

PRE-COURSE MATERIAL

FACE 2019

Hand On Facial Trauma Workshop



Under the aegis of

Indian Academy of Otorhinolaryngology Head and Neck Surgery &
Indian Society For Facial Trauma, Aesthetic And Reconstructive Surgery Of Otorhinolaryngologists
In association with **FACE ACADEMY INDIA & MERF ACADEMIA**



Limited To
20 Hands on
Participants Only



Prof. Mohan Kameswaran
MS, FRCS (Ed), FICS, FAMS, DSc, DLO

Course Directors



Dr. Jayanth Kumar Prakash
DLO, DNB(ENT), DO-HNS (RCS Eng)
FEBORL-HNS (European Board)

Date
21st & 22nd
December 2019

Venue
MERF, Chennai
Tamil Nadu, India

REGISTRATION ONLY ON ONLINE

For more details please log on to www.faceacademyindia.com

Dr Jayanth Kumar Prakash

FACE 2019 - Facial Trauma Workshop

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21th & 22nd December 2019

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Module 1 - ADULT TRAUMA LIFE SUPPORT

By Dr Meyei S Appachi & Dr C Karthikeyan

ATLS PROTOCOL

Rapid Primary Survey



Resuscitation of vital signs



Consider Need for patient transfer



Detailed Secondary Survey



Initiation of Definitive Care

Primary Survey and Resuscitation

A

AIRWAY WITH CERVICAL SPINE IMMOBILIZATION

- Assess airway patency
- Remove foreign bodies and suction out secretions/blood
- Basic manoeuvres and adjuncts to maintain airway patency
- Airway protection with definitive airway (Cuffed endotracheal tube or tracheostomy)
- Emergency Surgical airway (Needle/Surgical Cricothyroidotomy)
- Spine immobilization with C-Collar or In-line immobilization and Spine board

B

BREATHING WITH VENTILATION

- Start Oxygen 15L/Min via Non re-breathing mask
- Assess for rate and depth of ventilation
- Assess for chest expansion, paradoxical chest movements, Raised JVP, Tracheal shift
- Ventilate with BMV or definitive airway to maximize oxygenation
- Assess for life threatening chest trauma and resuscitation (Needle/tube thoracocentesis, 3 way dressing for open chest wound, pericardiocentesis)

C

CIRCULATION WITH HEMORRHAGE CONTROL

- Assess for shock
 - Agitation/Decrease consciousness
 - Poor CRT
 - Tachycardia
 - Hypotension
- Assess peripheral pulse in all four limbs and heart sounds
- Hemorrhage control
 - External – Direct Manual pressure, tourniquets
 - Internal – splinting, pelvic binder
 - Urgently transfer for damage control surgery
- Gain 2 large bore peripheral venous / Intra-osseous / Central venous access
- Correct hypovolaemia with crystalloids / blood component therapy
- Consider permissive hypotension

D

DISABILITY

- Assess
 - GCS (< 8 requires airway protection with elective intubation)
 - Pupil size and reaction to light
 - Lateralizing signs
 - Spinal cord injury level
- Exclude other causes of low GCS (Hypoxia, hypoperfusion, Sedation, alcohol, Hypoglycemia and other drugs)
- Manage raised intracranial pressure

E

EXPOSURE AND ENVIRONMENTAL CONTROL

- Full exposure
- Prevent or correct hypothermia

Secondary Survey

- A complete Head-to-Toe evaluation with complete history, physical examination and reassessment of vital signs. Begins only after Primary survey is completed and vitals normalized.

Item to assess	Establishes / Identifies	Assess	Finding	Confirm by
Level of Consciousness	Severity of head injury	GCS Score	<8, Severe head injury 9-10 Moderate head injury 13-15 Mild head injury	CT
Pupls	Type of head injury Presence of eye injury	Size Shape Reactivity	Mass effect Diffuse brain injury Ophthalmic injury	CT
Head	Scalp injury Skull injury	Inspect for laceration and skull fractures Palpable defects	Scalp laceration Depressed skull fracture Basilar skull fracture	CT
Maxillofacial	Soft-tissue injury Bone injury Nerve injury Teeth/mouth injury	Visual deformity Malocclusion Palpation to crepitus	Facial fracture Soft-tissue injury	Facial bone x-ray Facial bone CT
Neck	Laryngeal injury C-spine injury Vascular injury Esophageal injury Neurologic deficit	Visual inspection Palpation Auscultation	Laryngeal deformity Subcutaneous Hematoma Bruit Plastymal penetration Pain, tenderness of C-spine	C-spine X-ray Angiography / Duplex exam Esophgосopy Laryngосcopy
Thorax	Thoracic wall injury Subcutaneous emphysema Bronchal injury Pulmonary contusion Thoracis a disruption	Visual inspection Palpation Auscultation	Brusing, Deformity, paradoxical motion Chest wall tenderness crepitus Diminished breath sounds Muffled heart tones Mediastinal crepitus severe back pain	Chest X-ray CT Table thoracostomy Pericardiocentesis Bronchoscopy Angiography TE ultrasound
Abdomen / Flank	Abdominal wall injury Intraperitoneal injury	Visual inspection Palpation Auscultation Determine path of penetration	Abdominal wall pain / tenderness Peritoneal irritation Visceral injury	DPL/Ultrasound CT Celotomy Contrast GI x-ray Angiography

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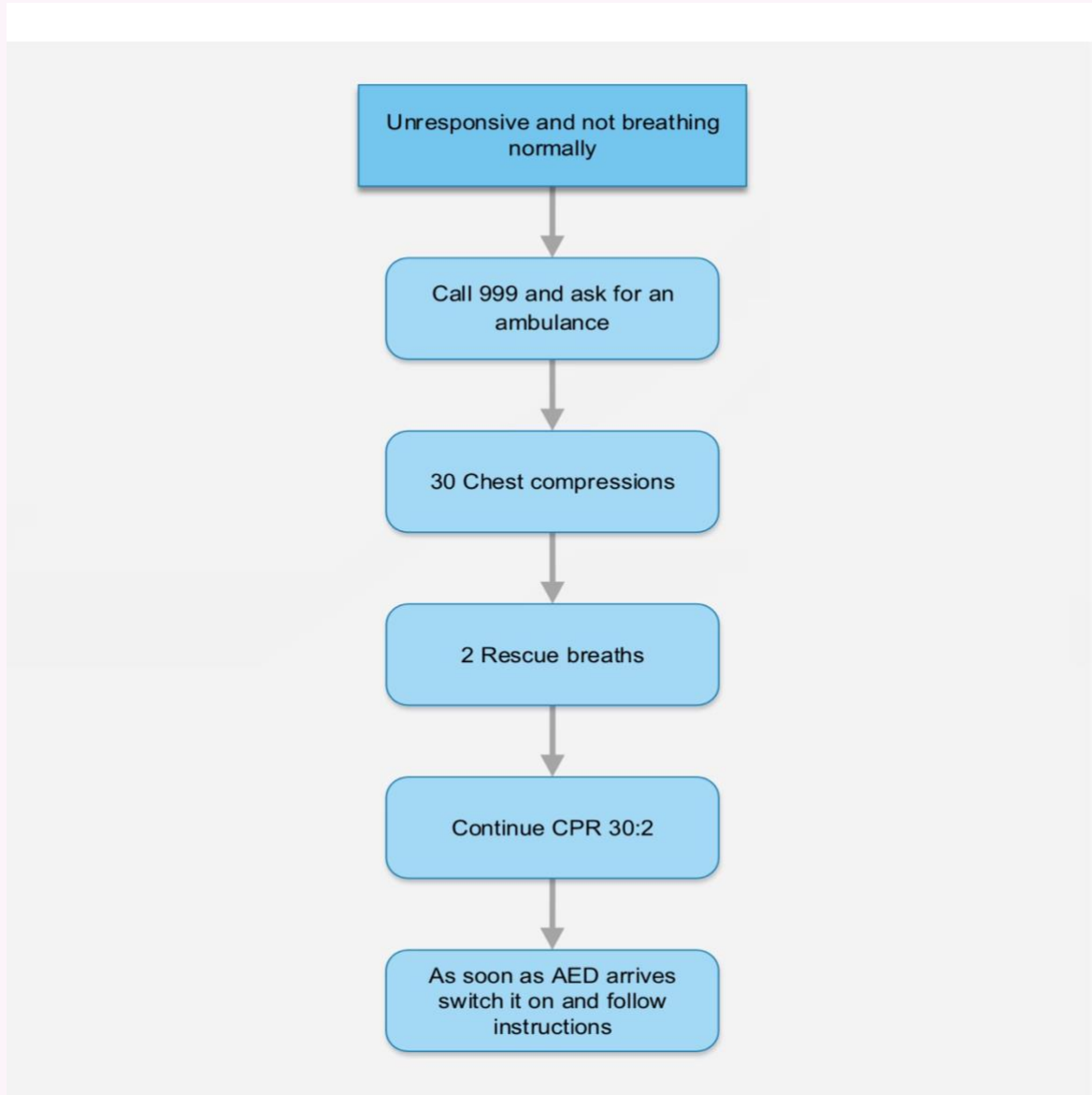
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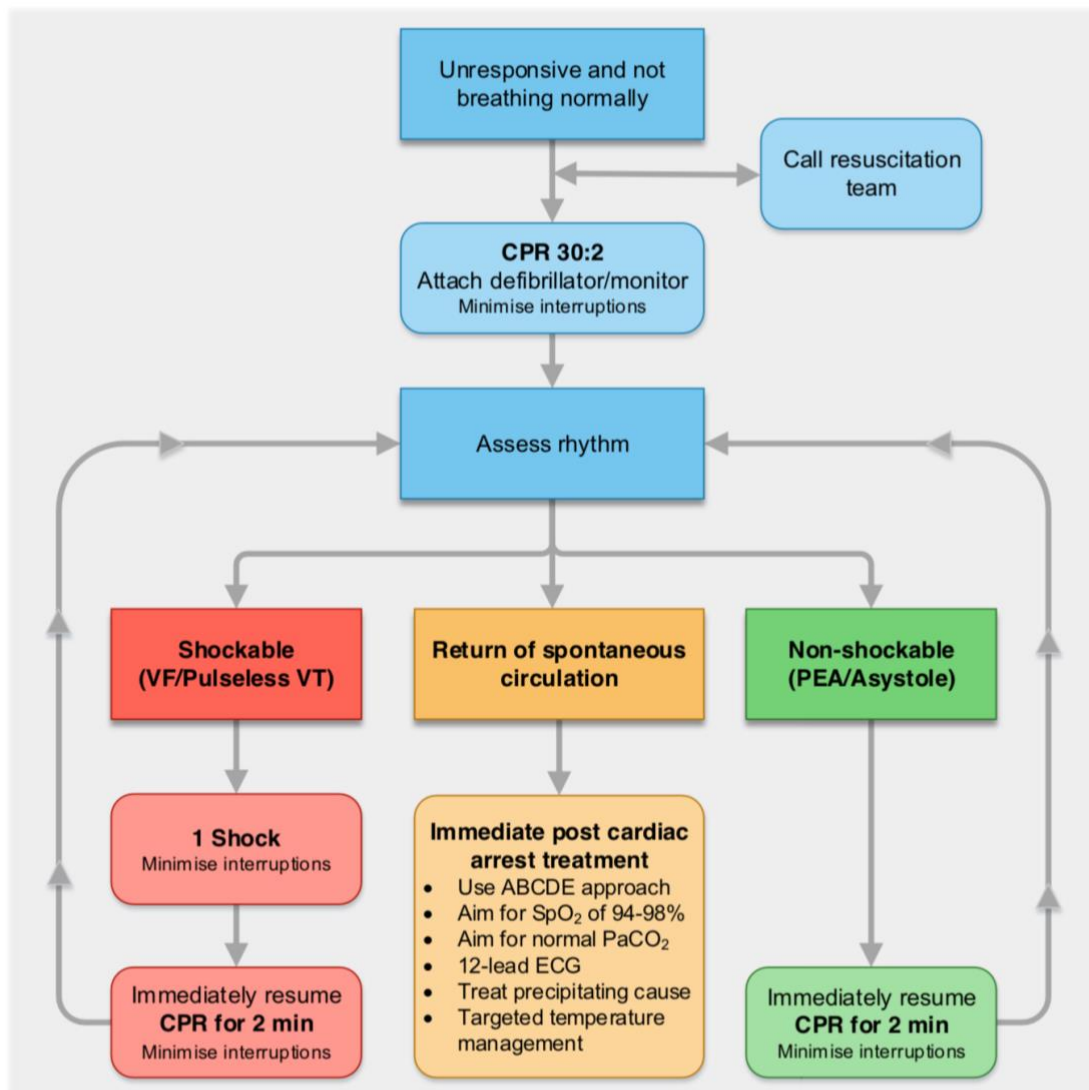
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	Retroperitoneal injury		Retroperitoneal organ injury	
Pelvis	GU tract injuries Pelvis fracture	Palpate symphysis pubis for widening Palpate bony pelvis for tenderness Determine pelvic stability only once Inspect perineum Rectal/vaginal exam	GU tract injury [hematuria] Pelvic fracture Rectal vaginal and/or perineal injury	Pelvic x-ray GU contrast studies Urethrogram Cystogram IVP Contrast-enhanced CT
Spinal Cord	Cranial injury Cord injury Peripheral nerve injury	Motor response Pain response	Unilateral cranial mass effect Quadriplegia Paraplegia Nerve root injury	Plain spine x-rays MRI
Vertebral column	Column injury Vertebral instability Nerve injury	Verbal response to pain, lateralizing signs Palpate for tenderness Deformity	Fracture vs dislocation	Plain x-rays CT
Extremities	Soft-tissue injury Bony deformities Joint abnormalities Neurovascular defects	Visual inspection Palpation	Swelling, bruising pallor Malalignment Pain, tenderness, crepitus Absent/diminished pulses Tense muscular compartments Neurologic deficits	Specific x-rays Doppler examination Compartment pressures Angiography

Adult Basic Life Support



Adult Advance Life Support



During CPR • Ensure high quality chest compressions • Minimise interruptions to compressions • Give oxygen • Use waveform capnography • Continuous compressions when advanced airway in place • Vascular access (intravenous or intraosseous) • Give adrenaline every 3-5 min • Give amiodarone after 3 shocks	Treat Reversible Causes • Hypoxia • Hypovolaemia • Hypo-/hyperkalaemia/metabolic • Hypothermia • Thrombosis - coronary or pulmonary • Tension pneumothorax • Tamponade – cardiac • Toxins	Consider • Ultrasound imaging • Mechanical chest compressions to facilitate transfer/treatment • Coronary angiography and percutaneous coronary intervention • Extracorporeal CPR
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Module 2 - BASICS OF FACIAL TRAUMA

By Dr Jayanth Kumar Prakash

CT scan in Facial Trauma

WHAT SPECIFICATIONS NEEDED?	Important Planes in Normal CT
2.3 mm sliced thickness (orbital fractures : 1 mm)	Axial
Axial - above the frontal sinus down to below mandible	Coronal
Axial images can be reconstructed 3D, coronal and sagittal	Sagittal plane
Viewing in both bony and soft tissue windows is necessary	3D image

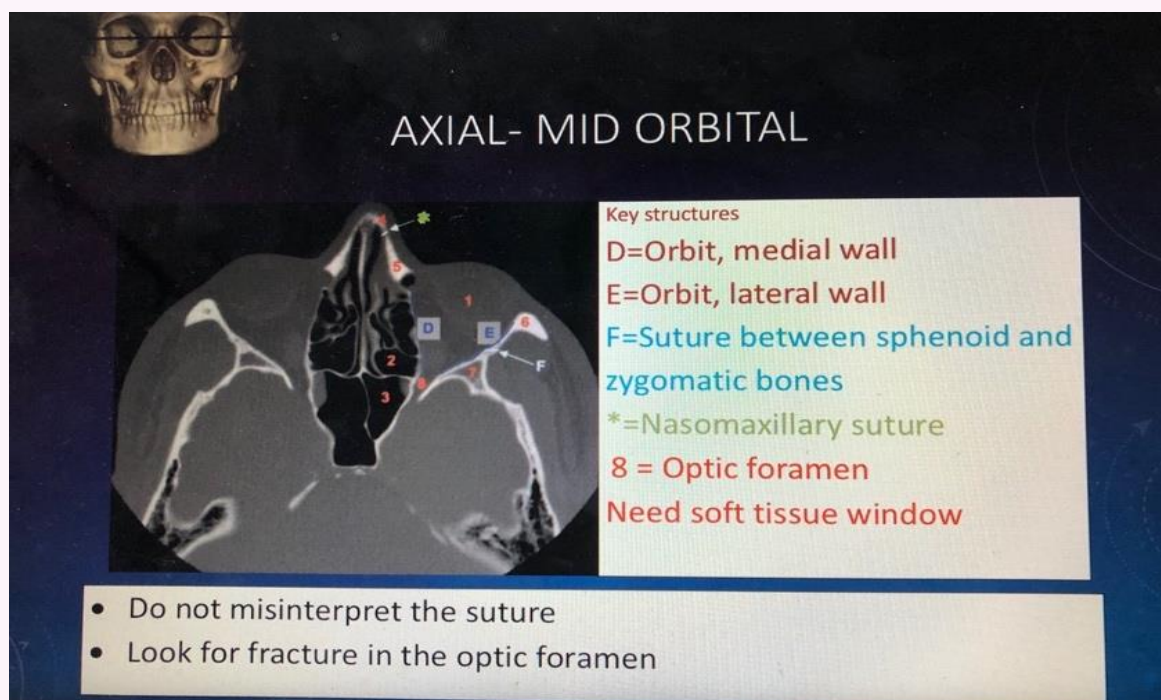
Axial CT

- Axial
 - Supra orbital rim
 - Mid orbital
 - Zygomatic arch
 - Mid Maxillary
 - Palate

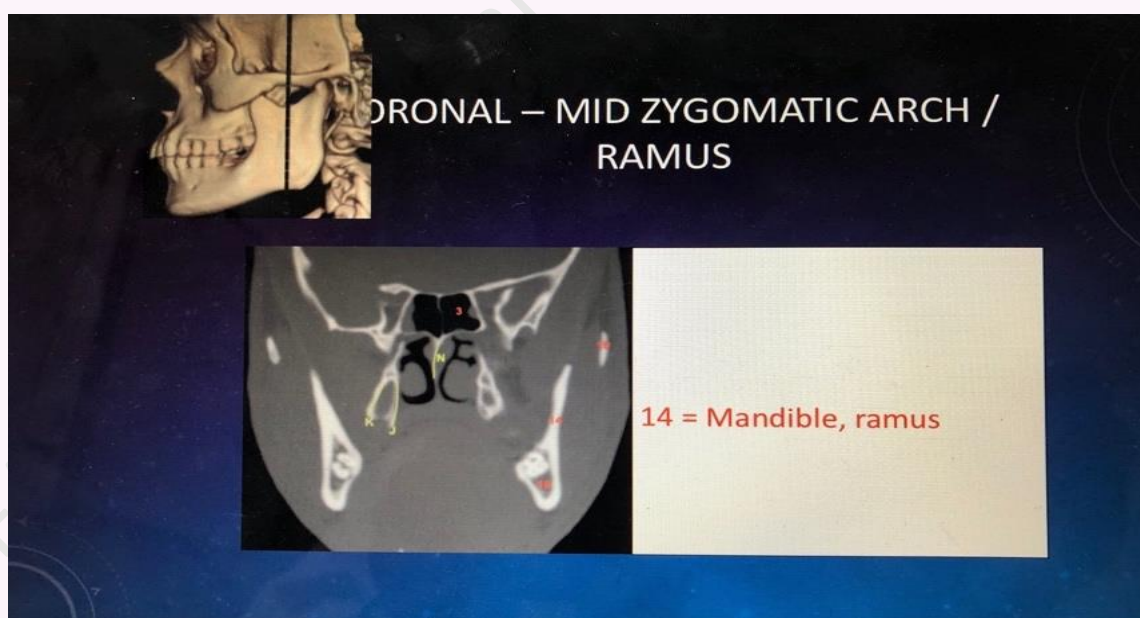
AXIAL – SUPRA ORBITAL RIM

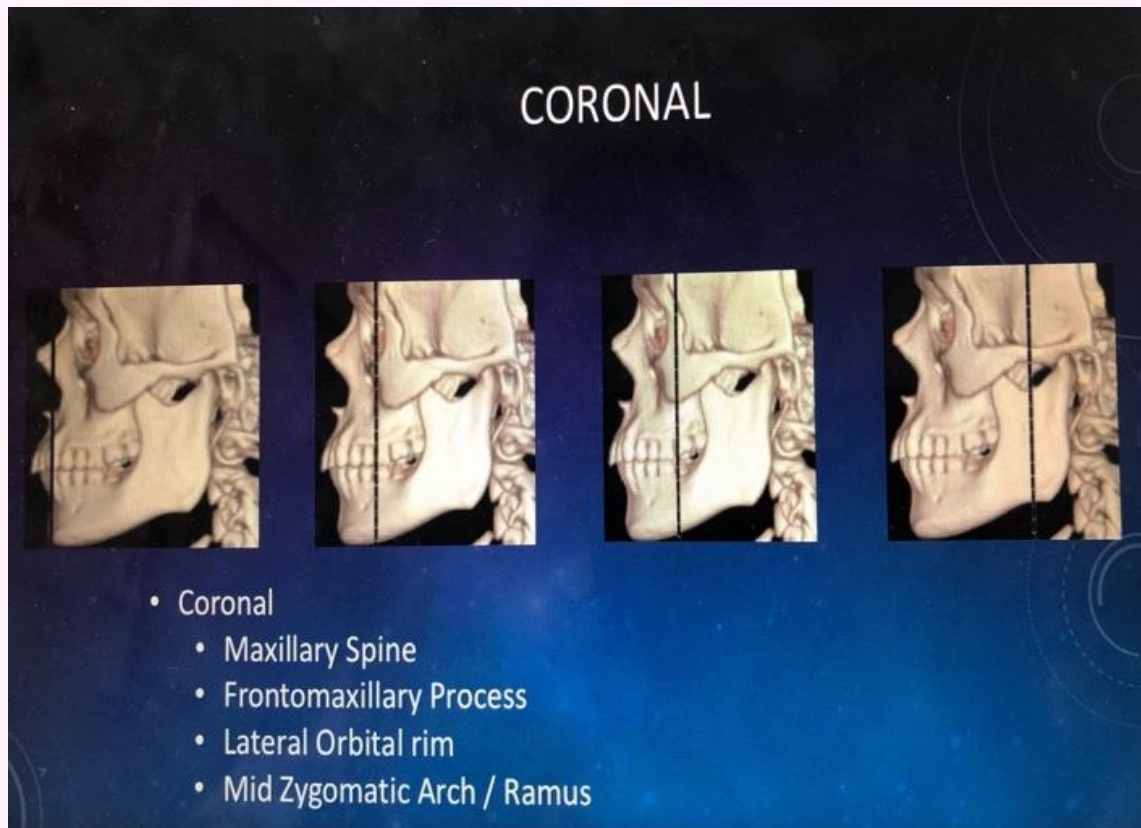
Key Structures
 A=Frontal Sinus, Anterior wall
 B=Frontal Sinus, posterior wall
 C=Supra orbital rim

- Posterior wall of frontal sinus fracture may co-exist with brain injury
- Presence of pneumocephalus signifies dural tear related with the fracture



Coronal CT

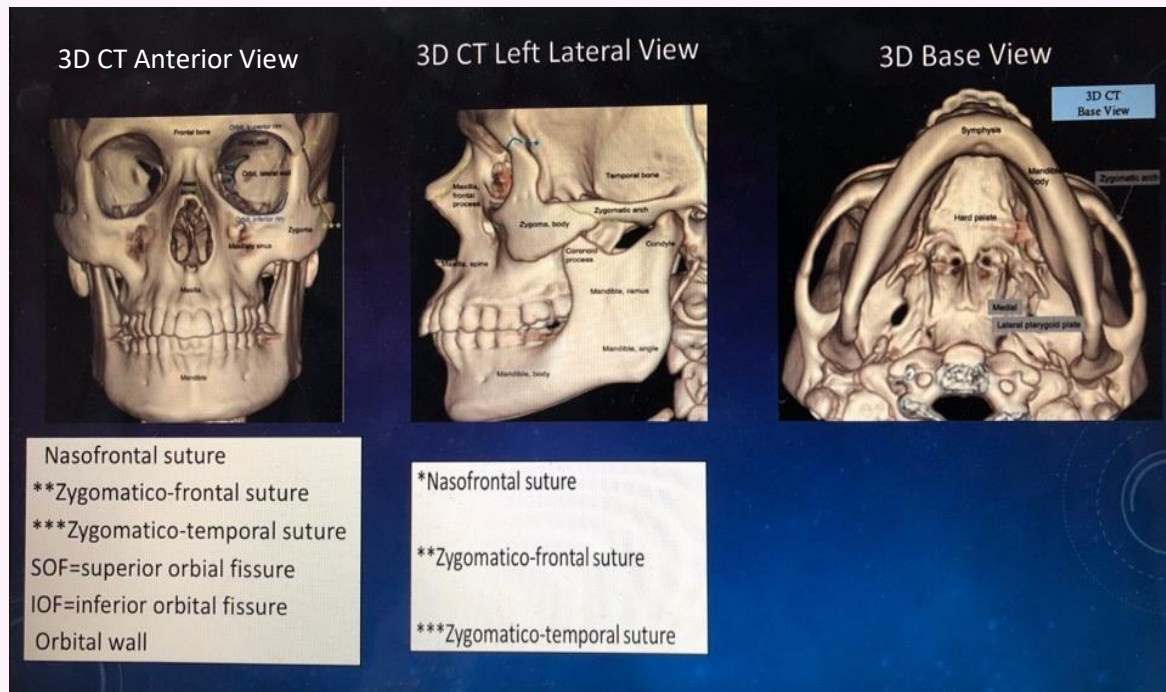




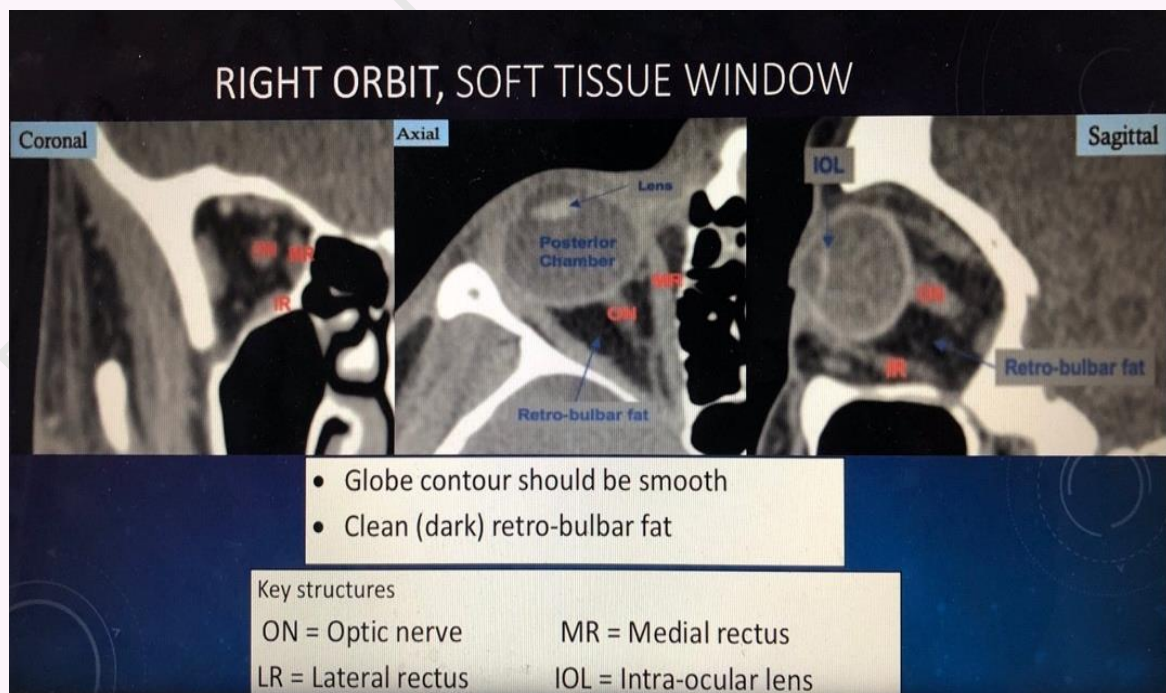
Sagittal



3D



Soft tissue window



CT Orthopanthogram



MRI might be indicated to better detect soft-tissue problems such as:

- Optic nerve edema or hematoma
- Ocular muscle disorders (incarceration, hematoma, disruption)
- Intraocular disorders (hematoma)
- Foreign bodies in the orbit

Buttress

By Dr Jayanth Kumar Prakash

Vertical Buttresses

3 paired vertical buttresses (from anteromedial to posterolateral):

- nasomaxillary buttress
- zygomaticomaxillary buttress
- pterygomaxillary buttress



Horizontal buttresses

- Superior orbital rims
- inferior orbital rims
- alveolar ridge



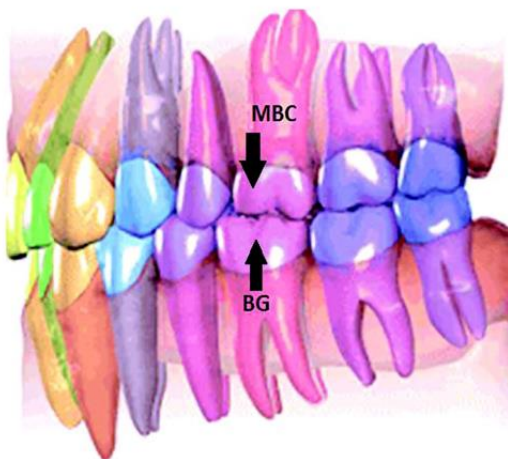
Occlusion

By Dr Jayanth Kumar Prakash

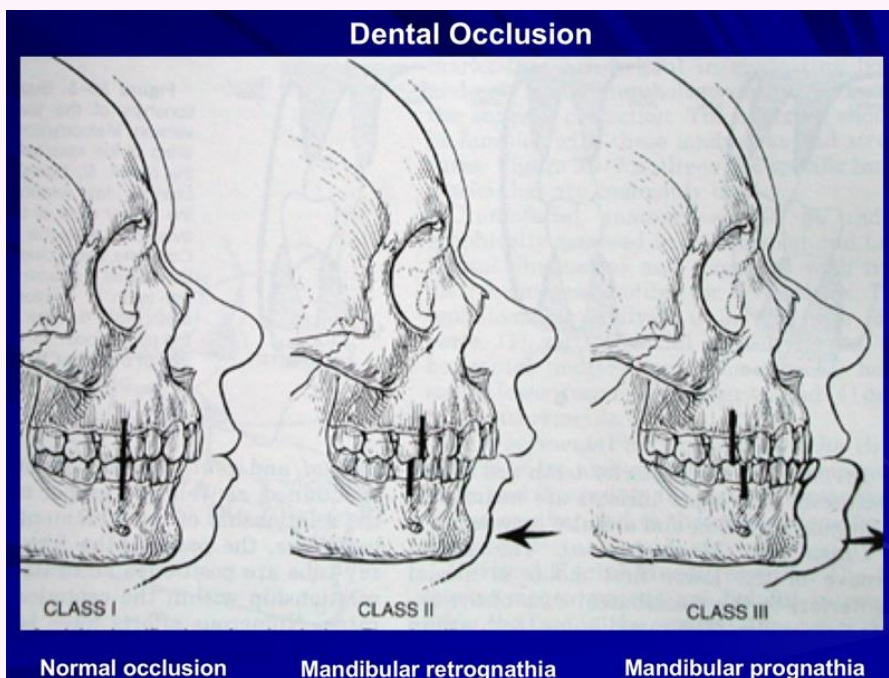
- Angle's classification (1887)
 - Based on relationship of permanent 1st molars and to a lesser degree the permanent canines to each other

Class	Molar relation	Canine relation
I	Mesiobuccal cusp of maxillary 1 st molar is in line with buccal groove of mandibular 1 st molar	Maxillary permanent canine occludes with distal ½ of mandibular canine and mesial half of mandibular 1 st premolar
II Div1 – Overjet Div2 – Lingual inclination	Buccal groove of mandibular 1 st molar is distal to mesiobuccal cusp of maxillary 1 st molar	Distal surface of mandibular canine is distal to mesial surface of maxillary canine by at least width of a premolar
III	Buccal groove of mandibular 1 st molar is mesial to mesiobuccal cusp of maxillary 1 st molar	Distal surface of mandibular canine is mesial to mesial surface of the maxillary canine by at least the width of a premolar

OCCLUSAL EVALUATION

**Figure 5.8**

Molar relationship in Class I occlusion, mesiobuccal cusp (MBC) of the upper first molar occludes with the buccal groove (BG) of the lower first molar.



Implants

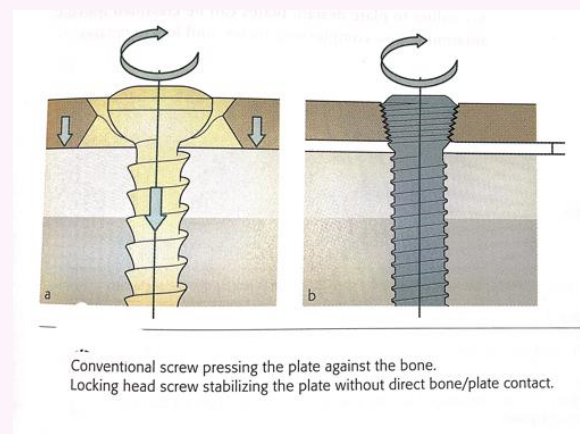
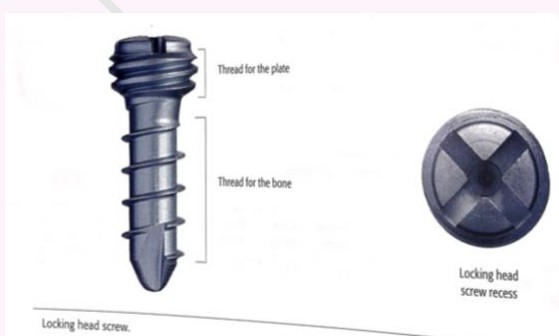
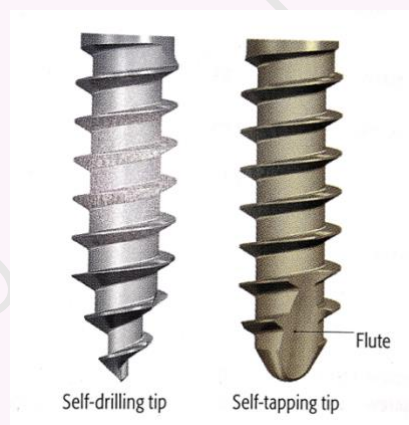
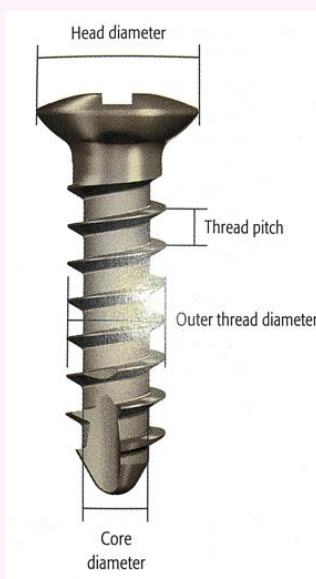
By Dr Jayanth Kumar Prakash

Implant material	Specification	Composition	
Commercially pure titanium	Grade 1	Ti (99%), N (0.03%), C (0.08%-0.10%), H (0.015%-0.0125%), O (.18%), Fe (.20%)	
	Grade 2	Ti (99%), N (0.03%), C (0.08%-0.10%), H (0.0125%), O (.25%), Fe (.30%)	
	Grade 3	Ti (99%), N (0.05%), C (0.08%-0.10%), H (0.015%-0.0125%), O (.35%), Fe (.30%)	
	Grade 4	Ti (99%), N (0.05%), C (0.08%-0.10%), H (0.0125%), O (.40%), Fe (.50%)	
Stainless steel alloy	316 L	Fe (approximately 65%), Cr (17-19%), Ni (13-15%), Mo (2.25-3.0%) N (0.10%), C (0.03%), Mn (2%), P (0.025%),	
Cobalt-chromium alloy	Vitalium	Co (58-65%) Cr (27%-30%), Mo (6.0%), c (0.4%), Mn (1.0%), Si (1.0%), Fe (5.7%)	
Titanium aluminium niobium alloy		TAN	Ti (approximately 67%), Al (5.5%-6.5%), Nb (6.5%7.5%), N (maximum 0.05%), C (maximum 0.8%), H (maximum 0.009%), O (maximum 0.20%), Fe (maximum 0.25%), Tn (maximum 0.5%)
Titanium molybdenum alloy		Ti-15Mo	Ti (approximately 85%), Mo (14%-16%), N (maximum 0.05%), C (maximum 0.10%), H (maximum 0.015%), O (maximum 0.20%), Fe (maximum 0.10%)
Poly L-lactic acid (PLLA) and Poly D, L-lactic acid (PDLA) combination			70% PLLA/30% PDLAII
Poly (L-lactide-co-glycolide)			85% L-lactide/15% Glycolide

Plate and screw materials

By Dr Jayanth Kumar Prakash

Adaptation plate	A 1.0 to 2.0 mm plate or Matrix plate with a chain-link design that permits linking of bone segment
Dynamic compression plate (DCP)	A plate using the gliding-hole principle to compress the fragments
Locking plate	A plate with a threaded hole. This plate is engaged by and therefore locked to the screw creating stable unit
Limited-contact dynamic compression plate (LC-DCP)	A compression plate with channels removed from the underside to permit less bone surface contact and more soft tissue ingrowth
Reconstruction plate	A wide plate with a higher profile and therefore strong enough to provide the effects of buttressing
Universal fracture plate	A plate with a chain-link design. While it looks like a reconstruction plate it is not as wide or as strong and therefore not as strong. It is a form of stabilization plate.
Plate profile	The height of the plate as measured from the undersurface (the portion which contacts bone) and the outer surface
Intersection bar	The connection between two holes of a plate
Strut plate	A plate composed of two plates linked together with interconnecting bars



Plates

Various shapes & Thickness



Meshes



Orbital Plates

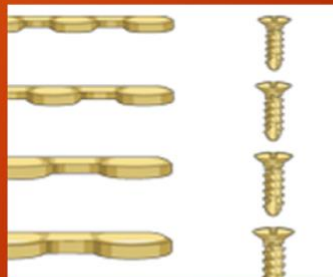
- fan-shaped titanium plate
- similar plate with porous polyethylene coating
- orbital reconstruction plate
- preformed anatomic orbital plates.



porous polyethylene implants or bone grafts can be used.

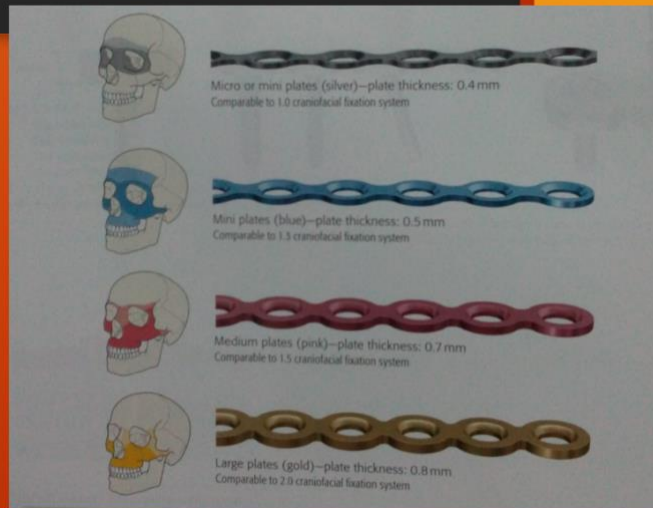
Conventional

- Conventional Plate & Screws system
- 1.0, 1.3, 1.5, and 2.0
- Numbers refer to the outer screw thread diameter in mm.



Matrix

- one screw type with a diameter of 1.55 mm
- Plates of varying thicknesses



Maxillomandibular Fixation (MMF)

By Dr Rajesh Yadav

There are various methods of immobilization. Most commonly in use are Erich arch bars.

ARCH BARS

Indications

- For a temporary fragment stabilization in cases of emergency.
- As a method of closed reduction for simple fractures and condylar fractures.
- Can be used for stabilization of alveolar fractures.
- Can be used intraoperatively for maintaining occlusion.
- Can be used for long term fixation of comminuted, infected and edentulous fractures.

Advantages

- Easy technique
- Cost effective
- No expertise required.
- Can be done under local anesthesia
- Can be done in minor operation theatre or bedside

Disadvantages

- Chances of injury to soft tissue
- Risk of contamination of blood borne infections.

Steps

- **Infiltration** - 2% lignocaine with adrenaline is injected at upper and lower gingivobuccal sulcus
 - Mental nerve block given
 - Inferior alveolar nerve block given
- Appropriate size of arch bar is selected according to patient's dental arch. Fig. 1a & b

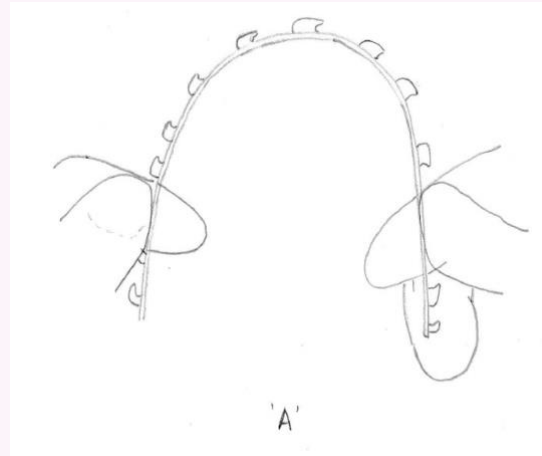


Fig. 1 & b showing appropriate sized arch bar

- Arch bar is contoured on dental arch and cut accordingly. Extra length of arch bar needs to be cut (fig. c & d) and posterior edge of bar needs to be bent to prevent soft tissue injury.

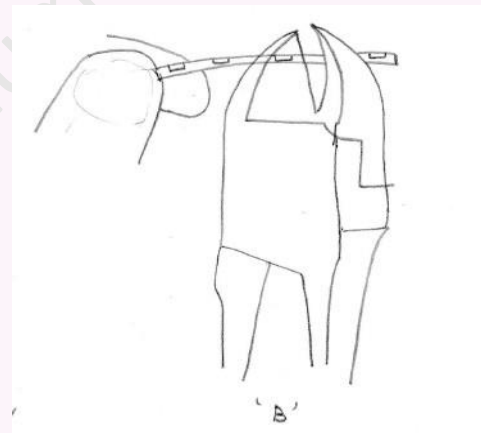


Fig. 1 c&d extra length of arch bar is cut

- 26 no wire is introduced through interdental space labially and is retrieved on lingual side



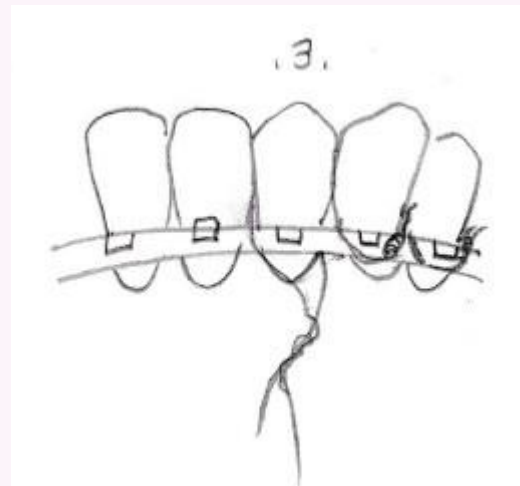
- Wire is again introduced into adjacent interdental space from lingual side and retrieved again on labial side.



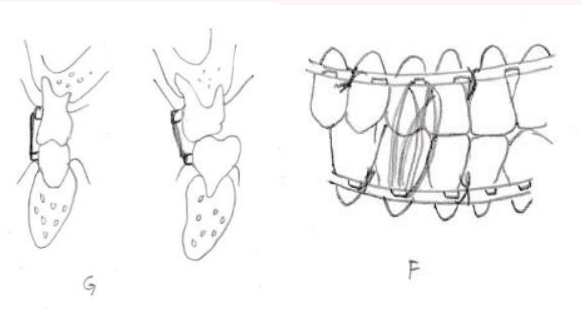
- The wire is introduced in such a way that passes above and below the arch bar. Then with the help of twister the wire is twisted around the lug.



- Similarly, arch bar is tightened on adjacent tooth.



- Similarly, arch bar is tightened on upper as well as lower dental arch



WIRING TECHNIQUES

1. Gilmer method

Advantages

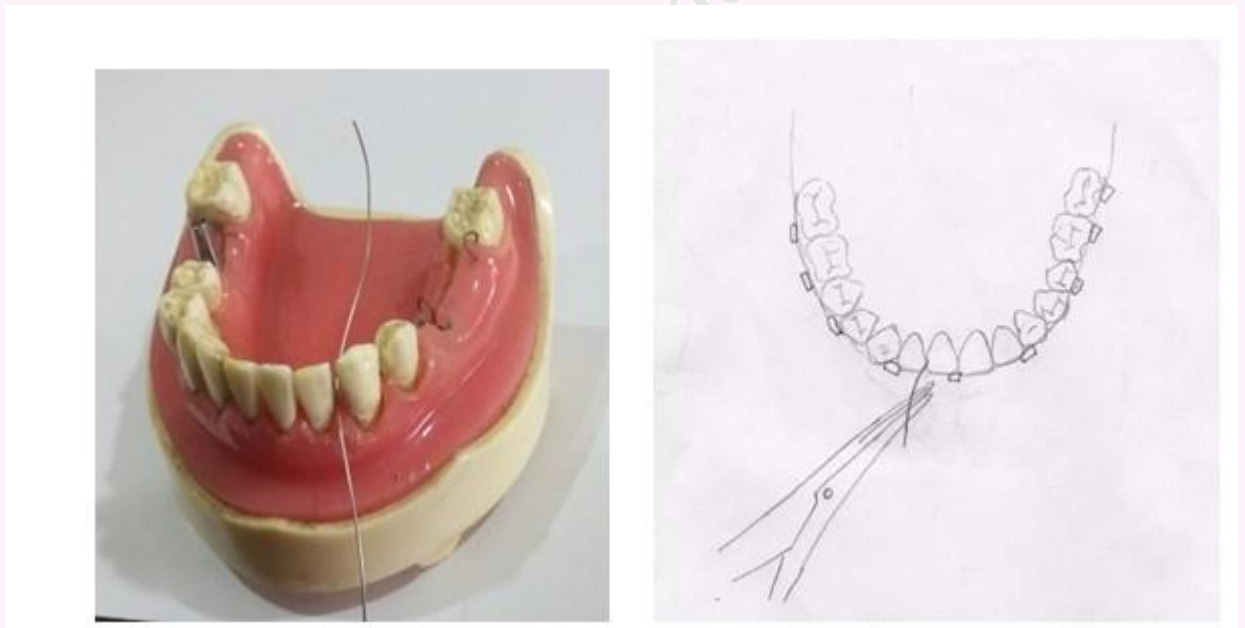
- Simple technique
- Effective technique
- Do not require arch bars

Disadvantages

- Fracture site cannot be inspected because of inability to open mouth. This can only be done after cutting the wire.

STEPS

- **Infiltration** - 2% lignocaine with adrenaline is injected at upper and lower gingivo-buccal sulcus
 - Mental nerve block given
 - Inferior alveolar nerve block given
- 26 no wire is introduced through interdental space labially and is retrieved on lingual side. Fig...



- wire is again introduced into adjacent interdental space from lingual side and retrieved again on labial side(fig.)



- With the help of a twister the wire is twisted and tightened around the neck of the tooth. (fig.)



- Adequate number of wires are passed in upper and lower teeth
- The teeth are brought into occlusion and immobilized by twisting one upper and lower wire. (fig.)



2. Eyelet method

Advantages

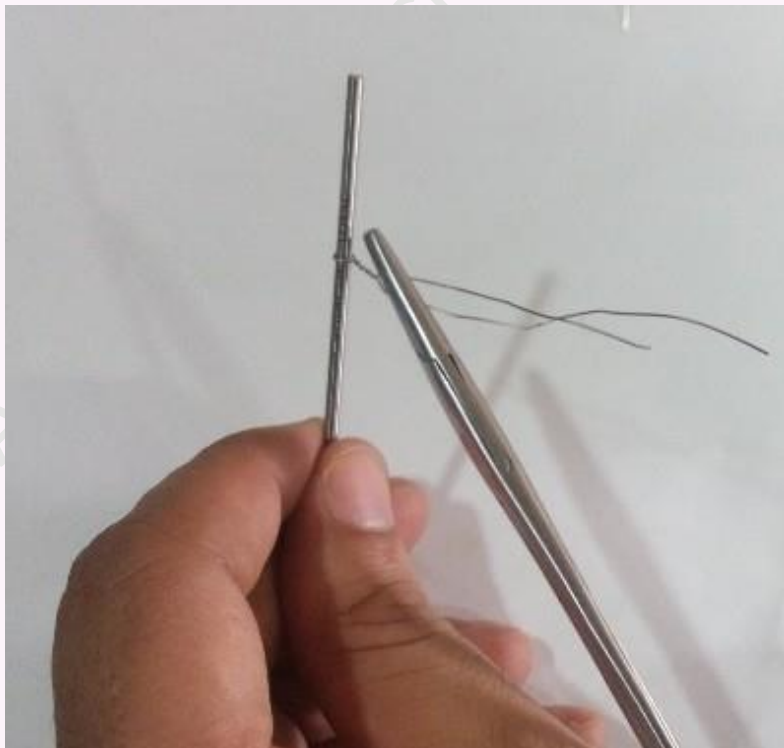
- Simple and cost effective technique
- Can be done without arch bar
- Fracture site can be inspected

Disadvantages

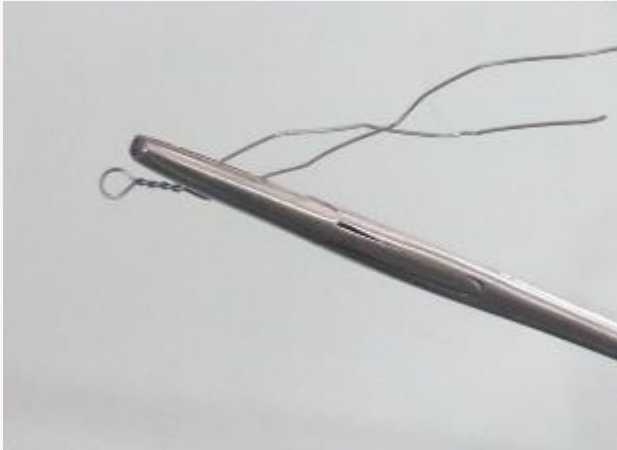
- Chances of soft tissue injury
- Risk of blood borne infections

Steps

- **Infiltration** - 2% lignocaine with adrenaline is injected at upper and lower gingivobuccal sulcus
 - Mental nerve block given
 - Inferior alveolar nerve block given
- Adequate size of around 20 cm wire is cut and looped around drill bit and twisted on drill bit for two and a half turns. (fig.)



- This forms a loop at one end of a wire.(fig.)



- Then other two ends of wire are passed through interdental space from buccal side and retrieved to the lingual side(fig).



- Then one end of wire is passed through posterior interdental space from lingual to buccal side



- Other end of wire is passed through anterior interdental space in the same manner.



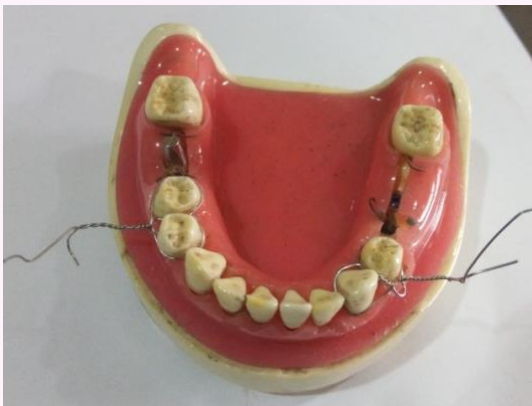
- Then any end of the wire is passed through the loop



- Free ends of both the wires are tightened around the tooth.



- Normally the eyelet wires are placed around premolar tooth at four quadrants of oral cavity.



- After achieving the occlusion, a wire is passed through upper and lower loop and is tightened for MMF.

3. Ernst ligature

Indications

- In case of emergencies can be used for temporary fixation prior to any definitive operative technique
- Can be used for simple fractures

Disadvantages

- Cannot be used for unstable, comminuted or infected fractures
- Cannot be used around loose tooth
- Risk of blood borne infections

Steps

- **Infiltration** - 2% lignocaine with adrenaline is injected at upper and lower gingivobuccal sulcus
 - Mental nerve block given
 - Inferior alveolar nerve block given
- Adequate size (20 cm) of wire is cut and is passed through one interdental space from labial side to lingual side.



- This wire is threaded back from adjacent anterior interdental space from lingual to labial side.



- The anterior end of the wire is passed from posterior interdental space from buccal to lingual side.



- This end of the wire is retrieved again on buccal side by passing through the adjacent anterior interdental space.



- This forms a loop around two teeth which is pulled and twisted.



- This is normally done on premolar teeth.
- Similar tightening is done on adjacent tooth



- Then upper and lower wire is twisted around each other.

INTERMAXILLARY SCREW FIXATION

Advantages

- Time saving technique
- Rapid method of immobilization
- Least chances of blood borne infections
- Least chances of soft tissue injury

Disadvantages

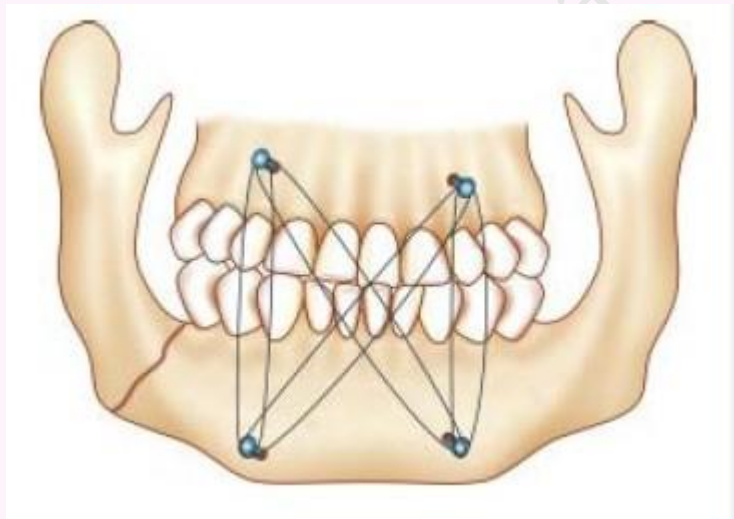
- Cost affair
- Requires precise placement
- Chances to damage root of mandibular or maxillary tooth
- Cannot be done on complicated and comminuted fractures
- Normally done in general anesthesia

Steps

- These screws are readily available in market in standard sizes. These screws are inserted according to the type of fractures.
- Screws are positioned in maxilla and mandible in such a way that roots of maxillary and mandibular tooth is not traumatized.



- These screws have preformed holes in it. Wire is passed through these preformed holes and fixation is accomplished.



Instrument

Dr Jayanth Kumar Prakash

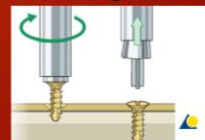
Instruments



Instruments



Self Retaining Screw drivers



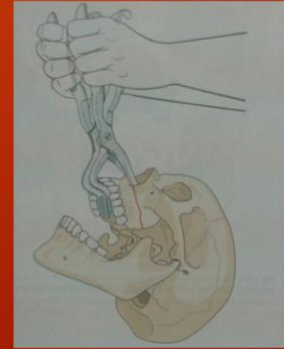
Instruments



Rowe's disimpaction
forceps



Rowe's elevator



Instruments



Silicone Mouth Props



Arch Bars



Dental Wires 24G, 26G, 28G

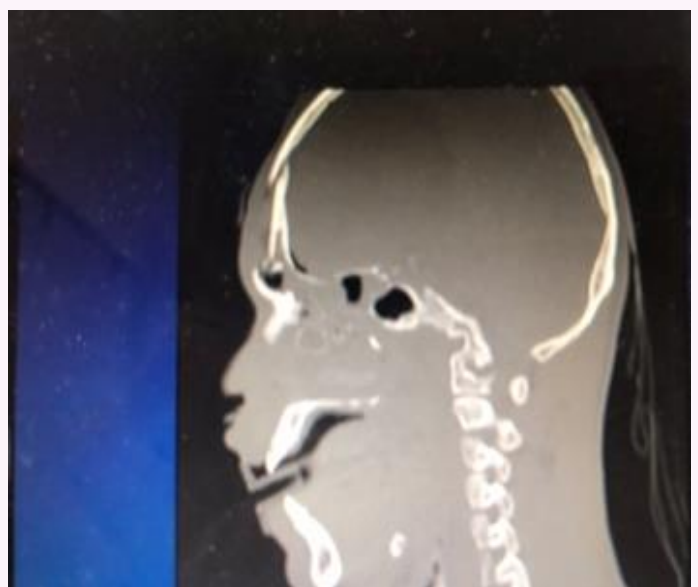
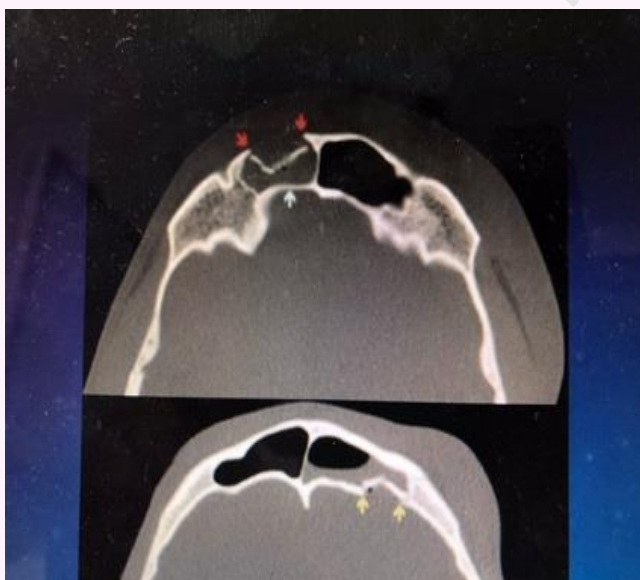
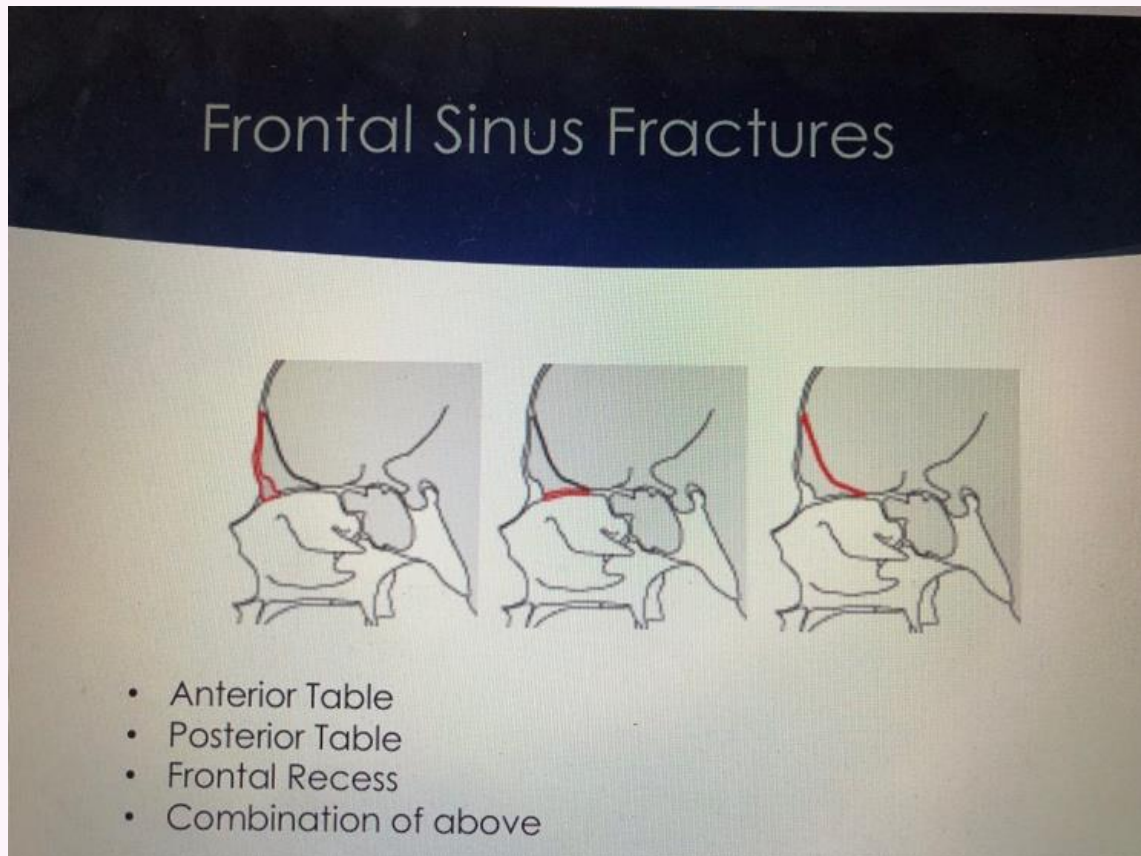


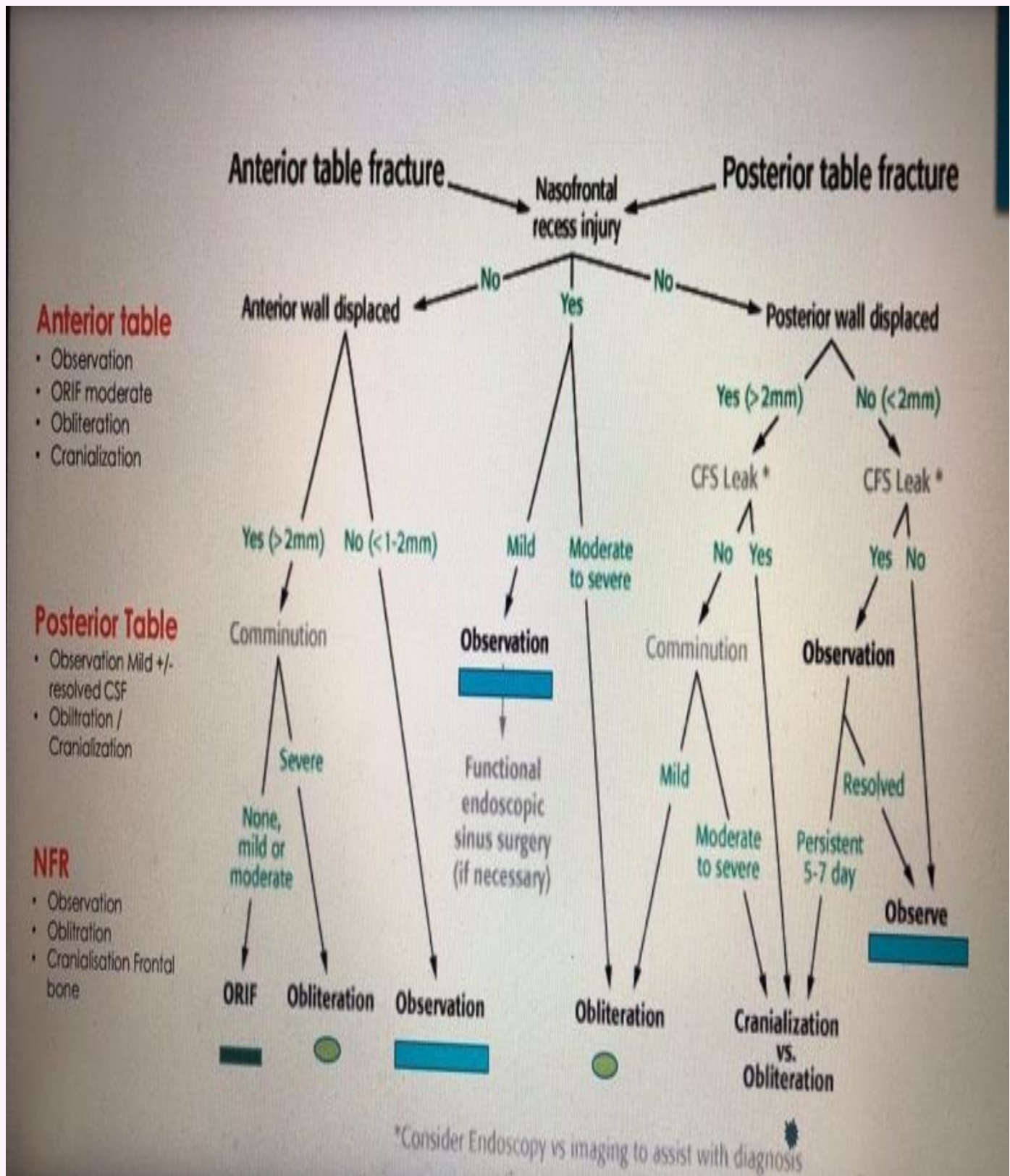
Extra oral Cheek
Retractors

Module 3 - UPPER FACE TRAUMA

By Dr Jayanth Kumar Prakash

Management of Fractures of the Frontal Sinus





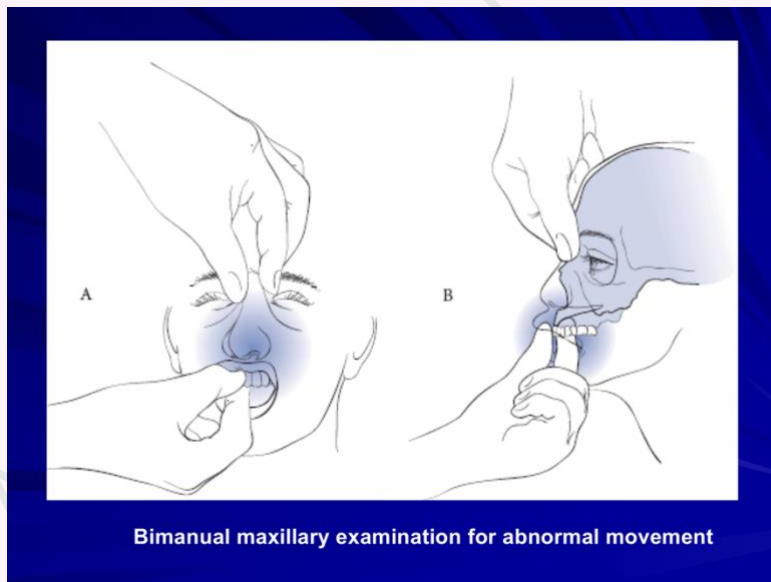
Module 4 - MID FACE TRAUMA

By Dr Jayanth Kumar Prakash

- Surgical approach to fracture midface
- Zygomatico- Maxillary Fractures
- Lefort Fractures
- Naso-Orbito-Ethmoid Fractures (NOE)
- Orbital Fractures.

Clinical signs for midfacial fractures include:

- ❖ Facial swelling (edema, hematoma, emphysema) (see picture), and deformity
- ❖ Subconjunctival bleeding (hyposphagma) (see picture)
- ❖ Oronasal bleeding
- ❖ Palpable and crepitating dislocated bony contour in the periorbital region
- ❖ Displacement of the globe (hyper-, hypo-, eno-, exophthalmos)
- ❖ Displacement of the medial canthal tendon (depending on the degree of NOE fracture)
- ❖ Compromised ocular motility
- ❖ Double vision
- ❖ Sensory deficit (hypoesthesia, anesthesia, paresthesia) of the trigeminal nerve
- ❖ Localized pain
- ❖ Occlusal disturbance
- ❖ CSF leakage (in case of anterior skull base involvement)



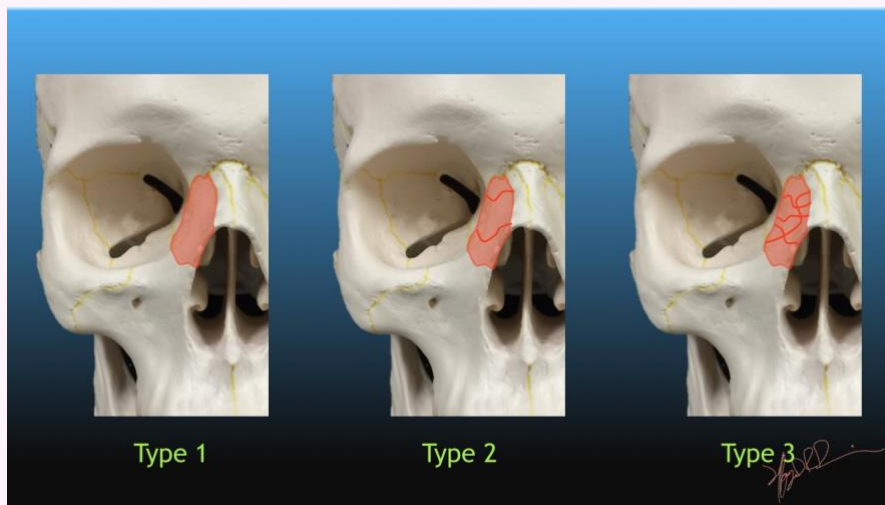
- Testing for mobility of the maxilla - Mobility of the midface may be tested by grasping the anterior alveolar arch and pulling forward while stabilizing the patient with the other hand. The level of a Le Fort fracture (ie, I, II, III) can often be determined by noting the structures of the midface that move in conjunction with the anterior maxilla.

Approach to Midface

By Dr Jayanth Kumar Prakash

- **Use of existing lacerations** - Facial fractures are often associated with lacerations. These existing soft-tissue injuries can be used to access directly the facial bones for management of the fractures.
- **Approaches to the maxilla** - Relevant to the required exposure in trauma of the midface two different approaches are possible:
 - maxillary vestibular approach
 - midfacial degloving approach.
- **Lower eyelid**
 - **Transcutaneous lower-eyelid approach** - There are three basic approaches through the external skin of the lower eyelid to give access to the inferior, lower medial, and lateral aspects of the orbital cavity:
 - subciliary
 - subtarsal
 - infraorbital
 - **Lower eyelid** - Transconjunctival lower-eyelid approaches are performed
- **Glabellar approach** - The glabellar approach can be particularly advantageous in elderly patients who have developed horizontal glabellar furrows due to the action of the procerus muscle.
- **Coronal approach** - The coronal or bitemporal incision is used to approach the anterior cranial vault, the forehead, and the upper and middle regions of the facial skeleton.
- **Superolateral orbital rim** - There are two periorbital approaches to the superolateral rim of the orbit:
 - the lateral eyebrow approach (supraorbital eyebrow approach)
 - the upper-eyelid approach.
- **Extended glabellar approach** - When wide visualization of the medial canthal area, lacrimal sac, and medial orbital wall is needed an extended glabellar approach is advantageous.
- **Zygomatic arch (indirect)** - Common indirect approaches for reduction of the zygomatic arch include:
 - temporal (Gillies) approach
 - transoral (Keen) approach.

Classification of Nasoethmoid Orbital Fractures



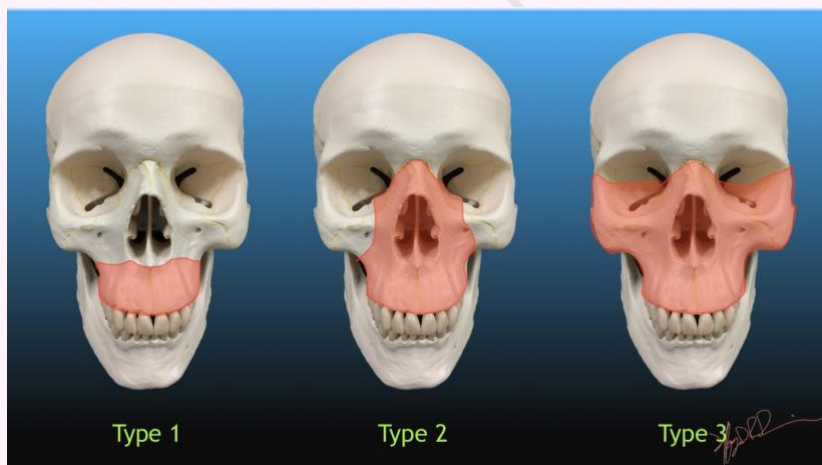
NOE Classification - Markowitz-Manson

Type 1 Single-segment central fragment

Type 2 Comminuted central fragment not involving the medial canthal tendon insertion

Type 3 Comminuted central fragment extending into the medial canthal tendon insertion

Le Fort Classification



Le fort Classification

Type 1 Transverse fracture through the maxillary sinuses, lower nasal septum, pterygoid plates - Direct horizontal impact to the upper jaw

Type 2 Oblique fracture crossing zygomaticomaxillary suture, inferior orbital rim, nasal bridge - Direct impact to the central midface

Type 3 Fracture above the zygomatic arch, through the lateral and medial orbital walls and nasofrontal suture - Craniofacial dissociation

Zygomaxillary Complex Classification

Knight and North classification

Group 1: Undisplaced fractures
 Group 2: Isolated displaced fractures
 Group 3: Displaced body fractures (unrotated)
 Group 4: Medially rotated
 4a: Outward at malar buttress
 4b: Inward at the FZ suture
 Group 5: Laterally rotated
 5a: Upward at the infraorbital margin
 5b: Outward at the FZ suture
 Group 6: Any additional fracture lines across the main fragment

Rowe and Killey classification

Type 1: No significant displacement
 Type 2: Isolated fractures of zygomatic arch
 Type 3: Fractures rotated around a vertical axis
 3a: Internally 3b: Externally
 Type 4: Fractures rotated around a horizontal axis
 4a: Medially 4b: Laterally
 Type 5: Fracture displacement of the complex enbloc
 5a: Medially 5b: Inferiorly
 5c: Laterally
 Type 6: Displacement of orbital floor
 6a: Inferiorly 6b: Superiorly
 Type 7: Displacement of the orbital rim segments
 Type 8: Complex comminuted fractures

Spissel and Schroll classification

Type 1: Isolated zygomatic arch fractures

Type 2: Fractures with no significant displacement

Type 3: Partially displaced fractures medially

Type 4: Totally displaced fractures medially

Type 5: Fractures with dorsal displacement

Type 6: Fractures with inferior displacement

Type 7: Comminuted fractures

Henderson classification

Type 1: Non-displaced fractures

Type 2: Isolated zygomatic arch fractures

Type 3: Zygomatic complex fractures but the frontozygomatic suture is undisplaced

Type 4: Zygomatic complex fractures with displacement of the frontozygomatic suture

Type 5: Pure blow-out fractures

Type 6: Fractures of the orbital rim only

Type 7: Comminuted or multiple fractures

Management of Midface Fracture

By Dr Jayanth Kumar Prakash

Le fort

Le Fort I, linear fracture

- Observation - Non- or minimally mobile Le Fort I fractures with unaffected occlusion in compliant patients with good dentition.
- Closed treatment - Non- or minimally displaced fractures in a compliant patient amenable to MMF.
- Open reduction internal fixation - Mobile maxillae with resulting malocclusion in cases where vertical restoration of one or more of the buttresses are indicated.

Le Fort I, unilateral comminution

- Closed treatment - Unilateral fractures in patients with minor malocclusion correctable with maxillary disimpaction in compliant patients amenable to MMF.
- Open reduction internal fixation - Unilateral comminuted fractures where vertical restoration of the buttress is required.

Le Fort I, bilateral comminution

- Open reduction internal fixation of Bilateral comminuted fractures where vertical restoration of the buttress is required.

Le Fort I, edentulous patients

- Observation - Standard treatment of edentulous patients with atrophic maxilla.
- Open reduction internal fixation - Malposition of the fractured maxilla resulting in inadequate support to wear prosthesis.

Le Fort II

- Observation - Non- or minimally mobile Le Fort II fractures with unaffected occlusion in compliant patients with good dentition
- Closed treatment - Non- or minimally displaced fractures in a compliant patient amenable to MMF.
- Open reduction internal fixation - Displaced Le Fort II fractures resulting in malocclusion or facial deformity.

Le Fort III

- Observation - Non- or minimally mobile Le Fort III fractures with unaffected occlusion in compliant patients with good dentition.
- Closed treatment - Non- or minimally displaced fractures in a compliant patient amenable to MMF.
- Open reduction internal fixation - Displaced Le Fort III fractures resulting in malocclusion or facial deformity.

NOE

NOE Type I

- Observation - Non- or minimally displaced fractures without telecanthus.
- Open reduction internal fixation - Clinically significant displacement of the fracture results in telecanthus or malposition of the medial canthal ligament.

NOE, Type II

- Open reduction internal fixation - Clinically significant displacement of the fracture results in telecanthus or malposition of the medial canthal ligament.

NOE, Type III

- Open reduction internal fixation - Clinically significant displacement of the fracture resulting in telecanthus or malposition of the medial canthal ligament.

Orbital Fracture

Orbit, orbital floor fracture

- Observation - Non- or minimally displaced fractures without orbital deformity and intact ocular motility.
- Orbital reconstruction - Standard method of treatment for the repair of critical sized orbital wall defects.

Orbit, medial orbital wall fracture

- Observation - Non- or minimally displaced fractures without orbital deformity and intact ocular motility.
- Orbital reconstruction - Standard method of treatment for the repair of critical sized orbital wall defects.

Orbit, combined fracture

- Observation - Non- or minimally displaced fractures without orbital deformity and intact ocular motility.
- Orbital reconstruction - Standard method of treatment for the repair of critical sized orbital wall defects.

Orbit, orbital roof fracture

- Observation - Non- or minimally displaced fractures without orbital deformity and intact ocular motility.
- Open treatment - Critical sized fractures affecting ocular motility or resulting in orbital deformity.

Zygoma Arch & zygomaxillary complex fracture

isolated zygomatic arch

- Closed treatment - Displaced fracture amenable for minimally invasive reduction techniques.
- Open reduction without fixation - Displaced fractures resulting in impingement of the coronoid process and/or facial deformities.
- Open reduction with fixation - Displaced unstable fractures resulting in impingement of the coronoid process and/or facial deformities requiring reduction and fixation.

Zygomaxillary complex fracture

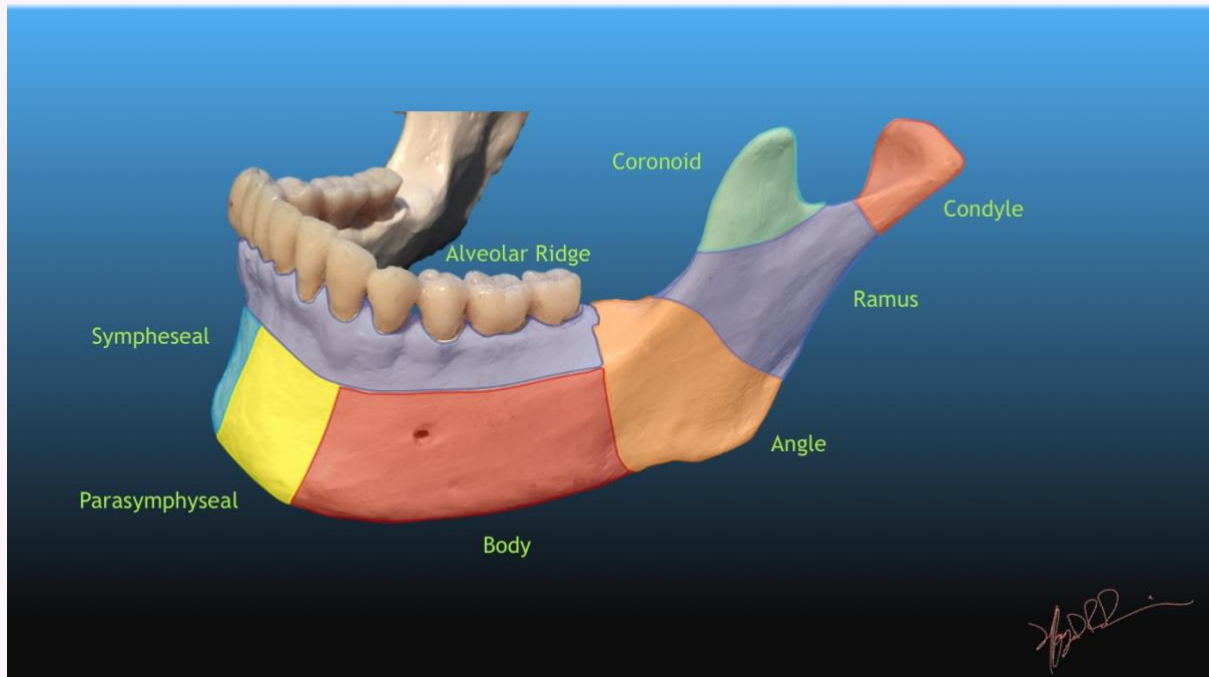
- Closed treatment - Displaced fracture amenable for minimally invasive reduction techniques such as bone hook or a Carroll-Girard type screw.

- ORIF, 1-point fixation (without orbital reconstruction) - Displaced simple noncomminuted fracture with minimal separation of zygomaticofrontal suture.
- ORIF, 2-point fixation (without orbital reconstruction) - Displaced fracture requiring 2-point exposure to verify reduction.
- ORIF, 3-point fixation (without orbital reconstruction) - Displaced and/or comminuted fracture requiring 3-point exposure to verify reduction.
- ORIF, 3-point fixation (with orbital reconstruction) - Displaced and/or comminuted fracture requiring 3-point exposure to verify reduction and need for orbital reconstruction.
- ORIF, 4-point fixation (with orbital reconstruction) - Complex zygomatic fractures where exposure of the zygomatic arch (4th point) is necessary to ensure proper reduction of the zygomatic complex.

Module 5 - LOWER FACE TRAUMA — MANDIBLE FRACTURES

- Load bearing versus load sharing
- Surgical approach to fracture Mandible
- Management of a Simple Fracture & Complex Mandibular Fracture

Dingman and Natvig Classification of Mandibular fractures



Classification	Adult fractures (Ogundare, et al.)	Pediatric (Owusu, et al)*
Sympyseal	4% of fractures	3% males, 4% females
Body	21% of fractures	6% males, 5% females
Parasympyseal	18% of fractures	
Angle	36% of fractures	15% males, 11% females
Ramus	18% of fractures	9% males, 8% females
Condylar	0.5% of fractures	19% males, 25% females
Coronoid	0.25% of fractures	
Alveolar	1% of fractures	4% males, 6% females

*Owusu: 44% fractures unspecified site or multiple sites

Approach to Mandible

By Dr Jayanth Kumar Prakash

- **Use of existing lacerations**- Frequently, patients with facial fractures also have lacerations. Very often, these existing soft-tissue injuries can be used to directly access the facial bones for management of the fractures.
- **Intraoral approach** - The intraoral approach is the usual access for simple fractures of the body, symphysis, and angular regions.
- **Endoscopic assisted Intraoral approach** - The Endoscopic assisted intraoral approach is the usual access for angular regions, ramus and area on or near the condylar process
- **Submental approach** - The submental approach is used to treat fractures of the anterior mandibular body and symphysis.
- **Submandibular approach** - This approach is selected for fractures of the mandibular body and angle regions unsuitable for intraoral treatment.
- **Retromandibular approaches** - The retromandibular approaches expose the entire ramus from behind the posterior border. They therefore may be useful for procedures involving the area on or near the condylar process/head, or the ramus itself.
- **Facelift (rhytidectomy) approach** - The facelift approach provides the same exposure as the retromandibular and preauricular accesses combined. The only difference is that the skin incision is placed in a more cosmetically acceptable location.
- **Preauricular approach** - The preauricular approach can be used to access and treat fractures in the mandibular condylar head and neck region.
- **Intraoral approach to condyle** - The ramus and condyle region can be exposed via an intraoral approach by extending the standard vestibular incision in a superior direction up the ascending ramus.

Management of Mandible Fracture:

By Dr Jayanth Kumar Prakash

Symphysis and parasymphysis, simple

- Closed treatment (MMF) - Non- or minimally displaced simple fractures in compliant patients with good dentition amenable to MMF.
- ORIF, two lag screw fixation - Oblique or sagittal fractures where two lag screws can be placed from the buccal or lingual cortices.
- ORIF, lag screw and plate - Oblique or sagittal fractures where only one lag screw is possible. The plate is used to supplement the fixation.
- ORIF, one plate and arch bar - Simple fractures when used in combination with a stable arch bar.
- ORIF, two plates - Cases where an arch bar is not possible because of missing teeth, loose teeth, or the objection to using an arch bar, or distal trailing fractures not amenable to the other treatments.

Symphysis and parasymphysis, complex

- Closed treatment - Non- or minimally displaced complex fractures in compliant patients with good dentition amenable to MMF.
- ORIF, two plates (basal triangle) - If control of the top of the basal triangle is required, the use of two plates provides this control.
- ORIF, reconstruction plate (basal triangle) - Maximum stability under load bearing conditions.
- ORIF, reconstruction plate (comminuted fracture) - Standard method of treatment of a comminuted fracture.

Body, simple

- Observation - Seldom indicated for non-mobile non-displaced fractures with undisturbed occlusion.
- Closed treatment - Non- displaced simple fractures in compliant patients with good dentition amenable to MMF.
- ORIF, one miniplate - Simple fractures in compliant patients with good dentition and buttressing of the segments after reduction.
- ORIF, two plates - Simple fractures in transitional areas of the mandibular body.
- ORIF, one large plate - Reduced bone buttressing requiring load bearing fixation.

Body, complex

- ORIF, two plates (basal triangle) - Basal triangle fracture.
- ORIF, reconstruction plate - Standard method of treatment of a comminuted fracture.

Angle and ramus, simple

- Observation - Seldom indicated. Usually for incomplete, non-displaced, non-mobile fractures in a compliant patient with undisturbed occlusion.
- Closed treatment - Non- or minimally displaced favorable fractures of the angle in compliant patients with good dentition amenable to MMF.

- ORIF, miniplate fixation to the oblique ridge - Standard method of treatment of isolated simple mandibular angle fractures.
- ORIF, two miniplates - Conditions when use of a secondary plate improves bone buttressing and fracture alignment.
- ORIF, reconstruction plate - Reduced bone buttressing requiring load bearing fixation.

Angle and ramus, complex

- Closed treatment - Non- or minimally displaced favorable fractures of the angle in compliant patients with good dentition amenable to MMF.
- ORIF, two plates (basal triangle) - If control of the top of the basal triangle is required, the use of two plates provides this control.
- ORIF, reconstruction plate (basal triangle) - Maximum stability under load bearing conditions.
- ORIF, reconstruction plate (comminuted fracture) - Standard method of treatment for comminuted fractures requiring load-bearing fixation.

Condylar process and head, simple and complex

- Observation - Non- or minimally displaced fractures in compliant patient.
- Closed treatment - Standard method of treatment for non-dislocated or minimally displaced fractures in compliant patients with good dentition and amenable for MMF.
- ORIF, one/two plate(s) - extraoral approach - Displaced fractures resulting in shortening of the ramus height or when the fracture segment interferes with normal mandibular function.
- ORIF, one/two plate(s) - intraoral approach - Low condylar process fractures.
- ORIF, one/two plate(s) - endoscopically assisted - Higher condylar process fractures amenable to an intraoral approach with endoscopic assistance.

Module 6 - FACIAL AESTHETIC RELATED TO FACIAL TRAUMA

- Laser - CO₂, Diode & Q switch Laser type
- Facial flaps

Laser**By Dr Jayanth Kumar Prakash**

There are Three laser modes:

- continuous (rarely used),
- pulsed (most common)
- q-switch or mode locked (extremely short, used for destruction of specific lesions)

The effect of the laser extends beyond the penetration of the light and the residual thermal damage. the heat transferred to the underlying collagen is believed to contribute to contraction and remodeling, leading to the skin tightening. As an example, CO₂ lasers have thermal damage zone of 100-150 mcm while Er:YAG lasers have a thermal damage zone of 10-40 mcm.

Fractional lasers treat only a fraction of the skin within a targeted area, leaving intervening areas of skin untouched. To produce this effect, the laser is emitted in numerous narrow, microscopic columns measuring 400 mcm in diameter and up to 1300 mcm deep. Higher energy with smaller spot sizes increases the depth of the laser. Re-epithelialization occurs from the sites of undamaged skin, resulting in shorter recovery. There are fractional varieties of CO₂, Er: YAG and others.

Comparision of laser to intense pulse light (IPL)

Characteristic	Laser	Intense pulse light (IPL) Broad band light (BBL)
Light	Monochromatic Collimated	Polychromatic Non-collimated
Target	Specific chromophores	various chromophores
Clinical use	Scar revision Skin resurfacing Photorejuvenation Hair removal Tattoo removal	Vascular lesion Hair removal Pigmented lesions Photorejuvenation
Level of discomfort	Low to high	High
Filters	No	Yes
Cooling	No	Yes

Skin types to use it	All	Avoid darker skin types
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Wavelengths emitted by different devices

Device	Wavelength (nm)	Clinical application
CO₂ laser	10,600	Rejuvenation To a lesser extent dyschromia
Er: YAG laser	2,940	Rejuvenation To a lesser extent dyschromia
Vascular pulsed dye laser (PDL)	585 and 595	Vascular lesion
Potassium titanyl phosphate (KTP) laser	532	Vascular lesions
Intense pulse light	500-1200	Small vascular lesions Pigmented lesions Hair removal To a lesser degree rejuvenation
Infrared laser Nd: YAG Diode laser Erbium: glass Broad band infrared	1000-1800 1320 1450 1540 1100-1800	Rejuvenation

Variables to Understand When Using the Laser

- Wavelength $\geq$ determines your targeted tissue.

Wavelengths will have different chromophores and absorptions. Wavelengths with high absorption target superficial targets while low absorption target deeper targets. Example: At a setting of 5 J/cm² and pulse duration of less than 1 ms, CO₂ light penetrates 20-30 mcm (less absorption), while an Er:YAG has more affinity of water and only penetrates 10-15mcm (higher absorption)

- Power per spot size $\geq$ density
By decreasing the spot size you increase the energy
- Time of pulse or pulse width $\geq$ thermal relaxation time

Thermal relaxation time is the time required for the tissues to dissipate more than 67% of the thermal energy. It tells us the time needed to cool a target before we can safely heat it again to prevent complications. Practical example: Pulse width for hair reduction in lighter skin is usually 15-30 ms, but in darker skin you increase the pulse width to 20-40ms.

- Cooling $\geq$ protection for the epidermis and anesthesia.

Advance Effects

- Persistent erythema.

Usually resolved after 2 months of CO₂ laser and 1 month of Er:YAG but may persist for a year. Green-based makeup can help hide erythema. The erythema is predicted to be of shorter duration with fractional lasers (less than a month in most patients)

- Dyspigmentation.
Transient post-inflammatory hyperpigmentation can occur in 30% of patients and is more likely to occur in patients with skin photo type II or higher. For these patients, consider to administer laser therapy in the fall and winter (reduced sun exposure). Daily sunscreen and sun protection is recommended. Hyperpigmentation can be treated with topical steroids, hydroquinone, retinoids, and/or peeling agents such as glycolic acid. Unfavorable color contrast between treated and non-treated areas can occur. Full face treatments or full facial units are advocated and transitioning (feathering) between treatment zones to minimize the color differences.
- Herpes labialis infection may occur after laser
Prophylaxis is recommended
- Bacterial and candida infections.
- Acneiform eruptions and milia.
- Particularly exacerbated by occlusive ointments often used during healing
- Scarring
- Ectropion when the lower lid skin is treated.

Ablative Vs. Non-Ablative Skin Rejuvenation

Ablative technologies remove the epidermis and portions of the superficial dermis to stimulate the underlying skin and induce collagen remodeling.

Examples of ablative lasers: CO₂ and Er:YAG.

Non-ablative lasers do not remove the epidermis and instead stimulate skin resurfacing by targeting deeper collagens, pigment, or blood vessels. The advantage is less down time (shorter recovery) and less risks, but might also lead to more modest results in skin tightening.

Example non-ablative technologies: IPL, radiofrequency, infrared and ultrasound.

Facial Flaps

By Dr Jayanth Kumar Prakash

Local Flaps - Classification

⌘ Blood supply

☑ random

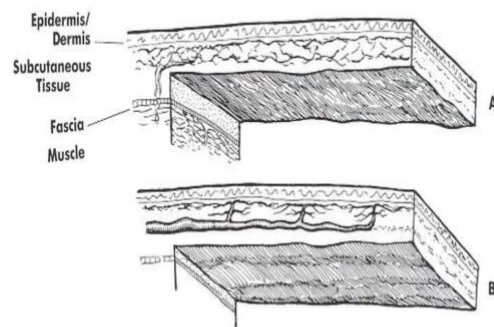
☑ axial

⌘ Tissue movement

☑ rotation

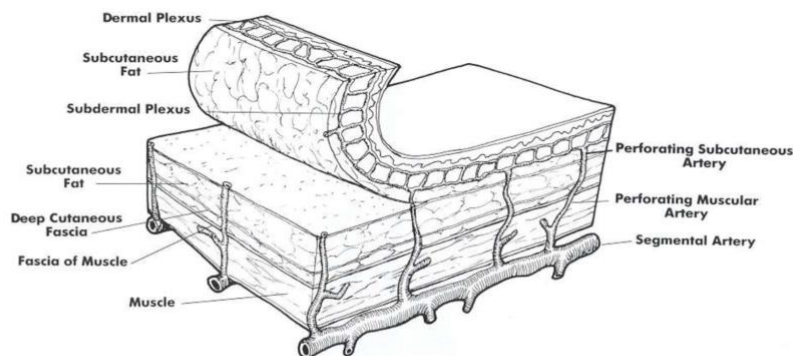
☑ advancement

☑ transposition



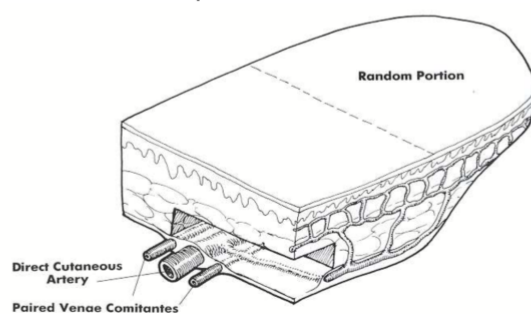
Random flaps

- ✂ Most common
- ✂ Based on subdermal plexus
- ✂ Unpredictable
- ✂ Length:width of 3:1 or 4:1



Axial flaps

- ✂ Limited by available vessels
- ✂ Based on direct cutaneous vessels
- ✂ Random flap at distal tip
- ✂ Examples
 - ☒ nasolabial
 - ☒ midline forehead flaps



Flap types

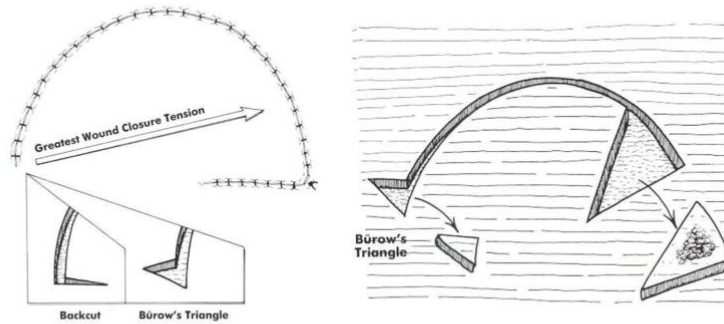
- ⌘ Rotation
- ⌘ Advancement
- ⌘ Transposition

- ⌘ Not concrete, variations exist

Rotation

- ⌘ Pivotal flap
- ⌘ curvilinear
- ⌘ standing cone results
- ⌘ two borders
- ⌘ broad based
- ⌘ Uses - cheek, forehead

Rotation flap



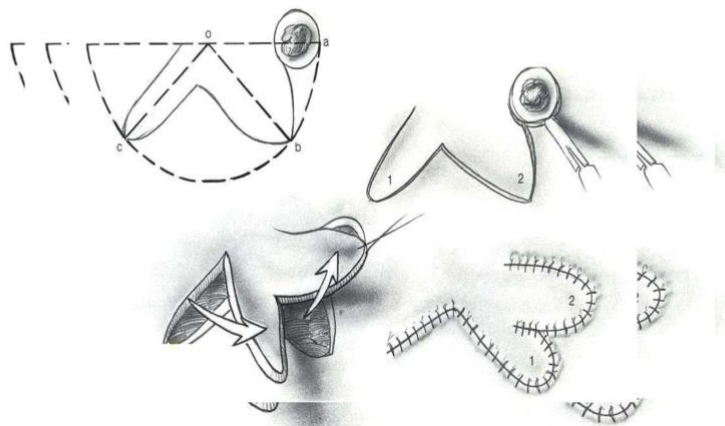
Transposition

- ⌘ Rhomboid, dufourmental, bilobed
- ⌘ Linear axis
- ⌘ Rotated over intact skin
- ⌘ Pivot point
- ⌘ Versatile

Bilobed

- ⌘ Double transposition flaps
- ⌘ Original description
 - ▢ 90 degree arcs
 - ▢ final 180 degree arc
- ⌘ Arcs of 90 to 110 degrees preferable
- ⌘ Uses - lower third of nose

Bilobed Flap

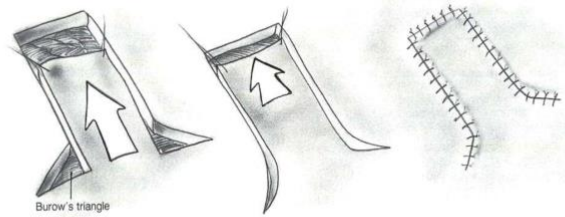


Advancement

- ⌘ Sliding movement
- ⌘ adequate undermining
- ⌘ standing cones created
- ⌘ Types
 - ☑ monopodicle, bipedicle, V-Y, A-T, cheek
- ⌘ Uses - forehead, brow

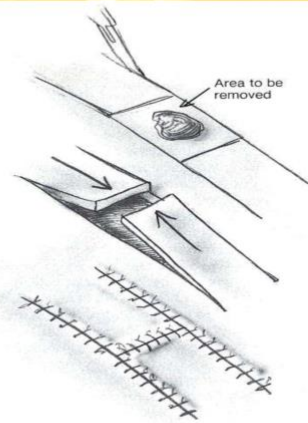
Monopedicle

- ⌘ Forehead, Brow
- ⌘ 3:1 ratio
- ⌘ Burow's triangles

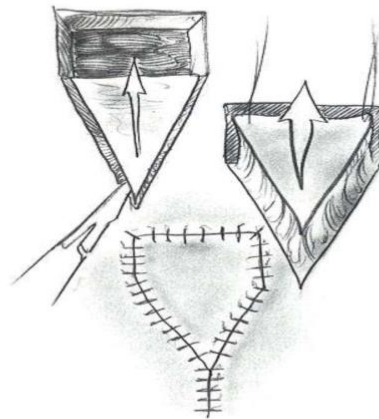


Bipedicle

- ⌘ Forehead, Brow
- ⌘ Disadvantage
 - ☐ long suture line

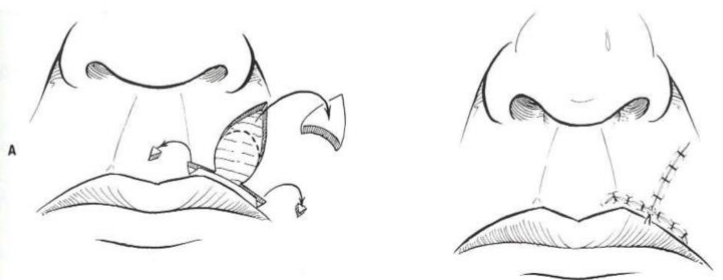


V-Y flap



A-T flap

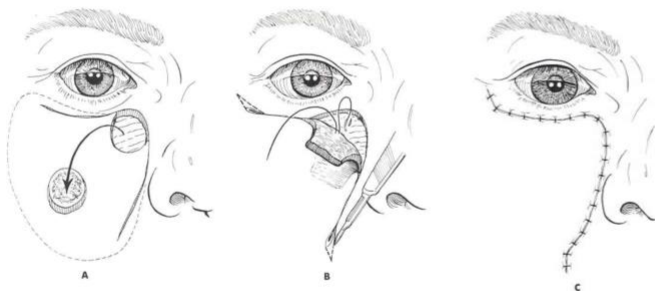
- ⌘ Bilateral advancement
- ⌘ triangular defect
- ⌘ Uses - hairline, brow, lip



Cheek advancement

- ⌘ Advancement
- ⌘ Some rotation
- ⌘ Uses - medial cheek, nasofacial sulcus
- ⌘ Prevent complications (ectropion)

Cheek Advancement Flap

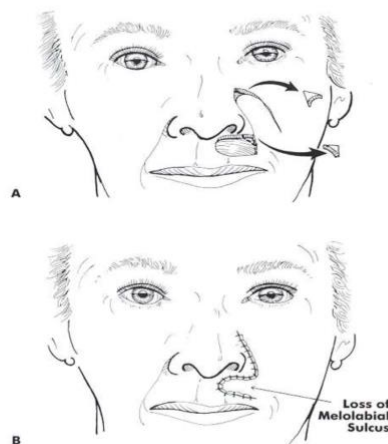


Nasolabial flap

- ⌘ Axial pattern - angular artery
- ⌘ Inferior and superior flaps
- ⌘ Uses - lower 2/3 of nose, perinasal area, upper lip
- ⌘ pin cushioning, blunting of nasofacial sulcus
- ⌘ potential ectropion, scleral show

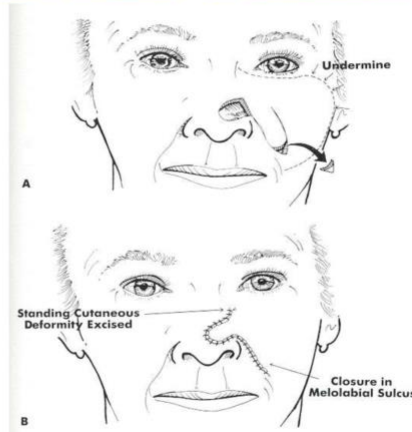
Nasolabial Flap

- ⌘ Inferiorly based



Nasolabial Flap

⌘ Superiorly based



Postoperative Care

⌘ Pain reliever

⌘ Wound care

☑ hydrogen peroxide, antibiotic ointment

⌘ Sutures removed at 5-7 days

⌘ Direct sunlight avoided for 2-3 months

⌘ Dermabrasion - 6-12 weeks

⌘ Revision/Irregularization - 6 months

Complications

- ⌘ Infection
- ⌘ Hematoma/seroma
- ⌘ Cyanosis
- ⌘ Failure/necrosis

Table 4-1 Factors Affecting Wound Healing

Local Factors	General Factors
Blood supply	Age
Denervation	Endocrine function (pancreas, thyroid)
Fluid collection	Drug therapy (antiinflammatory, cytotoxic)
Infection	Sepsis
Previous or concurrent irradiation	Major organ failure (pulmonary, cardiac, hepatic, renal)
Mechanical stress	Obesity
Surgical technique	Malignant disease

Modified from Bucknall TE, Ellis H: *Wound healing for surgeons*, East Sussex, England, Bailliere Tindall, 1984.