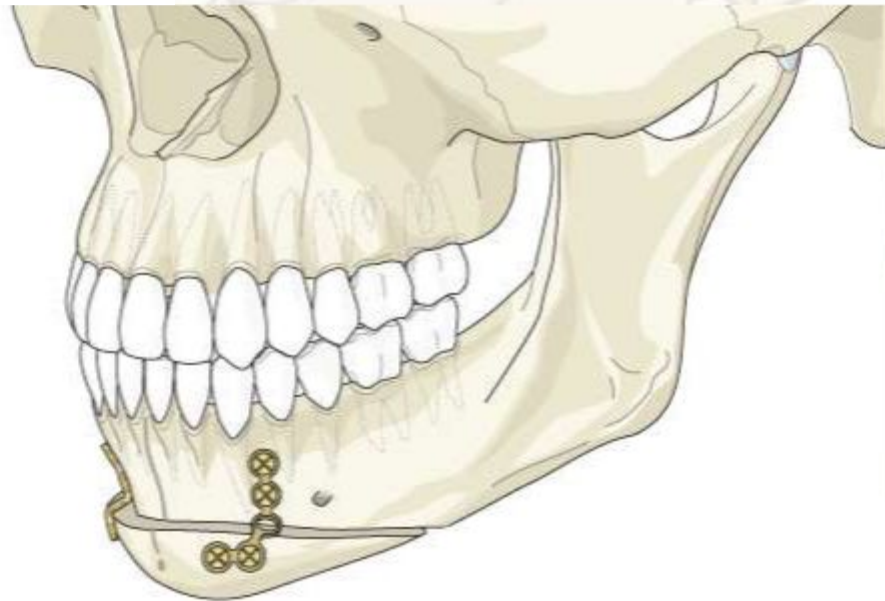
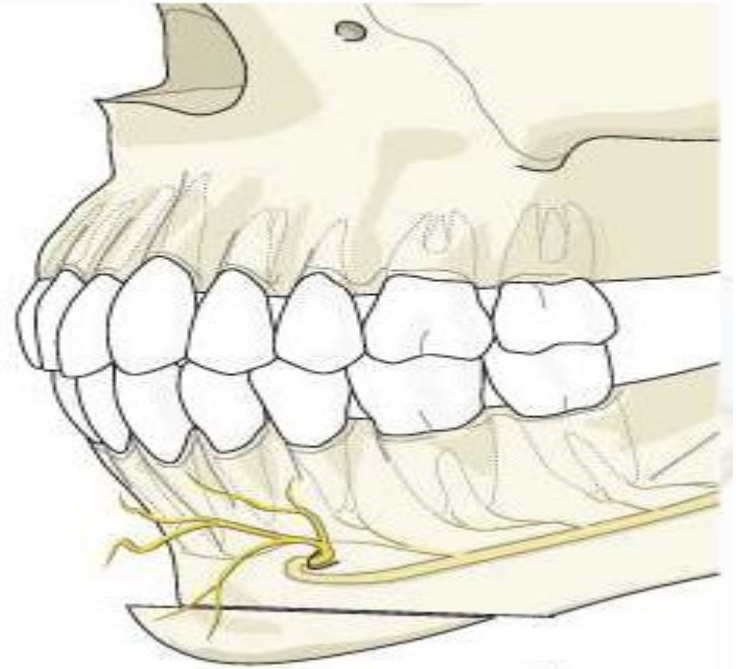
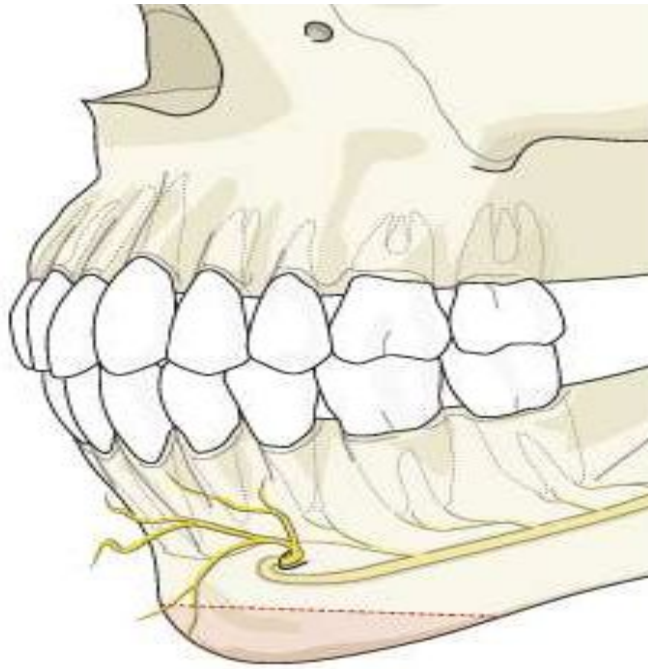
Horizontal Osteotomies of symphysis - functional genioplasty

- Advantages –
 - It involves creation of a tenon & mortise which not only preserves the insertions of labiomental muscles & at least some of the suprahyoid muscles but also improves stability of transosseous fixation
 - Superior positioning & advancement of chin & myocutaneous structures produce both functional & esthetic benefits

Horizontal Osteotomies of symphysis : Augmentation Genioplasty

- 2 basic types of augmentation genioplasties
 -
 - Horizontal osteotomy
 - Alloplastic augmentation

Horizontal osteotomies of symphysis : Augmentation Genioplasty



Alloplastic augmentation of chin

- Use of alloplasts affords the possibility of not only AP augmentation but also vertical & lateral augmentation
- Indication – dolicocephalic face with tapered chin
- Disadvantages –
 - Underlying bone resorption
 - Postoperative infection
 - Noninfectious inflammatory response

Alloplastic augmentation of chin

- **Surgical technique for alloplast insertion**
 -
 - Done simultaneously at the time of subapical mandibular osteoplasty
 - Placement through submental fold can be combined with open lipectomy or liposuction
 - I/O surgical approach via a vestibular incision

Horizontal osteotomies of symphysis -complications

- Prolonged neurosensory disturbance
- Avascular necrosis of mobilized segments
- Hemorrhage causing lingual hematomas & airway compromise
- Chin ptosis
- Bone resorption under alloplasts

Horizontal osteotomies of symphysis -complications

- Devitalization of teeth
- Mandibular fractures
- Creation of mucogingival problems
- Asymmetry & unesthetic end results