Maxillo Facial Trauma

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Department of Oral & MaxilloFacial Surgery

Place Of Worship

K.M.SHAH DENTAL COLLEGE & HOSPITAL

Objectives of lecture

- For exam point of you???
- For those who are interested to do post graduation in oral & maxillo facial surgery??

No…

SIGNAL VIOLATION

Objectives of lecture

- To make you aware of causes & consequences of an accident
- To make the students confident to act immediately at site of accident
- Student should be able to identify life threatening & urgent injury situations and act accordingly for primary management
- Student should be able to diagnose different maxillo facial injuries and be capable of giving basic definitive management in remote areas
- All maxillo facial trauma cases should necessarily treated by all maxillo facial surgeons only










Some Facts About
Road Traffic Accident

India recorded highest number of road accident deaths across the globe in 2019 as well

Car News

Times Drive Desk
Updated Oct 26, 2020 | 08:55 IST

While the total number of road accidents in India declined 3.86 per cent in 2019, the country still ranked first in the world for the total number of road accident deaths.

India recorded highest number of road accident deaths across the globe in 2019 as well

KEY HIGHLIGHTS

- A total of 449,002 accidents occurred in India in 2019
- 151,113 people were killed and 451,361 were injured due to road accidents last year
- National Highways accounted for an inordinate share of deaths yet again

Key facts

- 90% of the world's fatalities on the roads occur in **low-income** and **middle-income** countries (Global Status report on Road Safety 2018)
- Road traffic is a leading cause of death and injury across the World killing more than 1.35 million globally.
- Only **28 countries**, representing 416 million people (7% of the world's population), have adequate laws that address all five risk factors (speed, drink-driving, helmets, seat-belts and child restraints).

- *Road accidents in India kill almost 1.5 lakh people annually. Accordingly, India accounts for almost 11% of the accident related deaths in the World.*
- *Globally, 54% of accident related deaths are pedestrians, cyclists and motor cyclists.*
- *If the trend continues, the total number of road traffic deaths in India would increase by 100% between 2013 and 2027.*

- *Death And Injury Caused By Accidents On India's Roads:*

-17 accidents an hour;

-1 death every 4 minutes

- *As per the World Health Organization, accident related deaths, are known to be the eighth leading cause of death and the first largest cause of death among children aged 5-14 and adults in the age 15-29.*

- *"The loss to the Indian economy due to fatalities and accident injuries is equivalent to 3-5% of the nation's GDP. ,"*

Road Accidents : A Snapshot

- Emergence of Road Traffic Injuries (RTIs) a leading cause of Deaths & Disabilities
- India : 2011
  - Accidents 4.97 lakh (annual) (1 every minute)
  - Deaths 1,42,485 (one death every 3.7 minutes)
- Accidents impose significant costs
  - 3% GDP for India (1999-2000)
  - 1% GNP for low income countries
  - 1.5 % GNP for middle income countries
  - 2% GNP for high income countries
- Was 9th leading cause of death in 2004 and expected to be 5th leading cause of death by 2030 world wide.

Major Causes of Road Accident Deaths during 2019

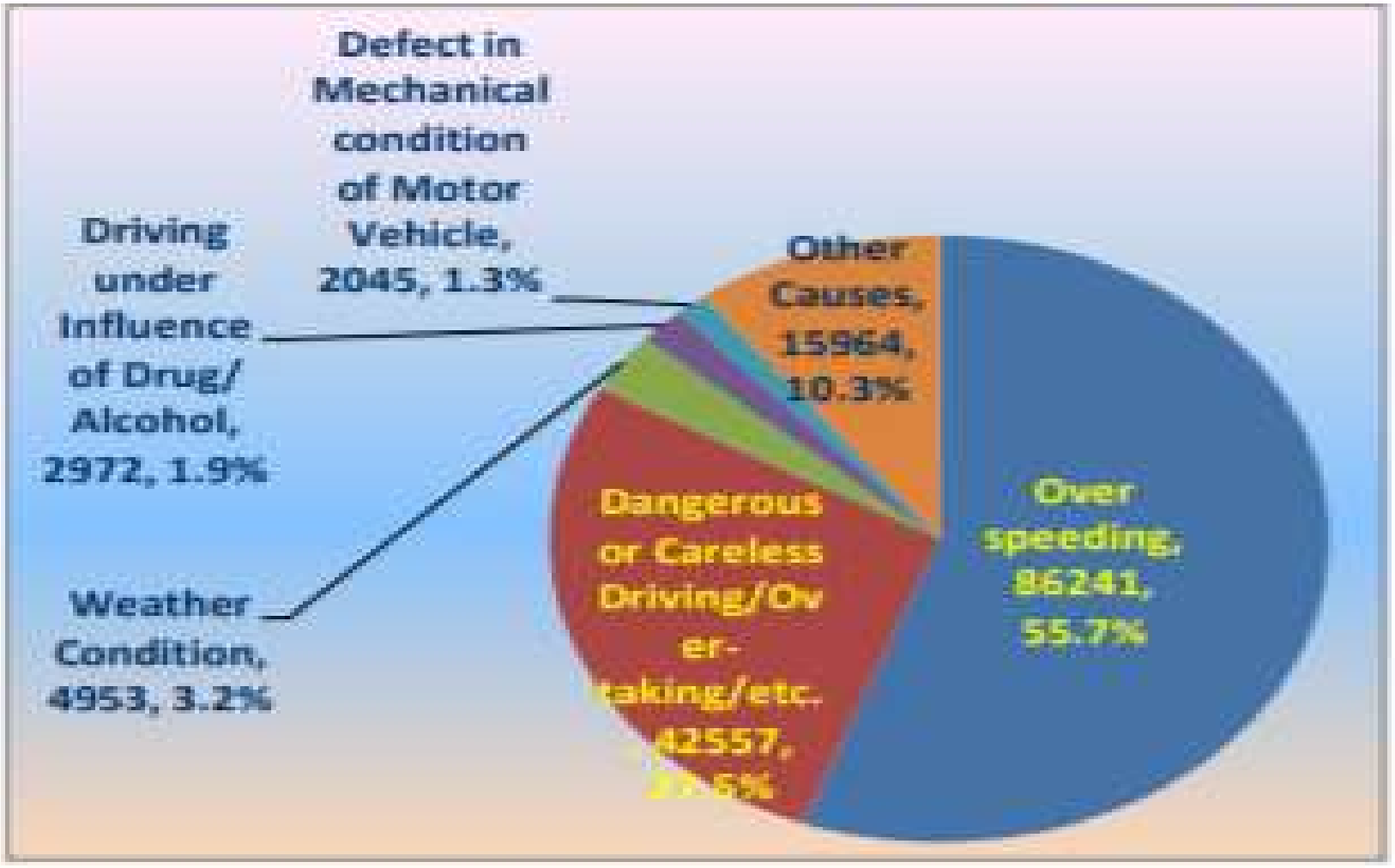
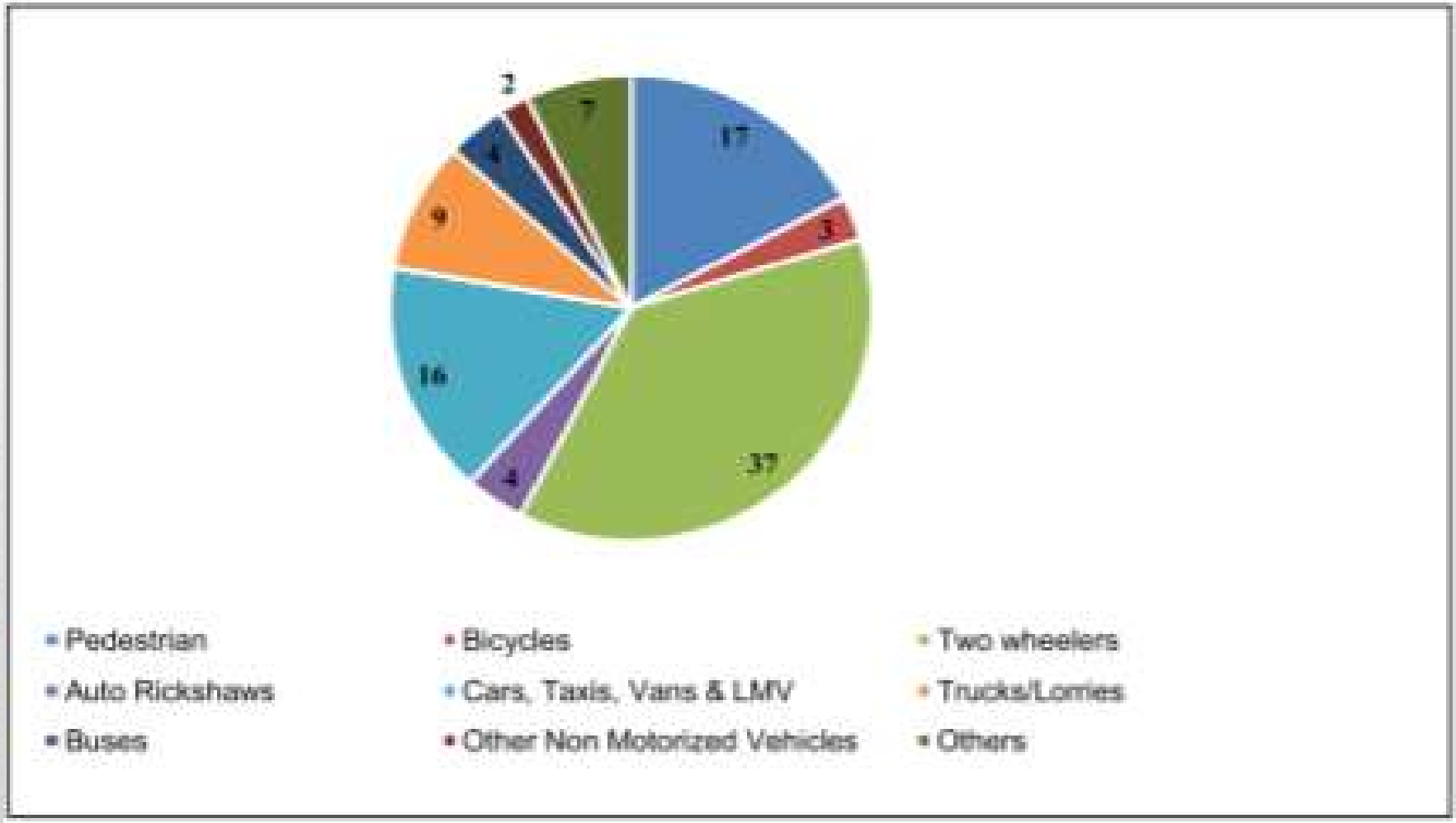


Chart 3.1: Share of persons killed in 2019 by Victim/Victim Vehicle Categories



Road Accidents in India Issues & Dimensions 2012
Ministry of Road Transport & Highways Government of India

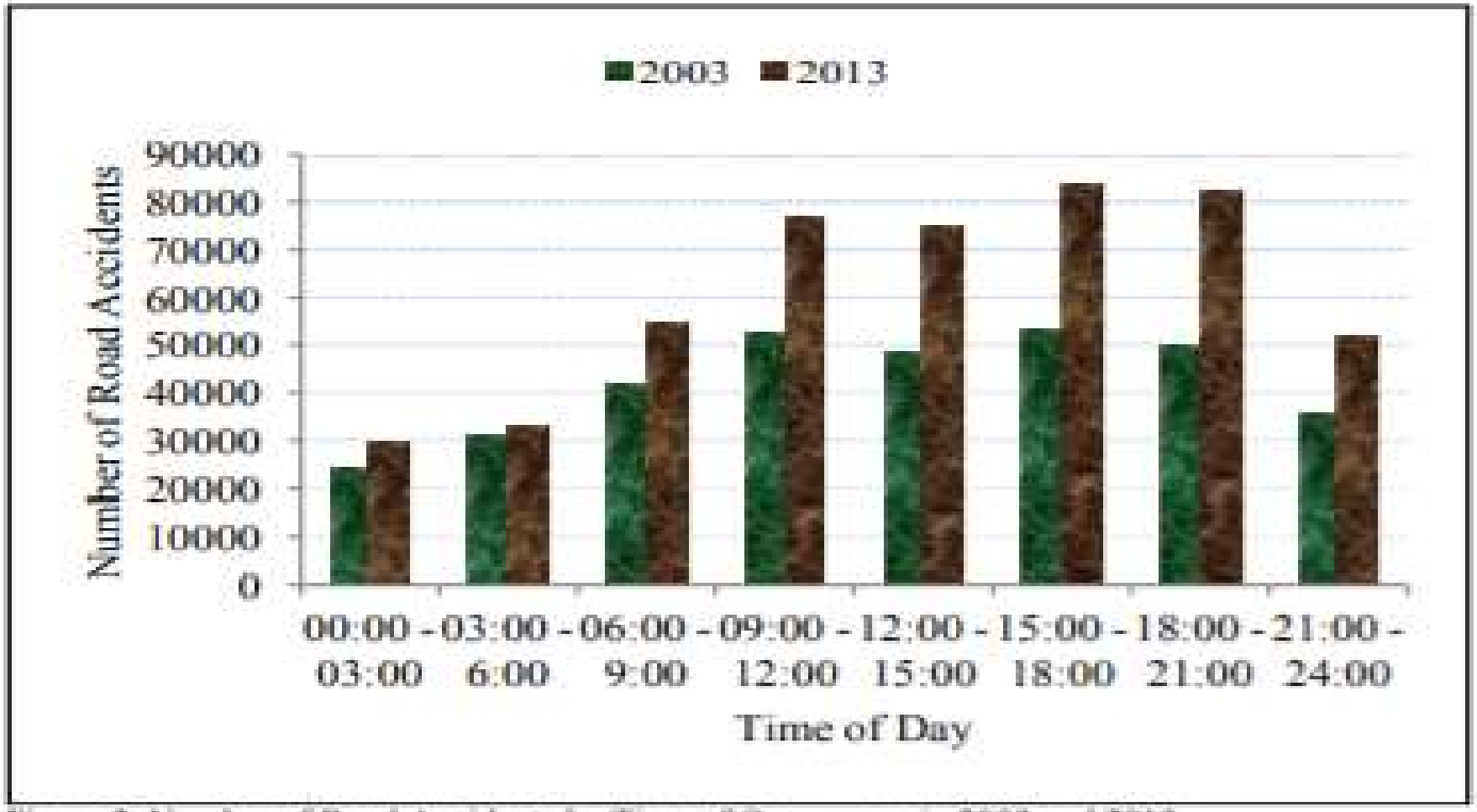
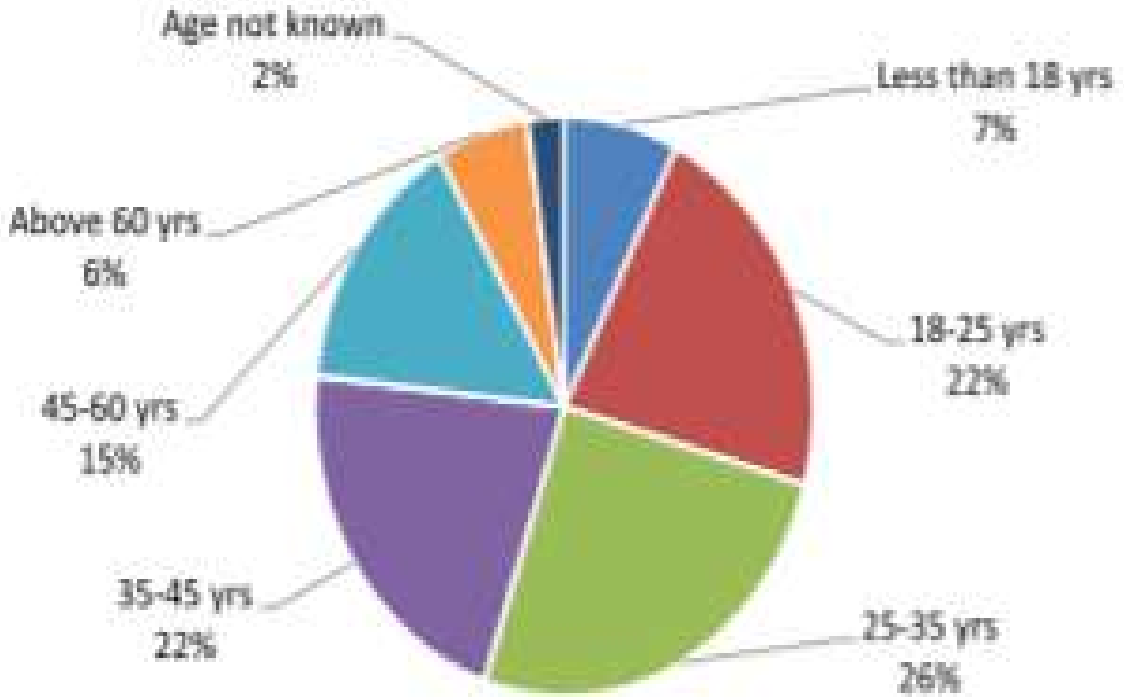


Figure 2. Number of Road Accidents by Time of Occurrence in 2003 and 2013

Chart 3.2: Age profileof road accident related deaths in 2019



Road Accidents in India Issues & Dimensions 2019
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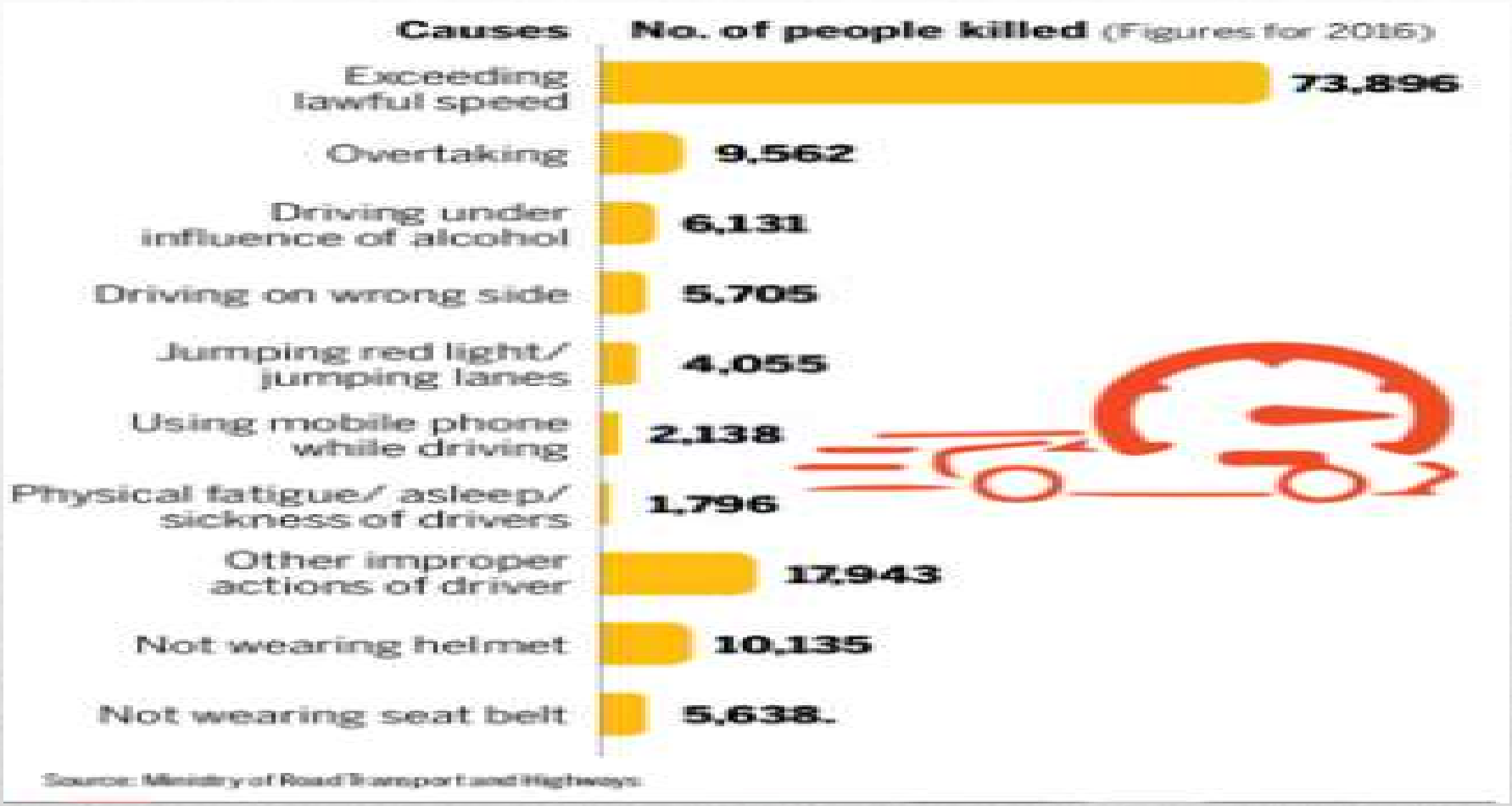


Road Accidents and Road Accident deaths on rule violation 2016

How many of you follow traffic rules?

Consequences of an accidents:-

1) Death
2) Disablement
3) Structural deformity
4) Functional deformity
5) Esthetic deformity
6) Complicated and compromi
7) Financial burden
8) Absence from the work


BoneAndSpine.com

How many of you actually wear helmet????

What is this?????

A little care can save your life.

- Riding a bike at **55 kmph** means you are moving at **49 feet per second.**

- It is the speed at which you would hit the ground, if you were to **jump** from the **fourth floor** of a building.

Accident without wearing Seat belt

Distracted Driving

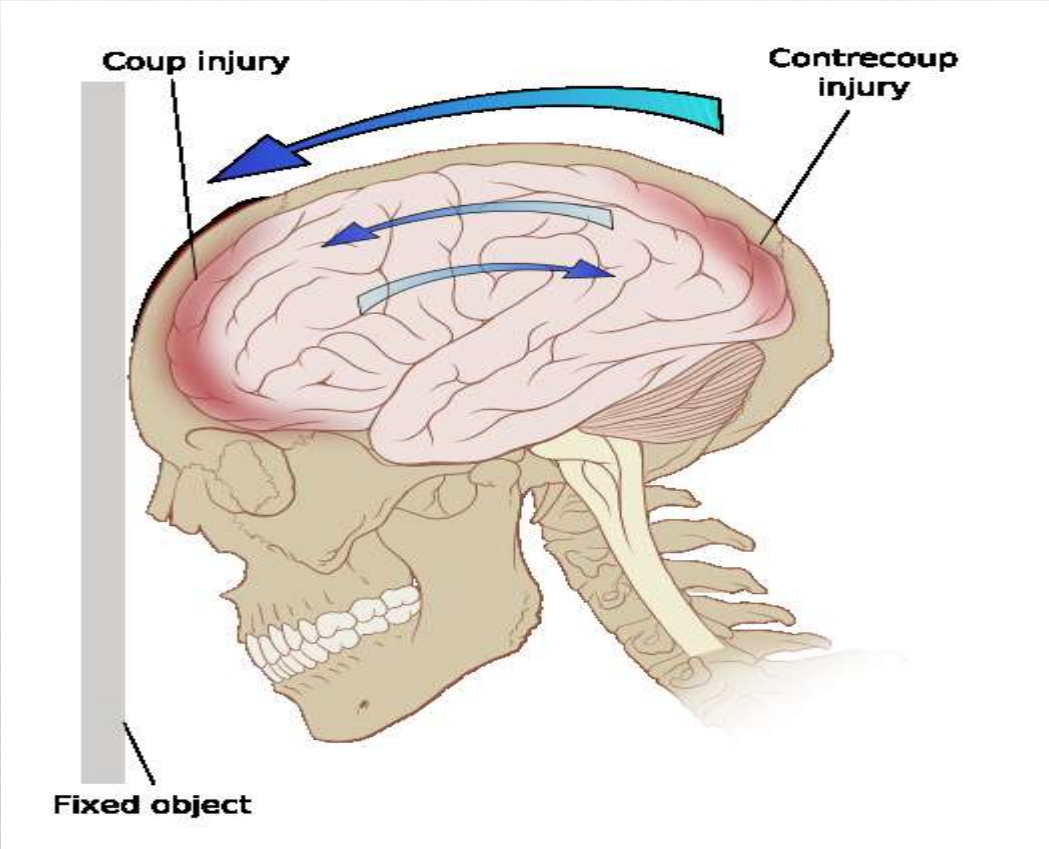
Reason ?????????

azdps.gov

Drivers using a mobile phone are approximately four times more likely to be involved in a crash


superhits
RED
FM 93.5
clideo.com

- **Countercoup:-** Coup and countercoup injuries can occur individually or together.
- When a moving object impacts the stationary head, coup injuries are typical, while countercoup injuries are produced when the moving head strikes a stationary object.



1) College Boy Was Doing Parade In NCC Camp Ground And Falls Down While Doing Parade. There Is A Bleeding From The Mouth And Both The Ears..

2) A 20 Yr Young Girl Was Driving Scooter Without Wearing A Helmet.. She Misses A Road Bump While Using Mobile Phone During Driving And Looses Her Balance..

3) Anil Kumble Was Playing Against The Fast Bowler Of West Indies And Suddenly Bouncer Ball Hits On His Left Lower Jaw..

He Spits The Blood On The Ground And Continues Playing Cricket..

4) There Is A Terrorist Attack At Civil Hospital Ahmedabad.. What Will You Do???

5) You Are Driving A Car On An Express Highway From Ahmedabad To Baroda...You Happen To See An Accident Between Passenger Bus And A Tourist Car..
You Find A Mass Causality Over A Road Side...What Will You Do???????

6) A 75 Yr Senior Citizen Sustain A Injury On His Edentoules Lower Jaw..

7) A BDS Practioner While Attempting The Removal Of Distoangular 3rd Molar Listens A Cracking Sound..

8) 10 Yr Old Boy While Jumping On The Ground Looses His Balance And Falls On The Ground... How Will You Proceed...

9) Patient Comes To You With A Complain Of Inability To Chew The Food Because Of Space In Between The Upper And Lower Teeth After He Had A Fist On His Left Jaw Few Days Back.

What is trauma?

What is Trauma?

- According to SAMHSA, trauma results from an event, series of events, or set of circumstances that is experienced by an individual as physically or emotionally harmful or threatening and that has lasting adverse effects on the individual's functioning and physical, social, emotional, or spiritual well-being.
- Trauma generally overwhelms an individual's or community's resources to cope, and it often ignites the "fight, flight, or freeze" reaction at the time of the event(s). Trauma produces a sense of fear, vulnerability, and helplessness.

- High Impact:
  - Supraorbital rim – 200 G
  - Symphysis of the Mandible –100 G
  - Frontal – 100 G
  - Angle of the mandible – 70 G
- Low Impact:
  - Zygoma – 50 G
  - Nasal bone – 30 G

Severity:

- 60% of patients with severe facial trauma have multisystem trauma and the potential for airway compromise.
- 20-50% concurrent brain injury.
- 1-4% cervical spine injuries.
- Blindness occurs in 0.5-3%
- 25% of patients with severe facial trauma will develop Post Traumatic Stress Disorder
- Refernces: Peter ward Booth

Assessment:

- Based on
  - Targeting care: Glasgow Coma Scale (GCS)
  - Predicting outcome: Abbreviated Injury Scale (AIS) and Injury Severity Score(ISS)
  - Assessing critically injured patients: APACHE II

Glasgow Coma Scale

BEHAVIOR	RESPONSE	SCORE
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place, and person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No response	1
Best motor response	Obeys commands	6
	Moves to localized pain	5
	Flexion withdrawal from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
	No response	1
Total score:	*Best response*	15
	Comatose client	8 or less
	Totally unresponsive	3

TABLE 1. Abbreviated Injury Scale (AIS)

AIS score	Injury
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Probably lethal*

* Although a perfect linear correlation with an AIS of 6 and mortality does not exist, survivability is unlikely.

Injury Severity Score; ISS

Region	Injury Description	AIS	Square Top Three
Head & Neck	Cerebral Contusion	3	9
Face	No Injury	0	
Chest	Flail Chest	4	16
Abdomen	Minor Contusion of Liver Complex Rupture Spleen	2 5	25
Extremity	Fractured femur	3	
External	No Injury	0	
		Injury Severity Score:	50

AIS Score	Injury
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Survivable

ISS	
1-8	Minor
9-15	Moderate
16-24	Serious
25-49	Severe
50-74	Critical
75	Maximum

APACHE II

- APACHE II ("Acute Physiology and Chronic Health Evaluation II") is a severity-of-disease classification system (Knaus et al., 1985) one of several ICU scoring systems.
- It is applied within 24 hours of admission of a patient to an intensive care unit (ICU): an integer score from 0 to 71 is computed based on several measurements; higher scores correspond to more severe disease and a higher risk of death.
- The first APACHE model was presented by Knaus et al. in 1981.

Application

- APACHE II was designed to measure the severity of disease for adult patients admitted to intensive care units. It has not been validated for use in children or young people aged under 16.
- This scoring system is used in many ways which include:
- Some procedures or some medicine is only given to patients with a certain APACHE II score
- APACHE II score can be used to describe the morbidity of a patient when comparing the outcome with other patients.
- Predicted mortalities are averaged for groups of patients in order to specify the group's morbidity.

Calculation

- The point score is calculated from a patient's age and 12 routine physiological measurements:

- AaDO2 or PaO2 (depending on FiO2)
- Temperature (rectal)
- Mean arterial pressure
- pH arterial
- Heart rate
- Respiratory rate
- Sodium (serum)
- Potassium (serum)
- Creatinine
- Hematocrit
- White blood cell count
- Glasgow Coma Scale

- These were measured during the first 24 hours after admission, and utilized in additional to information about previous health status (recent surgery, history of severe organ insufficiency, immunocompromised state) and baseline demographics such as age.
- The score is not recalculated during the stay; it is by definition an admission score. If a patient is discharged from the ICU and readmitted, a new APACHE II score is calculated

Triage


Decide to Save Lives
Right Patient,
Right Place,
Right Time
2011 Guidelines for Field Triage
of Injured Patients
www.cdc.gov/Fieldtriage
CDC

Definitions

Triage system: The process by which a clinician assesses a patient's clinical urgency.

Triage: A triage system is the basic structure in which all incoming patients are categorised into groups using a standard urgency rating scale or structure.

Re-triage:

- Clinical status is a dynamic state for all patients.
- If clinical status changes in a way that will impact upon the triage category, or if additional information becomes available that will influence urgency, then re-triage must occur.
- When a patient is re-triaged, the initial triage code and any subsequent triage code must be documented.
- The reason for re-triaging must also be documented.

Urgency:

- Urgency is determined according to the patient's clinical condition and is used to 'determine the speed of intervention that is necessary to achieve an optimal outcome'.
- Urgency is independent of the severity or complexity of an illness or injury.
- For example, patients may be triaged to a lower urgency rating because it is safe for them to wait for an emergency assessment, even though they may still eventually require a hospital admission for their condition or have significant morbidity and attendant mortality.


EMERGENCY
TRIAGE NURSE
Being the worst
makes you first.


[EN] PRODUCTS - Criticalform Triage Tags
0L$
An easy solution for your triage role-play needs. Simple have your patients wear the appropriate tag, and let the triaging begin.
no modify / copy / transfer


TRIAGE
AREA

Triage

- The term “triage” originates from the French word “trier” which means to sort, pick out, classify or choose.
- Triage systems were first used to prioritise medical care during the Napoleonic wars of the late 18th century.
- The triage principle of prioritising care to large groups of people has been adapted from its military origin for use in the civilian context of initial emergency department care.
- An effective triage system aims to ensure that patients seeking emergency care “receive appropriate attention, in a suitable location, with the requisite degree of urgency” and that emergency care is initiated in response to clinical need rather than order of arrival.

Emergency triage scales

- National Triage Scale (NTS)
- Australasian Triage Scale (ATS)
- Canadian Triage and Acuity Scale (CTAS)
- Manchester Triage Scale (MTS)
- Emergency Severity Index (ESI)

- The **National Triage Scale (NTS)** is a five category triage scale derived from the Ipswich and Box Hill Triage Scales.
- The NTS was formulated in 1993 by the Australasian College for Emergency Medicine (ACEM)

- five triage categories :-

Table 4.1. National Triage Scale categories

Numeric Code	Category	Treatment Acuity	Colour Code
1	Resuscitation	Immediate	Red
2	Emergency	Minutes (< 10 mins)	Orange
3	Urgent	Half hour	Green
4	Semi-urgent	One hour	Blue
5	Non-urgent	Two hours	White

The **Australasian Triage Scale (ATS)** was formulated in 2000 by ACEM and is a result of revision of the NTS

Table 4.2. Australasian Triage Scale categories

ATS Category	Description of Category	Response
1	Immediately life-threatening	Immediate
2	Imminently life-threatening or important time-critical treatment or very severe pain	Assessment and treatment within 10 minutes
3	Potentially life-threatening or situational urgency or human practice mandates the relief of severe discomfort or distress within 30 minutes	Assessment and treatment start within 30 minutes
4	Potentially life-serious or situational urgency or significant complexity or severity or human practice mandates the relief of severe discomfort or distress within 60 minutes	Assessment and treatment start within 60 minutes
5	Less urgent or clinico-administrative problems	Assessment and treatment start within 120 minutes

ATS categories for treatment acuity and performance thresholds[1]

ATS category	Treatment acuity (maximum waiting time)	Performance indicator (%)
1	Immediate	100
2	10 minutes	80
3	30 minutes	75
4	60 minutes	70
5	120 minutes	70

Summary of adult physiological predictors for the ATS

	Category 1 Immediate	Category 2 10 minutes	Category 3 30 minutes	Category 4 60 minutes	Category 5 120 minutes
Airway	Obstructed/ partially obstructed	Patent	Patent	Patent	Patent
Breathing	Severe respiratory distress/absent respiration/ hypoventilation	Moderate respiratory distress	Mild respiratory distress	No respiratory distress	No respiratory distress
Circulation	Severe haemodynamic compromise/ absent circulation Uncontrolled haemorrhage	Moderate haemodynamic compromise	Mild haemodynamic compromise	No haemodynamic compromise	No haemodynamic compromise
Disability	GCS <9	GCS 9–12	GCS >12	Normal GCS	Normal GCS

Risk factors for serious illness/injury – age, high risk history, high risk mechanism of injury, cardiac risk factors, effects of drugs or alcohol, rash and alterations in body temperature – should be considered in the light of history of events and physiological data. Multiple risk factors = increased risk of serious injury/illness. Presence of one or more risk factors may result in allocation to a triage category of higher acuity.

Paediatric physiological discriminators

	Category 1 – Immediate	Category 2 – Emergency Within 10 minutes	Category 3 – Urgent Within 30 minutes	Category 4 – Semi-urgent Within 60 minutes	Category 5 – Non-urgent Within 120 minutes
Airway	Obstructed Partially obstructed with severe respiratory distress	Patent Partially obstructed with moderate respiratory distress	Patent Partially obstructed with mild respiratory distress	Patent	Patent
Breathing	Absent respiration or hypoventilation	Respiration present	Respiration present	Respiration present	Respiration present
Circulation s/s dehydration ↓LOC/activity cap refill <2 sec dry oral mucosa sunken eyes ↓tissue turgor absent tears deep respirations thready/weak pulse tachycardia ↓ urine output	Severe respiratory distress, e.g. – severe use accessory muscles – severe retraction – acute cyanosis.	Moderate respiratory distress, e.g. – moderate use accessory muscles – moderate retraction – skin pale.	Mild respiratory distress, e.g. – mild use accessory muscles – mild retraction – skin pink.	No respiratory distress – no use accessory muscles – no retraction.	No respiratory distress – no use accessory muscles – no retraction.
	Absent circulation Significant bradycardia, e.g. HR <60 in an infant	Circulation present	Circulation present	Circulation present	Circulation present
	Severe haemodynamic compromise, e.g. – absent peripheral pulses – skin pale, cold, moist, mottled – significant tachycardia – capillary refill >4 secs.	Moderate haemodynamic compromise, e.g. – weak/thready brachial pulse – skin pale, cool, – moderate tachycardia – capillary refill 2–4 secs.	Mild haemodynamic compromise, e.g. – palpable peripheral pulses – skin pale, warm – mild tachycardia.	No haemodynamic compromise, e.g. – palpable peripheral pulses – skin pink, warm, dry.	No haemodynamic compromise, e.g. – palpable peripheral pulses – skin pink, warm, dry.
	Uncontrolled haemorrhage	>6 s/s dehydration	3–6 s/s dehydration	<3 s/s dehydration	No s/s dehydration
Disability	GCS<8	GCS 9–12 Severe decrease in activity, e.g. – no eye contact, – decreased muscle tone.	GCS >13 Moderate decrease in activity, e.g. – lethargic – eye contact when disturbed.	Normal GCS or no acute change to usual GCS. Mild decrease in activity, e.g. – quiet but eye contact – interacts with parents.	Normal GCS or no acute change to usual GCS. No alteration to activity, e.g. – playing – smiling.

When a triage code is selected there are three possible outcomes:

- **'Under-triage'** in which the patient receives a triage code that is lower than their true level of urgency (as determined by objective clinical and physiological indicators). This decision has the potential to result in a prolonged waiting time to medical intervention for the patient and risks an adverse outcome.

- **'Correct (or expected) triage** decision' in which the patient receives a triage code that is commensurate with their true level of urgency (as determined by objective clinical and physiological indicators). This decision optimises time to medical intervention for the patient and limits the risk of an adverse outcome.

- **'Over-triage'** in which the patient receives a triage code that is higher than their true level of urgency. This decision has the potential to result in a shortened waiting time to medical intervention for the patient, however, it risks an adverse outcome for other patients waiting to be seen in the ED because they have to wait longer.

Triage decisions

- Triage decisions are complex clinical decisions often made under conditions of uncertainty with limited or obscure information, minimal time and with little margin for error.

- Triage decisions are made in response to the patient's presenting signs or symptoms and no attempt to formulate a medical diagnosis is made

- Triage decisions can be divided into **primary** and **secondary** triage decisions.

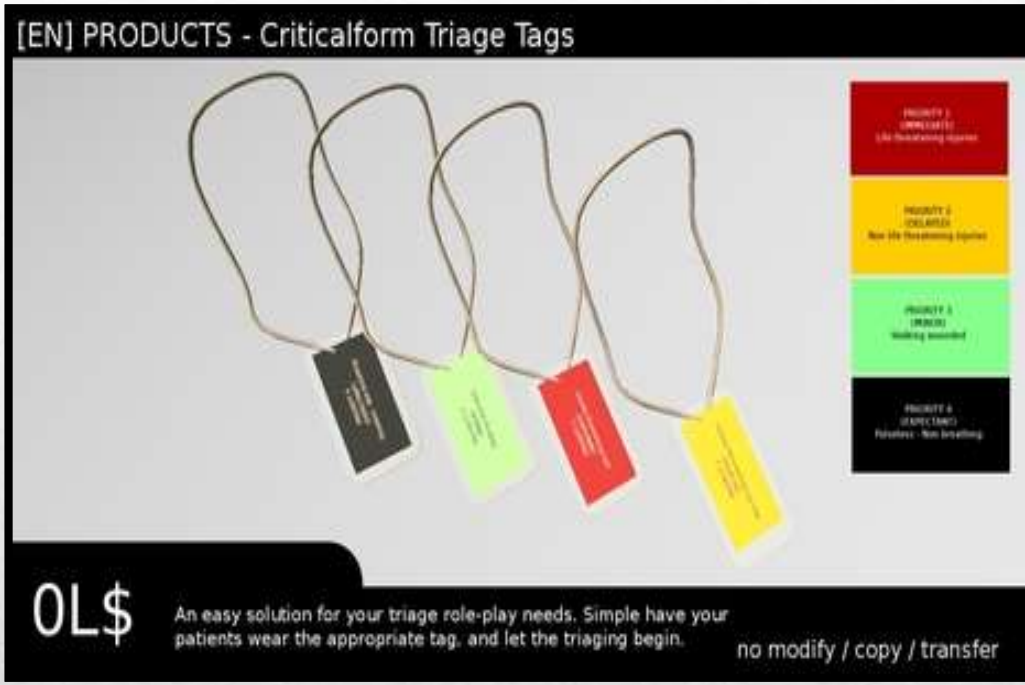
- **Primary triage** decisions should be based on both objective and subjective data as follows:

- Objective data:
- Primary survey; and
- Physiological data.

- Subjective data:
- Chief complaint;
- Precipitating event / onset of symptoms;
- Mechanism of injury;
- Time of onset of symptoms / event; and
- Relevant past history

Triage Tags

A triage tag is a prefabricated label placed on each patient that serves to accomplish several objectives:



- identify the patient.
- bear record of assessment findings.
- identify the priority of the patient's need for medical treatment and transport from the emergency scene.
- track the patients' progress through the triage process.
- identify additional hazards such as contamination.

- ***Definition Of Fracture.***
- *Causes Of Fracture.*
- *Factors That Affect The Types Of Fracture.*
- *Types Of Facial Injuries.*
- *Classification*
- *Clinical Features*
- *Radiographs*

Definition

- **A Fracture may be defined as a sudden break in the continuity of bone and it may be complete or incomplete.**

- **A fracture may be defined as a sudden, violent solution of continuity of bone, which may be complete or in complete in nature.**

- Row and williams

- *Definition Of Fracture.*
- ***Causes Of Fracture.***
- *Factors That Affect The Types Of Fracture.*
- *Types Of Facial Injuries.*
- *Classification*
- *Clinical Features*
- *Radiographs*

Causes Of Fracture

-Road Traffic Accidents.

-Falls.

-Industrial Trauma.

-Iatrogenic.

-Athletic Injury.

-Intended Injury.

-Interpersonal Violence.

-Animal Bite.

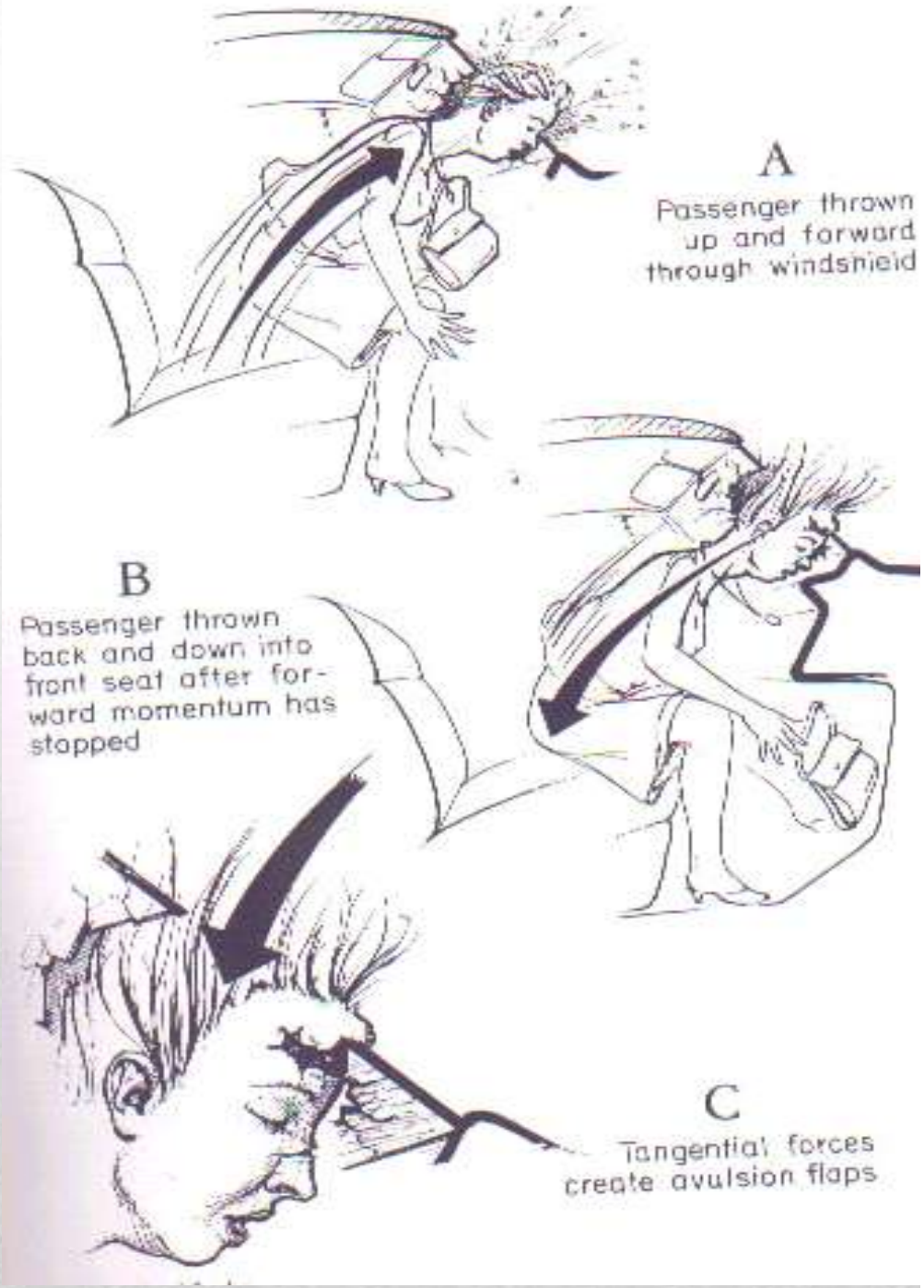
-Gun-shot-war Injury.

-Sporting Injuries.

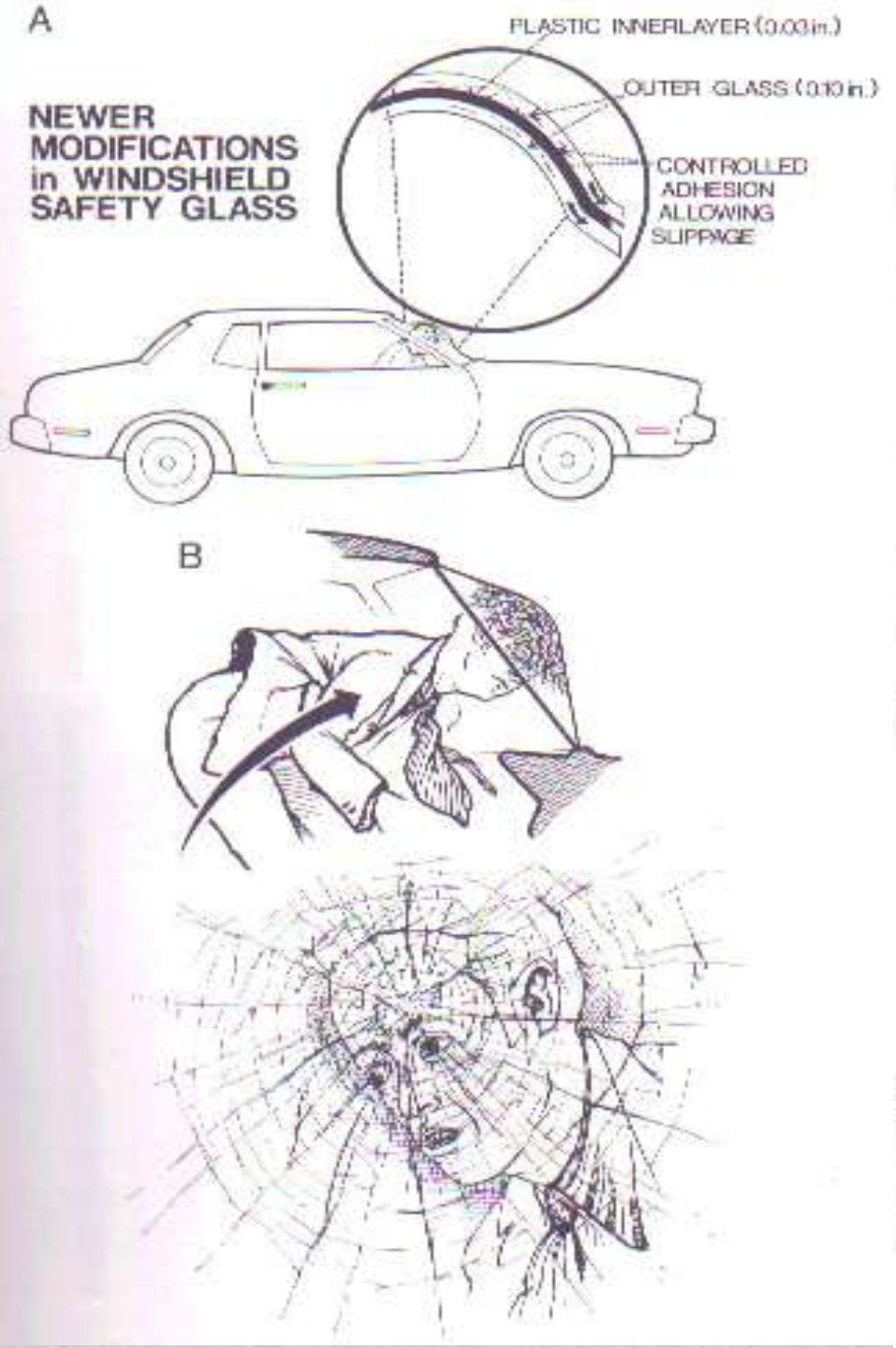
-Pathological Fracture.

Intended Injuries

Falls



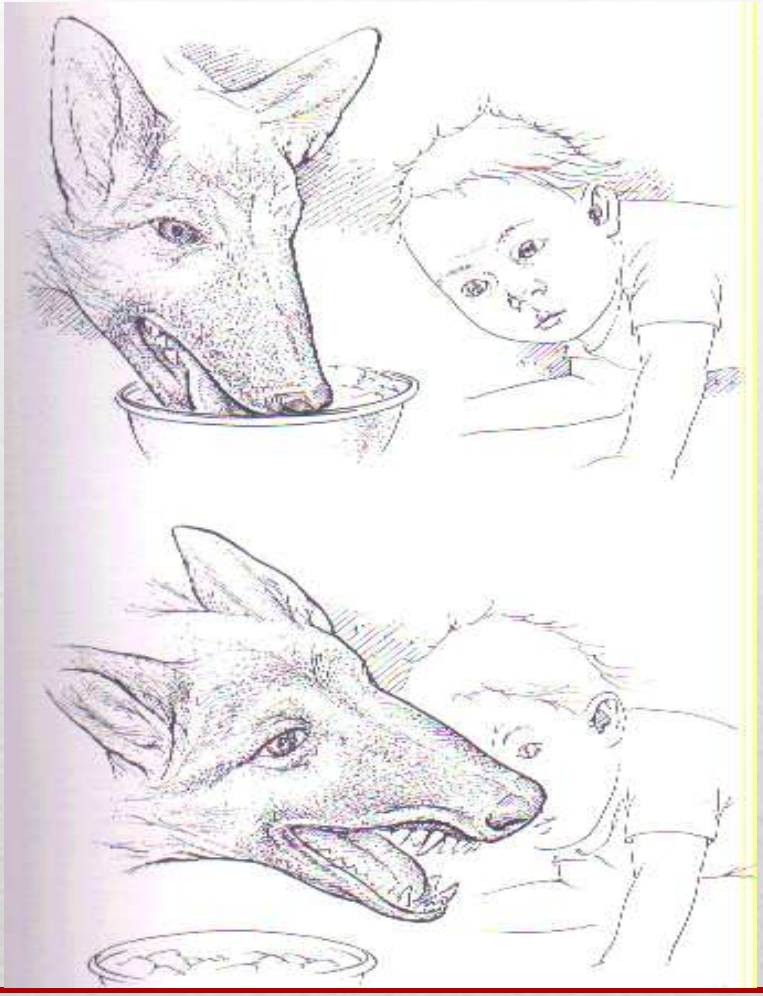
Tangential Forces Create Avulsion



Multiple Small Blunt Glass Particles Can Cause Numerous Small Lacerations, Small Triangular Avulsion Flaps And Tiny Avulsion Injuries.

Fracture and collapse of facial bones because of heavy object thrown upwards from the ground.

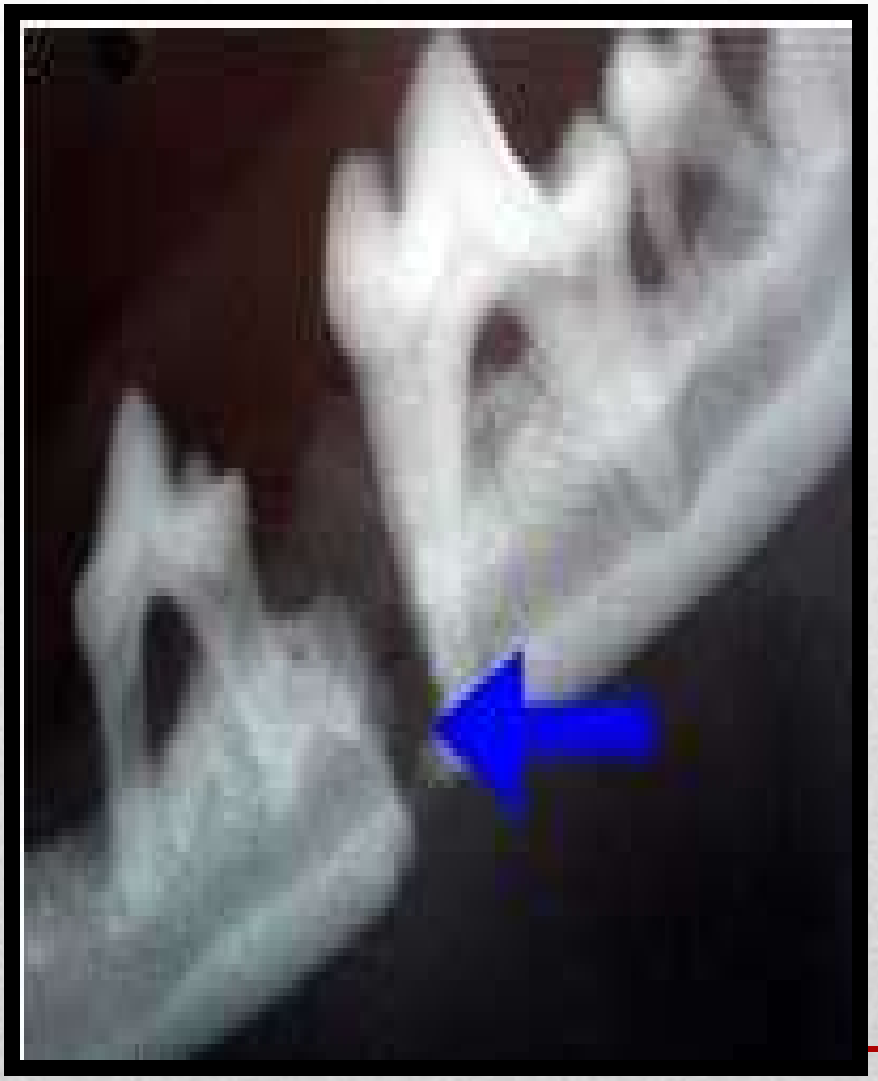
Animal Bite



Athletic & Sports Injuries

Gun Shot - War Injury

Pathological Fracture



SQ

1. Define fracture
2. Coup Injury
3. Counter coup injury
4. Whiplash injury

- *Definition Of Fracture.*
- *Causes Of Fracture.*
- ***Factors That Affect The Types Of Fracture.***
- *Types Of Facial Injuries.*
- *Classification*
- *Clinical Features*
- *Radiographs*

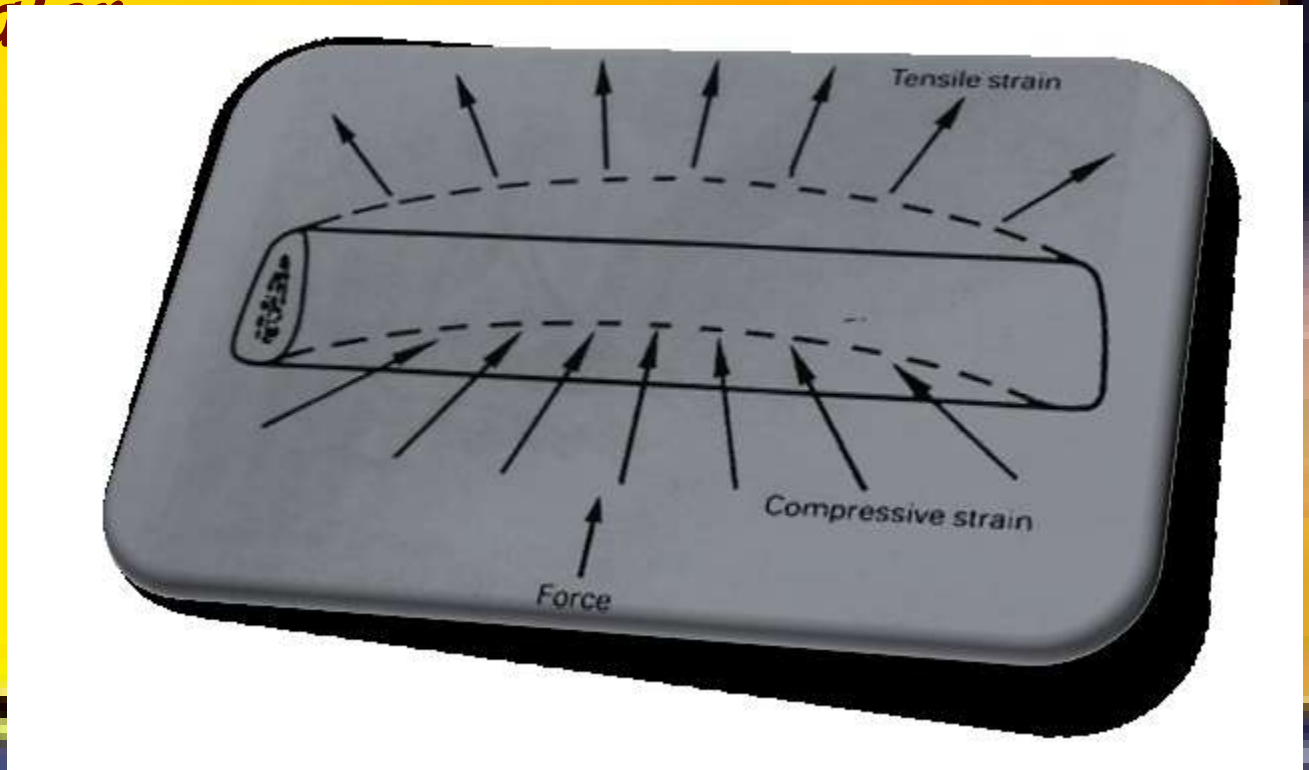
- It is **tubular long bone**, with its **strength** lying in **dense cortical plates**.

- The cortical bone plates are **Thicker Anteriorly** and at the lower border of Mandible, while **posteriorly** lower border is **relatively thin**.

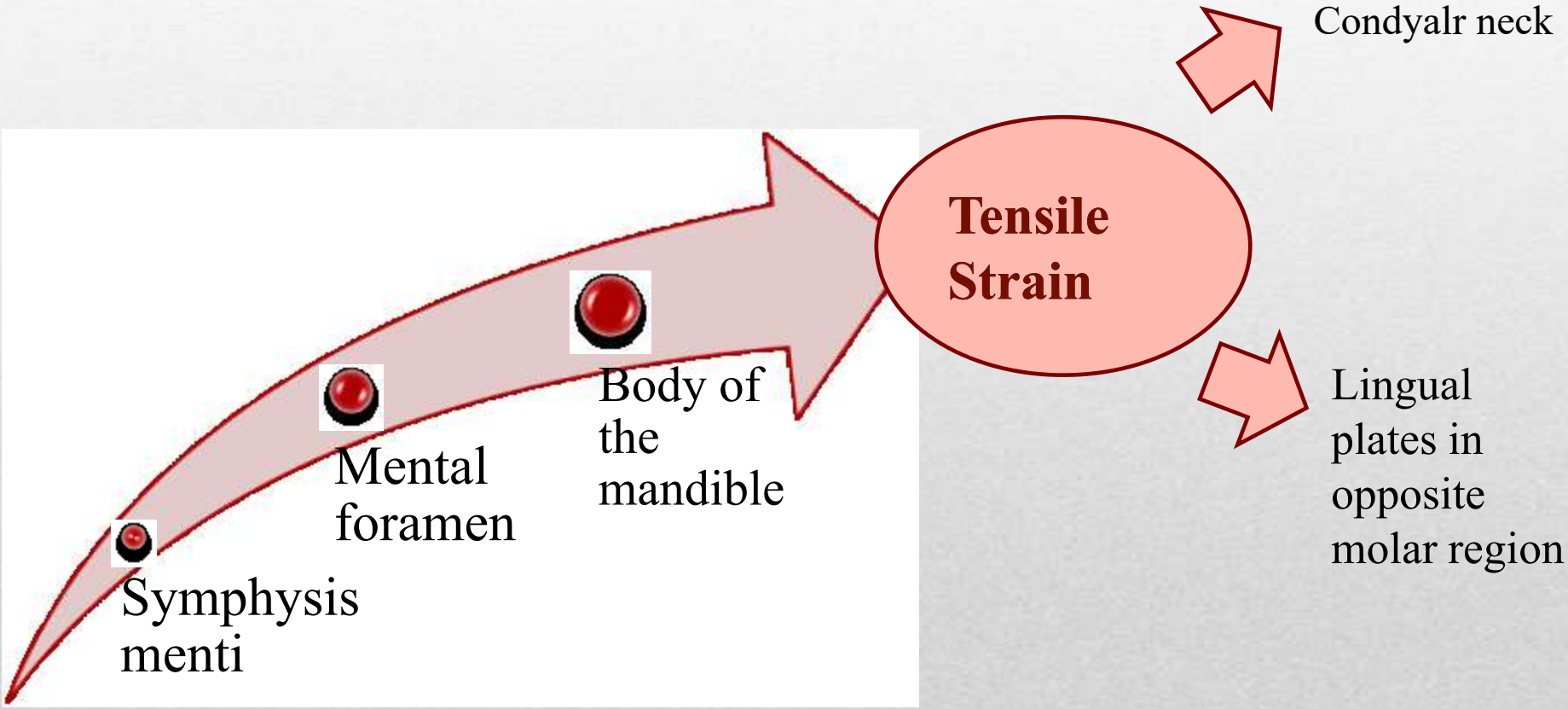
- So, mandible is **strongest anteriorly in midline** and **progressively less strength to the condyles.**

- Mandible is **sub cutaneous or sub mucosal** in its extent, except at **its upper and posterior portion of ramus**, where it is **covered** by **temporalis muscle.**

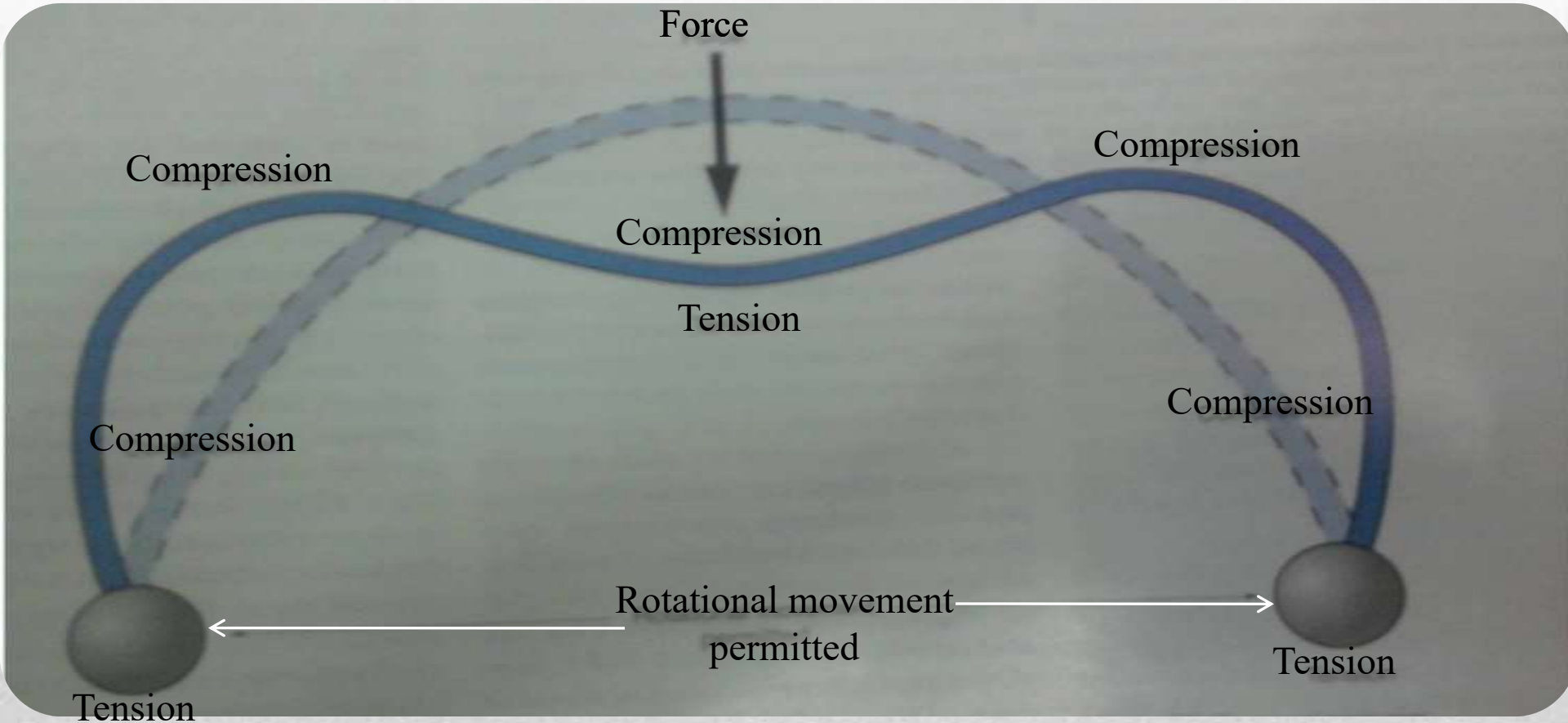
Bone fractures at the ***site of tensile strain,*** *since their* ***resistance to compressive force is grea***



- Isolated mandible is liable to a particular patterns of distribution of tensile strain , when forces are applied to it.



Anterior Force



Peterson's Principle Of Oral & Maxillo Facial Surgery 2nd Edition Vol 1 pg 403

Biomechanical Considerations

- **Huelke** and colleagues carried out the studies of **relationship between** the **nature, severity, and direction of traumatic force** on the resultant mandibular injury.

- They observed that more than 75% of all experimentally produced fracture of the mandible were in **primary area of tensile strain.**

- A notable **'exception'** was that communited condylar head injury that was produce by a load parallel to the ramus was primarily the result of a compressive force.

- In **response to loading**, mandible behaves like an **arch** which **distributes the force of impact** through out **its length.**

- It differs significantly from the arch that it **does not** have a **smooth curve of uniform bone**.

- But it has **discontinuities** such as
  - **foramina**,
  - **sharp bends**,
  - **ridges**
  - **regions of reduced cross sectional dimension like subcondylar area**.

- **Because of this** variation parts of the mandible develop **greater force per unit area and consequently tensile strain is concentrated in this location.**

- When a **force** is directed along the **parasymphysis** or a **body** region,
  - **Compressive strain** develops along **buccal** aspect
  - **Tensile strain** develop along **lingual** aspect.

- It produces **fracture** which **begins lingualy** and **spreads towards the buccal** aspect.

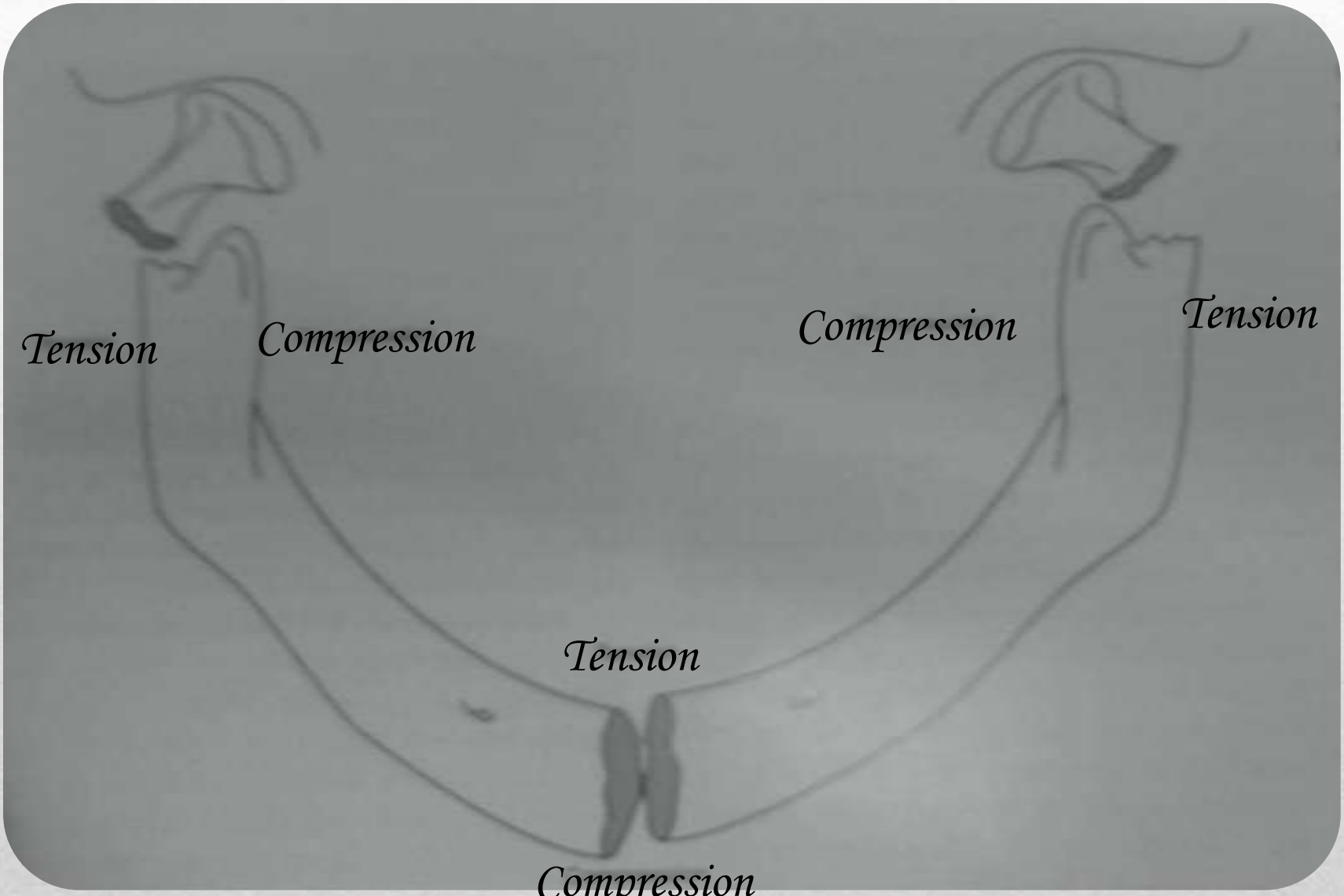
- The **mobile contra lateral condylar process** moves in **direction away from the impact** until it is **limited by** the **bony fossa** and associated **soft tissue**.

- At this point **tension** develops along the **lateral aspect** of **contra lateral condylar neck** and **fracture occurs**.

- **If** the **force** is **greater** along with the **contra lateral condylar neck** fracture there is continued **medial movement** of **smaller ipsilateral mandibular segment** which lead to **bending** and **tension** forces on the **lateral aspect** of **ipsilateral condylar process resulting into fracture**.

- Forces on **symphysis** are directed along an **axial plane** along the arch **of the mandible**.

- Because of **rotational capability** of the **condyles** in the glenoid fossa ,**tension develop** along the **lateral aspect** of the **condylar neck** and **lingual aspect** of the **symphysis** which leads to **bilateral condylar and symphysis fracture**.


Tension
Compression
Compression
Tension
Tension
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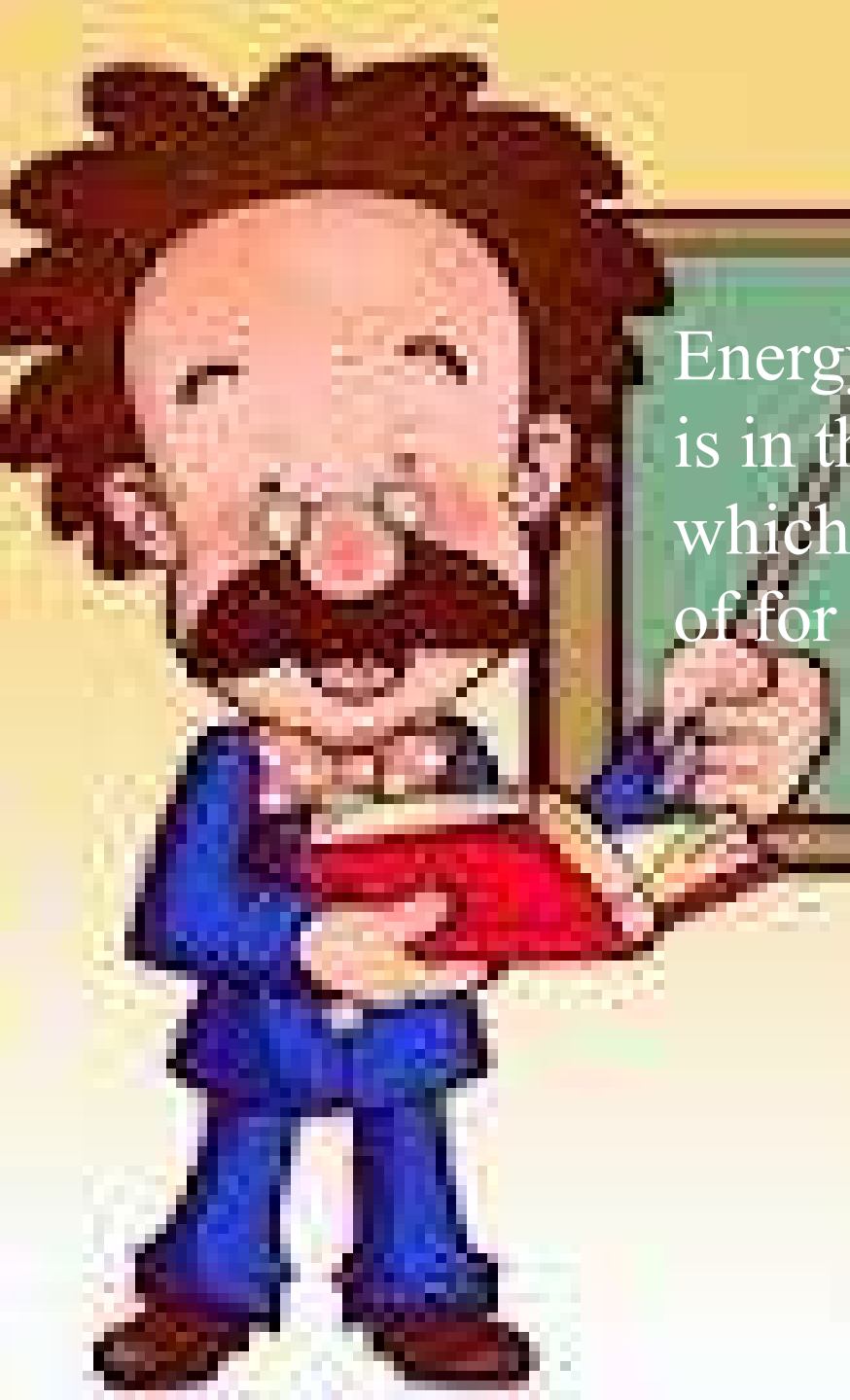


Energy required to fracture a mandible is in the order of **44.6 to 74.4 kg/m,** which is same as zygoma and about ½ of for frontal bone.


Clinical Angle
Surgical Angle
Anatomical Angle

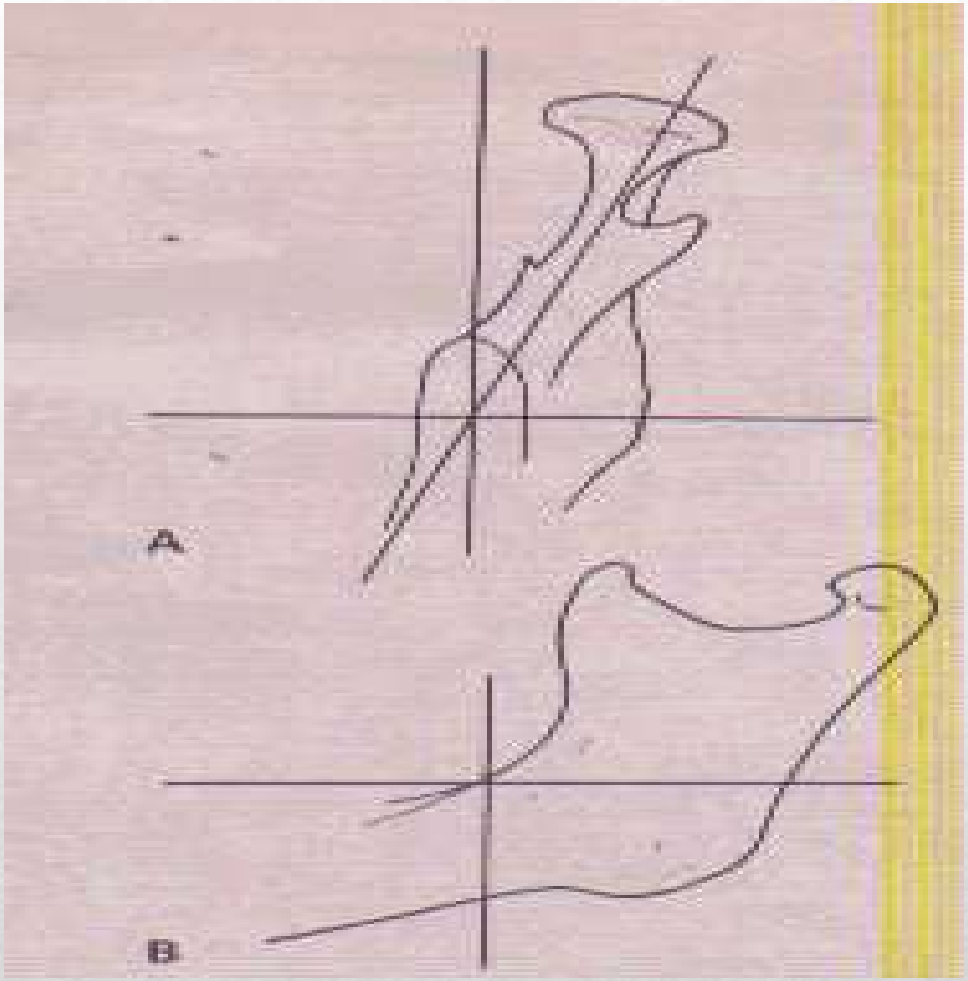
- **Clinical angle:** It is the junction between alveolar bone and ramus at the origin of internal oblique line.

- **Surgical angle:** It is the junction between the body of the Mandible and ramus at the origin of External oblique line.

- **Anatomical angle:** (Gonion) it is formed where lower border of the mandible meets the posterior border of ramus.

- In most of the cases, fracture line extends from the surgical angle downwards and backwards at the lower border of mandible anterior to masseter muscle.

- **Localization:-**Lingual surface of the mandible is one site of maximum tensile strain, resulting from anterolateral force on same side.



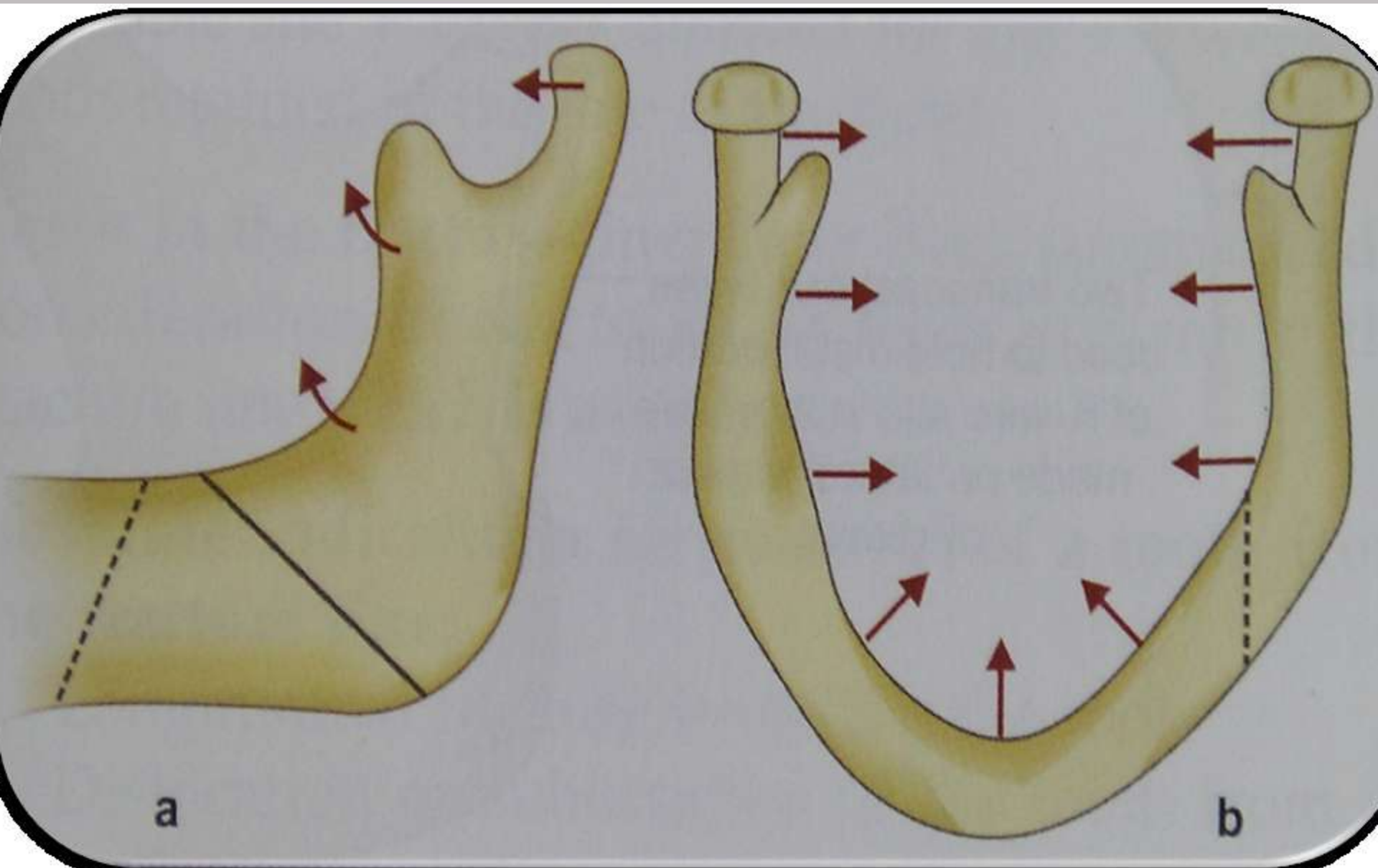
Effects Of Muscle Pull For Mandibular Fracture

Displacement Of Fractured Segment

- A fracture at the angle of the mandible prevents the elevator groups of muscles from having any direct effect on the anterior fragment.(tooth bearing segment).

- Thus there is a tendency for the posterior segment to ride upwards, forwards and inwards.

Effects Of Muscle Pull For Mandibular Fracture



Fracture in anterior region

- When there is **fracture in anterior region** of the mandible, muscles distracts the mandible lingualy.
- Muscles of the posterior group primarily try to close the mandible.
- Facial bones may be considered thin and unsupported.
- They form a compressible, energy absorbing shield for those vital organs, which lie within and behind them. eg. Eyes, lacrimal apparatus, pharynx, cervical spines & brain.

Fractures At The Angle Of Mandible:

Fractures At The Angle Of Mandible:

- Fracture at the angle of the mandible are influenced by the

  -medial pterygoid

  -masseter muscles.

- Fractures in this region is **classified** as….
  ~Vertically favorable
  ~Vertically unfavorable
  ~Horizontally favorable
  ~Horizontally unfavorable.

Fractures At Symphysis And Parasymphysis

Fractures At Symphysis And Parasymphysis

•The **mylohyoid muscle** constitutes a **diaphragm** between the hyoid bone and mylohyoid ridge on inner aspect of mandible.

Symphysis :-

•In **transverse midline fracture** of the **symphysis** the **mylohyoid** and **geniohyoid** muscle act as a stabilizing force.

•An **oblique fracture** in this region will tend to overlap under the influence of the **geniohyoid / mylohyoid diaphragm.**

Parasymphysis :-

- Bilateral fracture of **parasymphysis** area disrupts the periosteum over a wide area and displaced posteriorly under influence of **genioglossus muscle** and **geniohyoid muscle.**

- It removes the attachment of tongue to **fall back** and obstruct the oropharynx.

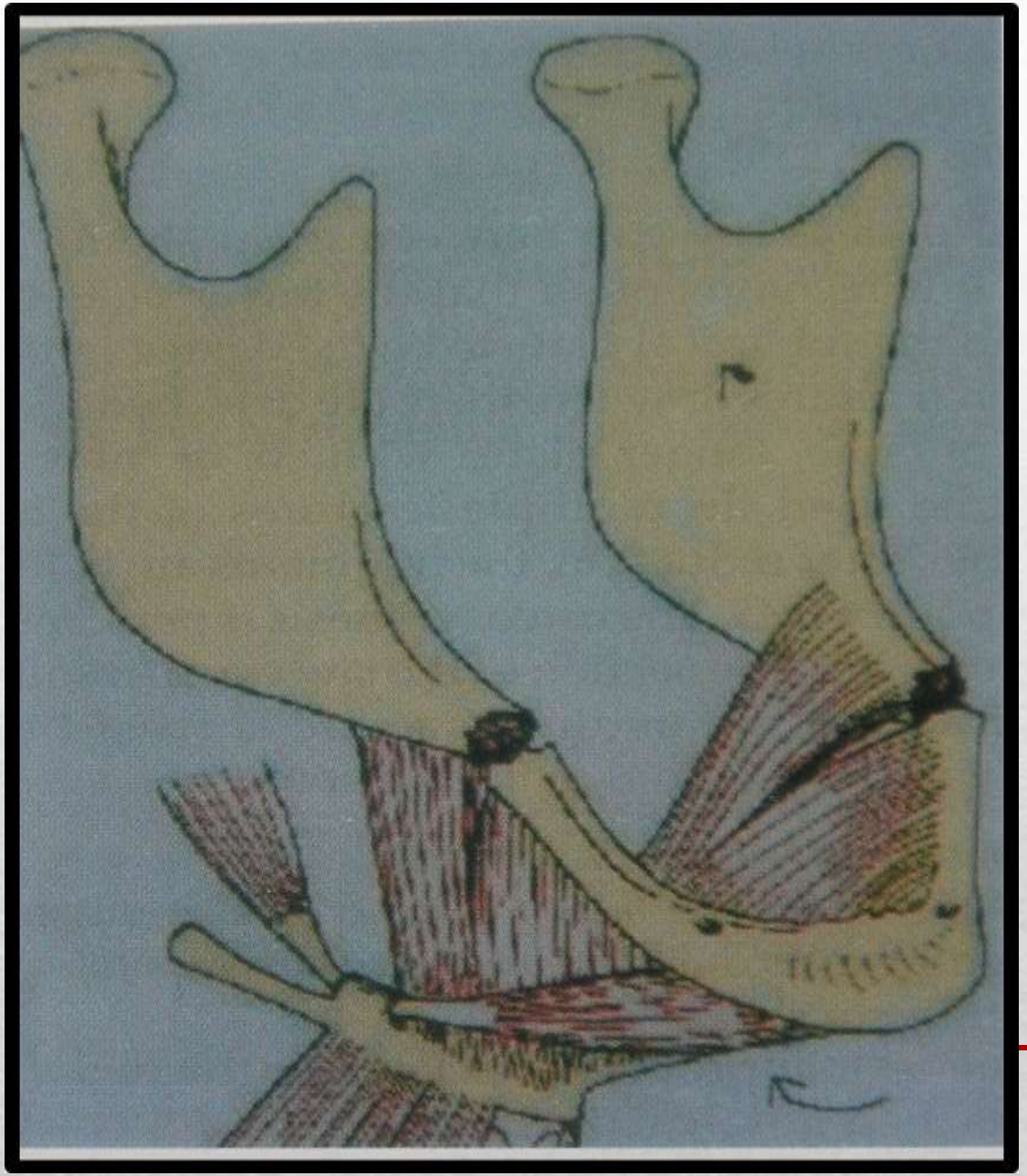
Fractures Of Edentulous Mandible:-

Fractures Of Edentulous Mandible:-

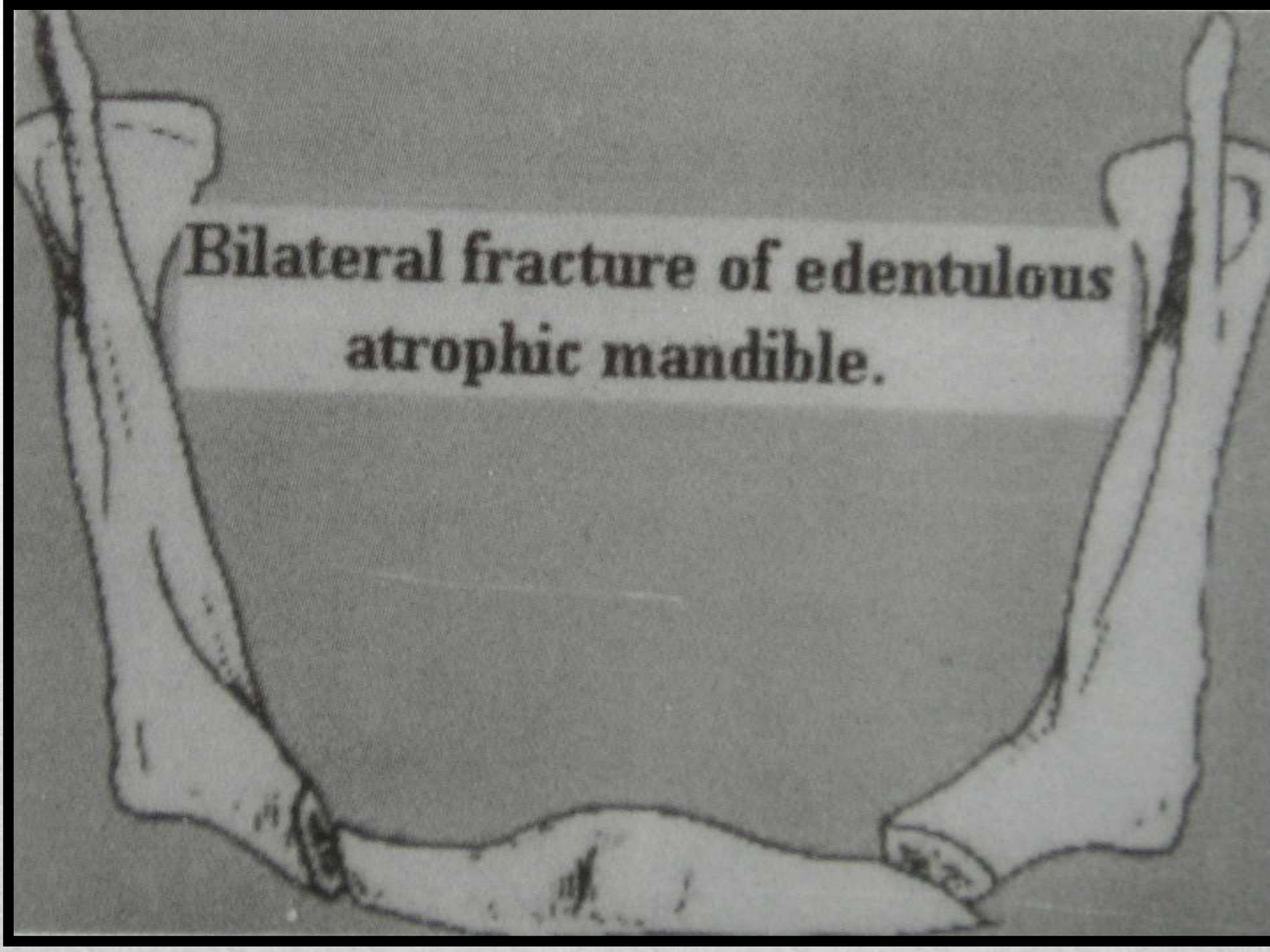
- Alveolar resorption in the molar area of the edentulous mandible become much less resistant to fracture. It is usual to see **bilateral fractures of body of mandible.**

- Extreme downward and backward angulation of the anterior part of the mandible takes place under the influence of the **digastric** and the **mylohyoid** muscles.

- This displacement may lead to respiratory distress.it is called "**bucket handle** "displacement.



Bucket Handle Fracture


Bilateral fracture of edentulous
atrophic mandible.

Short question

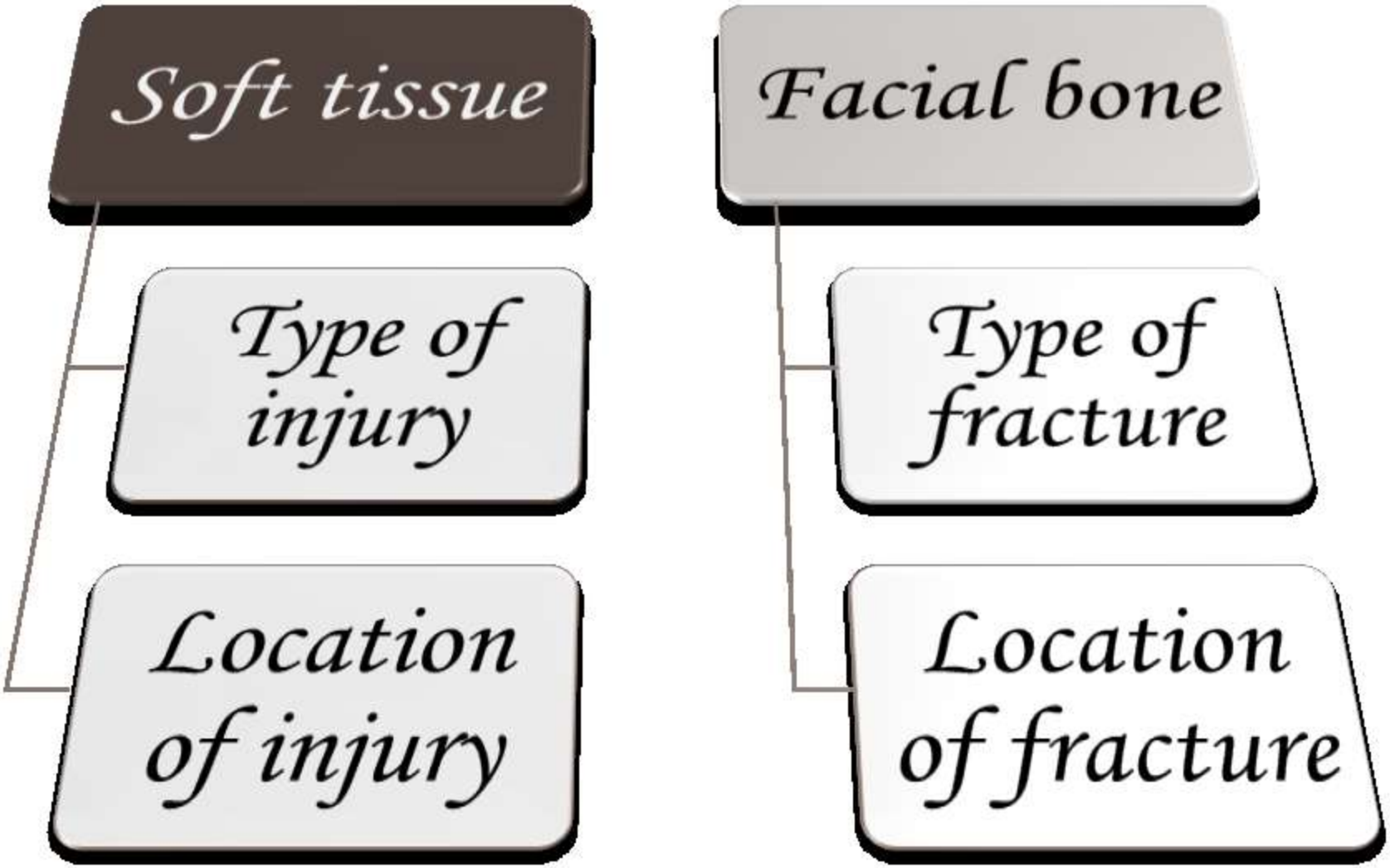
1. Define fracture.
2. Define clinical angle, surgical angle, anatomical angle of the mandible.
3. Which muscles play role for bucket handle fracture?
4. How much force is required to fracture a mandible?
5. In parade ground fracture which anatomic sites can be fracture?

Exercise for the next lectures

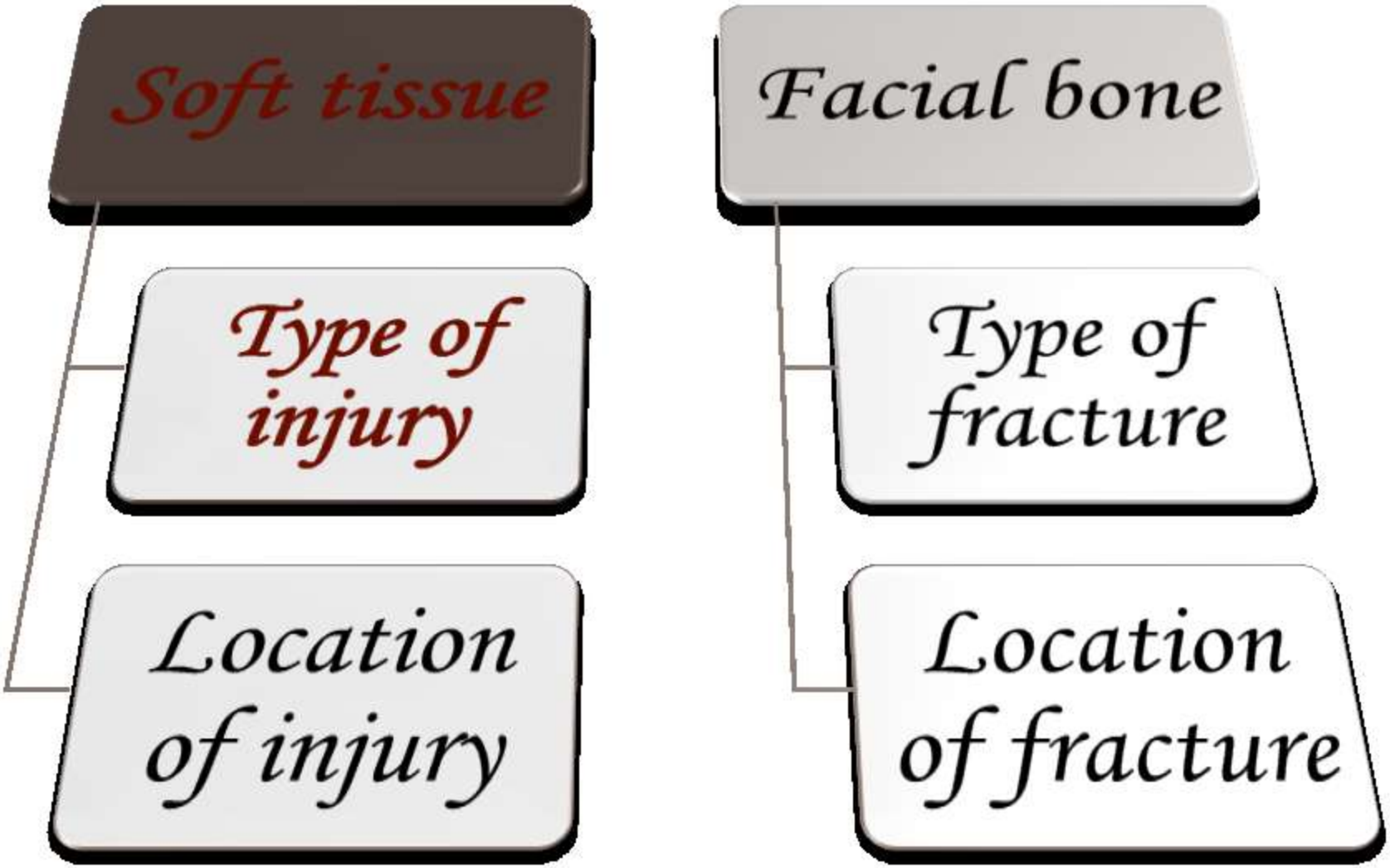
1) *Huelke and colleagues carried out the studies of relationship between the nature, severity, and direction of traumatic force on the resultant mandibular injury.*
2) *Types of maxillo facial injuries..*
3) *Classifications of fracture of mandible..*
4) *Examinations of trauma patient..*
5) *Primary care of trauma patient..*
6) *Management protocol for different mandibular fracture..*
7) *Definitive treatment for mandibular fracture..*
8) *Different types of wiring technique & arch bars for mandibular fracture treatment..*
9) *Different osteosynthesis in treatment of mandible fracture..*

- *Definition Of Fracture.*
- *Causes Of Fracture.*
- *Factors That Affect The Types Of Fracture.*
- ***Types Of Facial Injuries.***
- *Classification*
- *Clinical Features*
- *Radiographs*

Classification Of Injury



Classification Of Injury



(I) Soft Tissue Facial Injuries

(A) Type Of Injury

1. Abrasion

An injury caused by rubbing the surface of skin.

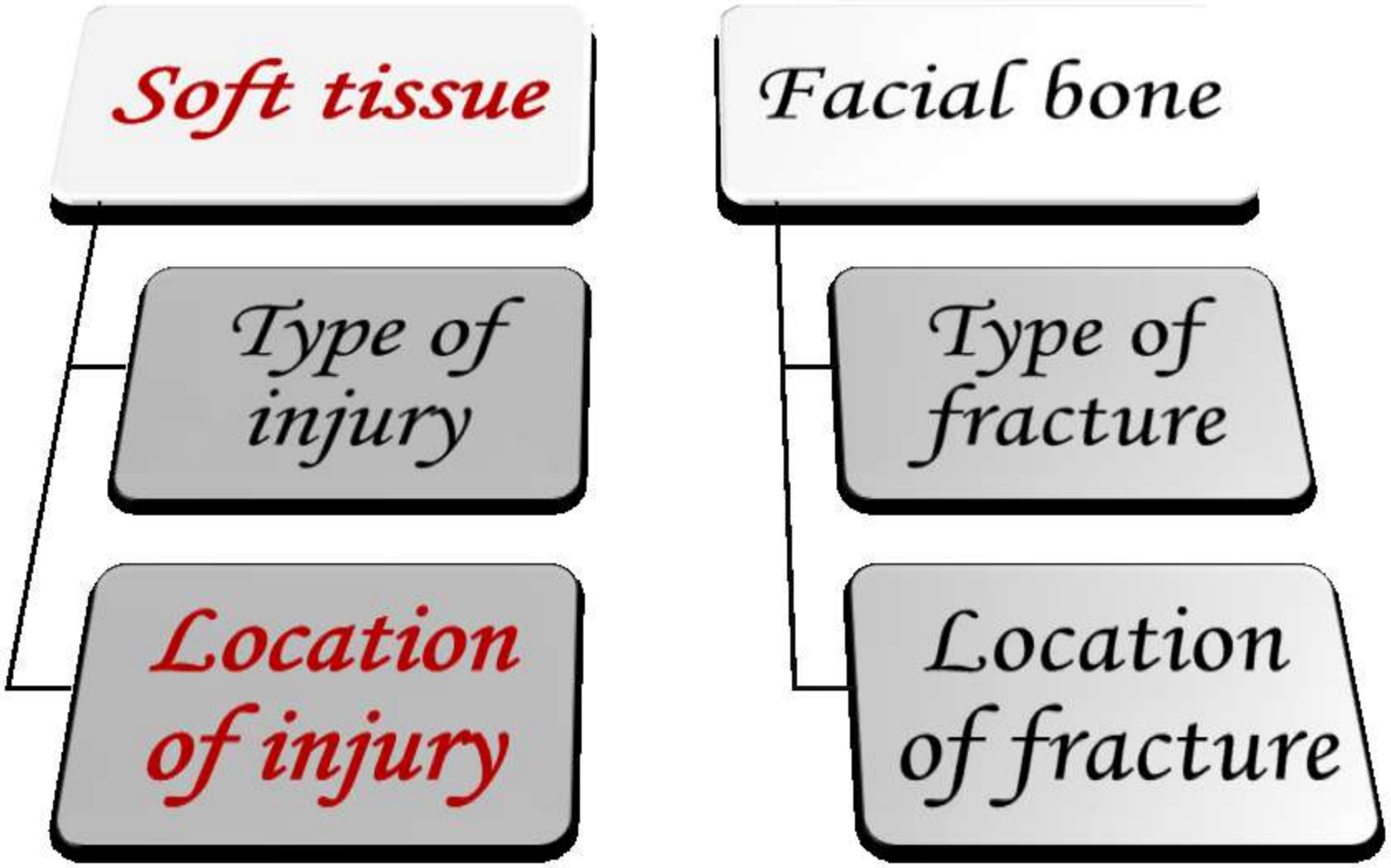
2. Contusion

With or without heamatoma. (A bruise or injury that does not break the skin)

3. Accidental Tattoo :- Numerous small foreign particles embedded in dermis.

4) **Retained Foreign Bodies.**
5) **Puncture.**
6) **Laceration**
7) **Avulsion Flap(undermined Laceration)**
8) **Avulsion Injury.(Loss Of Tissue.)**

Classification Of Injury



(B) Location Of Injury

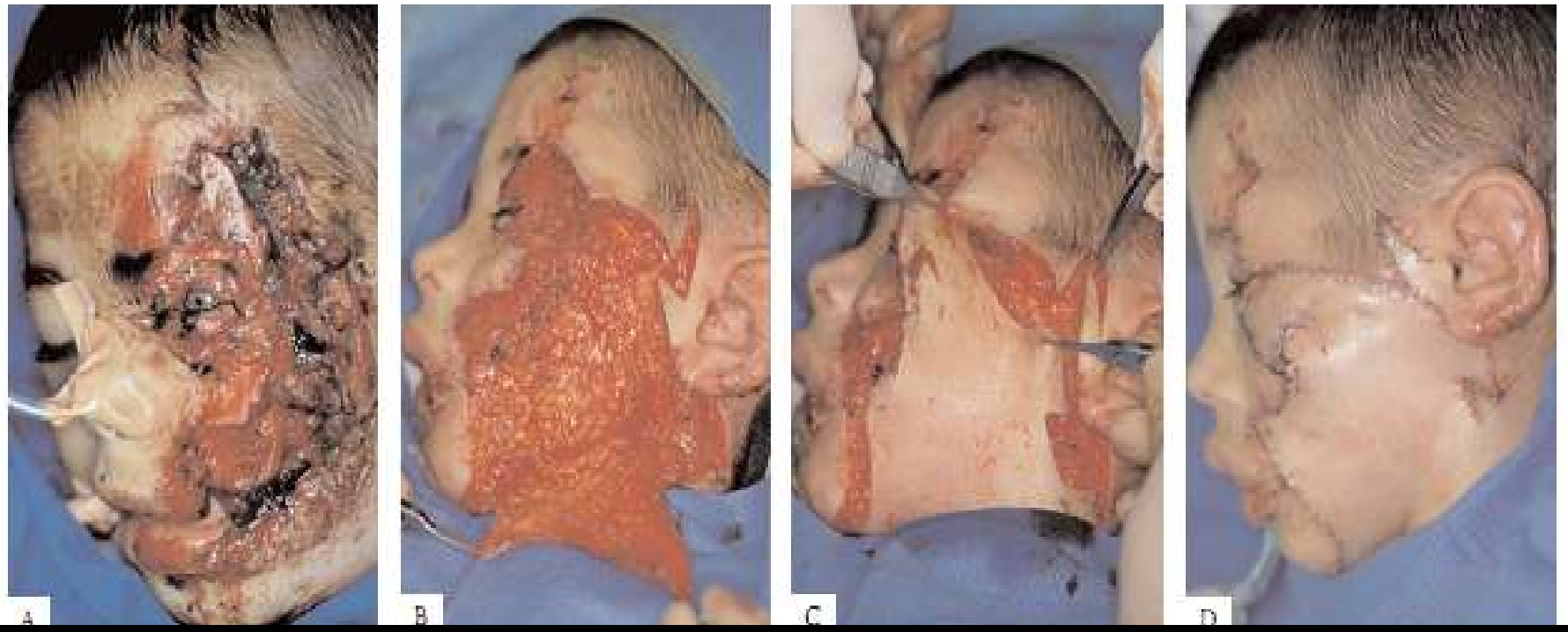
- Fore Head
- Brow
- Eyelid
- Nose
- Ears
- Cheek
- Chin
- Lips
- Intra Oral

Injury to cheek

Before clos

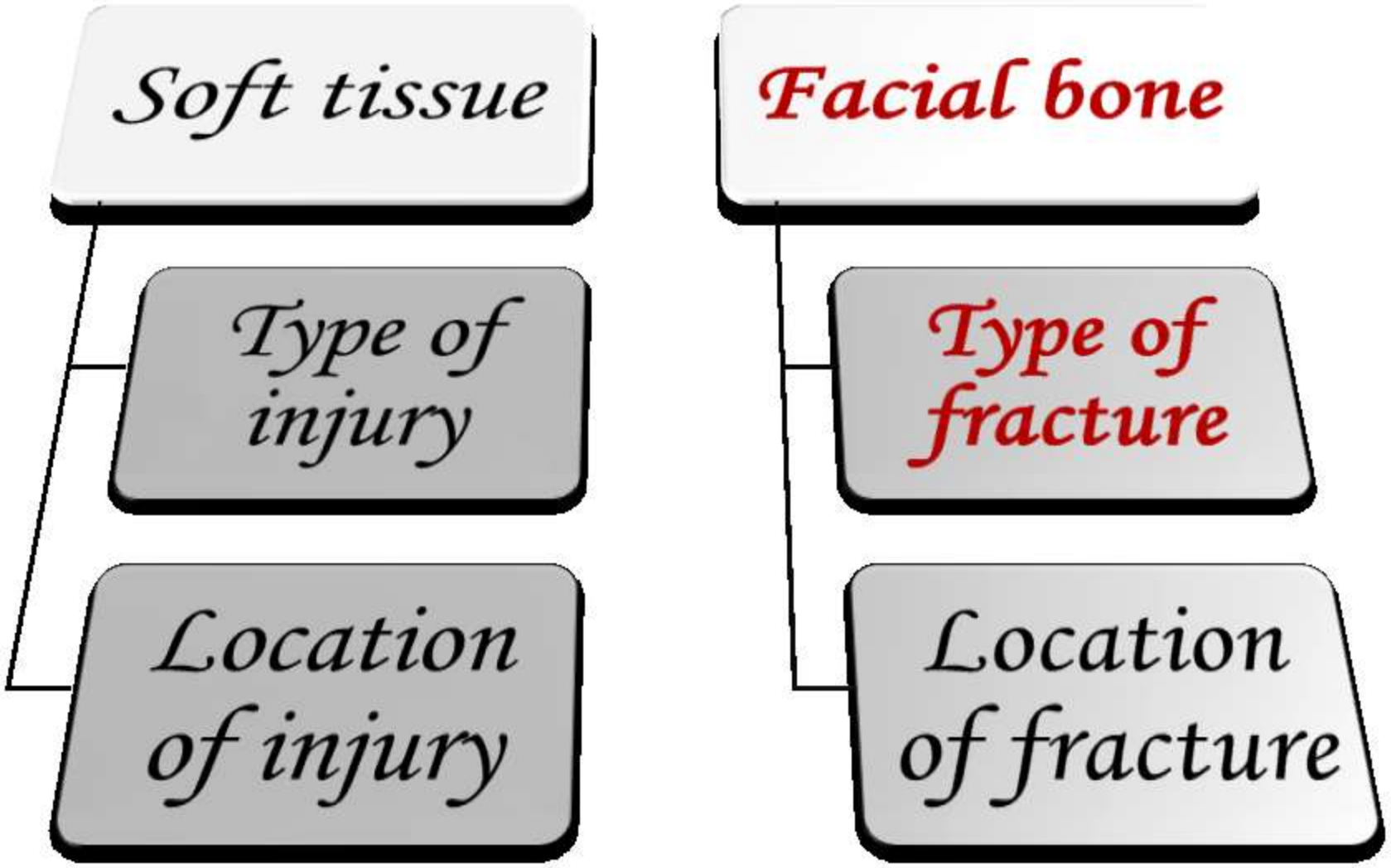
After suture removal

Injury Involving Eyelids



A- patient with avulsive injuries including the upper and lower eyelids.
B- elevation of multiple advancement and rotation flaps to gain coverage.
C- securing the flaps into position.
D- closure of lacerations and flaps

Classification Of Injury

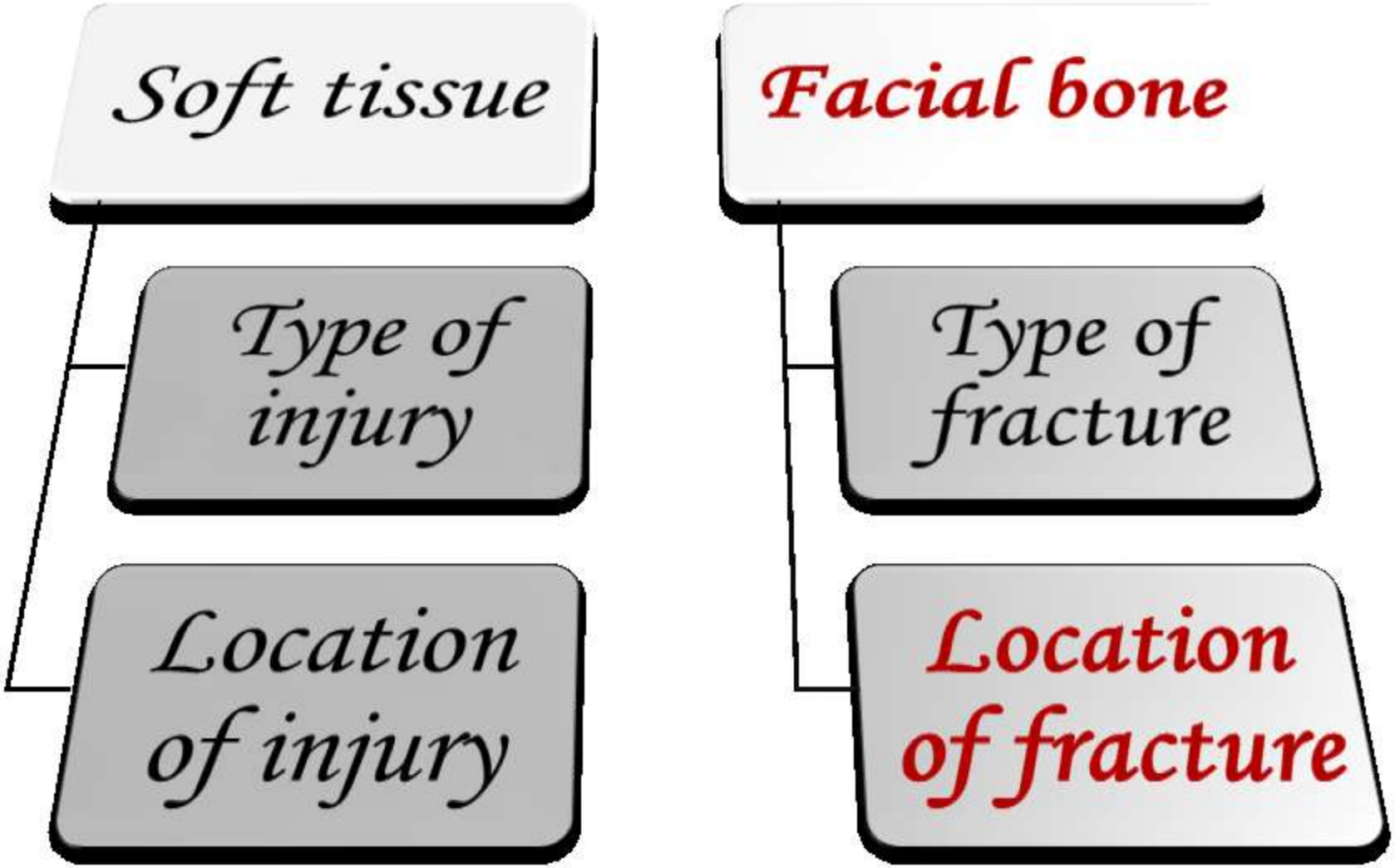


(II) Facial Bone Fractures

(A) Type Of Fracture

1) **Closed** (Simple):-(No Continuity to exterior)
2) **Open** (compound)
3) **Green stick** (mono cortical)
4) **Comminuted**
5) **Undisplaced**
6) **Displaced**

Classification Of Injury



(B) Location Of Fracture :-

- **Upper Face**

a) Frontal
b) Frontal sinuses (glabella)
c) Supra Orbital ridge.

(B) Location Of Fracture :-

Middle 3rd Of Face

a) Nasal bones and septum
b) Maxi sinuses
c) Orbital bones
d) Zygoma
e) Zygo.arch
f) Maxilla Lefort I, II, III.
g) Alveolar process
h) Maxillary dentition.

- **Lower 3rd Of Face: (Mandible)**

a) Dentoalveolar
b) Symphysis
c) Body
d) Angle
e) Ramus
f) Condyle
g) Coronoid

- *Definition Of Fracture.*
- *Causes Of Fracture.*
- *Factors That Affect The Types Of Fracture.*
- *Types Of Facial Injuries.*
- ***Classification***
- *Clinical Features*
- *Radiographs*

Classification Of Mandibular Fracture

1) Kruger's

- 1) Simple
- 2) Compound
- 3) Comminuted
- 4) Pathological
- 5) Greenstick
- 6) Complex
- 7) Impacted

2) According To Anatomical Region

- 1) dento-alveolar
- 2) condylar
- 3) coronoid
- 4) body
- 5) angle
- 6) ramus
- 7) parasymphysis
- 8) Symphysis

3) Relation Of The Fracture To The Site Of Injury

- Direct
- Indirect

4) Rowe And Killey's

1) Single Unilateral
2) Double Unilateral
3) Multiple
4) Bilateral

5) According To Direction Of Fracture And Favorability For Treatment

1) Horizontally Favorable
2) Horizontally Unfavourable
3) Vertically Favorable
4) Vertically Unfavourable

6) Completeness

- Complete
- Incomplete

7) Depending on the mechanism

- Avulsion
- Bending
- Burst
- Countercoup
- Torsional

8) Number of fragments

- Single
- Multiple
- Comminuted

9) Shape or area of the fractures

- Tranverse
- Butterfly
- Oblique
- Oblique surfaced

10) AO Classification:

F — Number of fracture

- F0: incomplete fracture
- F1: single fracture
- F2:multiple fracture
- F3: comminuted fracture
- F4: fracture with a bone defect

L — Location of fracture

- L1:precanine
- L2: canine
- L3:post canine
- L4: angle
- L5:supra-angular
- L6: condyle
- L7: coronoid
- L8: alveolar process

O — Status of occlusion

- O0: no malocculsion
- O1:malocclusion
- O2: nonexistent occlusion-edentulous mandible

S — Soft tissue involvment

- S0: closed
- S1: open intraorally
- S2: open extraorally
- S3: open intra & extraorally
- S4: soft tissue defect

A — Associated fracture

- A0: none
- A1: fracture &/or loss of tooth
- A2: nasal bone
- A3: zygoma
- A4: Lefort I
- A5: Lefort II
- A6: Lefort III

Kruger's General Classification:

SIMPLE: A fracture that does not produce a wound open to the external environment, whether it be through the skin, mucosa, or periodontal membrane.

Kruger's General Classification:

Compound: The fracture has communication with the external or internal environment through skin, mucosa or periodontal membrane communicates with the break in the bone.

Kruger's General Classification:

Comminuted: Direct violence to the mandible from penetrating sharp object and missile may cause limited or extensive comminution.In which bone is splintered or crushed into multiple pieces.

Pathological: this type of fractures result from minimal trauma to a mandible already weaken by preexisting pathological condition such as osteomyelitis, neoplasm..

Complex: Fracture associated with damaged to the important vital structures. For example, fracture with injury to inferior alveolar vessels ,facial nerve.

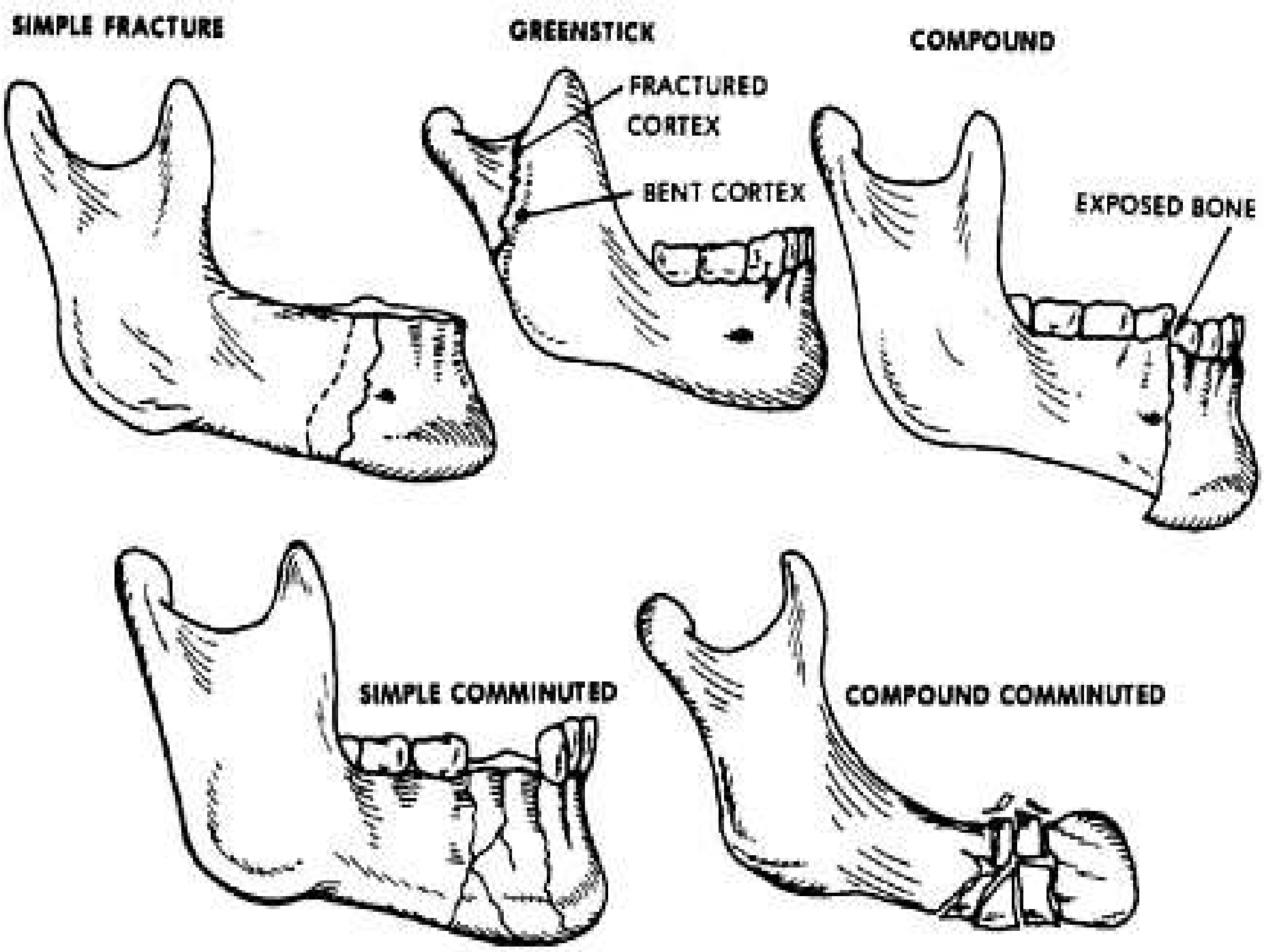
Impacted: Rarely seen in mandibular fracture.In which one fragment is firmly driven into other fragment. Clinical movement is not appreciable.

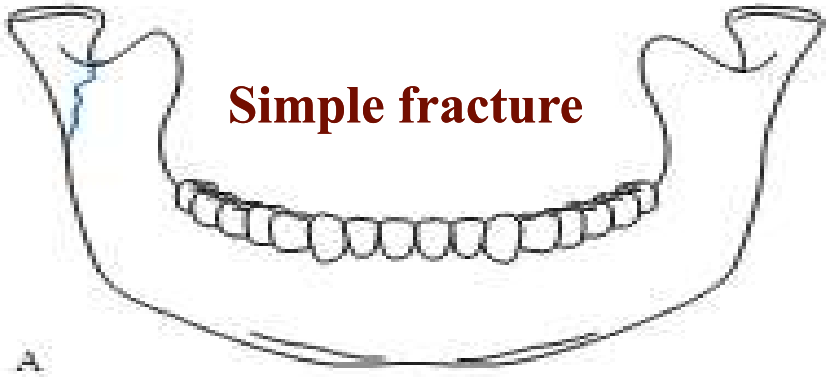
Greenstick: In which one cortex of bone is broken with other cortex being bent. It is an incomplete fracture seen in young children because of inherent resiliency of the growing bone.

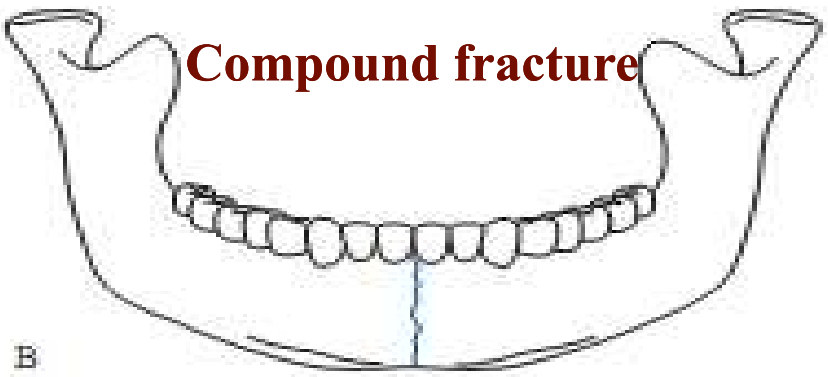
Multiple: A variety in which there are two or more lines of fracture on the same bone not communicating with one another.

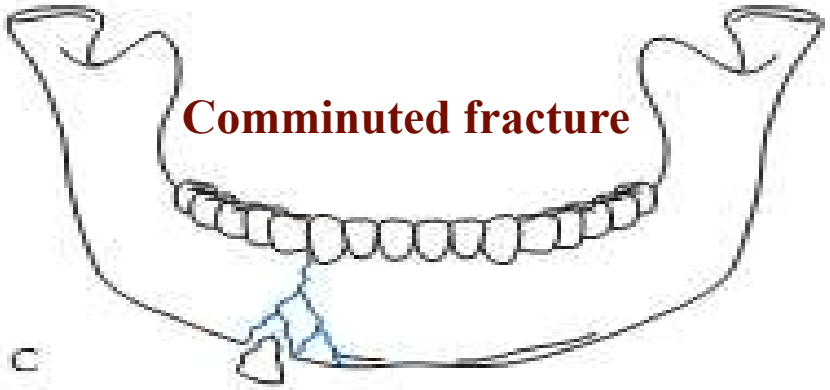
Atrophic: A spontaneous fracture resulting from atrophy of the bone, as in edentulous mandibles.

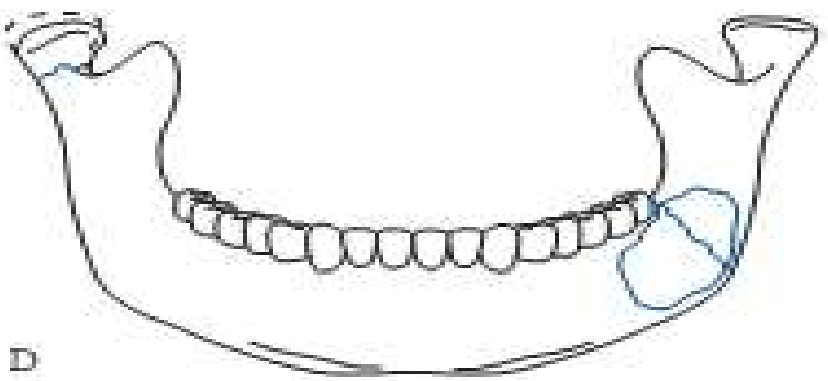
Indirect: A fracture at a point distant from the site of injury.


SIMPLE FRACTURE
GREENSTICK
FRACTURED CORTEX
BENT CORTEX
COMPOUND
EXPOSED BONE
SIMPLE COMMINUTED
COMPOUND COMMINUTED

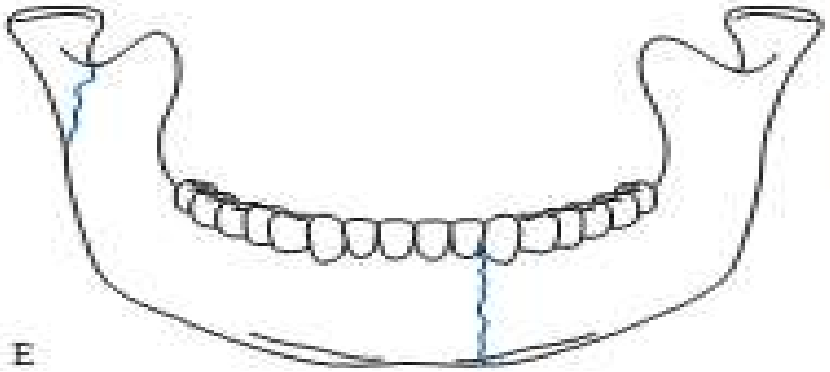








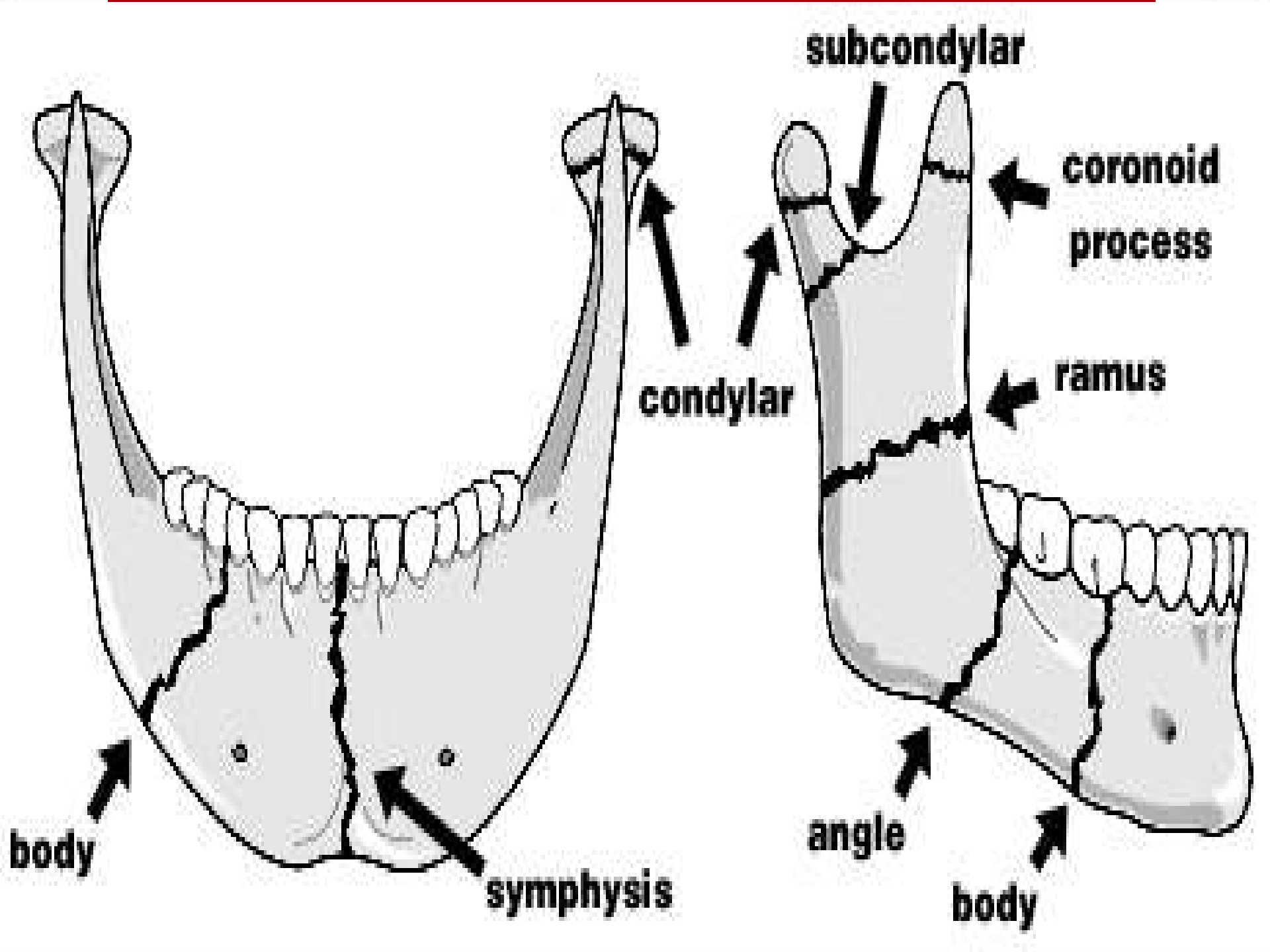
Impacted fracture in right subcondylar area and pathological fracture in the left angle area



Direct and indirect fracture

According to anatomical region:(by Dingman and Natvig's)

- Dentoalveolar
- Condyle
- Coronoid
- Ramus
- Angle
- Body
- Parasymphysis
- Symphysis


subcondylar
coronoid process
ramus
condylar
body
symphysis
angle
body

- **Relation Of The Fracture To The Site Of Injury:**

a) Direct Fracture
b) Indirect Fracture

Rowe And Killey's Classification:

- Fracture not involving the basal bone-are termed as **dento alveolar fractures.**
- Fracture involving the basal bone of the mandible Subdivided into:

a) Single unilateral
b) Double unilateral
c) Bilateral
d) Multiple

According To The Direction Of Fracture And Favorability For Treatment:

a) Horizontally favourable fracture.

b) Horizontally unfavourable fracture.

c) Vertically favourable fracture.

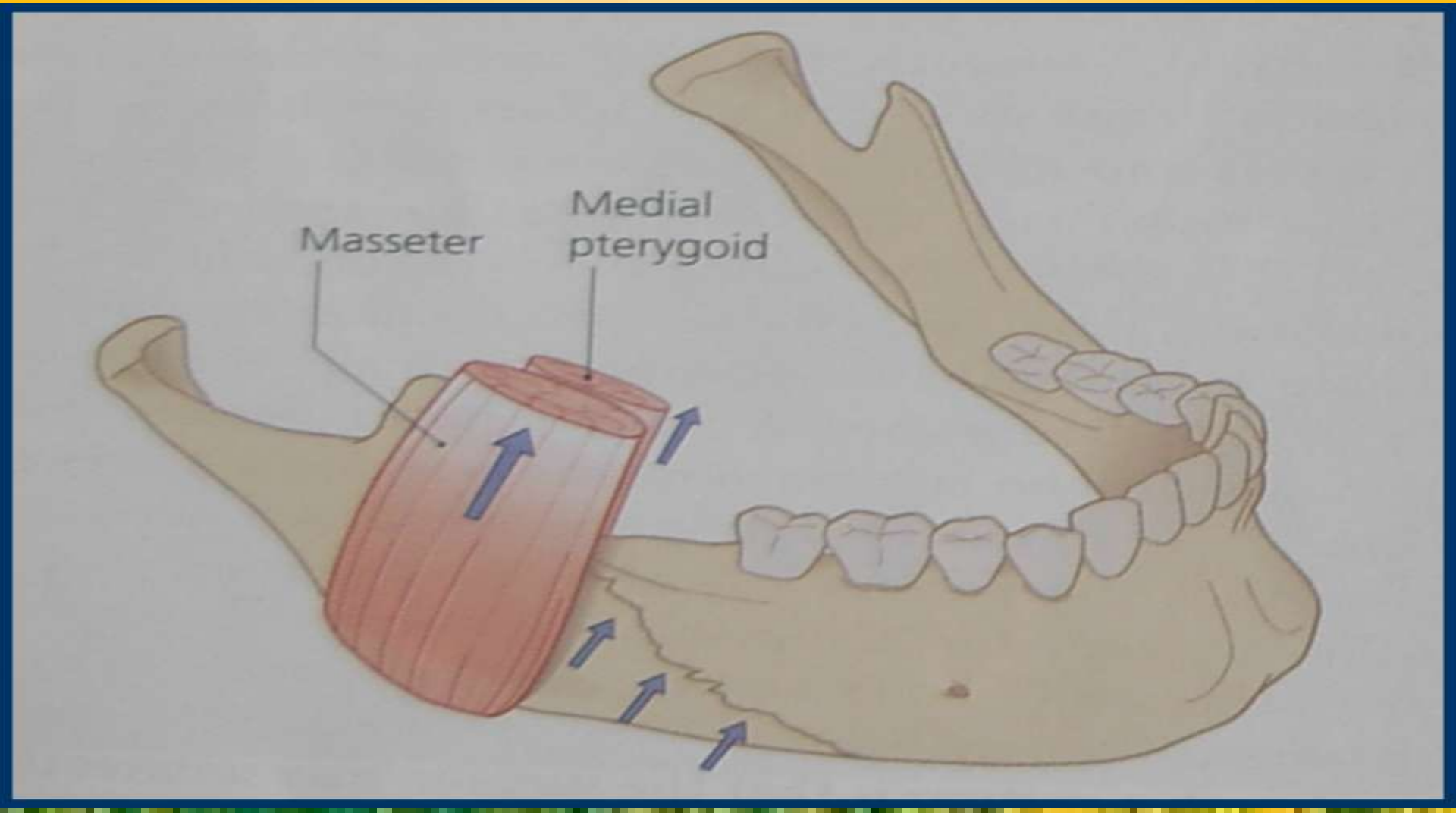
d) Vertically unfavourable fracture.

- This classification is aimed towards the angle fractures. The direction of fracture line is important to resist muscle pull.

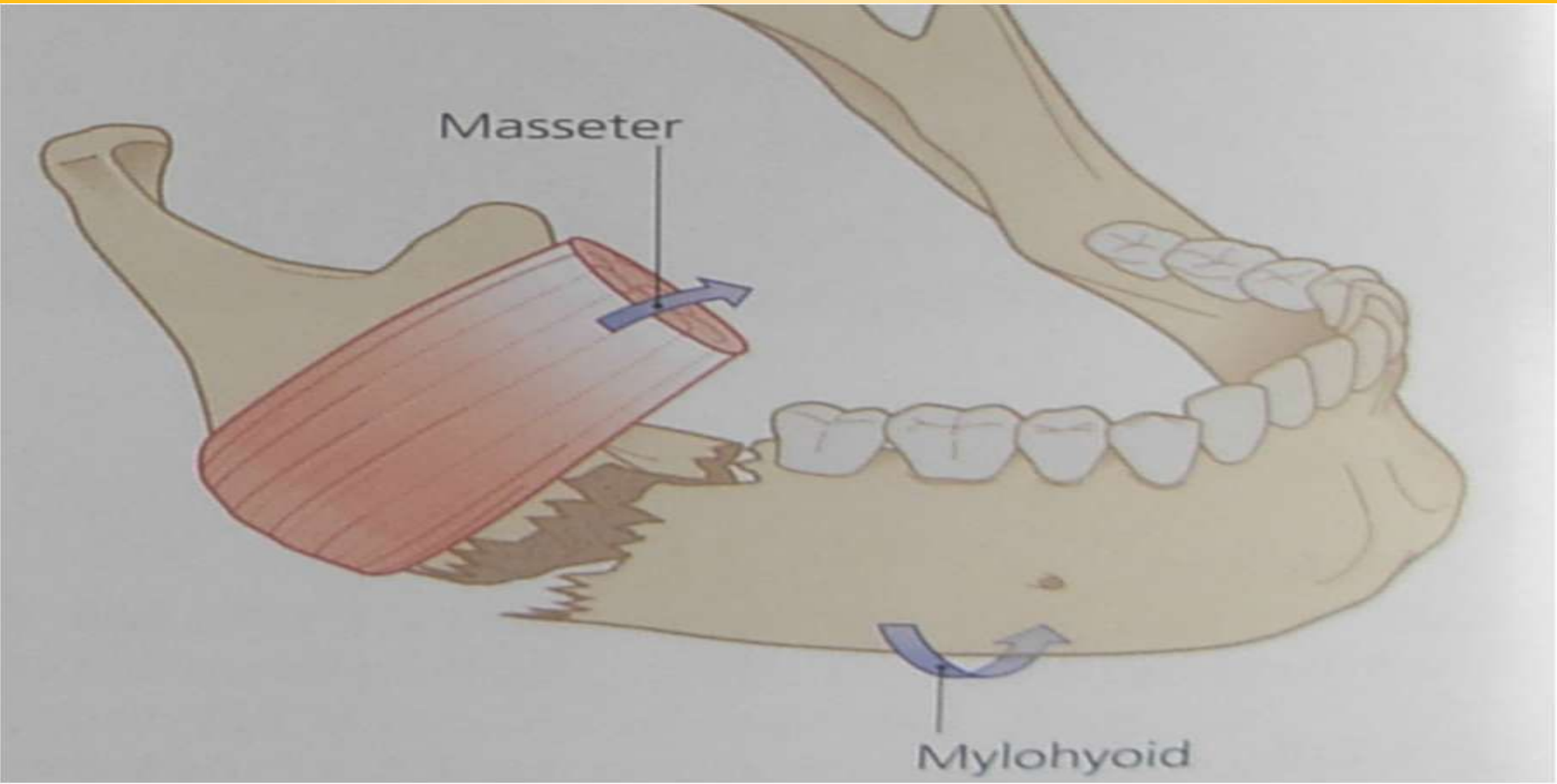
- **Favourable Fracture:** When the muscle pull resist the displacement of the fragment then the fracture line is considered as favourable.

- **Unfavourable Fracture:** If muscle pull distracts the fragment away from each other, resulting in displacement, then the fracture line is considered as unfavourable.

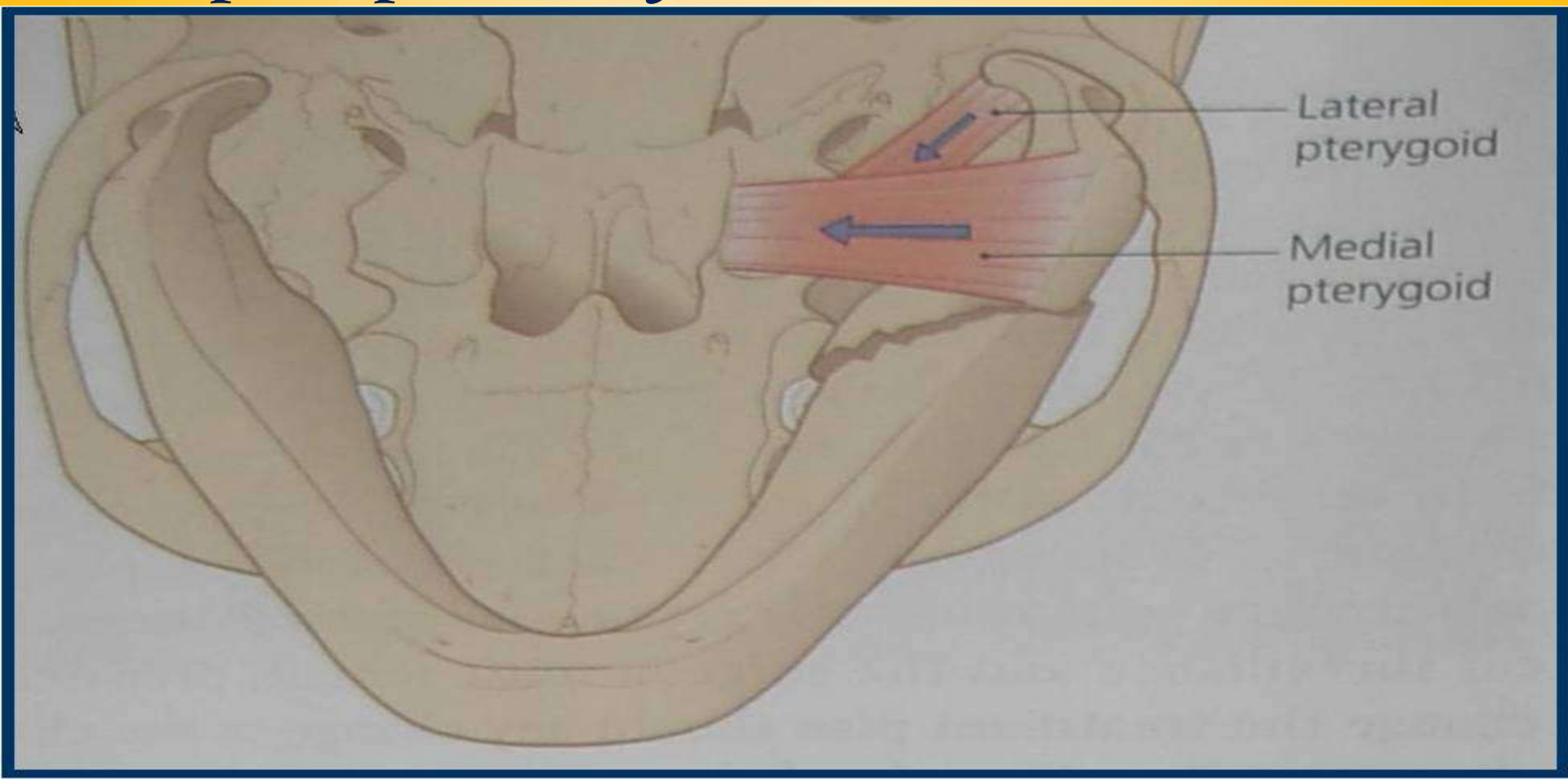
Horizontally Favourable Fracture:- It Extends From Upper Border Downwards And Forwards Up To Lower Border Of Mandible.



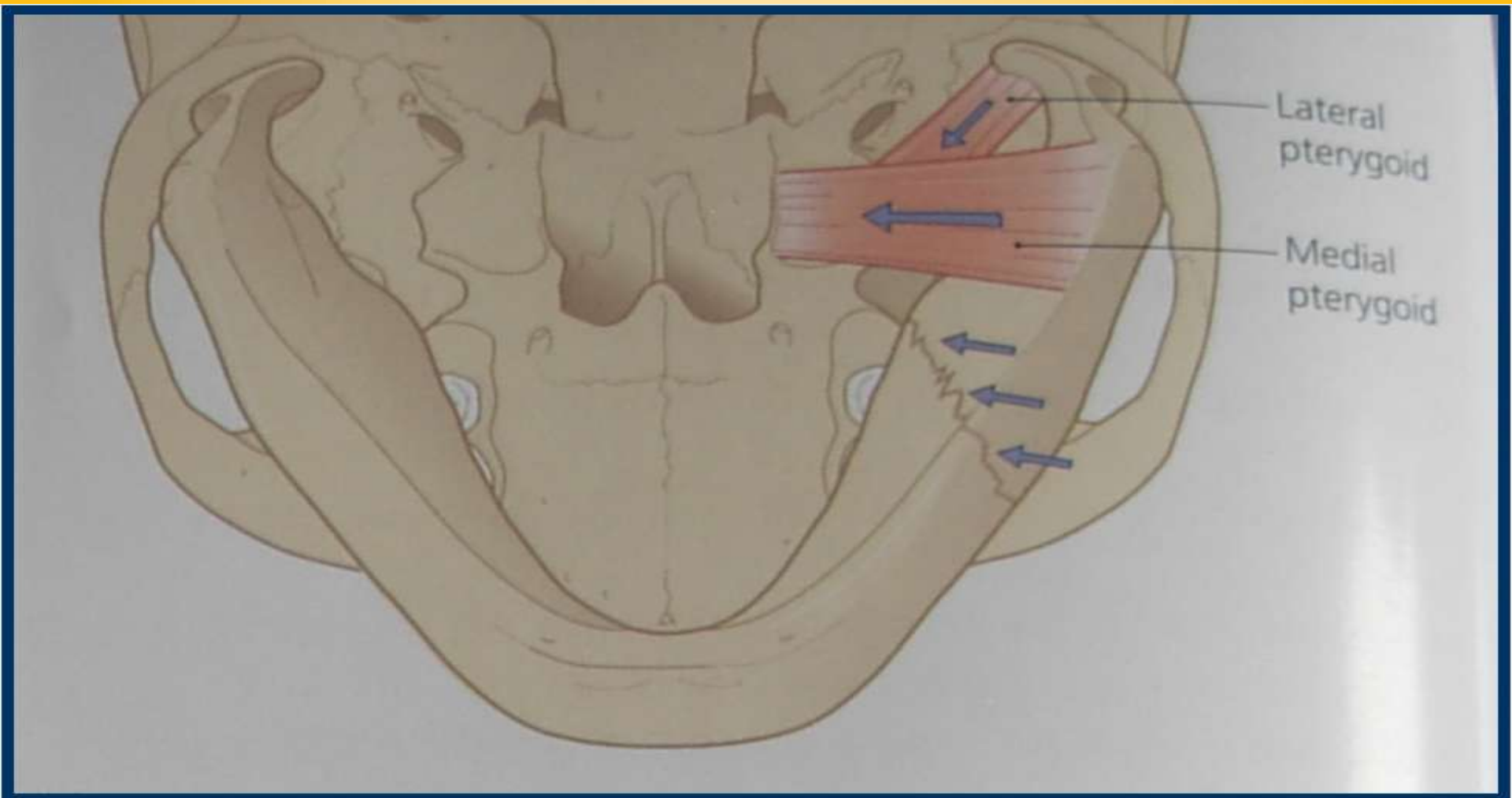
Horizontally un favourable fracture :- *It extends from upper border down wards and backwards to lower border.*



Vertically Unfavourable Fracture :- *This fracture line, when seen from upwards it runs from the lingual plate anteriorly, backwards through the buccal plate posteriorly*



Vertically favourable fractures :- *It runs from buccal plate anteriorly and backwards through the lingual plate posteriorly.*



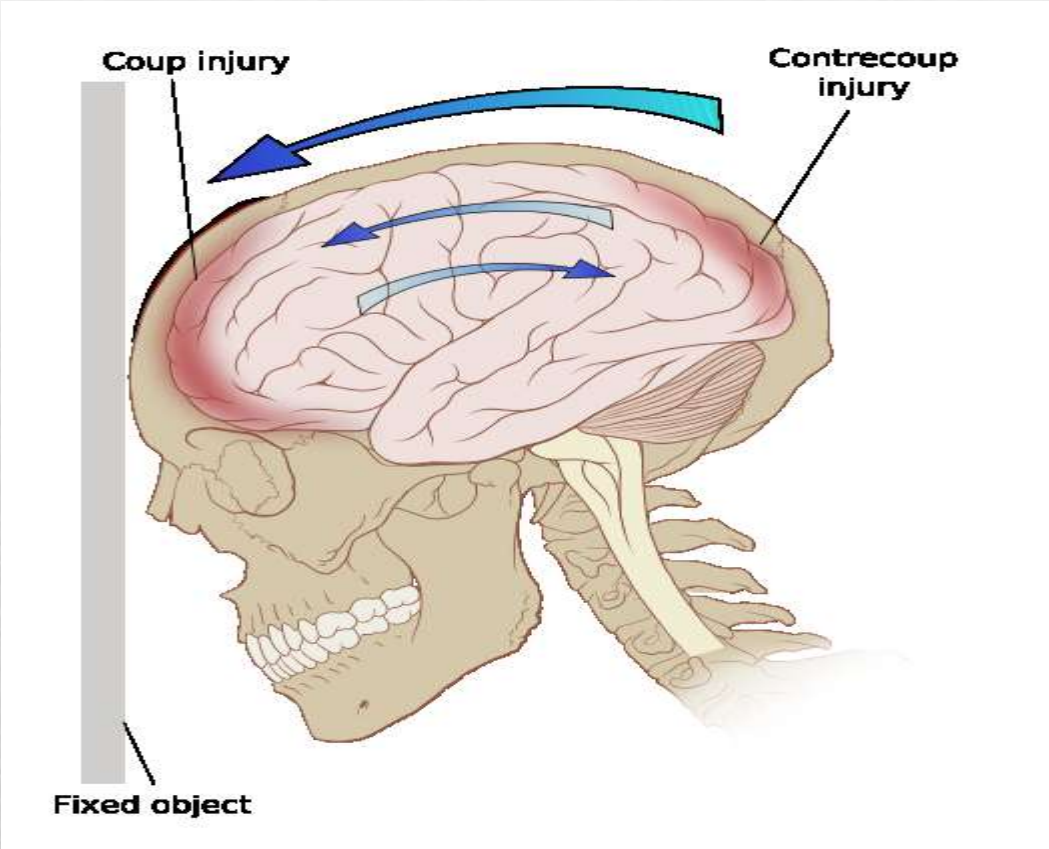
Depending On The Mechanism :-

- **Torsional:-** A fracture, also called a spiral fracture, in which a bone has been twisted apart.

- **Bending fracture:-** A curving of a long bone due to multiple minute fractures. A fracture indirectly caused by the bending of an extremity, such as the foot or the big toe.

- **Avulsion fracture:-**The detachment of a bone fragment that results from the pulling away of a ligament, tendon, or joint capsule from its point of attachment on a bone—called also *sprain fracture*

- **Countercoup:-** Coup and countercoup injuries can occur individually or together.
- When a moving object impacts the stationary head, coup injuries are typical, while countercoup injuries are produced when the moving head strikes a stationary object.



Shape Or Area Of The Fracture

- **Butterfly Fracture:-** A Fracture Indirectly Caused By The Bending Of An Extremity, Such As The Foot Or The Big Toe.
- **Transverse Fracture:-.** A Fracture In Which The Line Of Break Forms A Right Angle With The Axis Of The Bone
- **Oblique Fracture:-** A Fracture In Which The Line Of Break Runs Obliquely To The Axis Of The Bone.

Condylar Fracture Classification

Condylar Fracture Classification

1) Unilateral Or Bilateral

2) Rowe & Killey's classification

(a) simple fractures

(b) compound fractures

(c) comminuted fractures associated with zygomatic arch fractures

(3) Raw And Killy's Classification

(a) Intracapsular Or High Condylar Neck Fractures :-

i) Fractures involving the articular surface
ii) Fractures above or through the anatomical surface,which do not involve the articular surface.

(b) Extracapsular Or Low Condylar Neck Fractures.

(c) Fractures Associated With Injury To The Capsule, Ligaments And Meniscus.

(d) Fractures Involving The Adjacent Bone:- eg. Roof of the glenoid fossa or tympanic plate of external auditory meatus

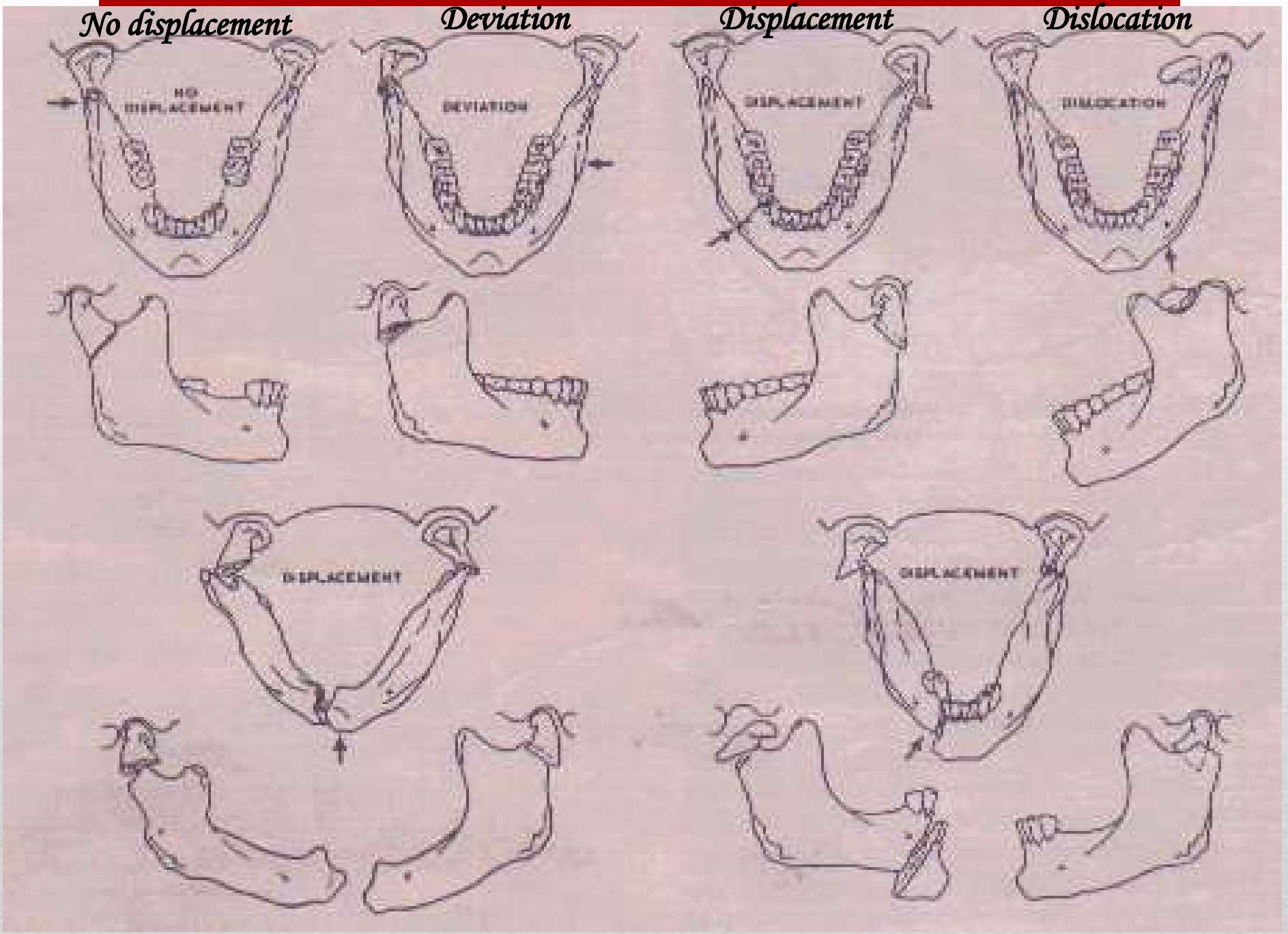
4) Clinical Classification By MacLennan

a) No Displacement

b) Deviation

c) Displacement

d) Dislocation


No displacement
Deviation
Displacement
Dislocation
NO DISPLACEMENT
DEVIATION
DISPLACEMENT
DISLOCATION
DISPLACEMENT
DISPLACEMENT

5) Wassmund's Clasification:-

Type I:-

- Fracture of the neck of the condyle with **slight displacement** of the head.
- The angle between the head and the axis of the ramus varies from **10 to 45 degrees**.
- These type of fracture tend to **reduce spontaneously**.

Type II:-

- An angle of **45 to 90 degrees** is seen between the head and the ramus.
- There is a tearing of the medial portion of the joint capsule.

Type III:-

- The fragments are **not in contact**.
- Head is **displaced medially** and forward due to the pull of lateral pterygoid muscle and spasm.
- The fragment is generally **confined within the area** of the glenoid fossa.
- The capsule is torn and head is outside the capsule.
- **Open reduction is advocated**.

Type IV:-

- Fractured head articulates on or forward to the articular eminence.

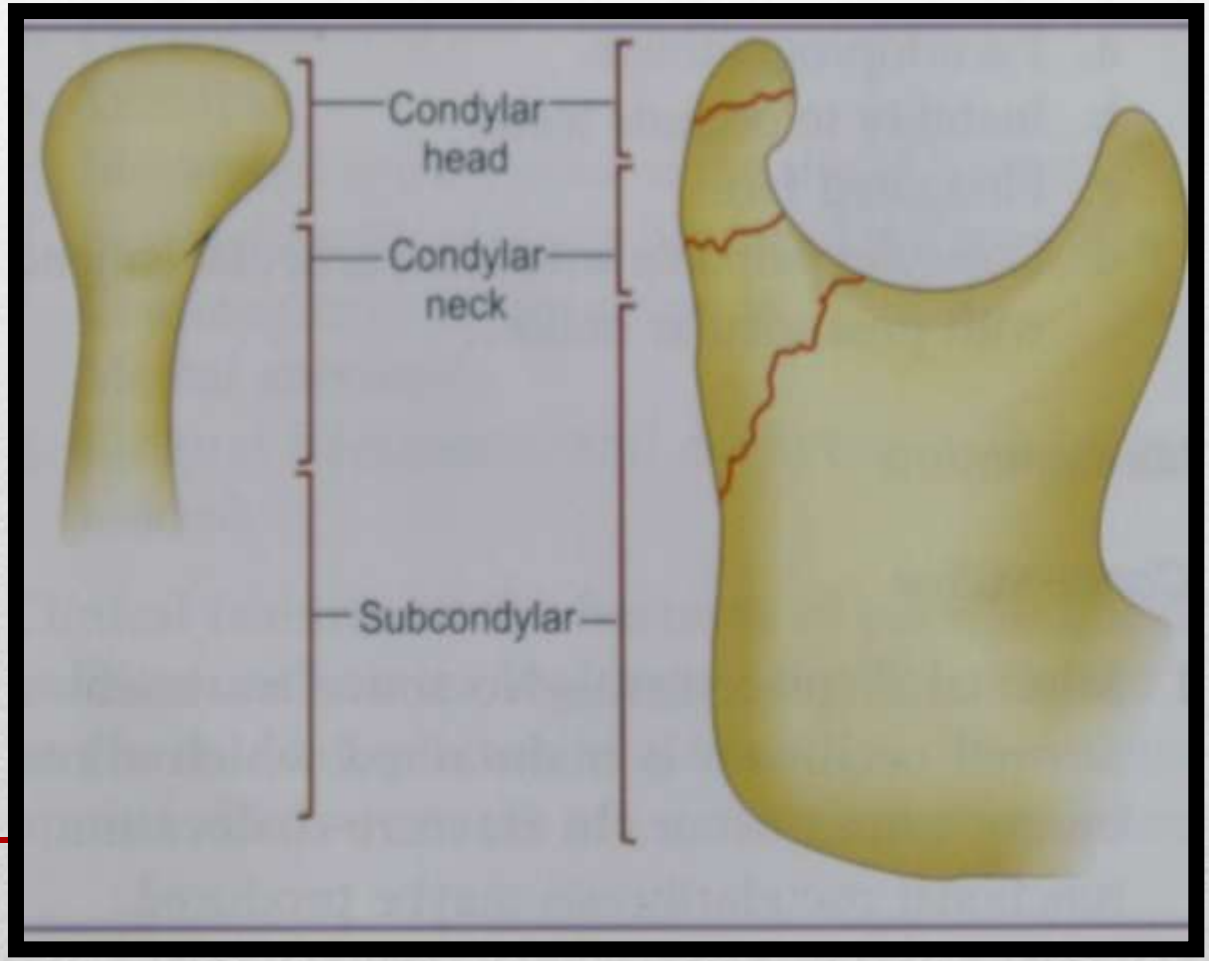
6) Lindhal Classification:-

a) Fracture Level:-

i) Condylar Head Fracture, Intracapsular

ii) Condylar Neck

iii) Sub condylar Fracture



b) Relationship of condylar fragment to mandible

i) Undisplaced (or fissure fracture)

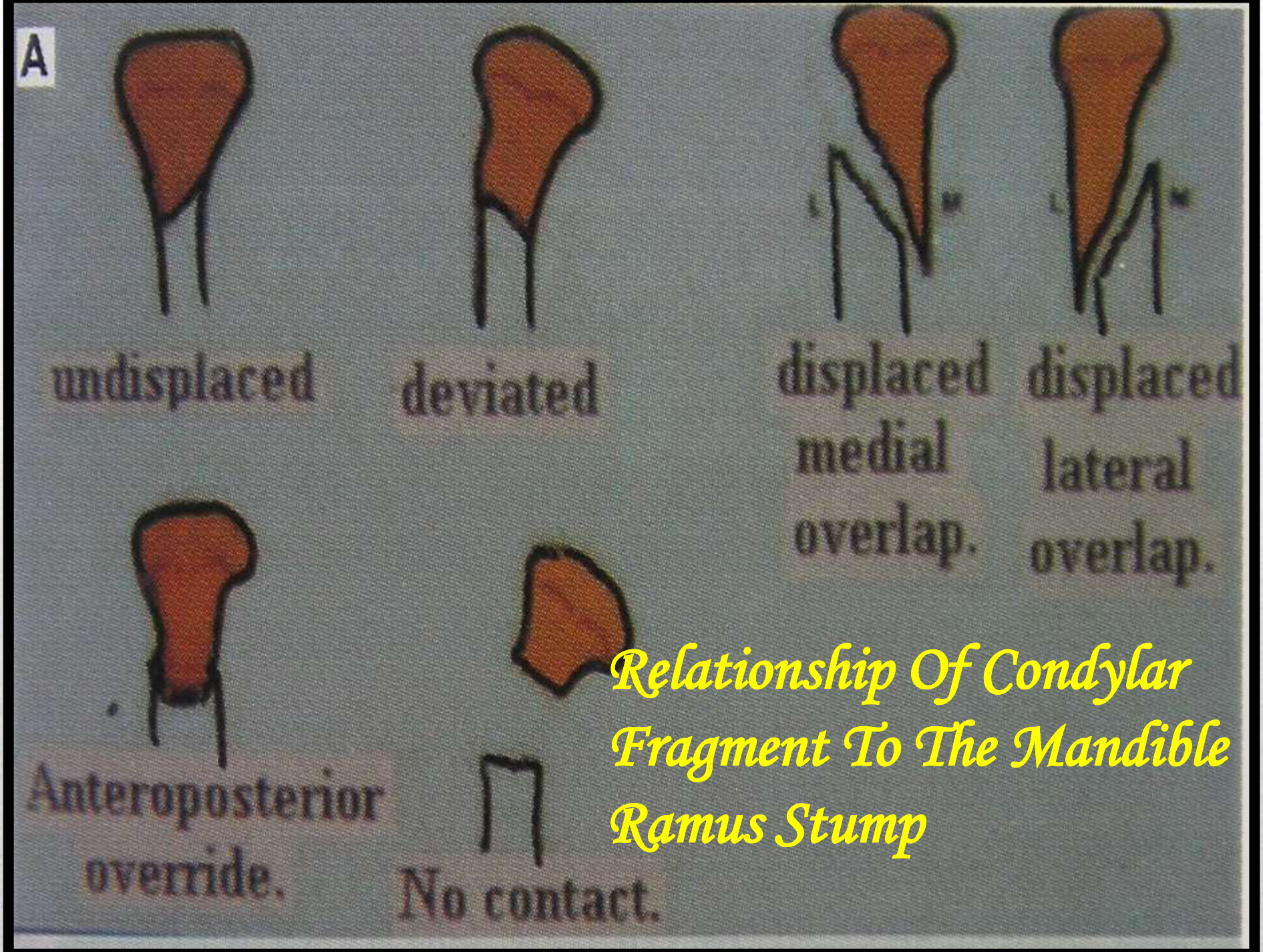
ii) Deviated

iii) Displaced with medial overlap of the condylar fragment

iv) Displaced with lateral overlap of condylar fragment

v) Antero-posterior overlap is possible, but infrequent

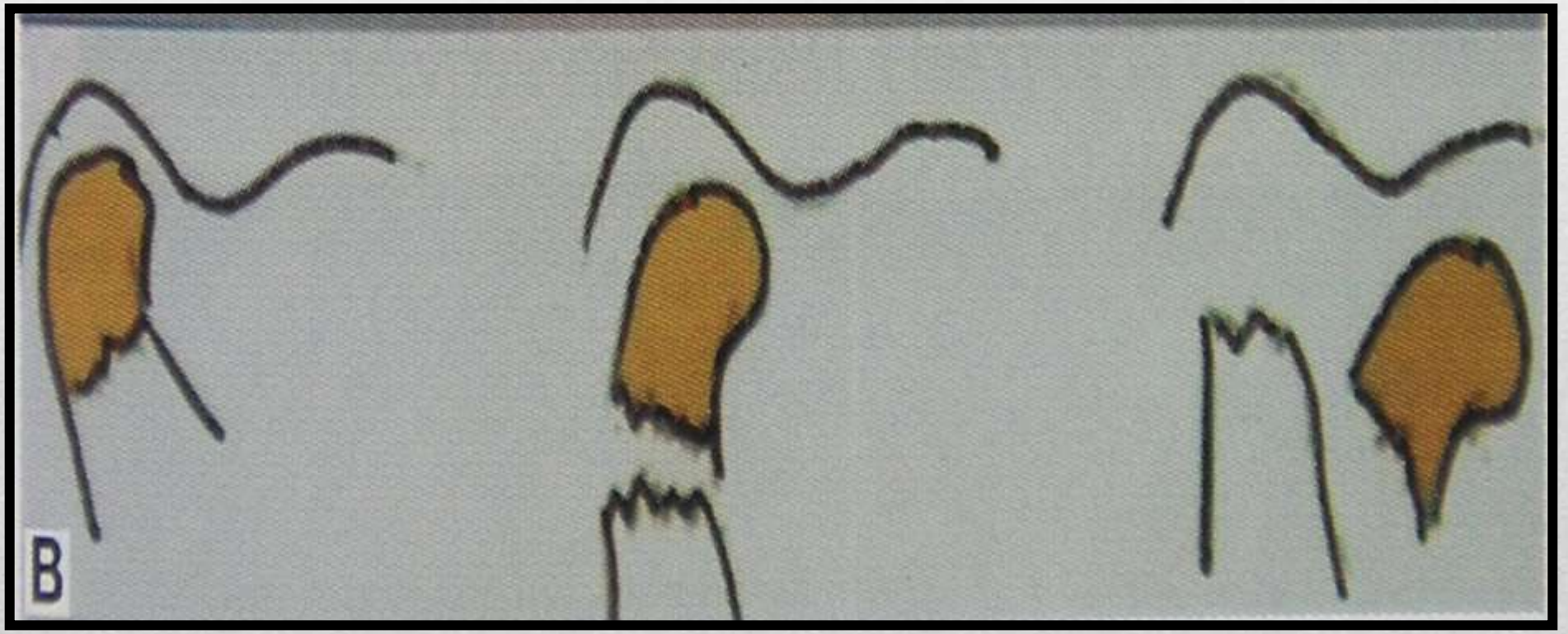
vi) Without contact between the fragment.


A
undisplaced
deviated
displaced medial overlap.
displaced lateral overlap.
Anteroposterior override.
No contact.
Relationship Of Condylar Fragment To The Mandible Ramus Stump

c) Relationship Of Condylar Head To Fossa

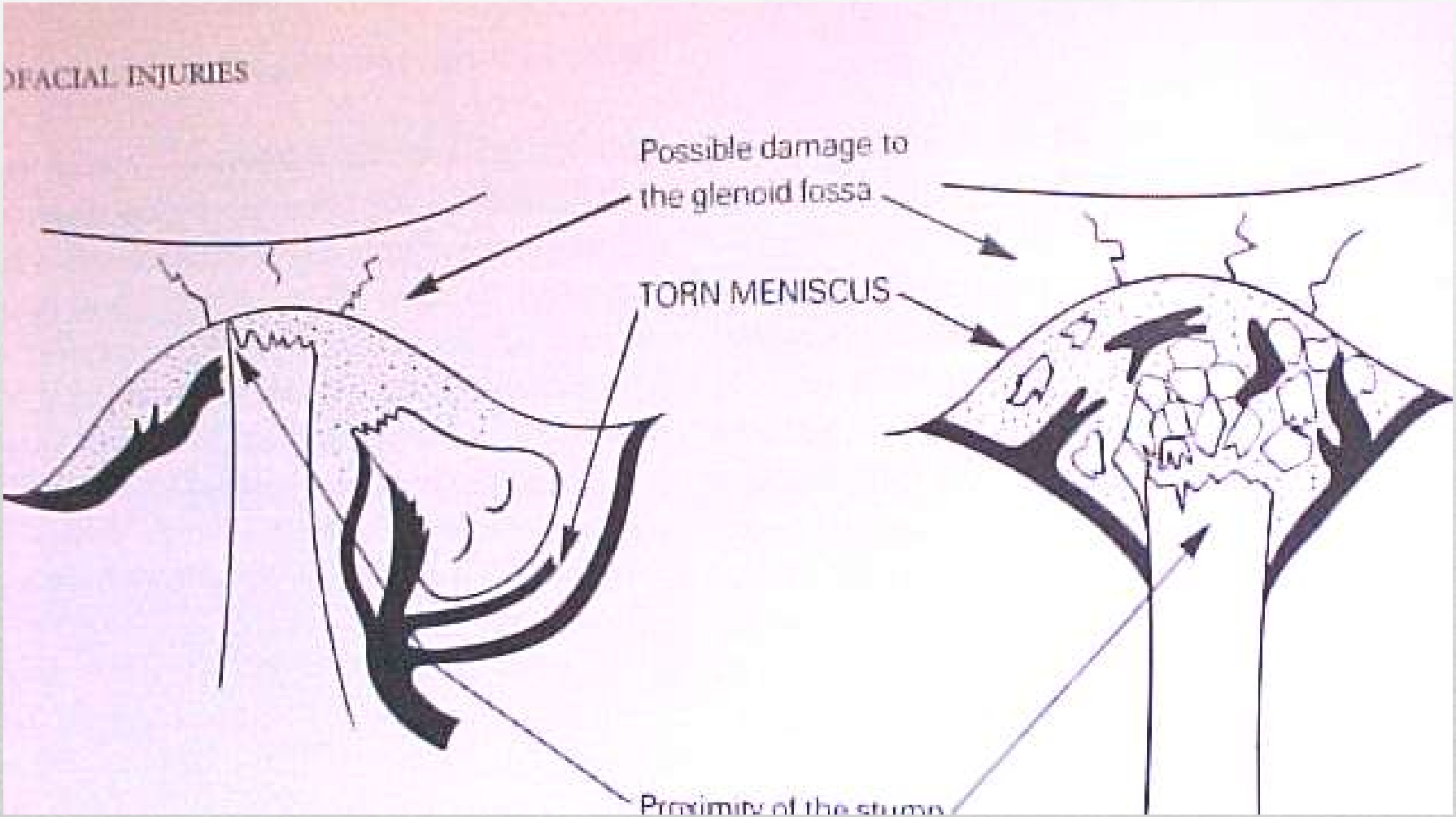
i) **No Displacement**: Joint Space Appear Normal

ii) **Displacement:** Joint Space Is Increased, But Condyle Is Still Related To The Glenoid Fossa.



d) Injury to meniscus:

It may be torn ,ruptured/ herniated in forward/ backward directions



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- *Classification*
- ***Clinical Features***
- *Radiographs*

Pre Op

Before Closure

After Closure

Lacerated deep wound

Hematoma

Lacerations

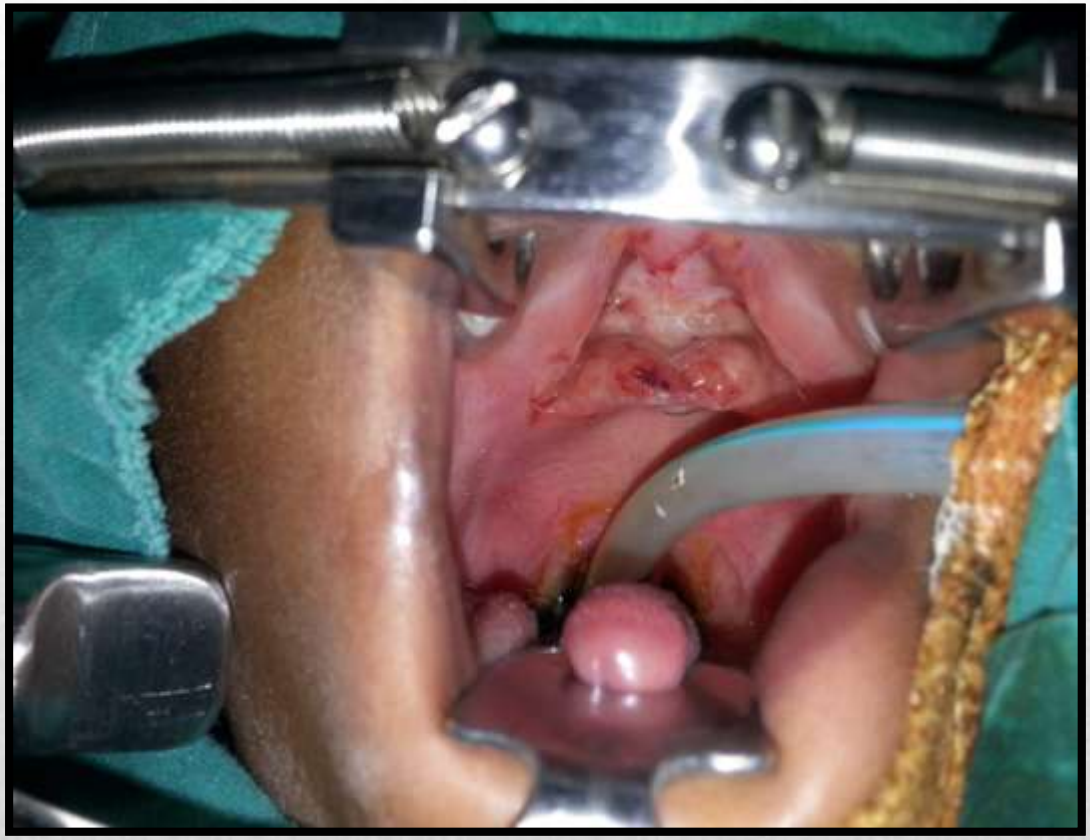
A- Patient with multiple lacerations. B- closure of lacerations.

Laceration, Abrasion, Continuous lacerated Lip injury

Sublingual Hematoma

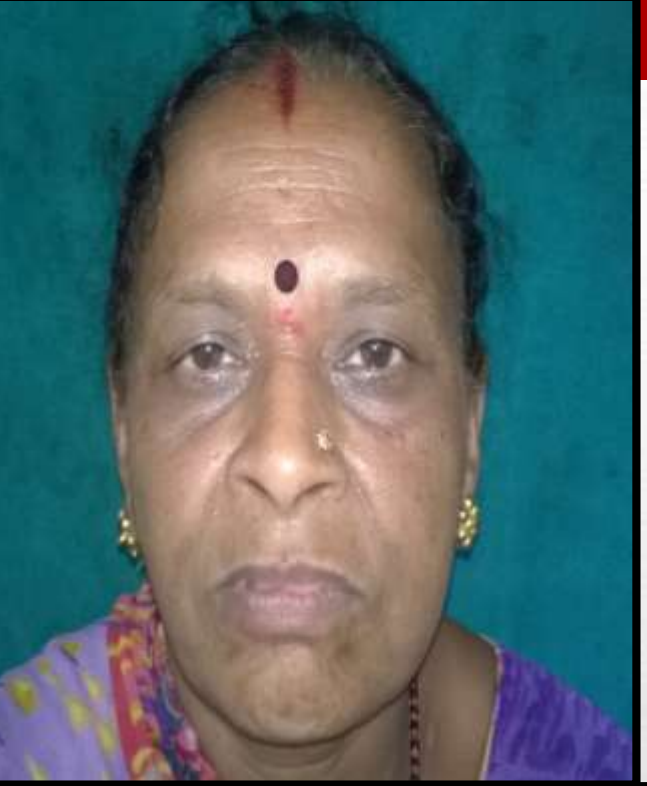
Post op

Which Soft tissue injury ?



Mucosa overlying soft palate was avulsed

Subconjuctival haemorrhage



Chief complaint:- Paresthesia in lower left lip region

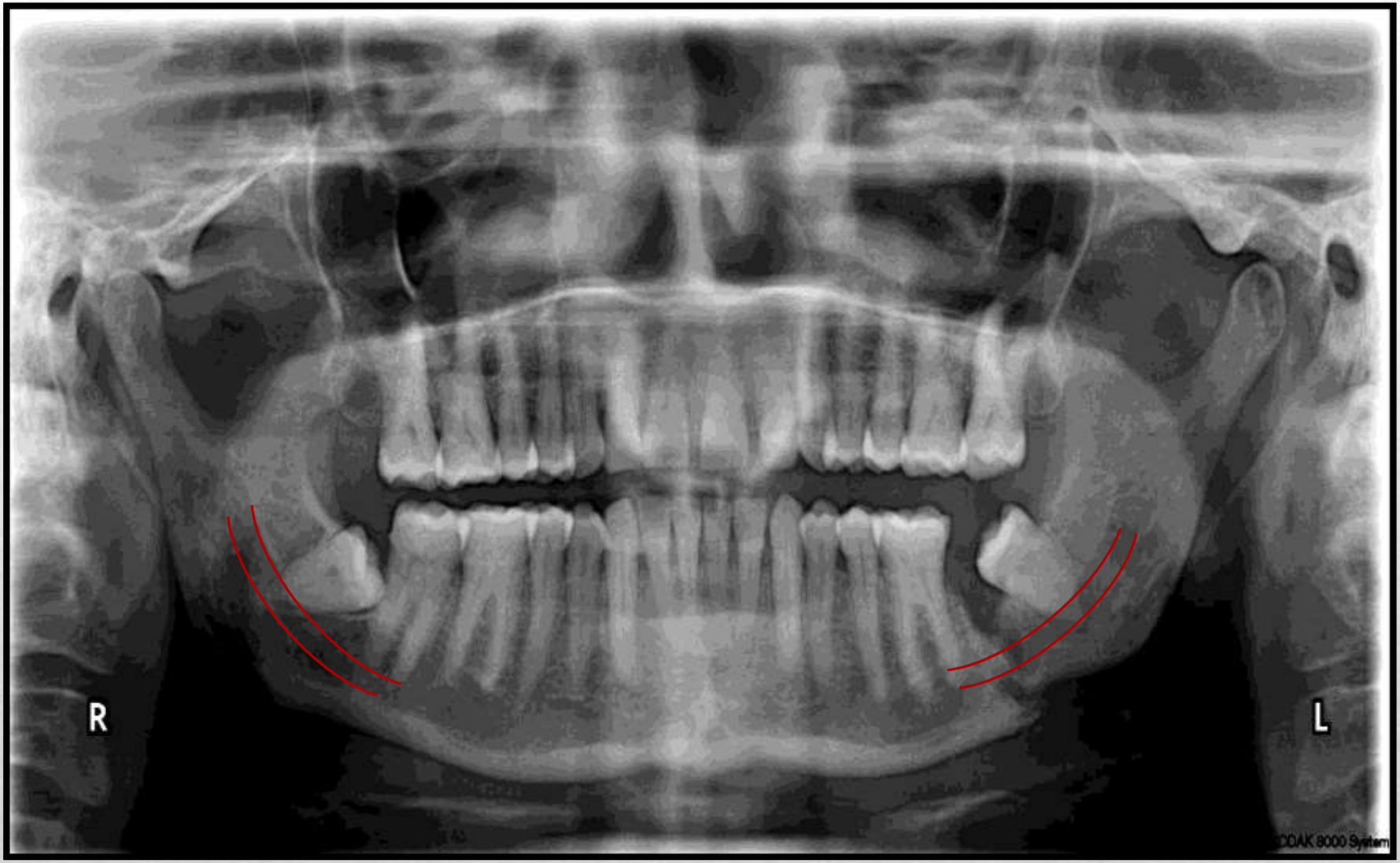
H/o- extraction of 37 before 1 month by in M.P.

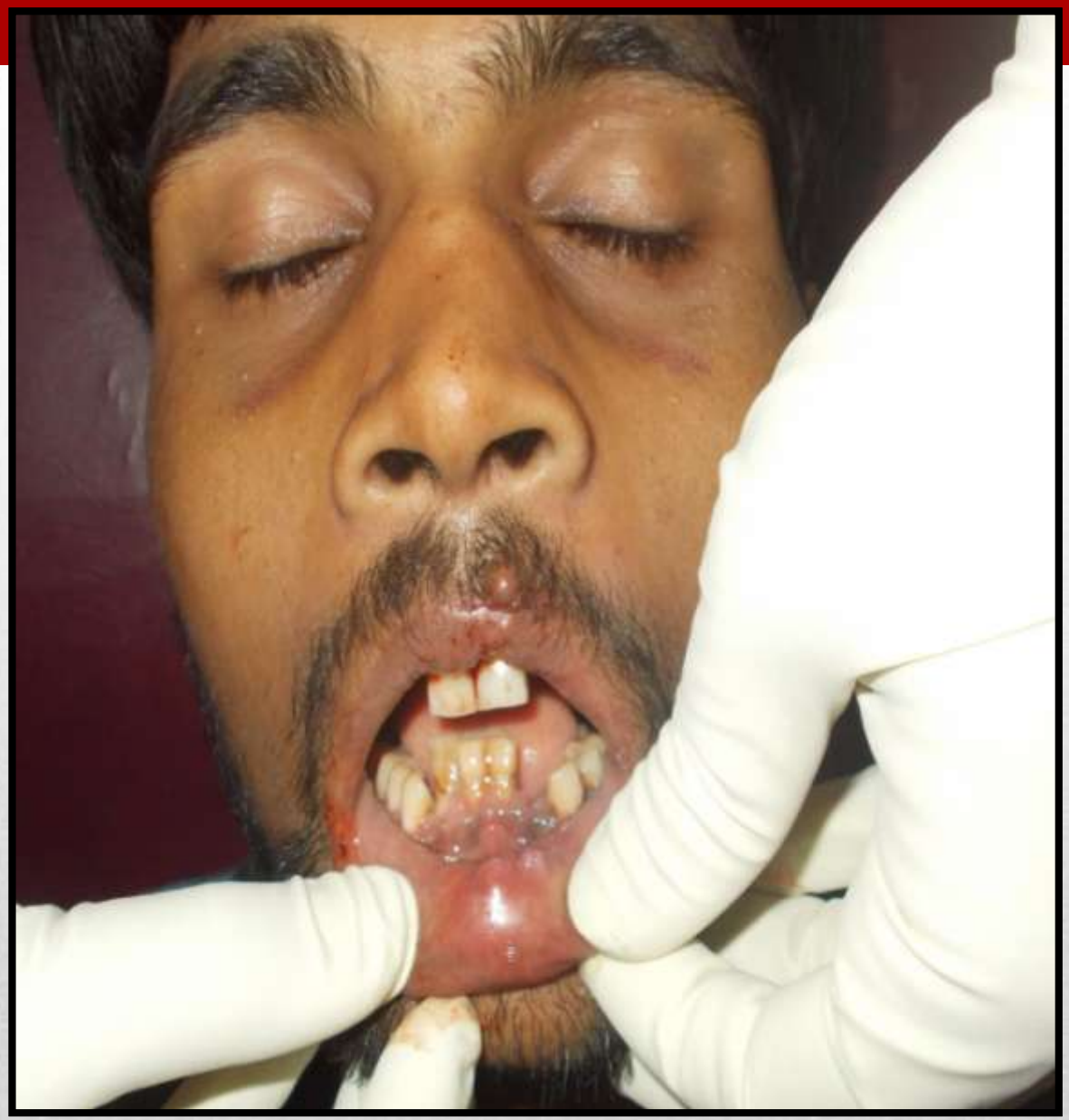
O/E- bilateral Occlusion maintained.

- No any relevant cause found intra and extra orally.

OPG was advised

Iatrogenic fracture





Step deformity

Mobility Of Segments On Palpation

Palpable step

Facial Asymmetry & Extra oral swelling

Pre Op

Post Op

Step deformity, Posterior open bite, Deranged occlusion

Ecchymosis

Deviation Of Jaw

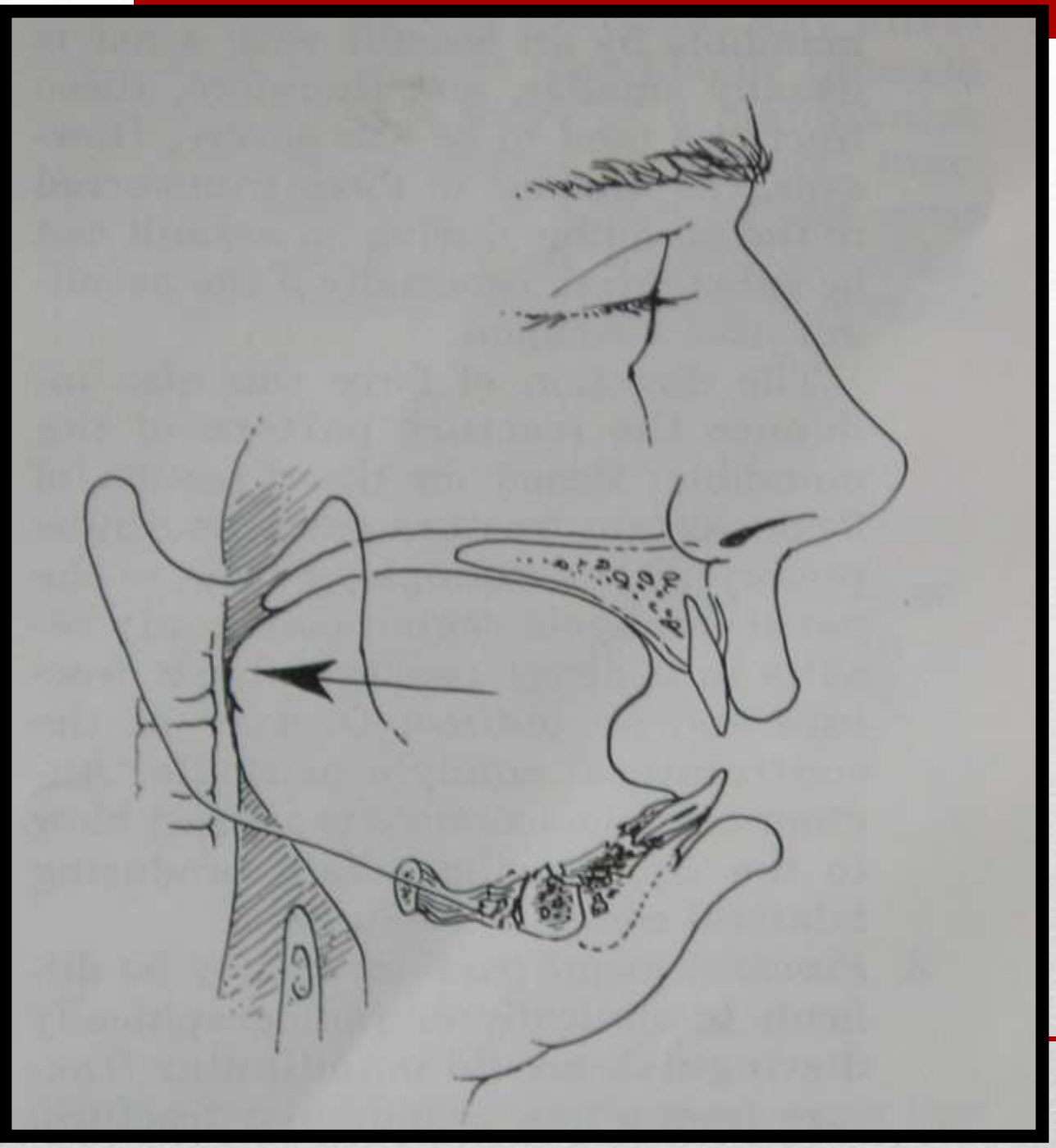
Clinical Features

Extra Oral

- Presence of laceration or abrasion at the site of impact.
- Facial deformity
- Inability to open or close the mouth (open bite/close bite)
- Palpable step
- Tenderness to palpation
- Hematoma
- Crepitus
- Anesthesia-paresthesia (Altered sensation of V3)
- Dribbling of blood stained saliva

Intra-oral

- Deviation Of Jaw
- De-ranged Occlusion
- Ecchymosis/ Hematoma
- Gingival Laceration
- Mucosal Laceration
- Step Deformity
- Mobility Of Segments On Palpation
- Tenderness
- Crepitus
- Paresthesia/ Anesthesia
- Fracture Of Tooth Or Prosthesis



Posterior inferior displacement of Comminuted mandibular Symphysis segment

This fracture may Result in posterior Displacement of Tongue with Subsequent airway obstruction

Clinical Features Of Condylar Fracture

- Evidence of facial trauma, mandible, symphysis.
- Localized pain & swelling in region of TMJ.
- Limitation in opening the mouth.
- Deviation of jaw on opening the mouth towards # side
- Posterior dental open bite on the Contralateral side.
- Shift of dental occlusion towards the ipsilateral side.
- Possible cross bite.

- Blood in the external auditory canal.
- Pain & lack of condylar movements upon palpation.
- Protrusion & deviation of mandible towards the # side.
- Difficulty in lateral excursion and protrusion.
- **Anterior open bite** with **bilateral subcondylar** fracture. This is associated with **posterior gagging** of the occlusion. **Why???**
- Persistent **CSF leak** through the ear is indicative of associated fracture of the middle cranial fossa.it is known as **'otorrhoea'**

- *Definition Of Fracture.*
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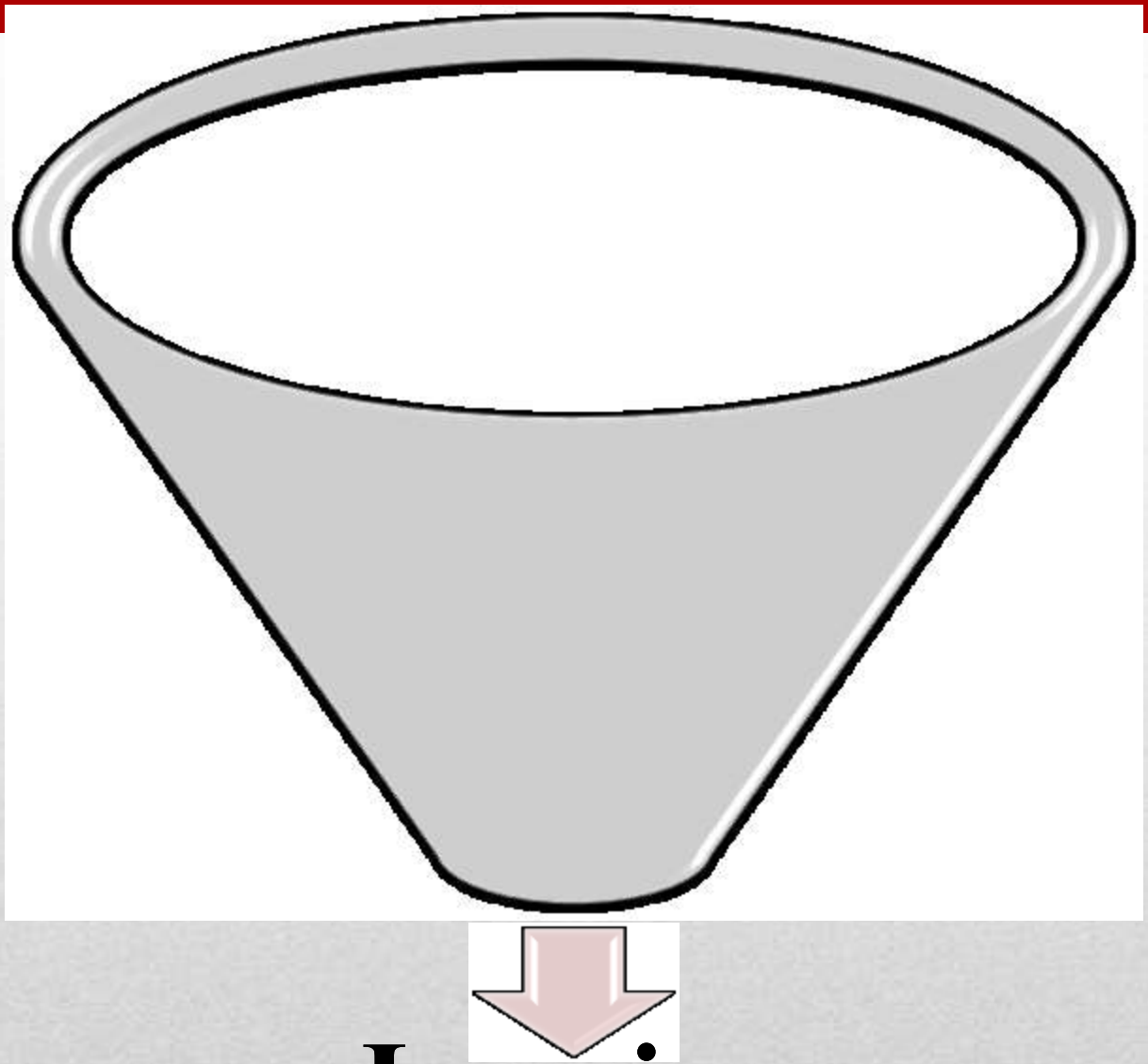
- *Clinical Features*
- ***Radiographs***

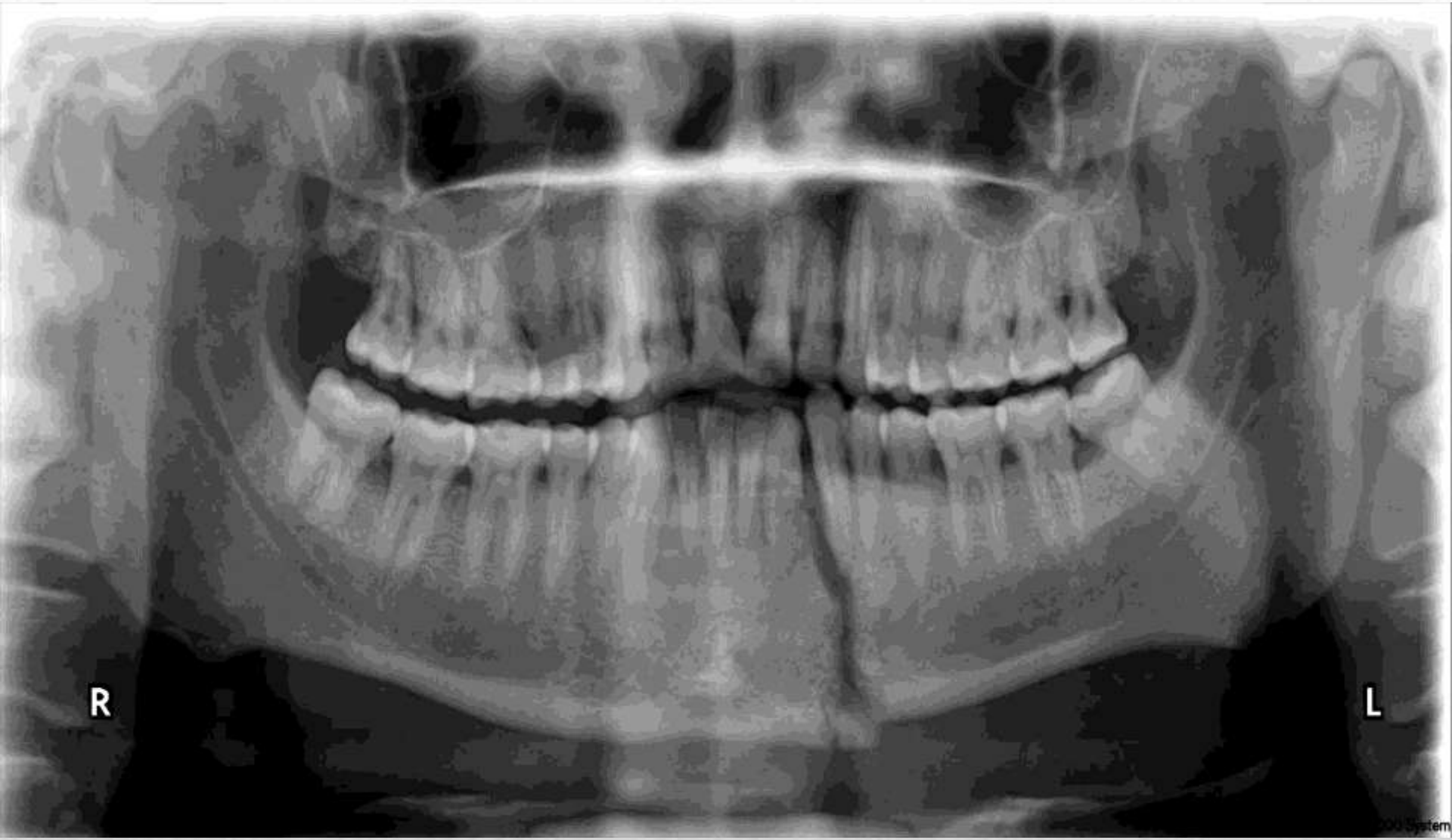
Which Imaging Modalities Are Required ???

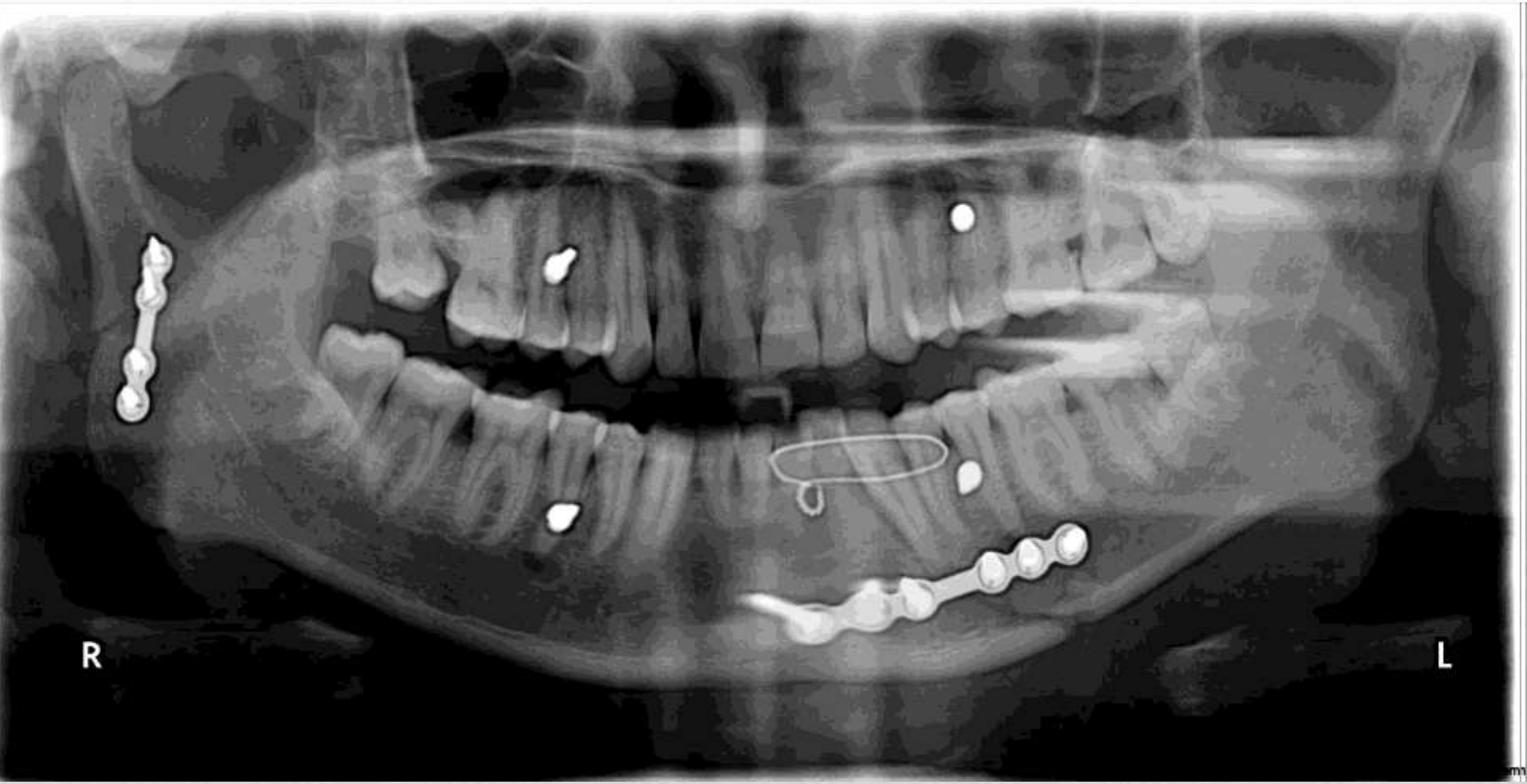


Imaging Modalities

- **Plain radiograph**
  - **OPG**
  - **Lateral oblique**
  - **PA mandible**
  - **AP mandible (reverse Townes)**
  - **Lower occlusal**
  - **SMV**
  - **OMV**

OPG




R
L

Identify Type Of Fracture

A

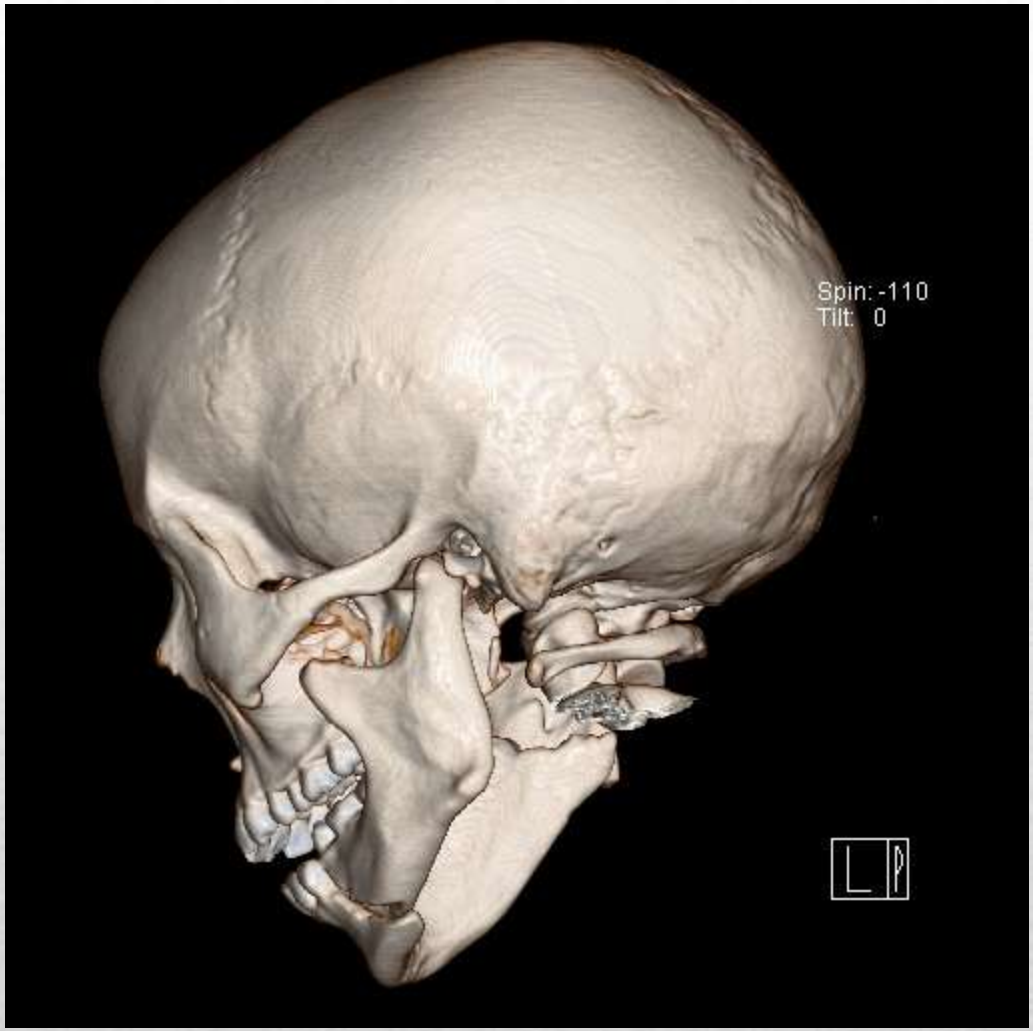
P

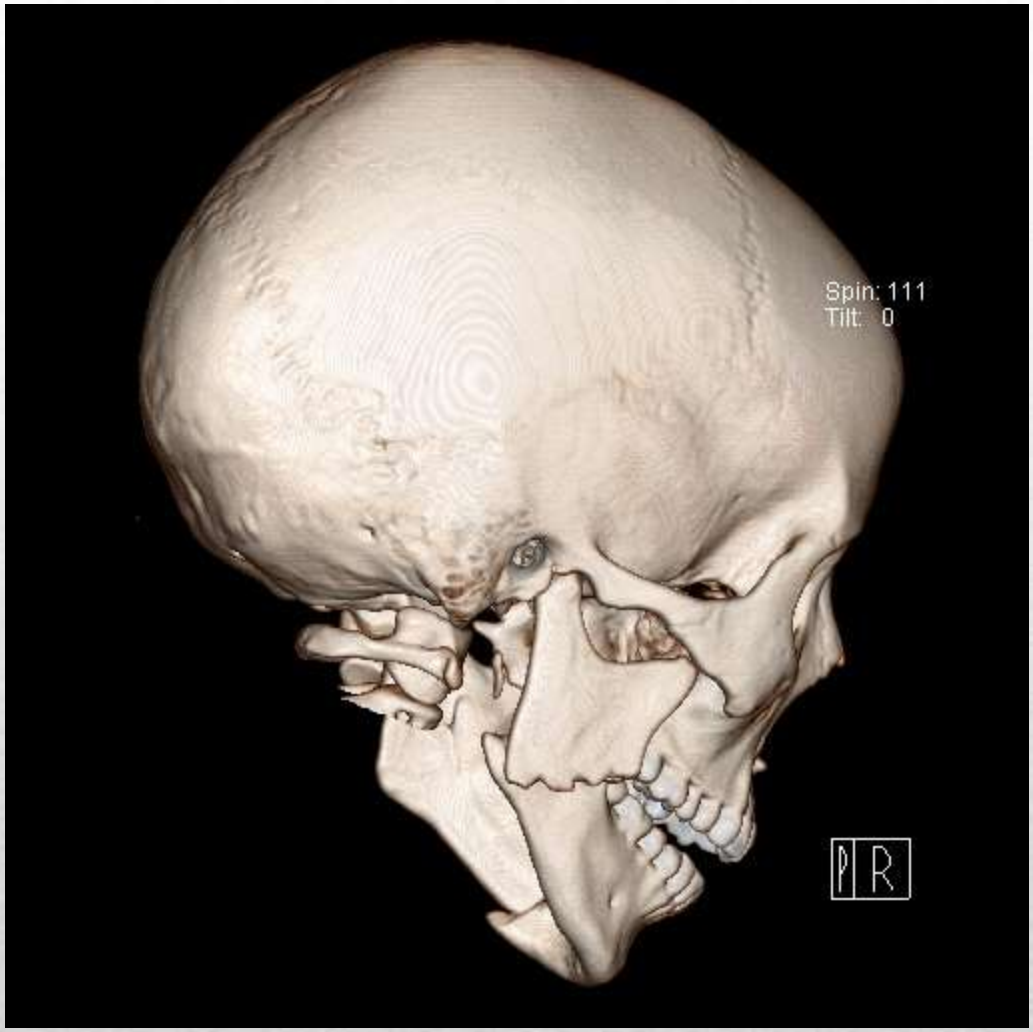
PA Mandible

PA Mandible

Lateral oblique

3D CT


Spin: -110
Tilt: 0
L
P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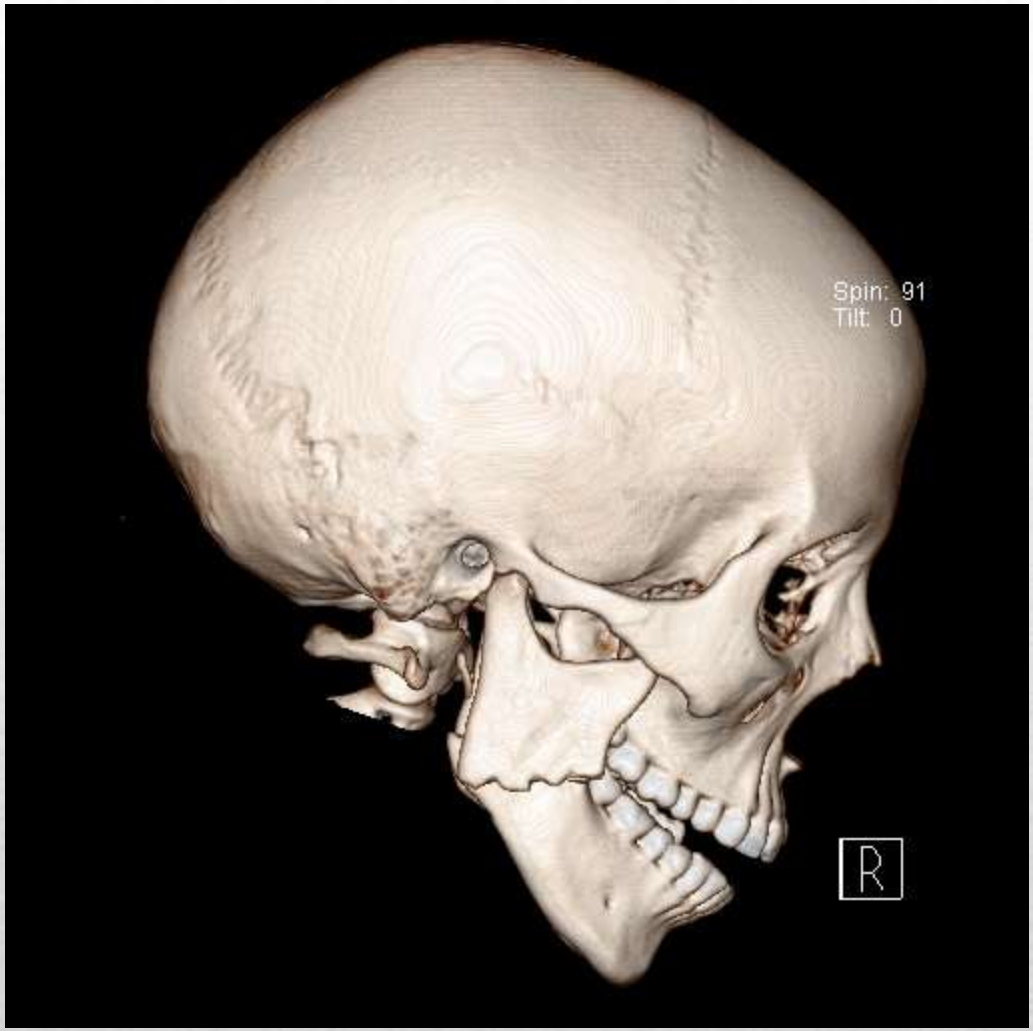
Tilt: 0
P R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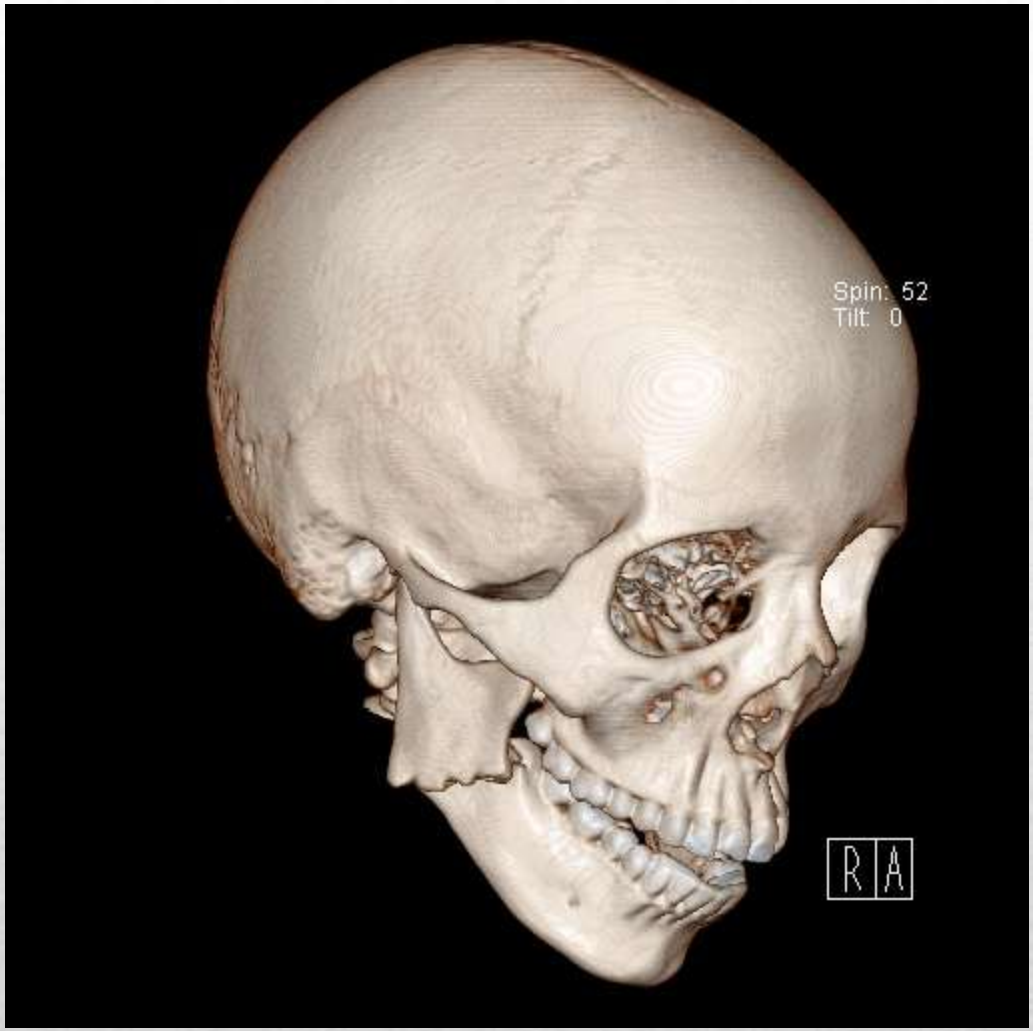
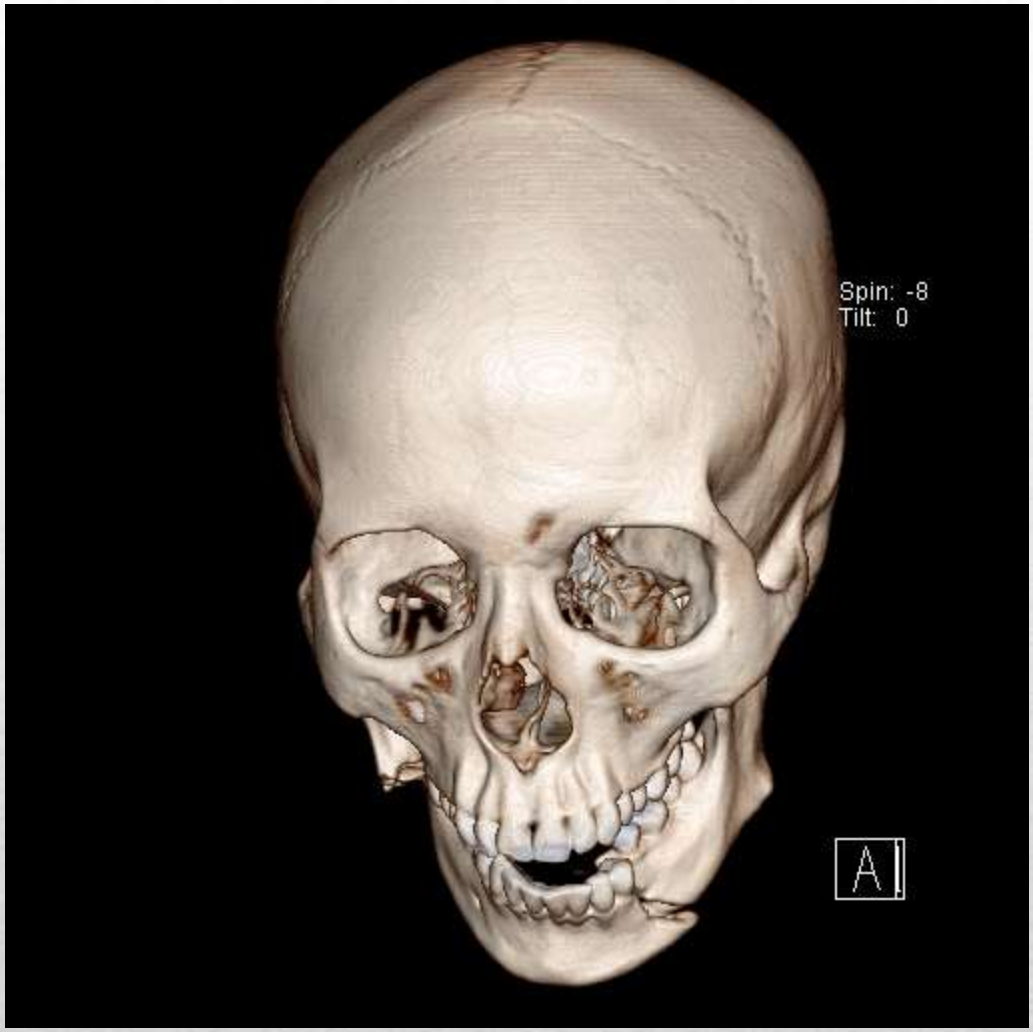
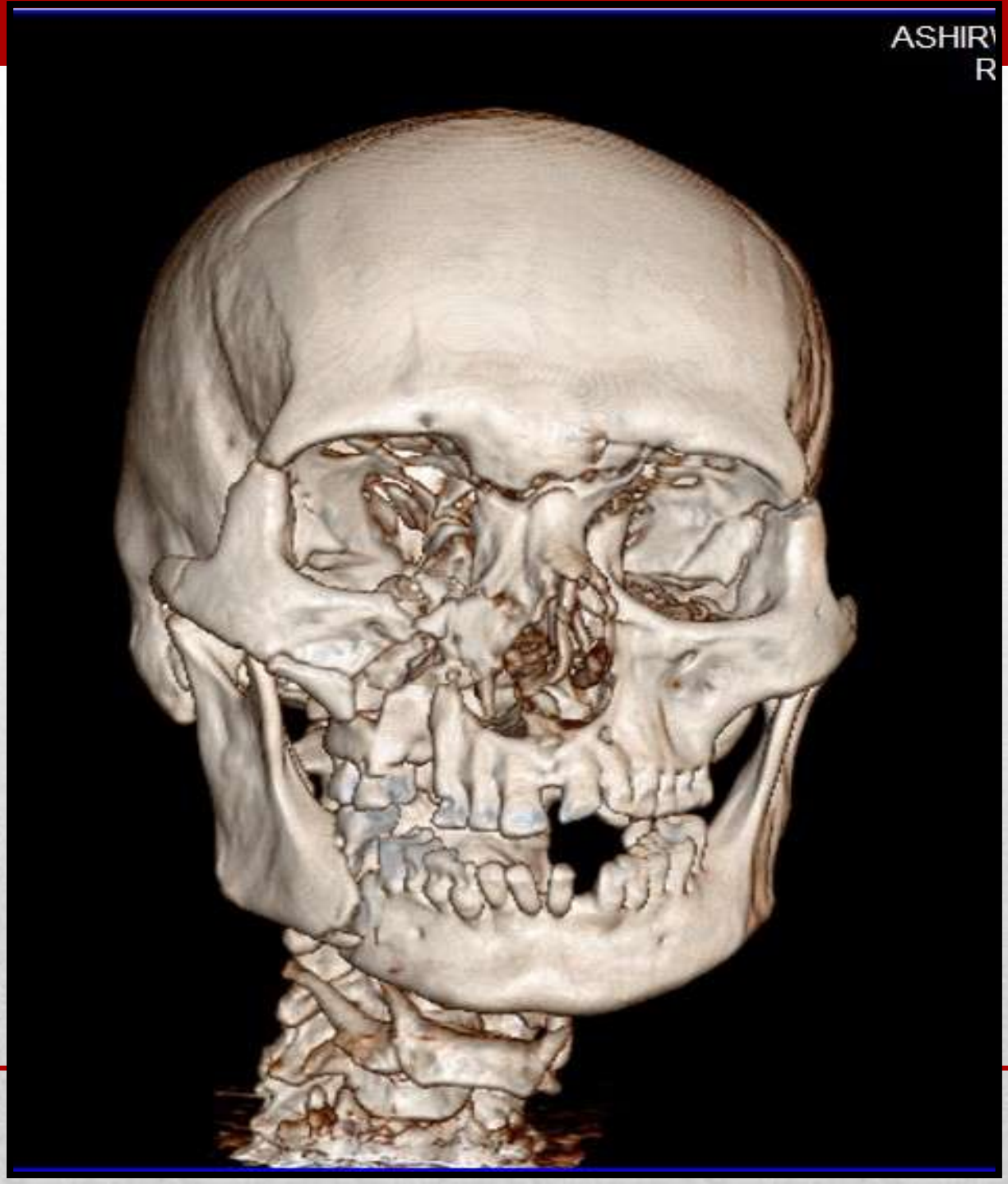
Tilt: 0
R


Spin: 52
Tilt: 0
R A


Spin: -8
Tilt: 0
A


ASHIR
R

Short questions

Question 1:- What is F2, L3, S2, A4 in FLOSA classification?

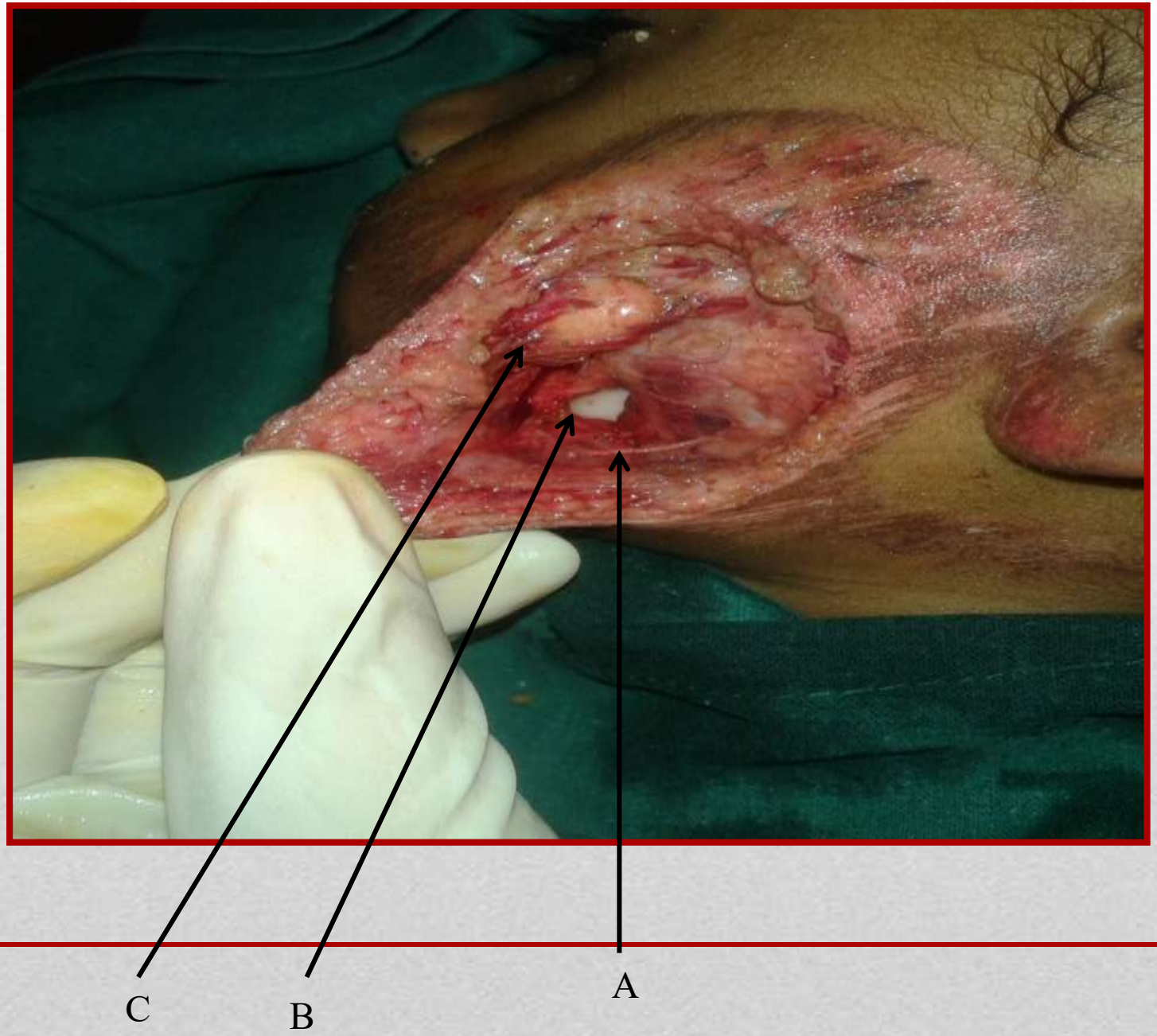
Question 2:- Which are the direct & Indirect Fracture site in Guardsman fracture?

Question 3:-

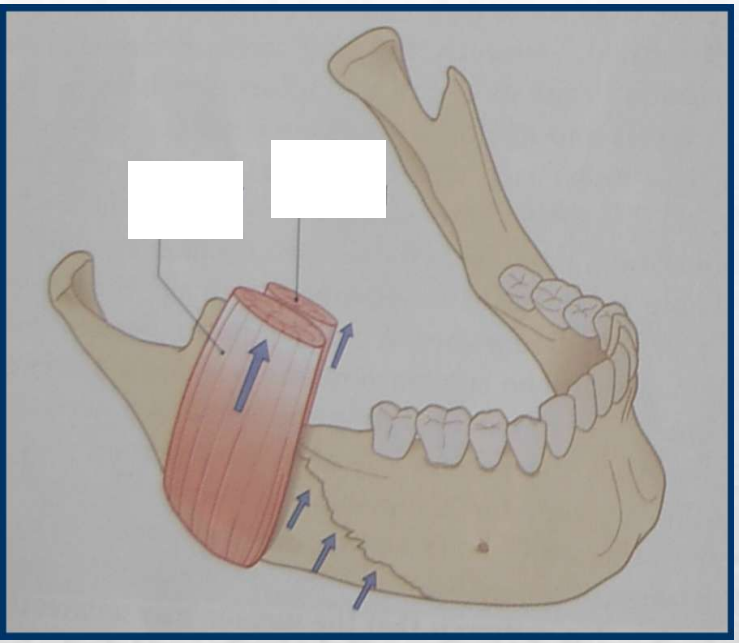
In A 17 year old girl with left condylar fracture :-

- Deviation of jaw on opening the mouth_____side
- Posterior dental open bite on the _____side.

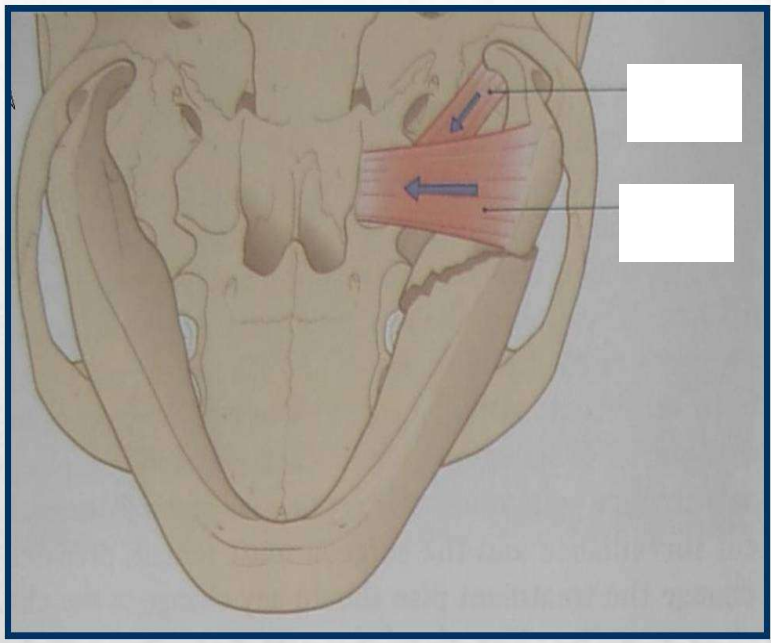
Question 4:-Identify the structure



Question 5:-Identify the type of fracture



A



B

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- ***Clinical Examination***

God Gave You Ears, Eyes And Hands ; Use Them On The Patient In That Order".

-Sir William Kelsey Fry

- Accurate history of injury helps to understand the severity of injury, accurate prediction of patient's condition and timely warning of impending complication and other dangers.
- Many accidents occurs under the effect of alcoholic drinks or drugs or both.
- Accident may have occurred because of fit, stroke, heart attack, insulin coma or other cause which has caused loss of control over vehicle.

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- ***Initial Assessment And Intensive Care***

Initial Assessment And Intensive Care

Basic Protocol / Principles Of Treatment

What Will You Do If You Happen To Be At Accident Site???

- Do not be afraid of legal aspect. Humanitarian approach is always placed superior to legal implications.
- Call immediately to nearby police station and or major hospital. (Always keep list of emergency phone numbers updated in your mobile phone)

- Try to flag down oncoming traffic from a considerable distance of accident site, to prevent multiple disaster.
- Danger from fire, explosive chemicals, or radio active substances should be considered.
- Priority of attention is then focused on the needs of victims of accident.
- The two potentially life saving actions are

(1) To ensure the airway.

(2) To stop accessible bleeding.

Trauma

First Peak

(Seconds)

Major Damage

- Brain
- Brain Stem
- Spinal Cord

Second Peak

(Golden Hour)

Minutes To Hours

- Subdural Haematoma
- Extradural Haematoma
- Haemo pneumothorax

Death

- Key management concerns related to injured patients involves- stabilization of patient and transportation to trauma patient for extended care.

- Patient Transport
  - Ground Ambulance:
    - Basic Ambulance
    - Advance Life Support Ambulance.
  - Air Ambulance

- **The ATLS(Advance Trauma Life Support)** protocols defines initial assessment and priority of the treatment that corresponds to the injury and stability of vital signs of the patients.

Trauma injuries are divided into 3 categories.

1) **Severe-** immediate threat to life because of interference with vital physiologic functions.

2) **Urgent**- no immediate threat to the life. they have stable vitals signs, they require surgical intervention.

3) **Non urgent-** no immediate threat to life. This patients requires medical or surgical intervention after significant evaluation.

Primary Survey: ABCS

- **A**irway Maintenance With Cervical Spine Control
- **B**reathing And Adequate Ventilation
- **C**irculation With Control Of Hemorrhage
- **D**isablity– Neurological Status
- **E**xposure/Environmental Control: Completely Disrobe Patient To Detect Injuries While Preventing Hypothermia

Partial Obstruction Of Airway After Maxillo Facial Injuries May Be Due To Following Factors :

- Obstruction of nasal and oral airway occurs by blood clot, vomit, saliva, bone,teeth and broken dentures.
- Inhalation of any the above.
- Closure of both the naso pharynx and oro pharynx by bodily backward displacement of tongue and its attachments in symphyseal fractures of mandible
- Occlusion of the oro nasopharynx by downward and backward displacement of fractured maxillae

Control of Haemorrhage :-

- The immediate next priority is to control the accessible bleeding, whether it is in maxillo facial area or any where in the body.

- No attempt should be made to explore the wound at this juncture.

- They should be firmly dressed and these dressing should not be disturbed until the patient has shifted to full surgical care.

Hypovolemic shock in the multisystem injured patient:

Classification of hemorrhage:

- Class-1
- Class-2
- Class-3
- Class-4

	Class-1	Class-2	Class-3	Class-4
Blood volume loss	Up to 15%	15 to 30%	30 to 40%	>40%
Adult blood volume amount	<750ml	750-1500ml	2000ml	>2000ml
Need for blood transfusion	no	Generally not	Almost always	Yes
tachycardia	minimal	present	marked	marked
Systolic pressure change	none	none	decreased	decreased
Diastolic pressure change	None	decreased	decreased	Decreased or absent

Control of Infection :-

Main factors which control the infection are:

- Surgical techniques of cleanliness
- Wound toilet.
- Control of hemorrhage and
- Hematoma formation.
- Immediate and complete coverage of the wound.
- Early antibiotic administration at an early stage for prophylaxis.

Wound Care

Tetanus Prophylaxis

- *Active immunization is the only reliable safeguard against the development of tetanus, In addition to good surgery.*

- *Ideally all members of the community should be immunized and be maintained in a immunized state.*

- *But this is not achieved.*

Protocol for tetanus prevention:

(A) Previously immunized individuals:-

(1) Immunised within past 10 yrs :-

- 0.5 ml of Adsorbed tetanus toxoid I. M. as a booster dose.

(2) Immunised before more than 10 years :-

- 0.5 ml I.M. of tetanus toxoid.
- In wounds neglected for more than 24 hrs, give additional 250 units of human Anti tetanic globulin in a different syringe and at different sites.
- Initiate the antibiotic therapy.

(B) Individuals not previously immunized

1) *Clean minor wounds :- (tetanus unlikely)*

- *0.5 ml of adsorbed tetanus toxoid as an initial immunizing dose.*

2) *All other wounds :-*

- *0.5 ml of adsorbed tetanus toxoid as an initial immunizing dose. Plus 250 units of human Anti tetanic globulin, at different sites in a different syringe.*

General Examination :-

It should be conducted in 3 stages.

First to recognize any threat to life or limb that requires urgent attention this may take little more than few seconds.

Second is to identify all the conditions that requires a treatment and so as to provide a base for plan of treatment. This may take more than few minutes.

Third is to identify new developments so that complication can be prevented or be dealt with promptly. This stage varies in length from hours – days or even weeks.

Individual Regions examination

Examination of head :-

- Head injury – Brain injury.
- Level of consciousness– state of pupils, actions of muscle.
- Intracranial hemorrhage can cause oligaemic cerebral Hypoxia.
- Cerebral Hypoxia, ultimately leads to confusion, restlessness, violently un cooperative patient.
- Victims of cerebral concussion, contusion or laceration may be restless. And does not allow examination.
- Patient is not aggressive until he is provocated.

Glass Gow Coma Scale:

- It was developed by Teasdale and Jennet.
- It was the first system to quantify the severity of head injury.

Glass Gow Coma Scale:

EYE OPENING(E)	VERBAL RESPONES(V)	MOTOR RESPONES(M)
4-Spontaneous	5-Normal conversation	6-Normal
3-To voice	4-Disoriented conversation	5-Localizes to pain
2-To pain	3-Words, but not coherent	4-Withdraws to pain
1-None	2-No words, only sounds	3-Decorticate posture
	1-None	2-Decerebrate
		1-None
		Total=E+V+M

- **Examination of neck :-**Fracture of cervical spine, cervical spondy lysis.
- **Examination of chest :-**Injury to chest can be localized painful to deep penetrating affecting ventilation of lungs. e.g.Haemothorax.
- **Examination of abdomen :-**Damage to viscera. Particularly kidneys, spleen, liver.
- **Injuries to Bones and joints:-**Any other Fractures of long bones, hip joints, shoulder joints, etc.

Local Examination

- After thorough general examination, and institution of necessary resuscitatory measures, detailed local examination can be carried out.
- To begin with, all blood clot, road dirt and other debris must be cleaned from hair, face and mouth.

Inspection

Examination of scalp :-

- It should be inspected for contusion and lacerations underneath the hair and also at the back of head.

- Depth of the wound, hematoma, skull fracture should be inspected.

Examination Of Ears :-

- The external auditory meatus should be examined for discharge of C.S.F. Leakage.
- In case of fracture dislocation of condyle. Sharp end of condylar neck can penetrate into ant. Wall of ext. Audi. Meatus.

- After cleaning the blood clot from ext.Audi meatus, careful examination is carried out T.M.J. Or middle cranial fossa fracture, ear drum will appear blue, bulging and will exhibit transmitted pulsation of C.S.F.

- **Battle's sign** :-Posterior auricular bruising over the mastoid process is frequently associated with a fracture of middle cranial fossa

Examination of eyes :-

- Any puncture wound in proximity with eyes should be examined for broken glass or foreign body.
- Various injuries to eye ball should be consulted with ophthalmic surgeon.
- Circumorbital ecchymosis these suggest fracture of walls of orbit.

•Sub conjunctival hemorrhage.

Frequently Asked In Viva Questions

- Why sub conjunctival hemorrhage remains bright red in colour????

- Because of atmospheric oxygenation of blood through conjunctiva, prevents reduction of hemoglobin.

- In conscious patients :

  - visual acuity in both eyes should be assessed.

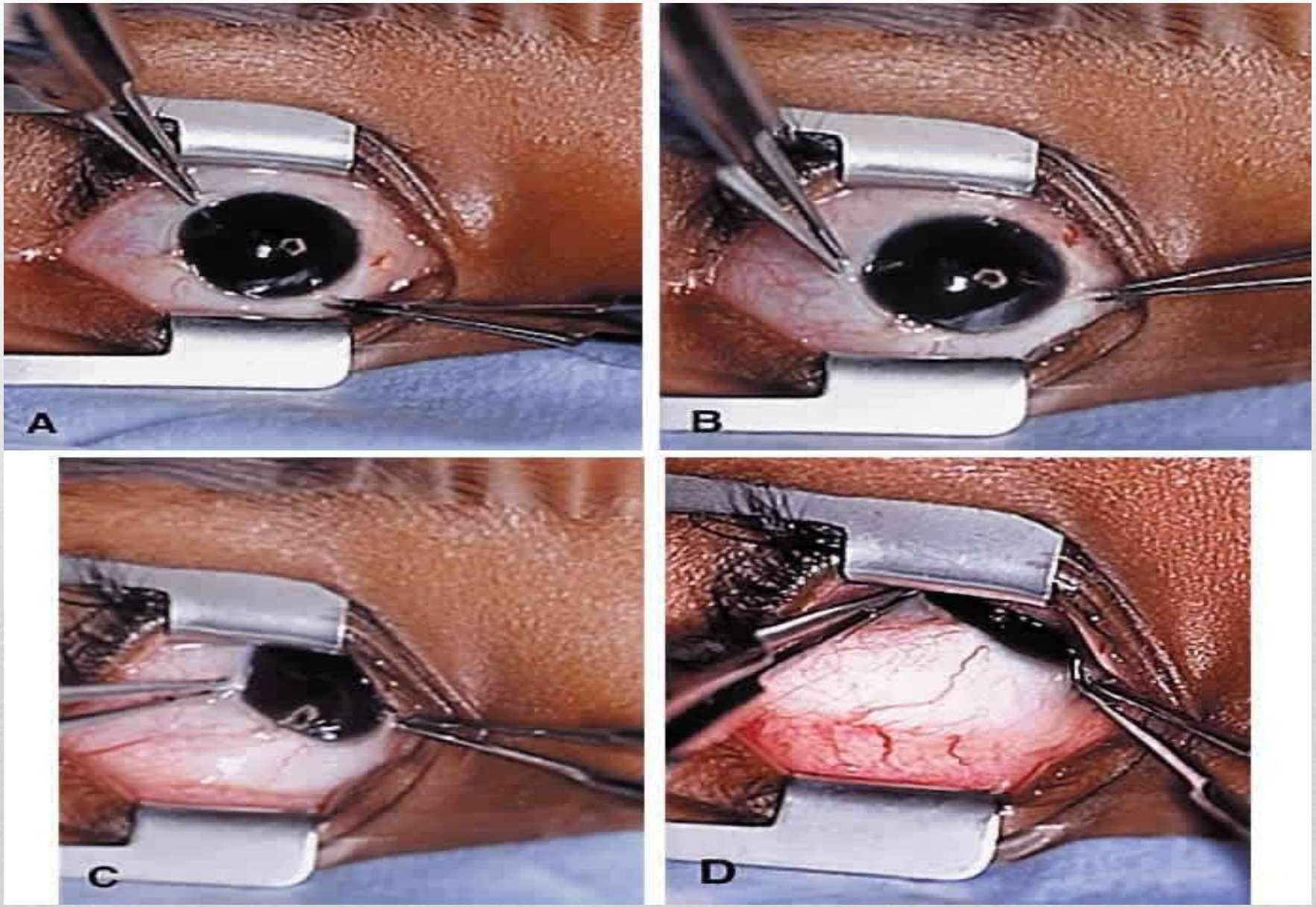
  - Pupil level of both eyes should be checked.

  - Full range of ocular movements should be checked.

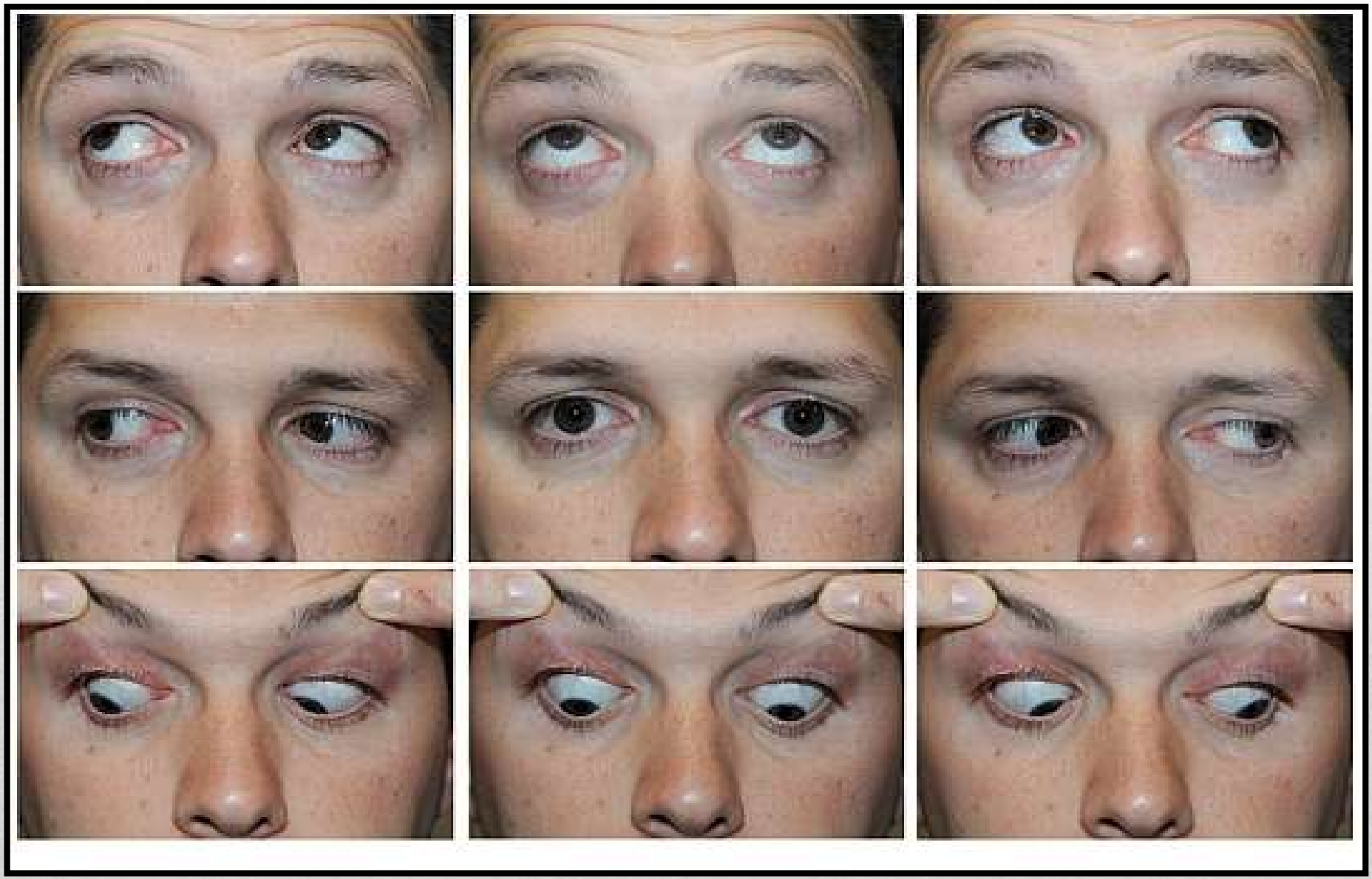
  - Diplopia should be tested.

Pupil level of both eyes should be checked.

Diplopia should be tested.



Full range of ocular movements should be checked.

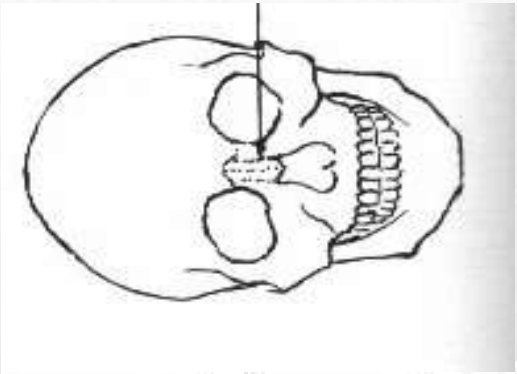


Examination of Nose :-

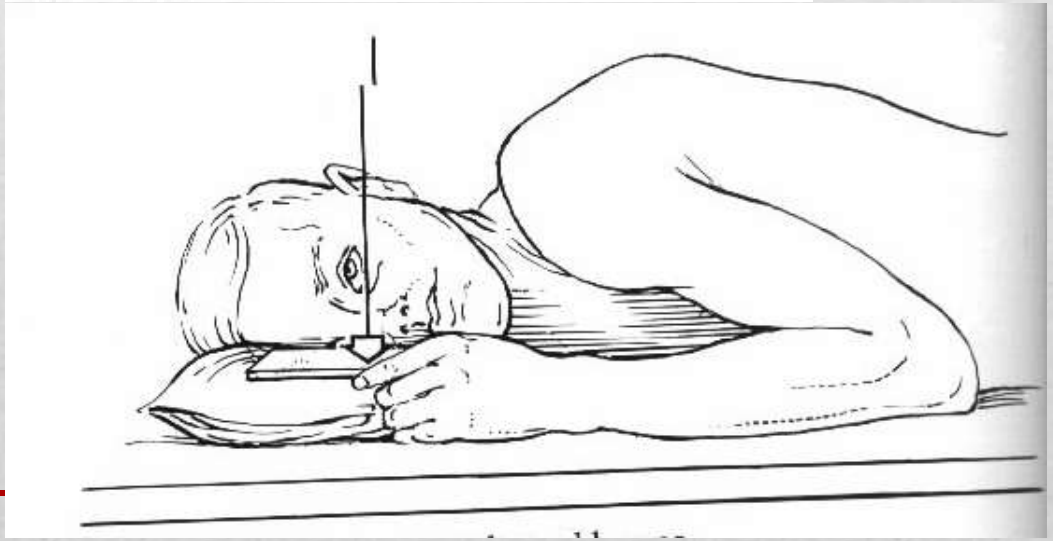
- Any deviation or depression of nasal bridge.
- Any epistaxis or C.S.F. Rhinorrhoea.
- Collapse of naso-ethmoid bridge in lefort fractures.

depression of nasal bridge.

deviation of nasal bridge.



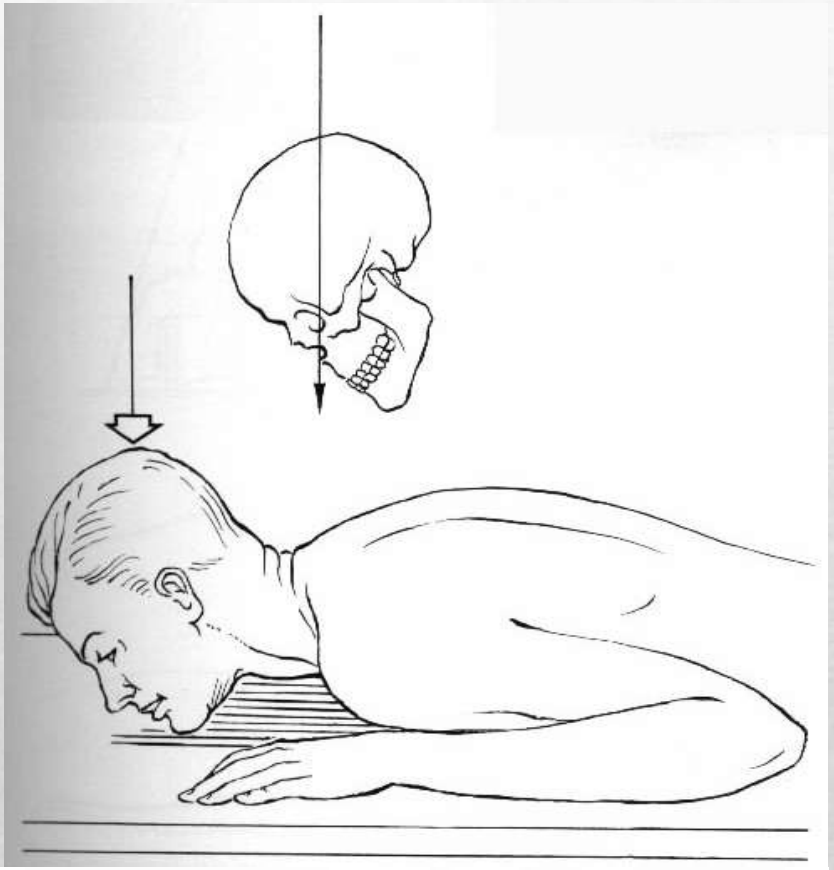
Lateral view of nasal bones.



Examination of middle 1/3rd of face

In a typical bilateral fracture of maxillae, three characteristic features are seen.

- Bilateral circum orbital ecchymosis.
- Lengthening of middle 1/3rd of face.
- Gross bilateral edema.



Waters (occipitomental) view.

Sensory Loss

- Damage to infra orbital nerve causes paresthesia in distribution area.
- Damage to inferior dental nerve causes paresthesia of lower lips.
- Neura praxia to supraorbital or sup. trochlear nerve.

Motor loss :-

- When terminal branches of facial nerve are affected, it causes motor paralysis of muscles.

Surgical Emphysema

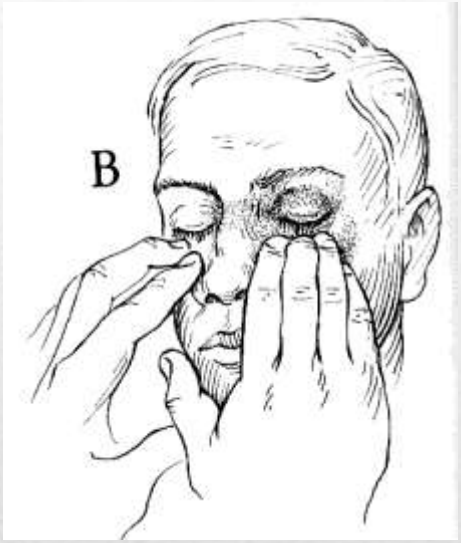
- The presence of air in tissue space may result from maxillary fractures, nose ethmoidal fractures and zygomatic fractures.

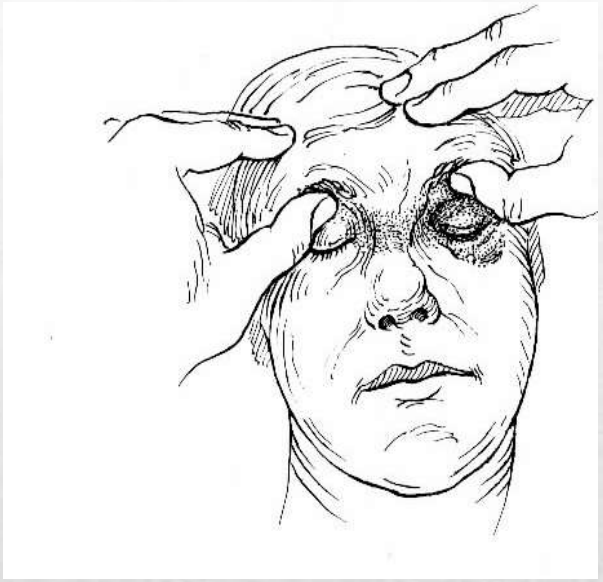
- Emphysema transmits cracking sound to finger tips.

Palpation

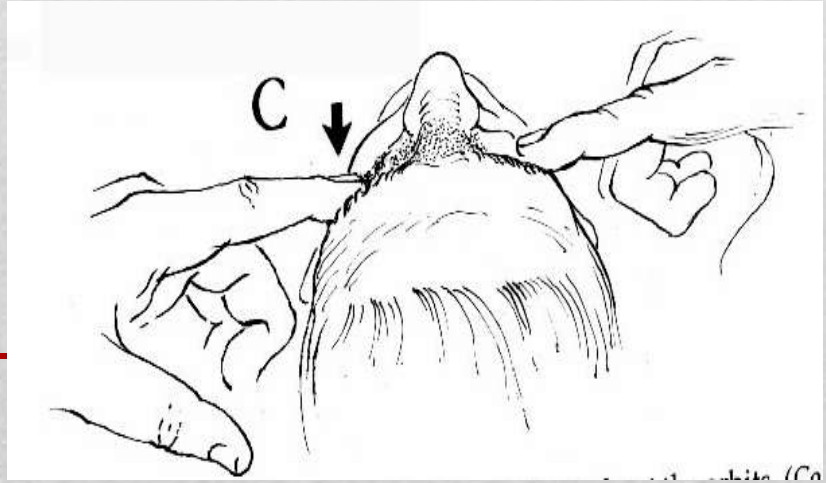
- More effectively carried out by standing behind the patient.
- Index finger are placed on either side of nasal bridge and moved along the superior orbital margin, to check for tenderness or step deformity.
- The fingers are then passed over fronto-zygo. suture.
- Index and middle fingers are used bilaterally to palpate the outline of zygo. bone and arch.

Infra orbital margin is palpated from the front of the patient to check for step deformity.

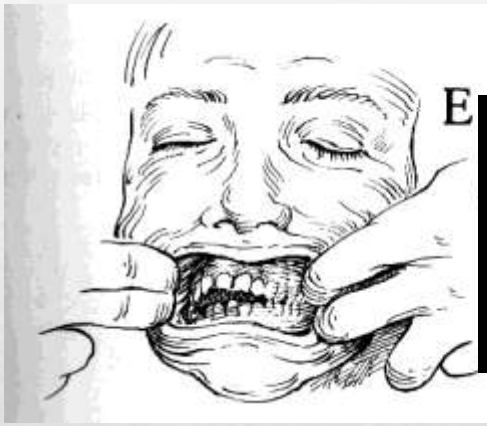




Comparing height of malar eminences

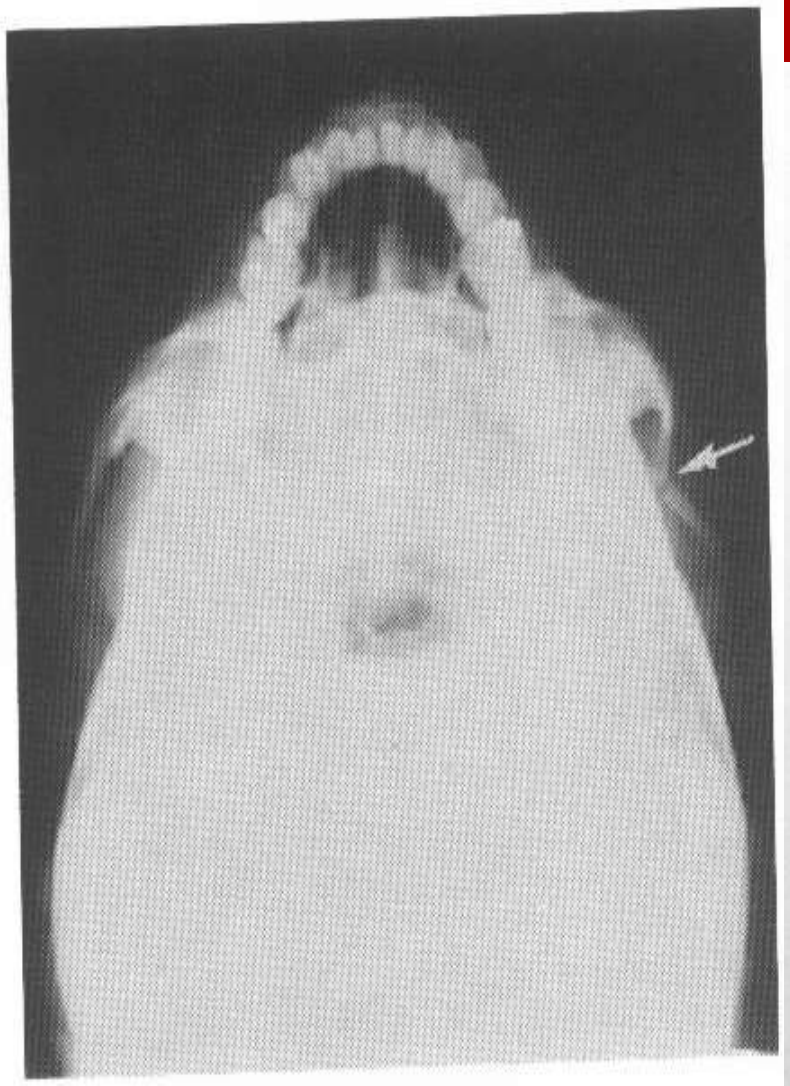


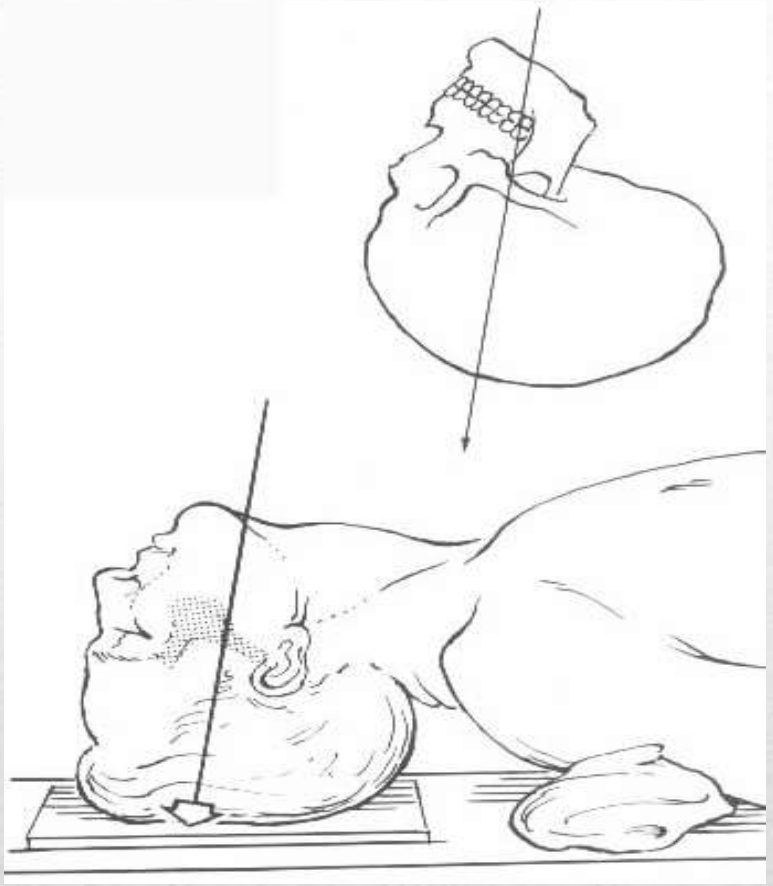
Palpation for depression of zygomatic arch



Visulizatio n of gross dental occlusion

Maneuver to ascertain motion in maxilla





Zygo. Arch Examination

Examination Of Mandible

- Fingers of both hands palpate the both sides of lower border while thumbs are placed on the lateral aspect from the back of the patient.
- Fingers are moved back to check for step deformity.

T.M.J. Examination :-

- From the front of the patient, little finger is placed in external auditory meatus with the pulp directed forwards while patient attempts to move mandible in all directions.

In Unilateral Dislocation

- Midline Is Shifted To The Opposite Side.

- Posterior Open Bite On Affected Side.

- Inability To Close The Mouth.

In bilateral dislocation :-

- No displacement of midline.
- chin is protruded.
- Posterior gagging of teeth.
- Marked anterior open bite.
- Restricted movement.
- Difficulty of speech.
- Drooling of saliva.

Intra Oral Examination

Inspection

In mandible fractures:-

- Compounded intra oral fracture.
- Blood stained saliva.
- Foetor oris.
- Sublingual haematoma.

Mandible**:-**

Palpated in buccal ,labial or lingual sulcus for tenderness , arch contour deformity

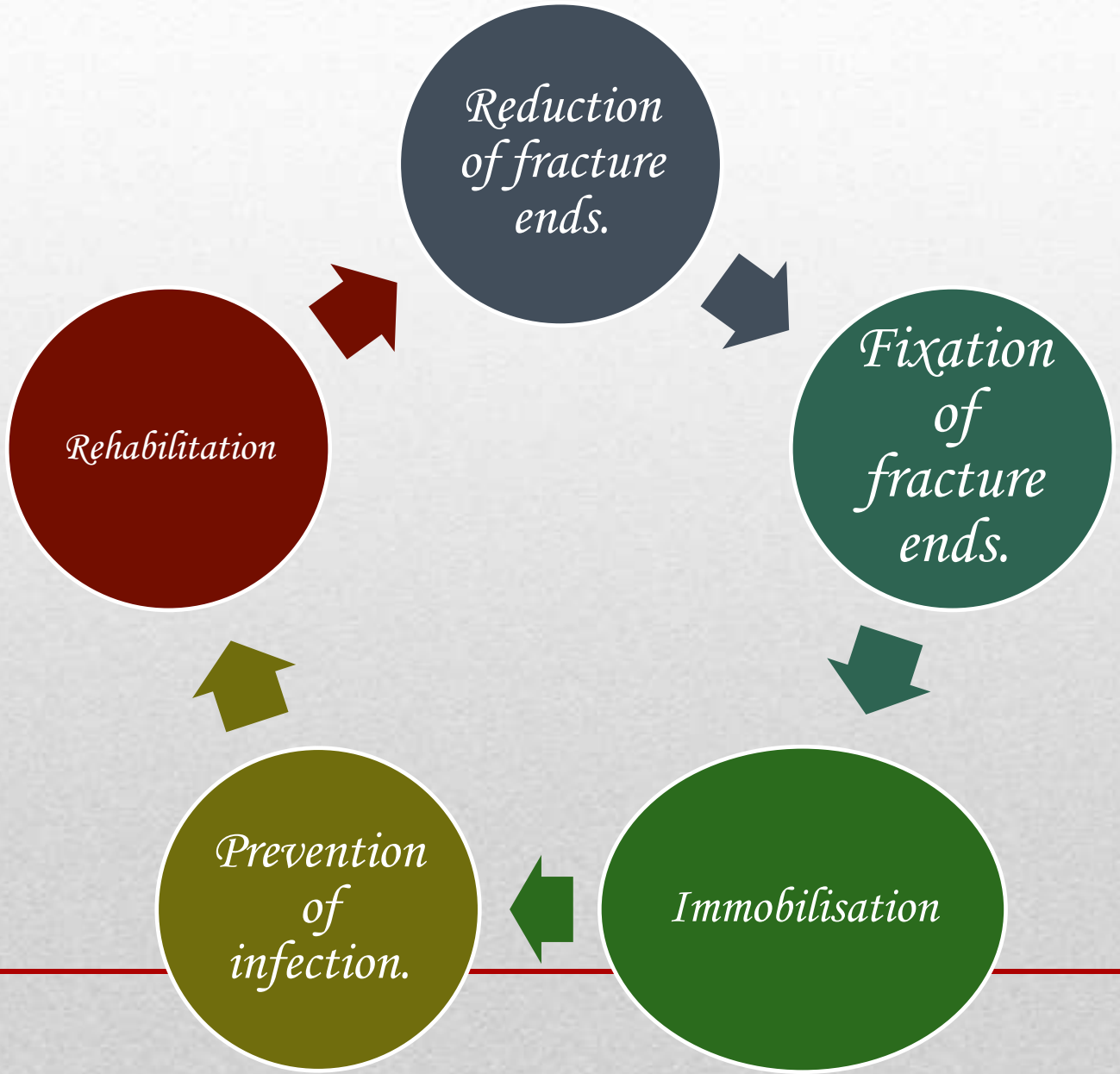
In maxillary fractures :-

- When complete detachment of maxilla without intra oral communication occurs.
- There is no blood in saliva.
- Coagulation plaque in the vault of palate.

- **Guerin's sign:** Some ecchymosis in buccal sulci near the zygo. prominences or occasionally in greater palatine foramen region.

Treatment Of Mandibular Fractures

Basic Principles Of Treatment Of Any Fracture Are:-



What are the objectives to be achieved in treatment of fractures:-

- *Restoration of function of the area affected.*
- *Quality of the function is also restored.*
- *Speedy recovery with easy and safe methods.*
- *Restoration of cosmetics*

Protocol for treatment of mandibular fractures

*Philip L. Maloney,*J Oral Maxillofac Surg,59:879-884, 2001

- Simple Fractures Of The Condylar Process And Ramus Are Usually Treated By Closed Reduction.

- Patients Are Placed In Maxillo mandibular Fixation (MMF) For 48 To72 Hours, Followed By Training Elastics And Close Observation To Ensure That A Malocclusion Does Not Occur.

- No MMF is required for coronoid fractures; arch bars and training elastics are used only if a malocclusion is present

• Simple or compound fractures with a time delay from injury to immobilization of less than 72 hours are treated by a closed reduction (CR) or, if indicated, open reduction with rigid fixation (ORIF).

•Compound fractures where there is a delay from injury to mobilization of more than 72 hours are treated with MMF and intravenous antibiotics for a period roughly equal to the time from injury to initial treatment (eg, a patient with a 5-day-old compound fracture receives intravenous antibiotics for 5 days).

•If the closed reduction is adequate, the patient is continued on oral antibiotics for an additional 10 to 14days and maintained in MMF and on a blenderized diet for 5 to 6 weeks from the time of closed reduction. If not, ORIF is performed, and MMF is maintained for 10 to 14 additional days.

• Edentulous patients are treated with rigid fixation, no MMF, and a blenderized diet for 4 to 5 weeks.

•Teeth in the line of fracture are judged individually. If sound, firm, and the supportive tissues are intact, they are retained except if an open reduction is to be performed; then, partially erupted and impacted third molars in the line of fracture are removed.

In Which Clinical Situation Active Treatment May Be Un Necessary:-

The surgeon should not consider surgery in following cases.

1) Most unilateral condylar fractures.
2) Most coronoid process fractures.
3) Undisplaced and some displaced fractures of ascending ramus.
4) Undisplaced fractures of edentulous mandible.
5) Green stick fracture in children.
6) Some fractures of nasal and zygomatic bones with minimal displacement.

Reduction:-

- Reduction of fracture means the restoration of a functional alignment of the bone fragments.
- Less precise reduction may be acceptable if a part of the body of mandible is edentulous or there are no opposing teeth.
- The presence of teeth provide an accurate guide for the alignment of bony fragments.
- Any pre existing occlusal abnormalities should be considered.

- **Types Of Reduction:**

1. Close Reduction
2. Open Reduction

Indications For Closed Reduction

1. Non-displaced favorable fractures
2. Grossly comminuted fractures
3. Fractures exposed by significant loss of overlying soft tissue.
4. Mandibular fractures in children with developing dentition
5. Coronoid process fracture
6. Condylar fractures

Advantages Of Closed Reduction

- Inexpensive
- Easy Availability, Convenient
- Short Procedure And Stable
- Conservative, No Need To Surgical Tissue Damage
- Callus Formation Allows Bridging Of Small Bony Gape

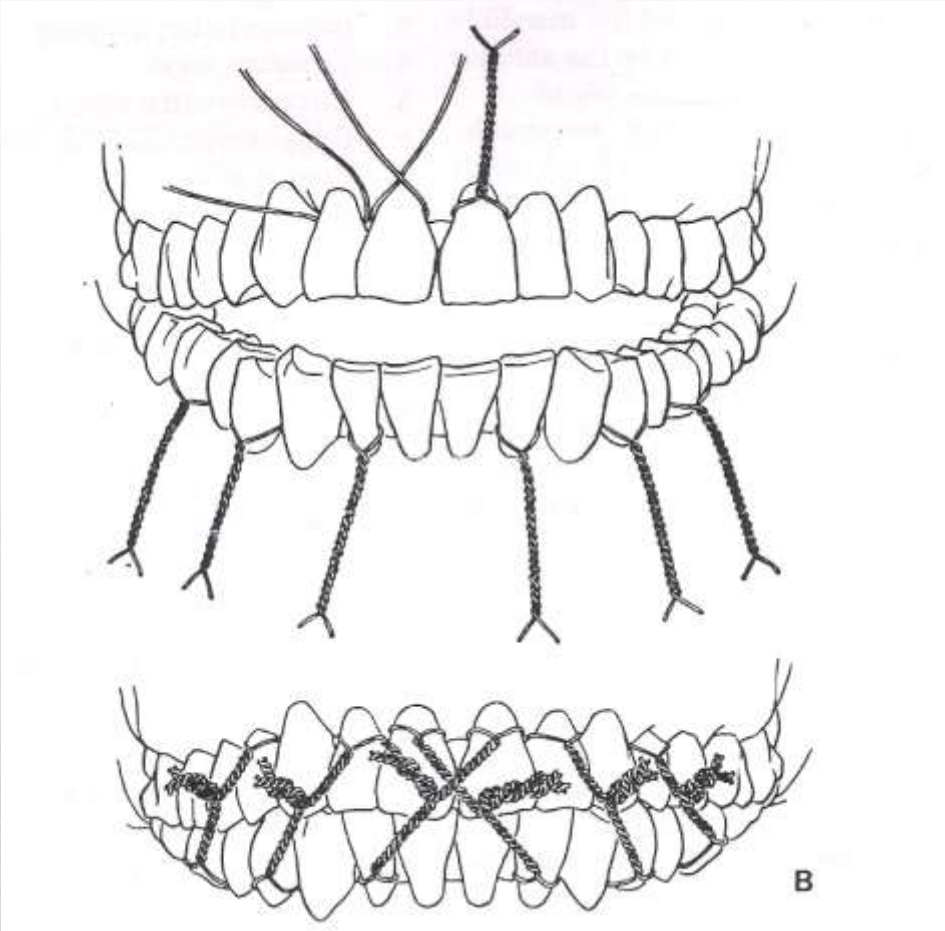
Disadvantages Of Closed Reduction

- Can Not Obtain Absolute Stability
- Difficult Nutrition
- Possible Temporo Mandibular Sequelae
- Muscular Atropy And Stiffness
- Myofibrosis
- Change In Temporo Mandibular Joint Cartilage
- Decrease The Range Of Motion Of Mandible
- Irreversible Loss Of Bite Force
- Weight Loss
- Risk Of Wound To Operators Manipulating Wiring.

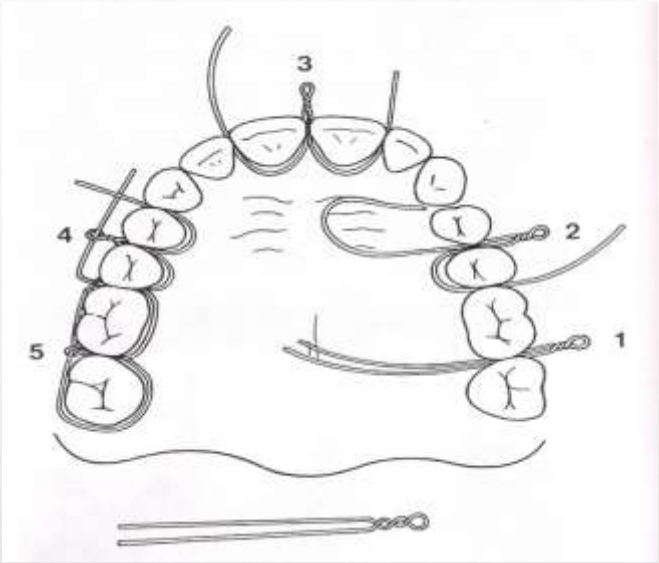
Technique For Closed Reduction:

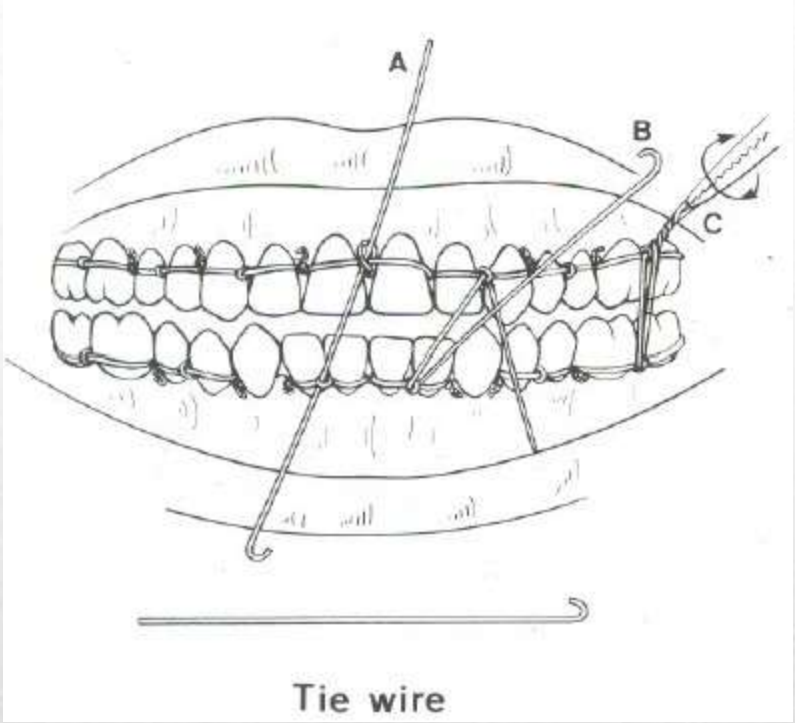
- Direct inter dental wiring.
- Indirect inter dental wiring.
- (Eyelet, Ivy loop)
- Continuous or multiple loop wiring.
- Arch bars.
- IMF screws
- Cap splints.
- Gunning type splints.
- Pin fixation

Gilmer's Method

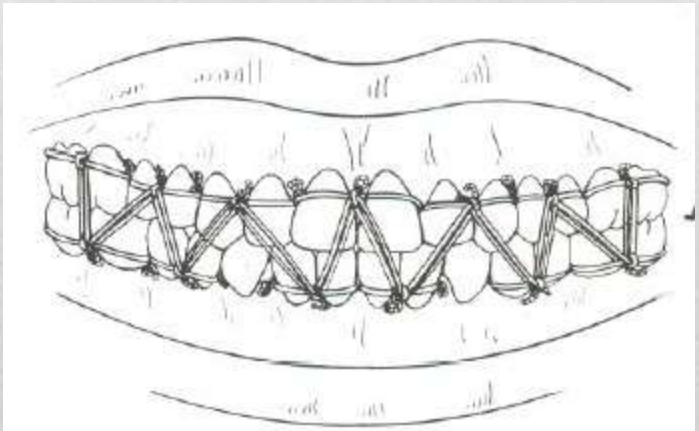


Ivy Loop Method

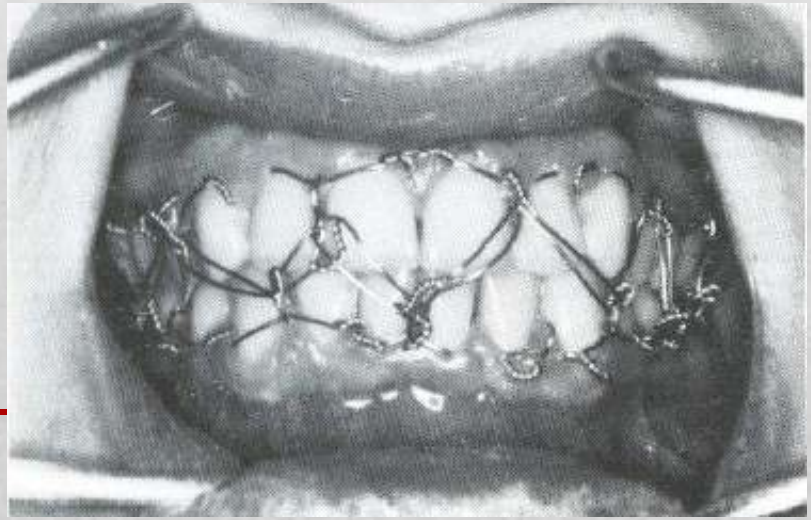




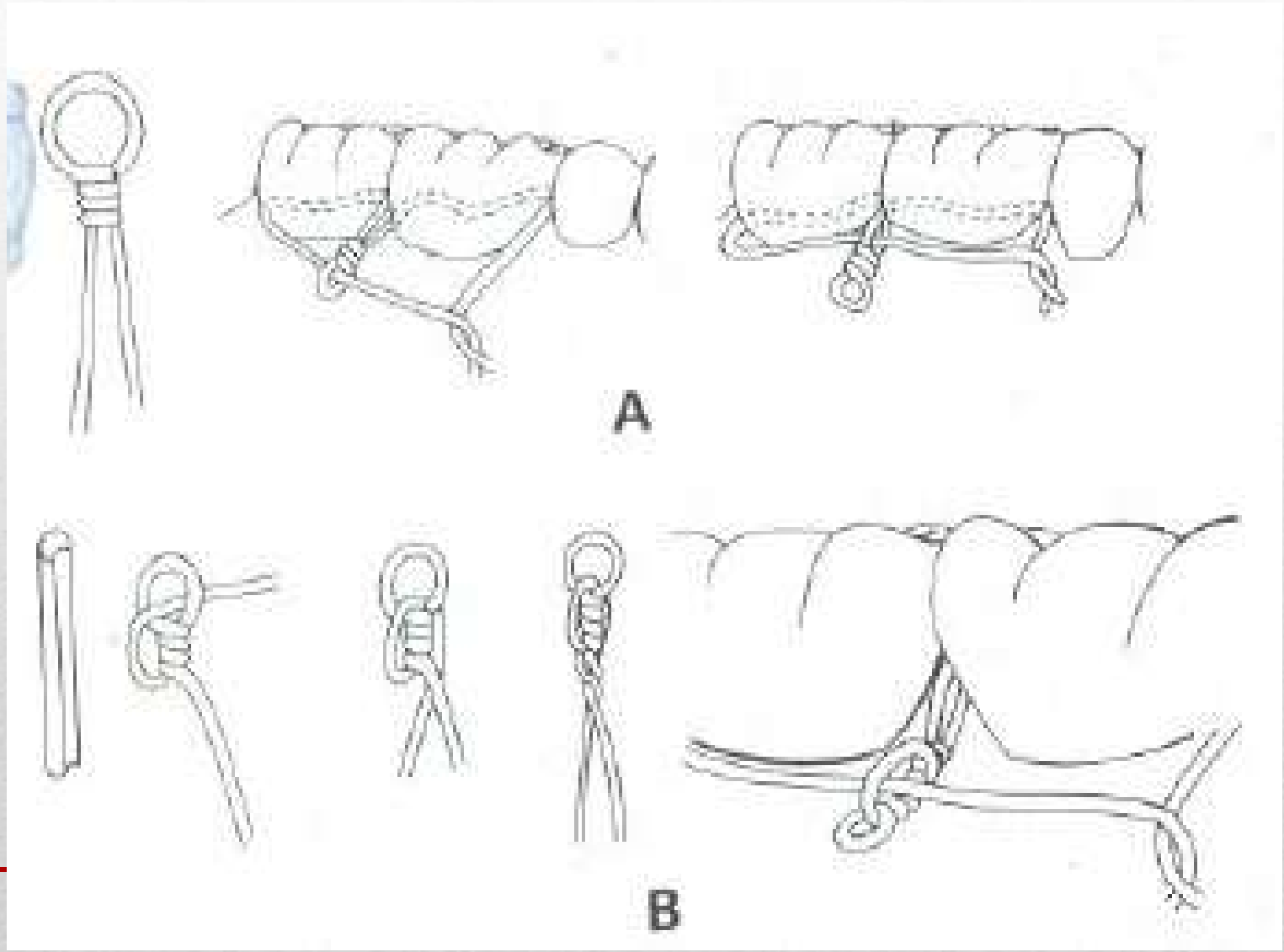
Tie wire



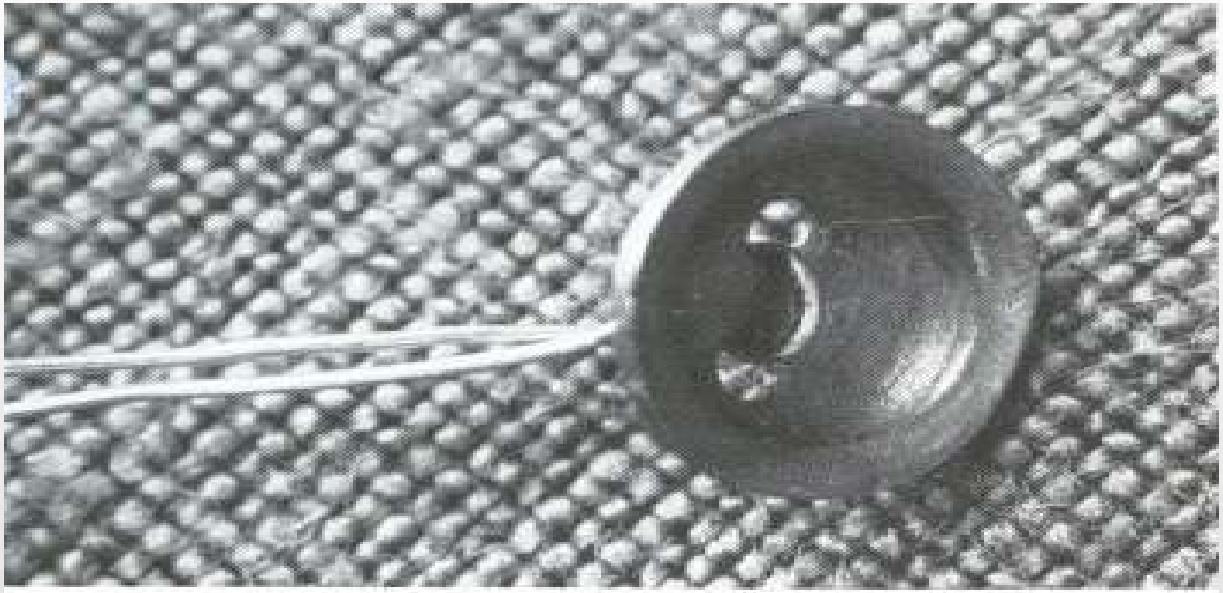
Completed wiring

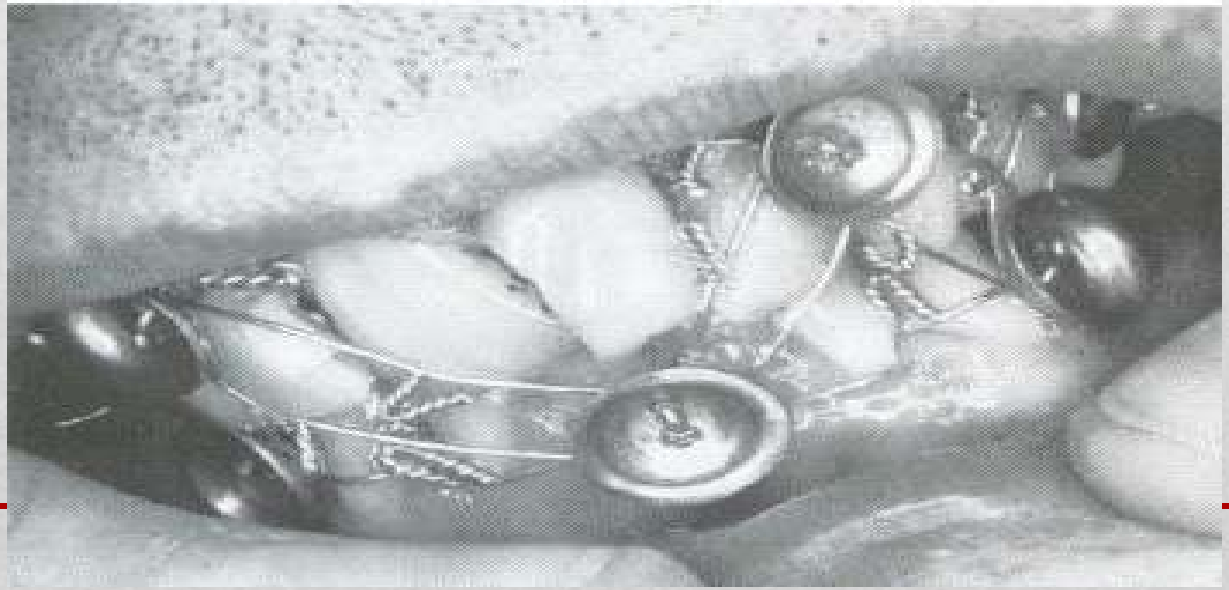


Williams Modification(1968)

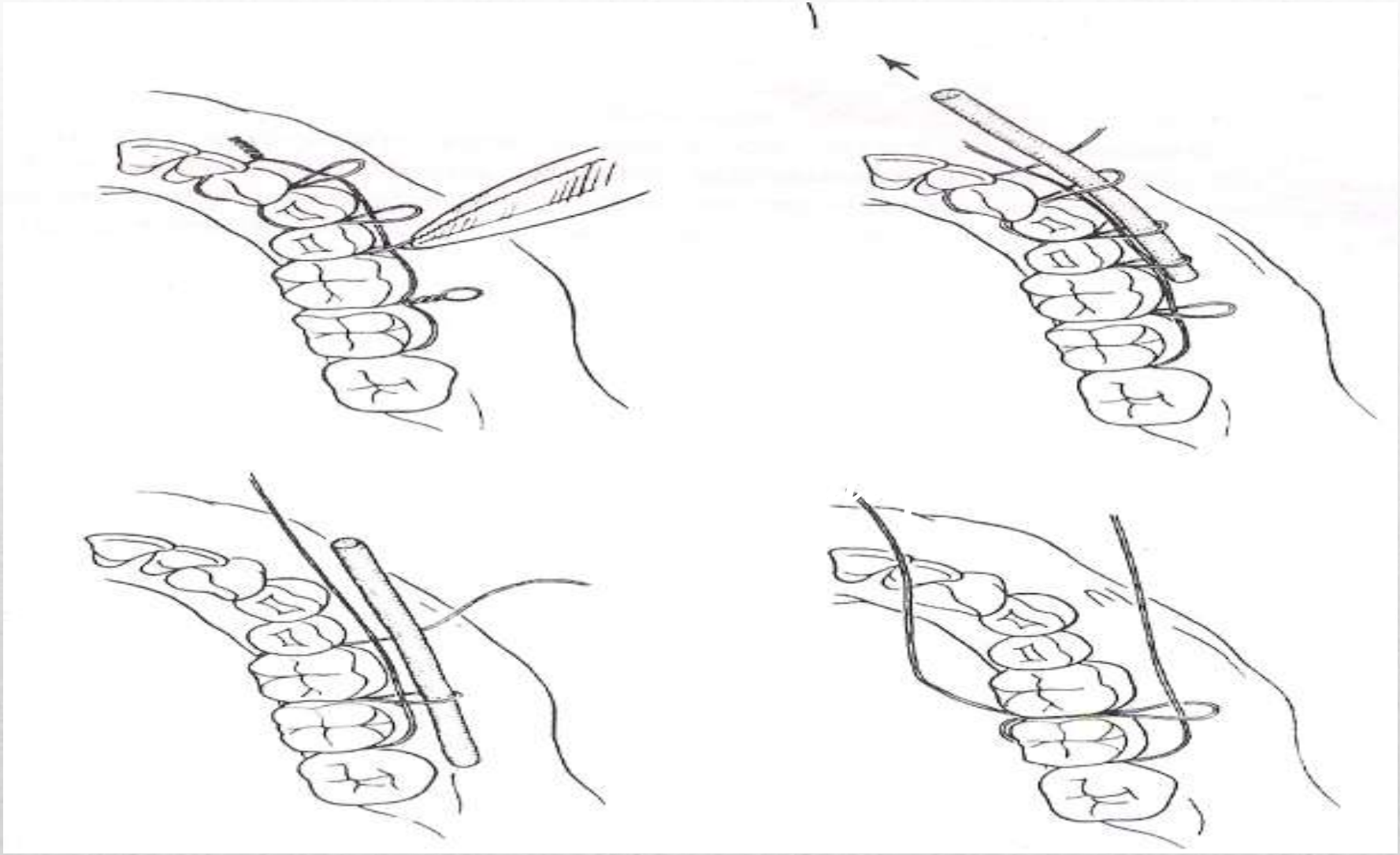


Leonard Button Wiring

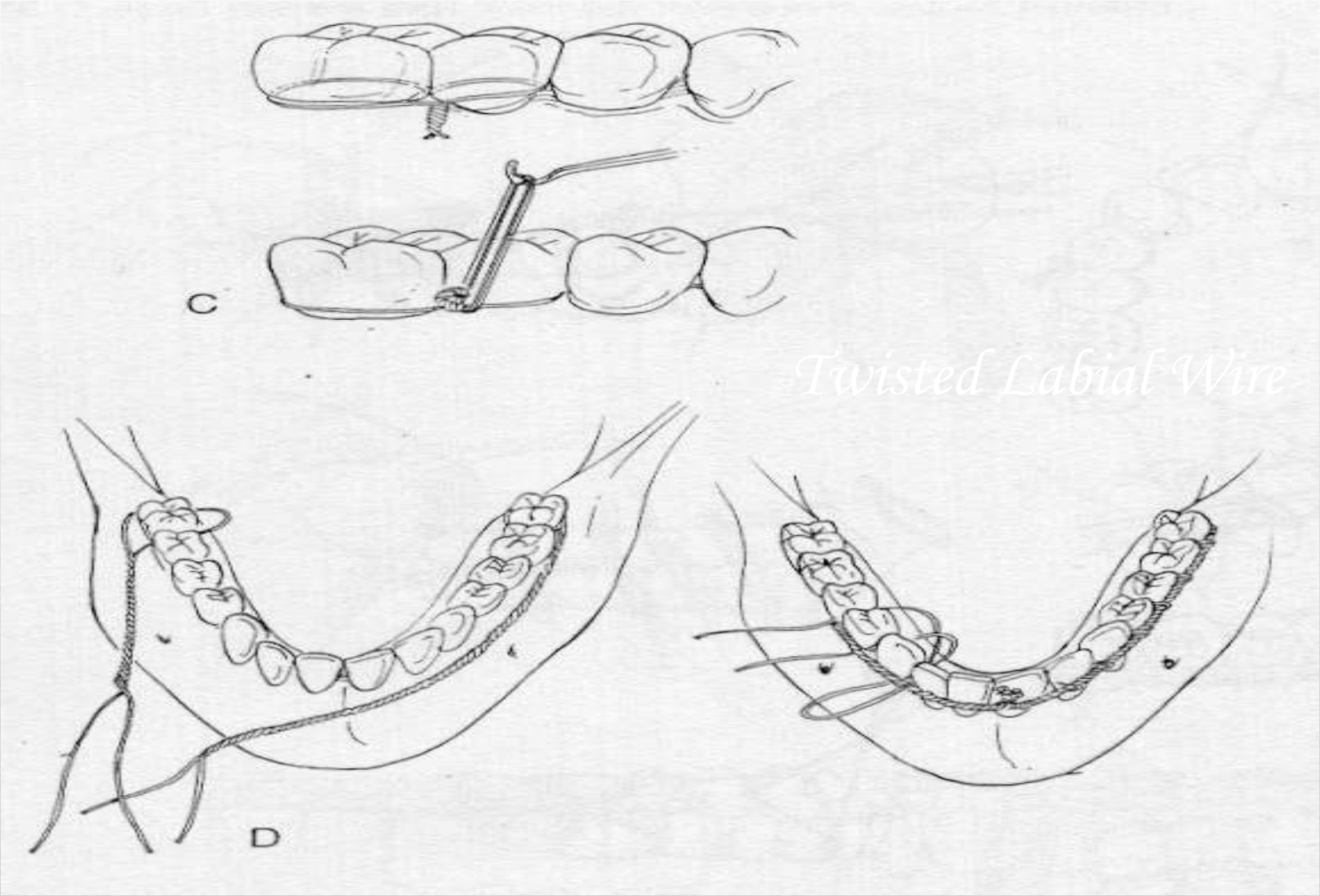




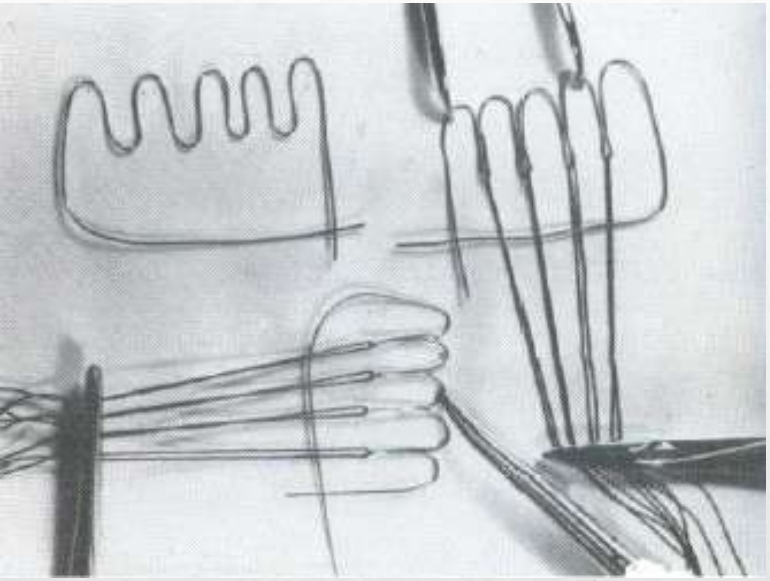
Stout Method(1943)

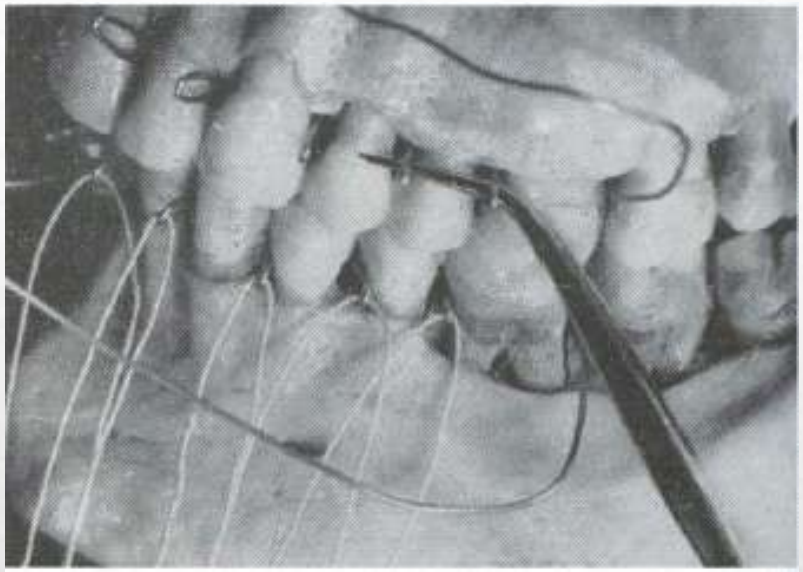


Fulton Risdon (1968)

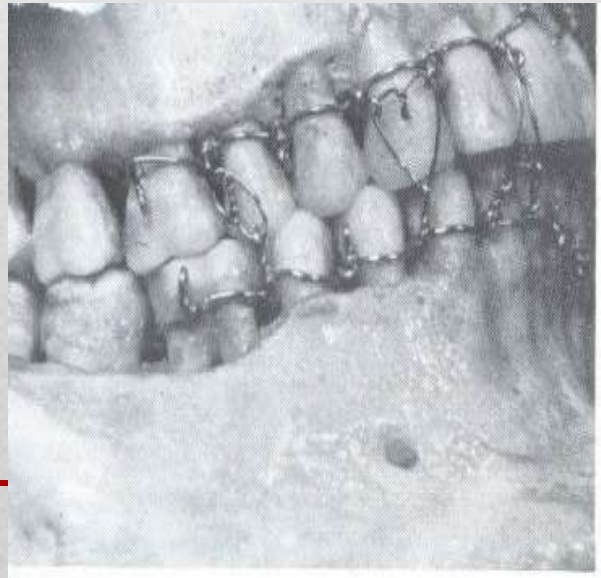


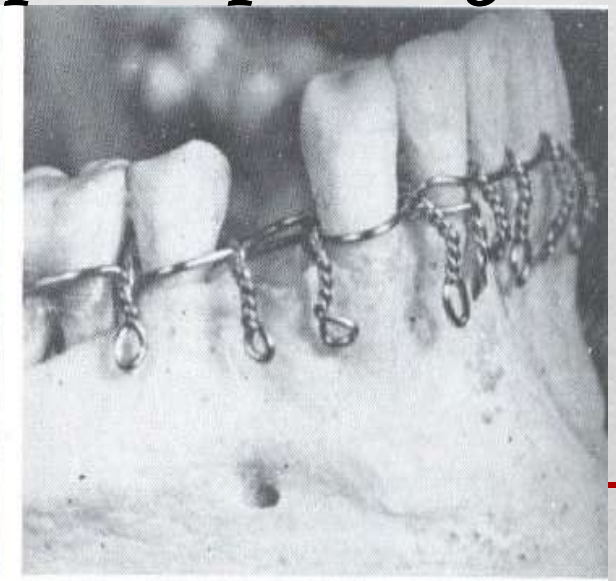
Obwegeser Method



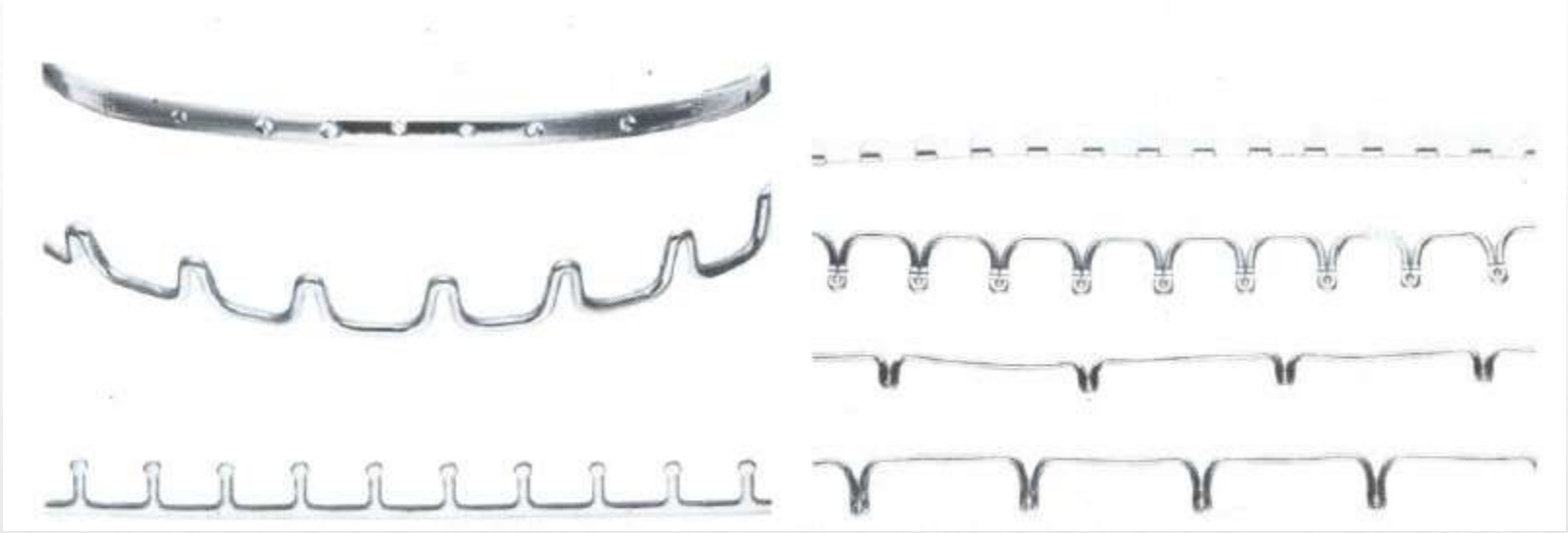


Continous Multiple Loop Wiring





Arch Bars



- Risdon Arch Bar
- Jelenko Arch Bar
- Erich Arch Bar
- Krapps Arch Bar
- Erich Arch Bar
- Hamilton (1967)

Arch Bars

- Many types of prefabricated arch bars are available.
- Mast popular one and commonly used is the ERICH ARCH BAR.
- It is a prefabricated arch bar with hooks incorporated on the outer surface with flat malleable stainless steel metal strip.
- It provide an effective, quick and inexpensive method of fixation.

- *The bar is available in spool form. The bar should be cut accurately to the length of dental arch*

- *Accuracy in this regard will prevent injury to adjacent soft tissue by protruding ends.*

- *Each bar is to be fixed to the upper and lower dental arches.*

- *The bar attach to lower arch with the hooks in a downward direction*

- *The bar should be adapted to the buccal surface by giving the shape of arch by bending it.*

- *Bending of arch bar should be start at the buccal side of last tooth progressing past the midline and finishing at other end .*

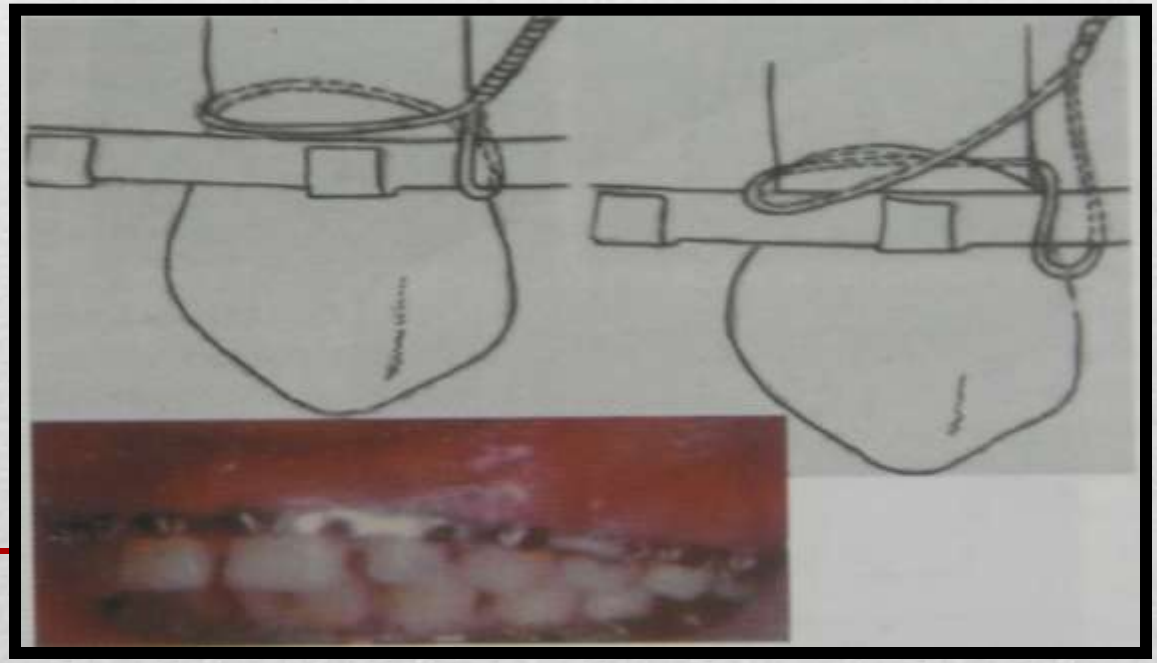
- *The arch bar is fixed to each tooth, with 26 gauge stainless steel wire, which is passed from the mesial surface of a tooth to the lingual side and back on the buccal side from the distal surface of the tooth.*

- *One end of the wire is above the bar and other below.*

- *By twisting the two ends of wire together the bar is attached securely and firmly to the neck of the teeth on the buccal surface of the arch.*

- *The twisting of the wire should be always done in clock wise manner, so that later on removal of wire done in anticlock wise manner.*

- *Improper adaptation of bar, ligation of an insufficient number of the teeth and insufficient tightening will result in inadequate stability of the arch bar*



Advantages Of Arch Bar:

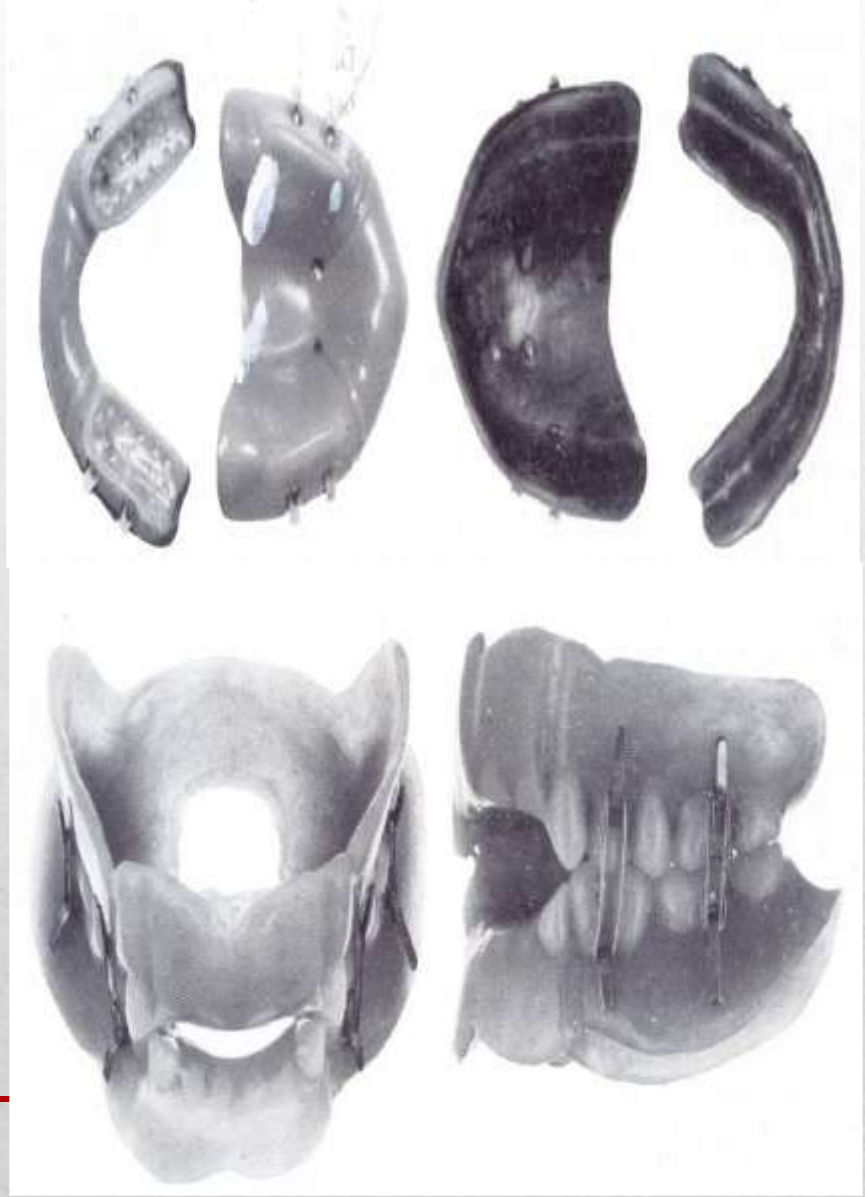
- *It lead to less trauma because of the thin wire and greater stability in arch, even if some teeth missing, because the edentulous gape can be spent by this rigid appliance.*

- *If some wire is broken in between then the fixation will not suffer and it can be replaced easily*

- *The hook are flat and do not irritate the tissue.*
- *In case of displaced mandibular body fracture, the arch bar can be divided and placed on either side of the fracture line.*
- *The use of ERICH ARCH BAR is accepted universally for its obvious advantages*

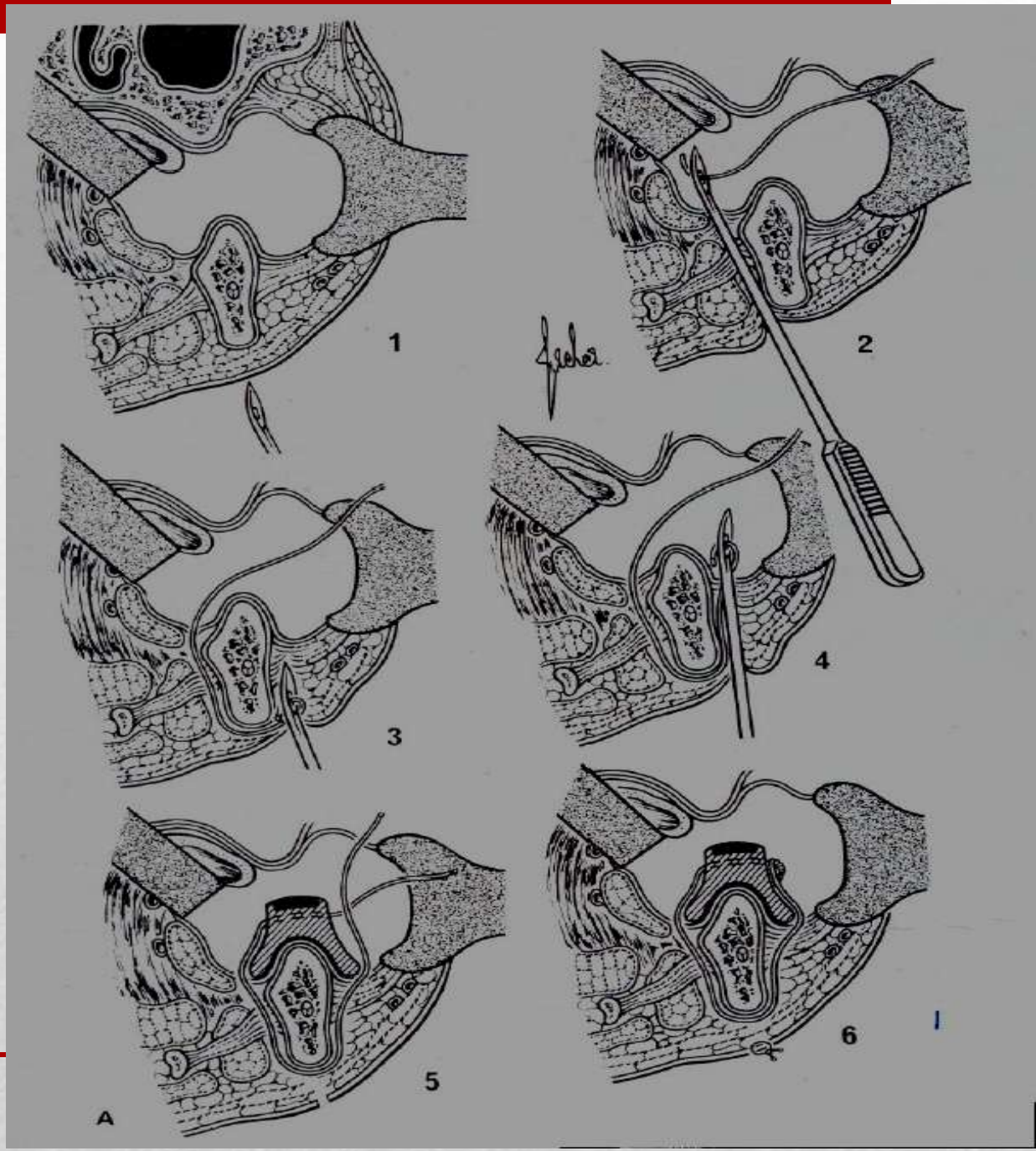
Fractures Of Edentulous Mandible

- *Gunning Type Splints*



Thomas Bryan Gunning-
(1885)

Circummandibular Wiring (Bradley-1975)



Open Reduction:

Indications:

- Displaced unfavourable fracture
- Multiple fractures
- Associated midface fractures
- Associated condylar fractures (bilateral)
- When inter maxillary fixation is contraindicated
- To facilitate the patient's early return to work
- Fracture of edentulous mandible with severe displacement
- Edentulous maxilla opposing a mandibular fracture.

- *Delay of treatment and interposition of soft tissue between non-contacting displaced fracture.*

- *Malunion.*

- *Special systemic condition contraindicating intermaxillary fixation. E.g. patient with difficult to control sezuires, psychiatric or neurological problems, compromised pulmonary functions, gastro-intestinal disorders.*

Open Reduction And Direct Skeletal Fixation

- Trans-osseous wiring. (osteosynthesis)
- Bone-plating.
- Intra medullary pinning.
- Titanium mesh.
- Circumferential straps.
- Bone clamps.
- Bone staples.
- Bone screws.

Advantages Of Open Reduction

- *Early return to normal jaw function.*
- *Normal nutrition*
- *Avoidance of airway problems.*
- *Get absolute stability and promote bone healing.*
- *Bone fragments re-approximated exactly by visualization.*
- *Easy oral access.*
- *Decrease patient discomfort, greater patient satisfaction*
- *Decrease hospital time*
- *Lower rate of non union or mal union*

Disadvantages Of Open Reduction

- *Need for an open procedure*
- *Prolong anesthesia*
- *Risk to neuromuscular structures and teeth*
- *Need for the secondary procedure to remove hardware*
- *Higher frequency facial nerve palsy*
- *higher frequency of malocclusion*
- *No bridging of small bone defects.*

Methods Of Immobilization

(A) Osteosynthesis Without Intermaxillary Fixation

1. Non compression small plates
2. Compression small plates
3. Mini plates
4. Lag screw

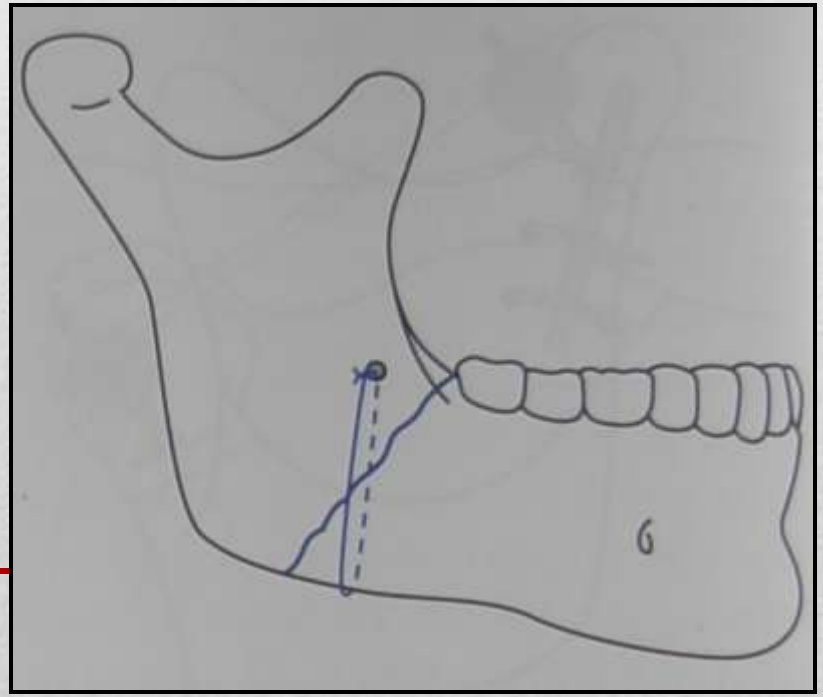
4CIS Mini & Micro Plate/Screw System

(B) Intermaxillary Fixation

1. Bonded brackets
2. Dental wiring
3. Arch bars
4. Cap splints

(C) Intermaxillary Fixation With Osteosynthesis

1. Transosseous wiring
2. Circumferential wiring
3. External pin fixation
4. Bone clamps
5. Transfixation with krischner wires



Trans osseous wiring (osteosynthesis)

Indications:-

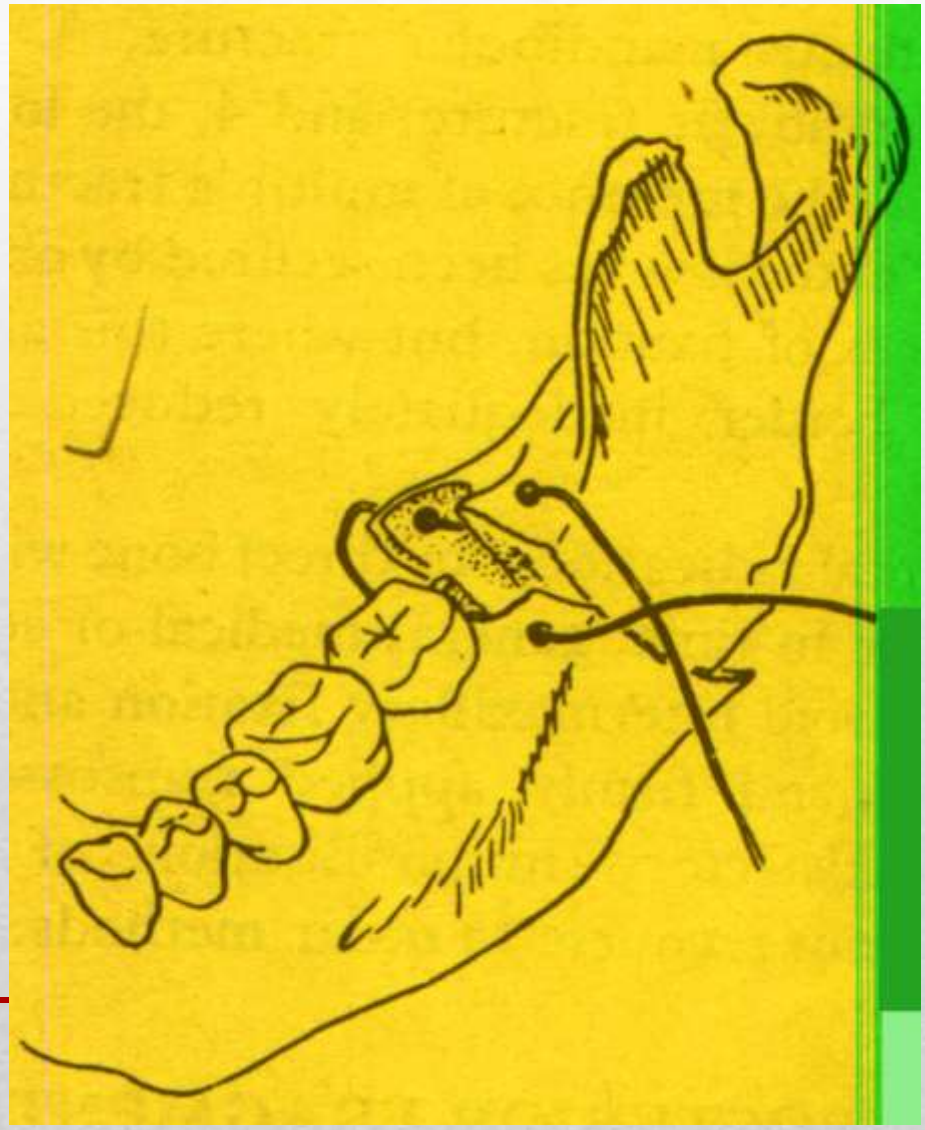
(1) For the control of edentulous posterrior fragment of the mandible.
(2) Edentulous mandibular fracture.
(3) Grossly comminuted fracture.
(4) The lower border of mandible in multiple fractures

Contra indication :-

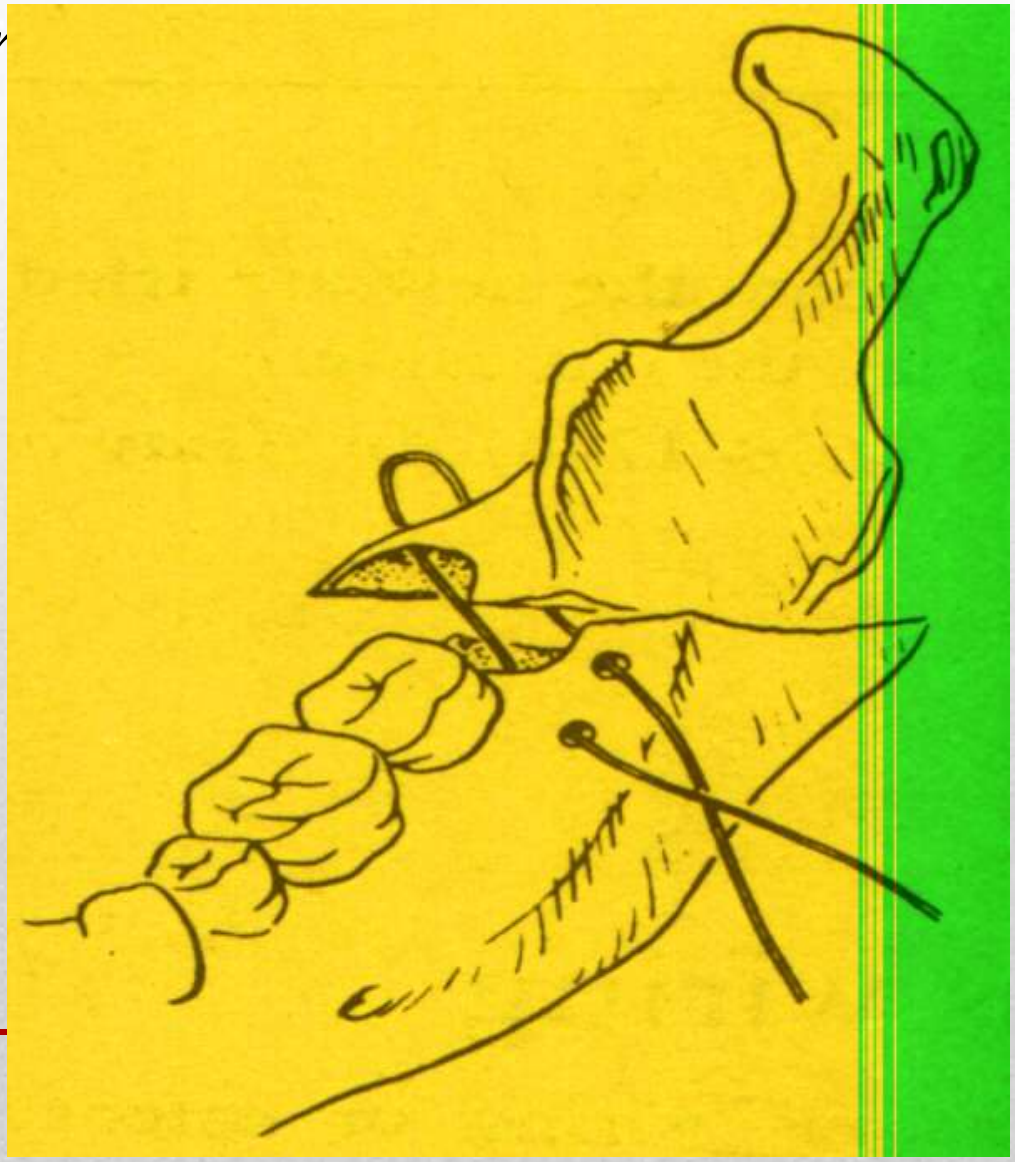
Fracture which are compound into the mouth should be conservatively treated, as chance of infection, sequestration and extrusion of wire.

Upper border wiring :- (Trans alveolar wiring)

It is done in case of vertically and horizontally Unfavourable fracture.



- *Hole in the lingual plate is drilled at higher level, than hole in the anterior fragment (buccal plate)*



Lower border wiring technique (Trans osseous wiring)

Anaesthesia :- General Anaesthesia is prefered. This procedure can be completed under local anaesthesia, augmented with I.V. sedation.

Sterilisation :-

- *Pre operatively, all instruments should be autoclaved, or sharp instruments chemical sterilisation over night.*

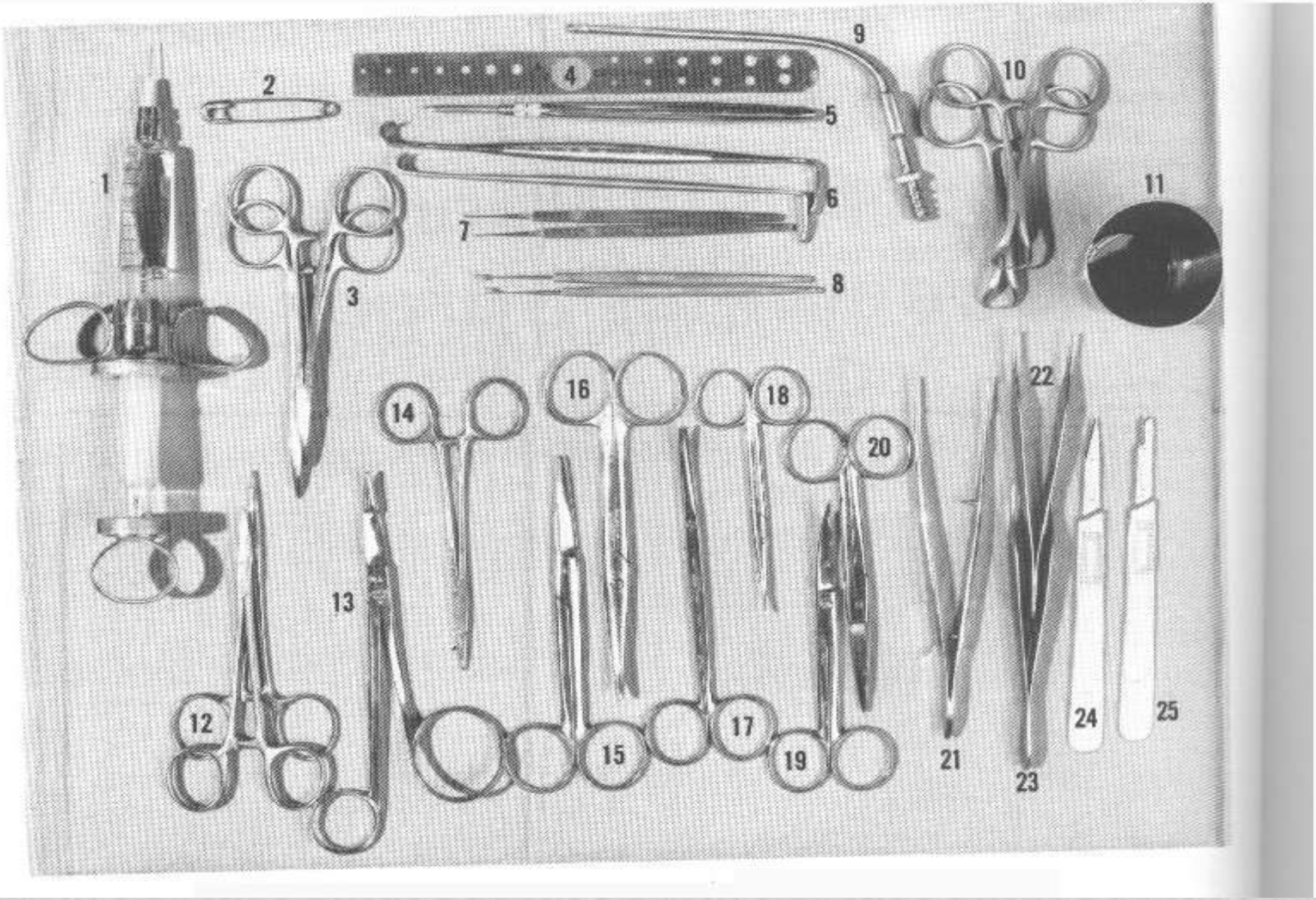
- *Fumigation of operation theatre.*

- *Strict aseptic conditions are maintained during exposure and closure of bone.*

- *'No touch' technique is adopted. Bone holding instruments, drills, are not touched by operator's hand directly.*

- *Oral cavity is excluded from operative site, by sterile drapes, to prevent contamination of saliva.*

Armamentarium :-



Procedure :-

Incision :-

- *Before putting the incision, the assistant will mark the incision line and fracture site and surface land mark of facial vessels, where it will cross the lower border of mandible.*
- *E/o skin incision is placed, below the lower border of mandible, apprx. 1 finger breadth away, into natural skin lines*

- *This incision in plalysma and deep fascia avoids injury to mandibular branch of facial nerve.*

- *It is helpful to infiltrate L.A. Solution with Adrenalin into the tissues. It helps in defining tissue planes and achieves haemostasis.*

- *Before infiltration, permission from anaesthetist should be taken, to avoid the risk of cardiac arrythemias or ventricular fibrillation.*

- *After skin incision, platysma is exposed. and minor bleeding points may be secured or cauterized.*

- *Blade used for the skin incision should be removed and fresh blade is used to avoid contamination of skin organisms in to deep tissues.*

- *Pltaysma is divided and retracted upwards with the skin flap upwards.*

- *Branches of the facial vessels are identified, clamped, cut or ligated.*

- *Blunt and sharp dissection is carried out.*

- *After the facial vessels are dissected or ligated, (with 3-0 catgut) lower border of the mandible can be palpated.*

- *If the cut in the masseter muscle is required, it is cut 5 - 8mm upward from the lower border (its insertion).*

- *Periosteum is also cut and retracted upwards about 1cm.,Taking care, not to perforate the oral mucosa. And avoiding injury to mental nerves.*

- *The periosteum and the tissues on the medial surface are also retracted upwards up to 1cm.*

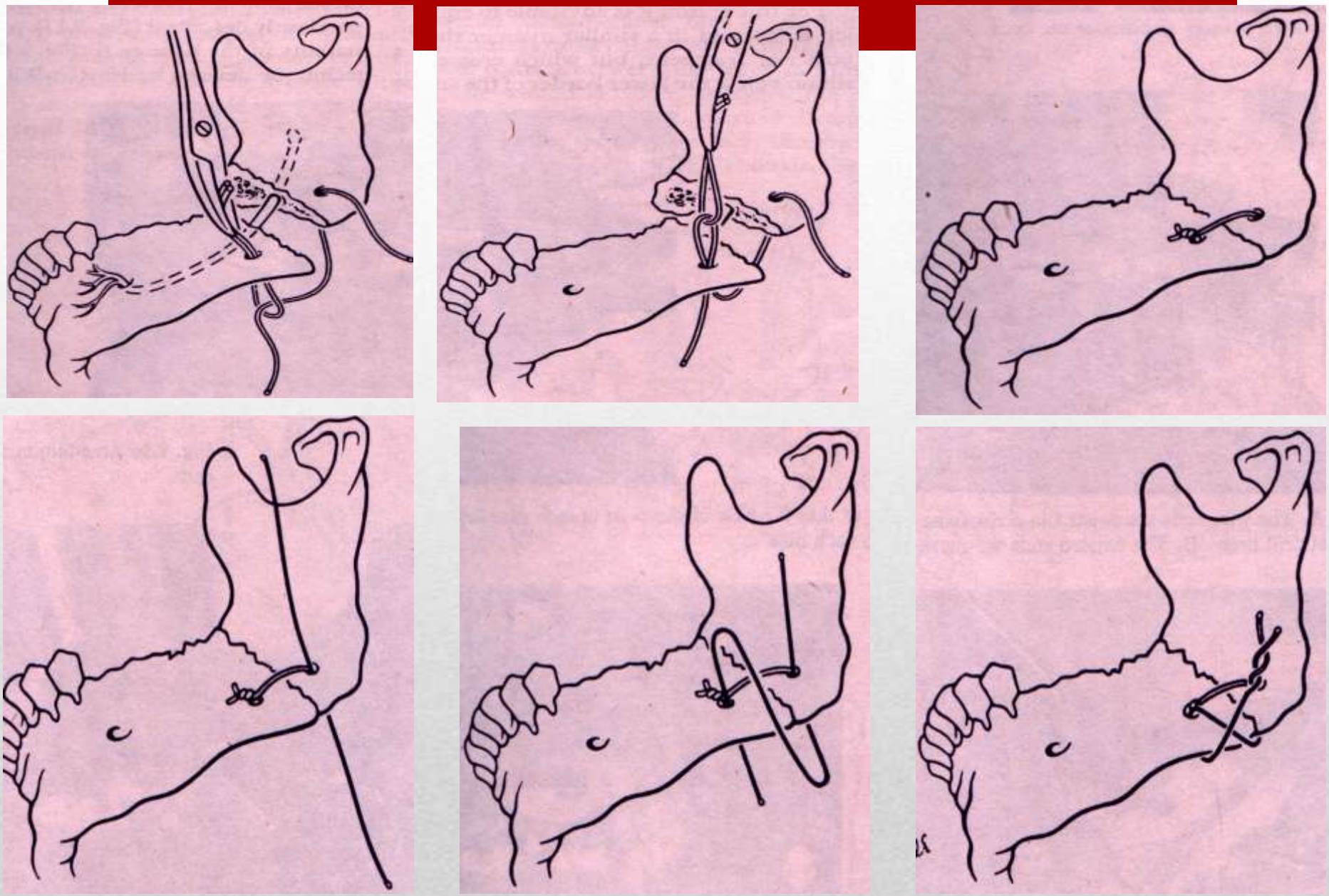
- *The end of the bones are held by bone holding forceps.*

- *This forceps have a hole though the upper blade, to enable the drill to pass through and lower blade will act as guard for deeper tissues.*

- *Hole is drilled with 6 no round bur in a straight hand piece.*

- *The hole in the posterior fragment should be at higher levels than the hole in anterior fragment, so that tension in wire acts at right angles to the unfavourable fracture line.*

- *The hole in drilled, in such a way that the injury to Inf. dental neuro vascular bundle is avoided.*



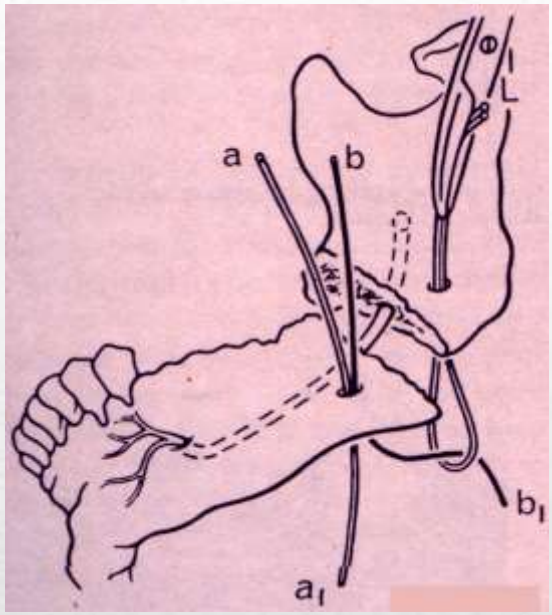
Technique for insertion of the transosseous wires

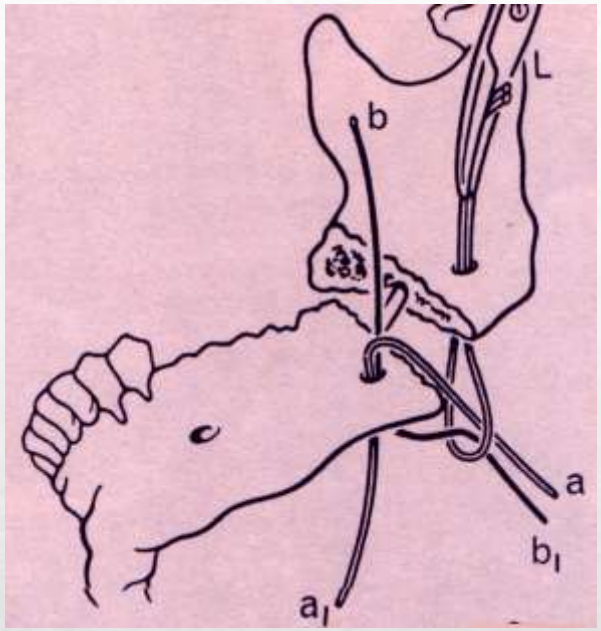
- *'26' gauge, st. steel wire is passed in the hole and tightened. Twisted ends are cut short and projecting ends are turned over and pressed in to the anterior hole in bone.*

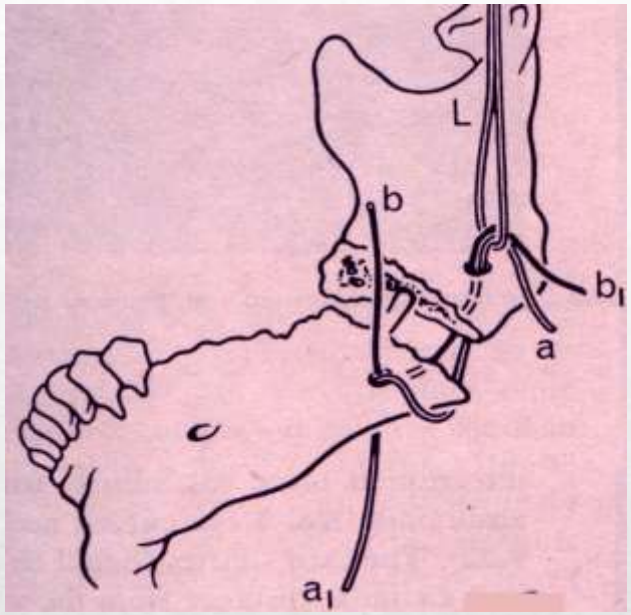
- *Before final tightening, I.M.L. is carried out in normal occlusion.*

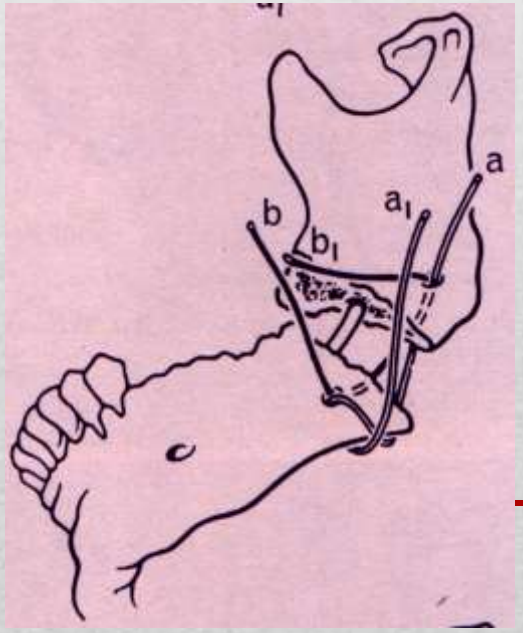
- *Tongue is sutured with 2 0 silk to keep in a protruded position to avoid tongue fall after recovery from G.A.*

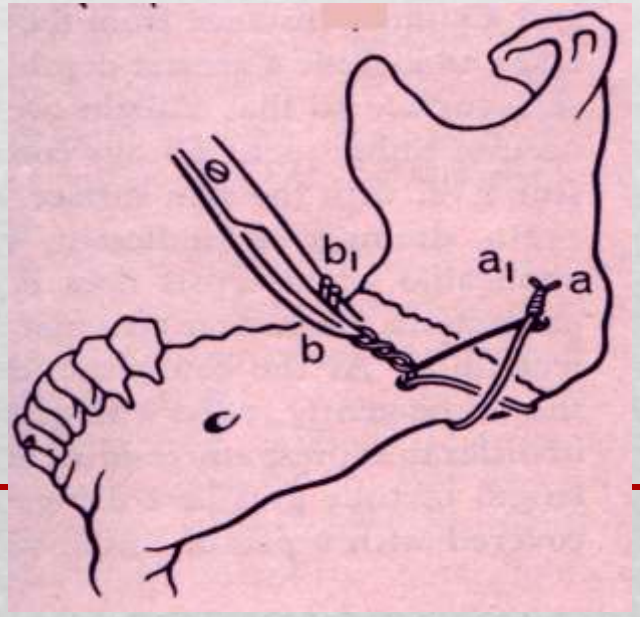
Hayton William's Method.

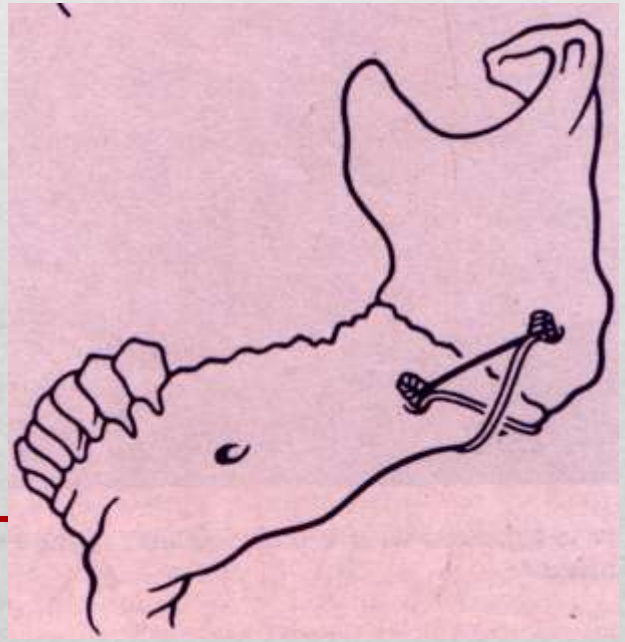










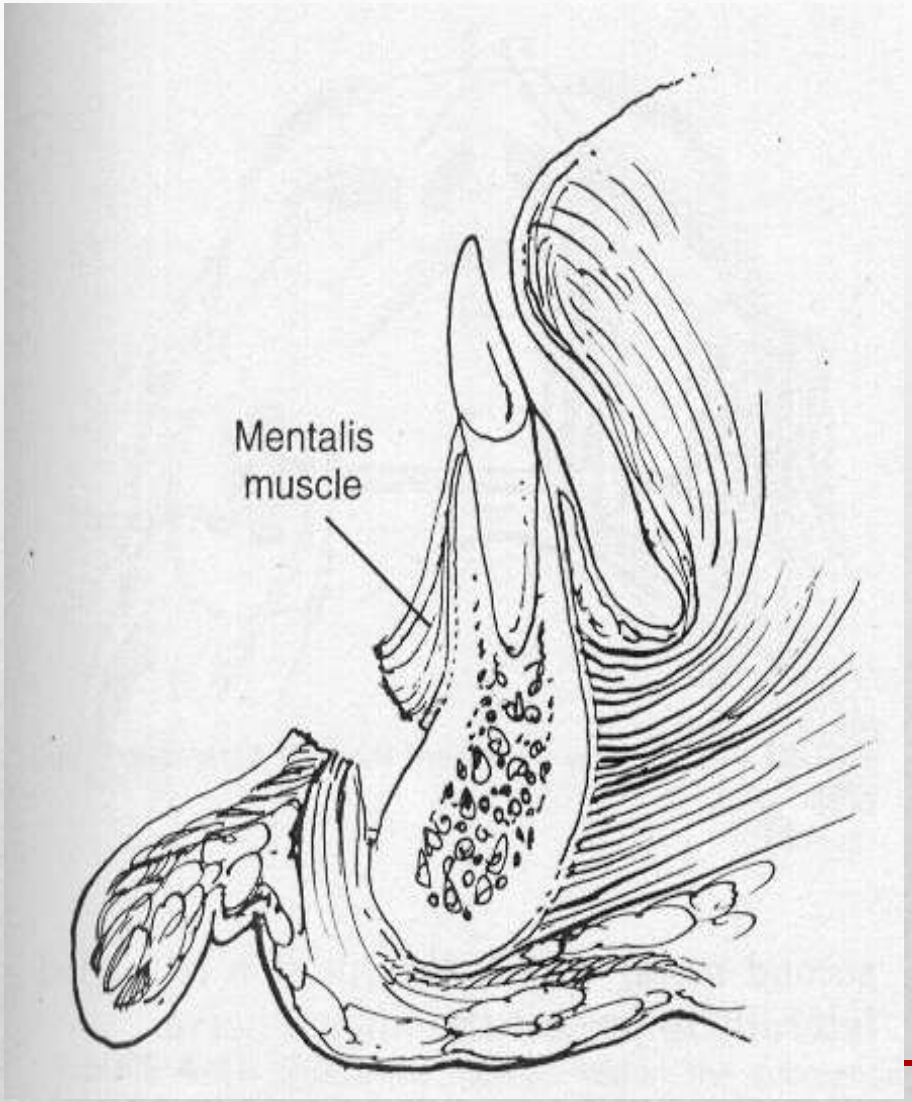


Wound closure :-

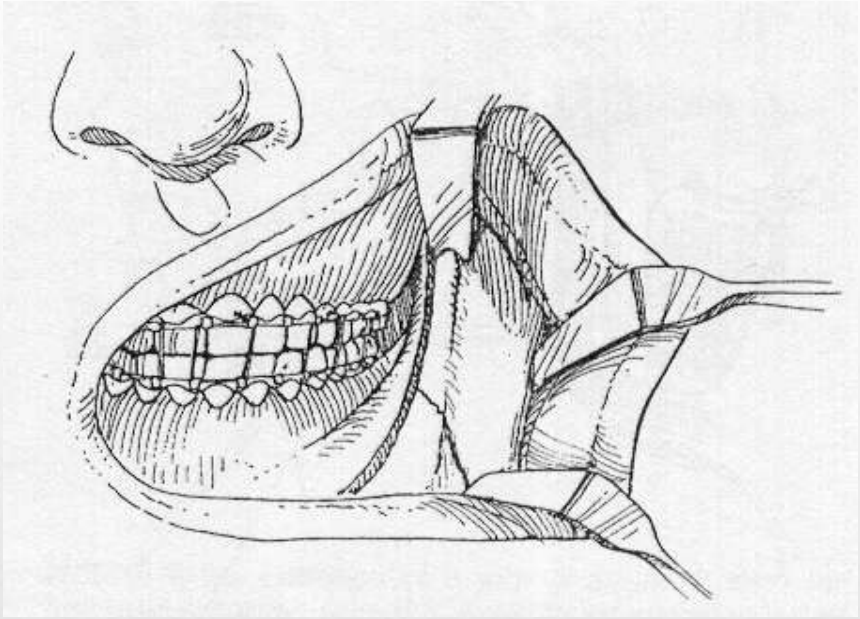
- *It is performed in layers.*
- *Deep fascia and periosteum are sutured with 3-0 interrupted cat gut sutures, the knot being tied in deep surface. platysma is also sutured in same manner.*
- *Skin is closed with atraumatic needle, no.3, with eye 4-0 or 5-0 silk sutures.*

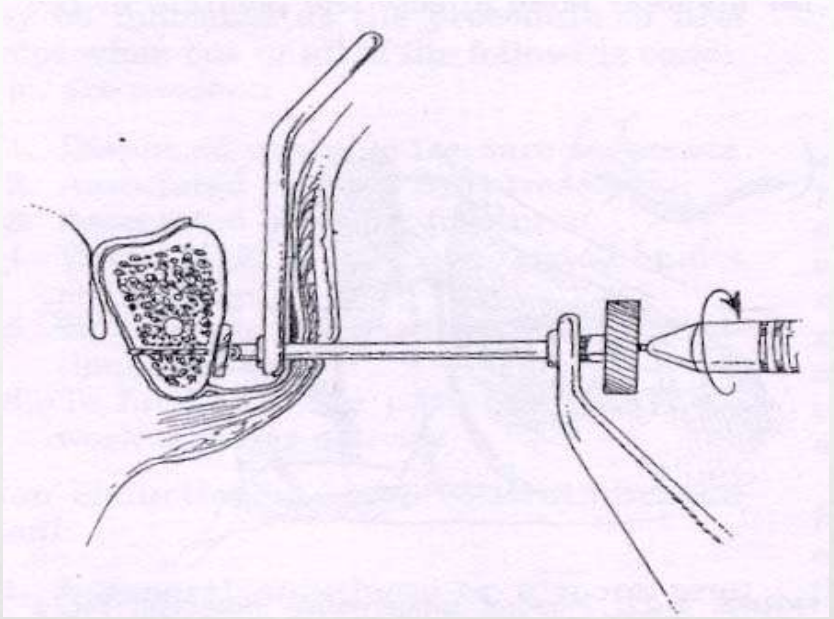
- *skin sutures are taken with tension so eversion of margin takes place.*
- *No drainage tube is required as it is carried out in aseptic area with good haemostasis*
- *Dry Dressing is given.*
- *Sutures (skin) are removed after 7 days.*
- *Postoperative antibiotics, anti inflammatory drugs are given.*

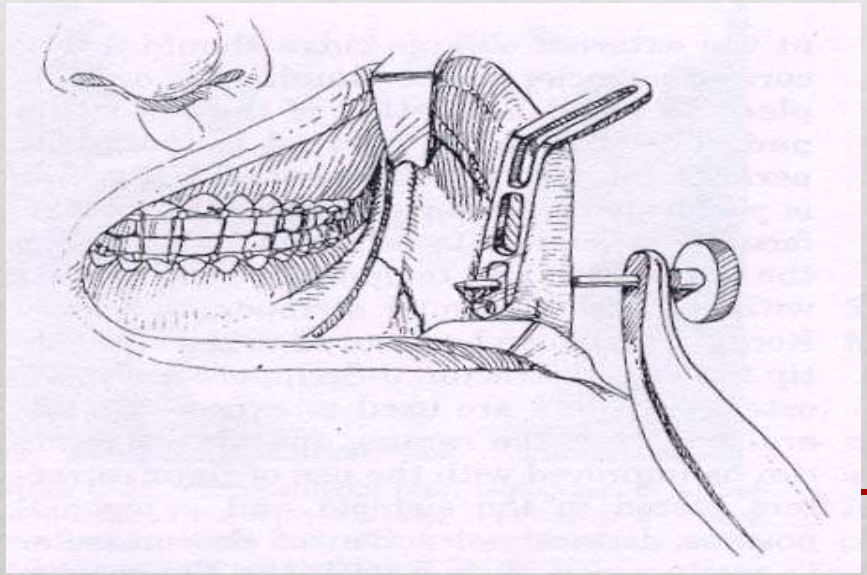
Surgical Approaches To The Mandible



Intraoral symphysis and paarasymphysis



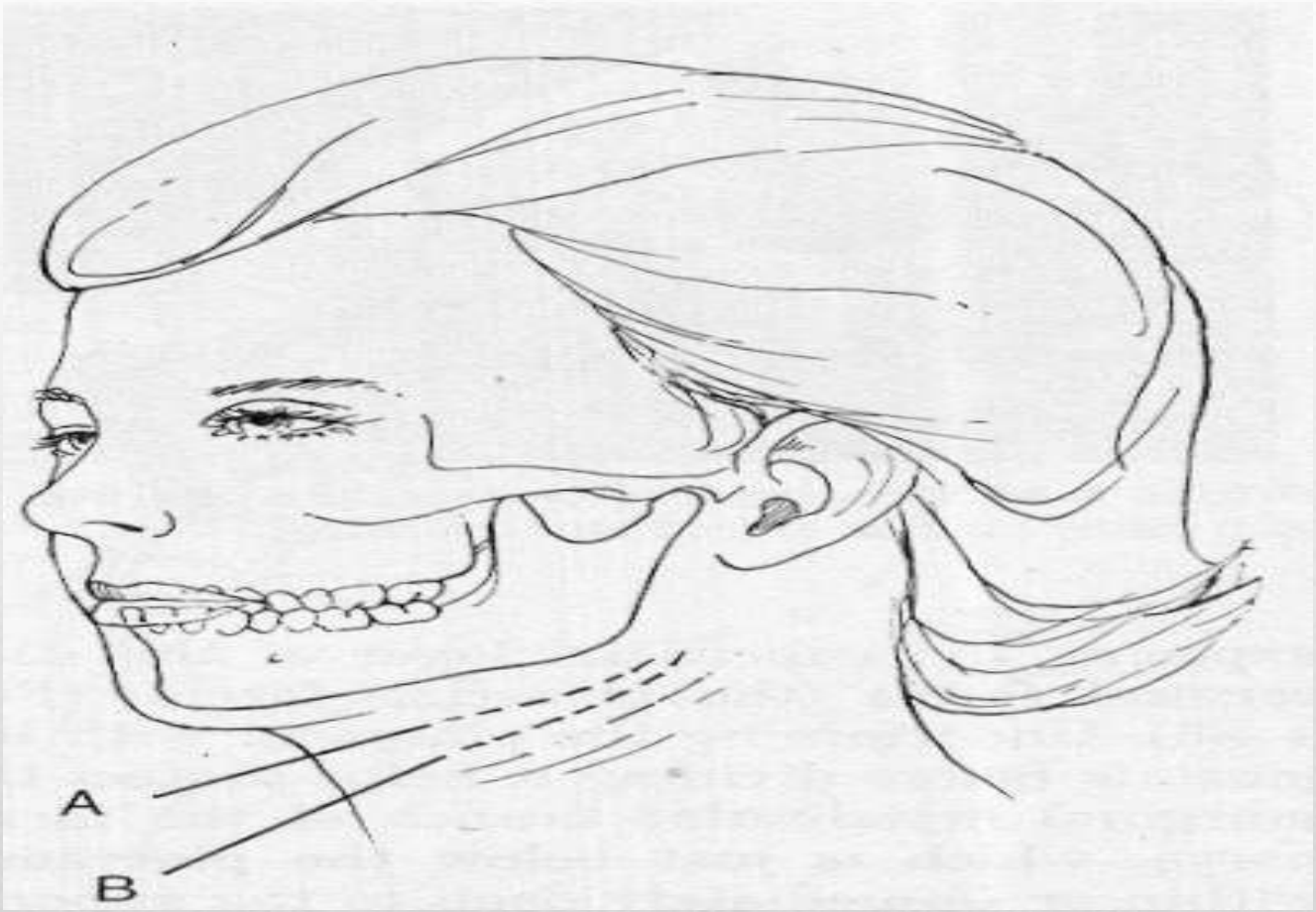




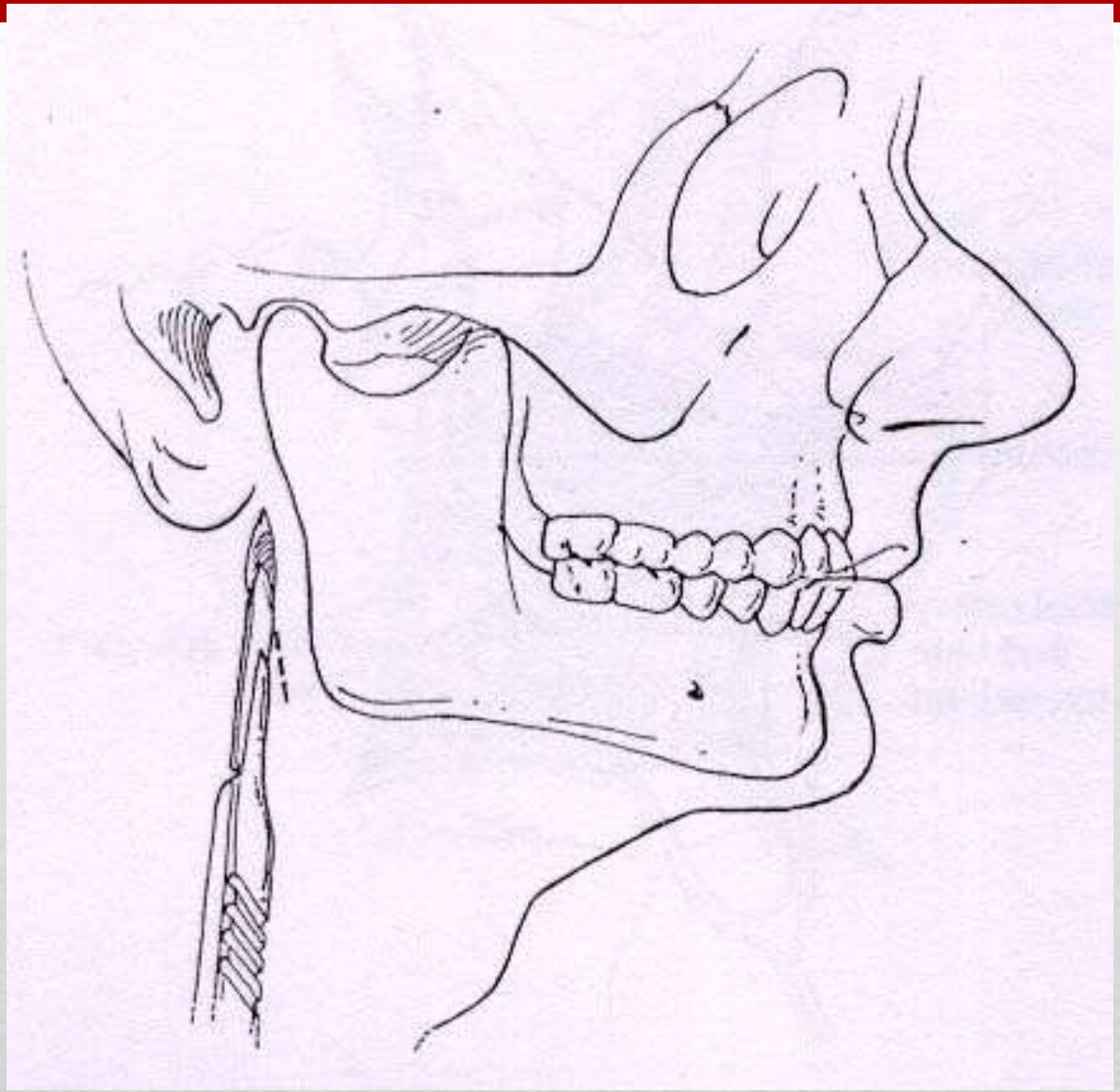
Intraoral body, angle and ramus

Extra oral Approaches

Submental



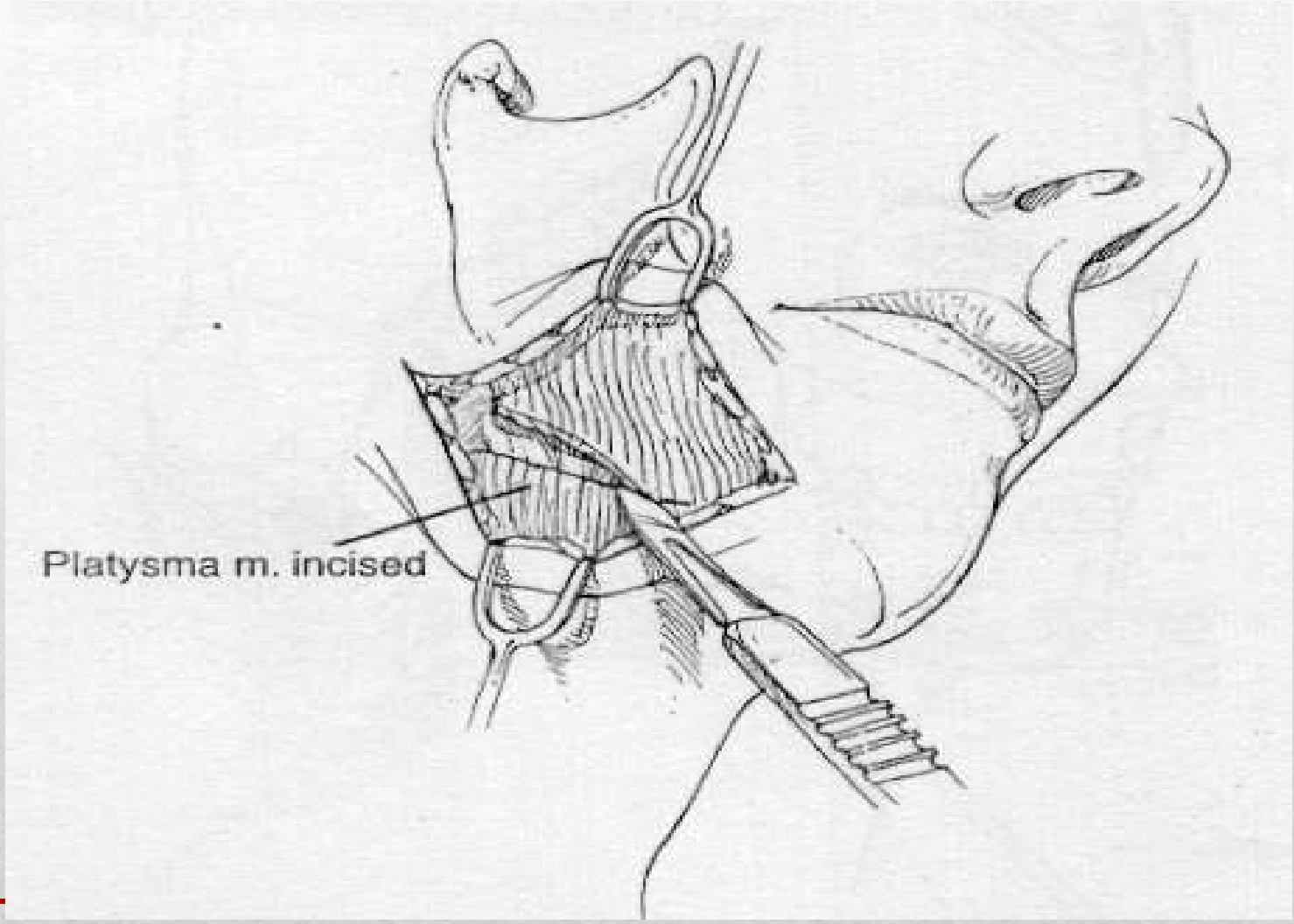
Submandibular



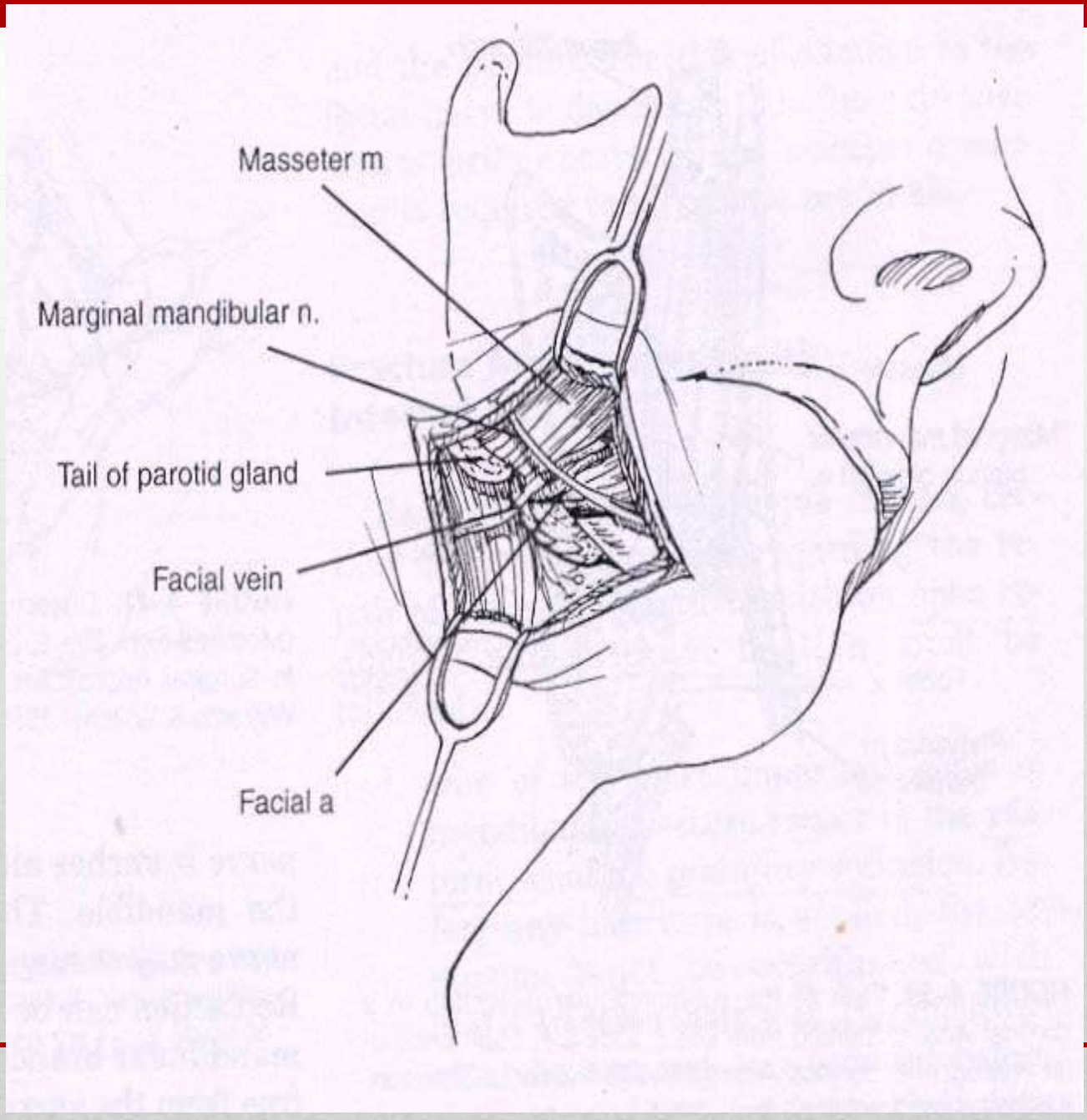
Retromandibular

Submandibular Approach

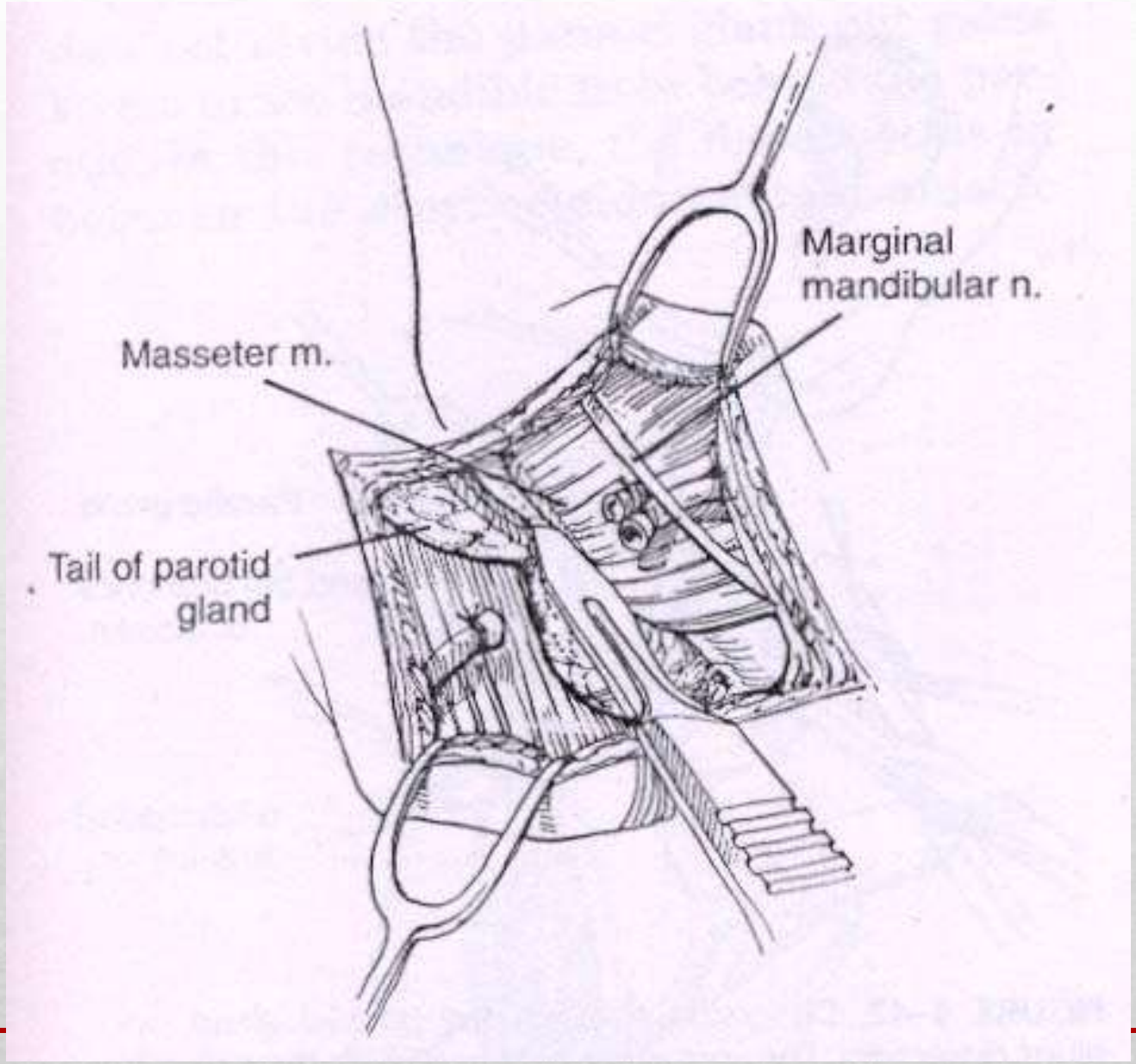
1)



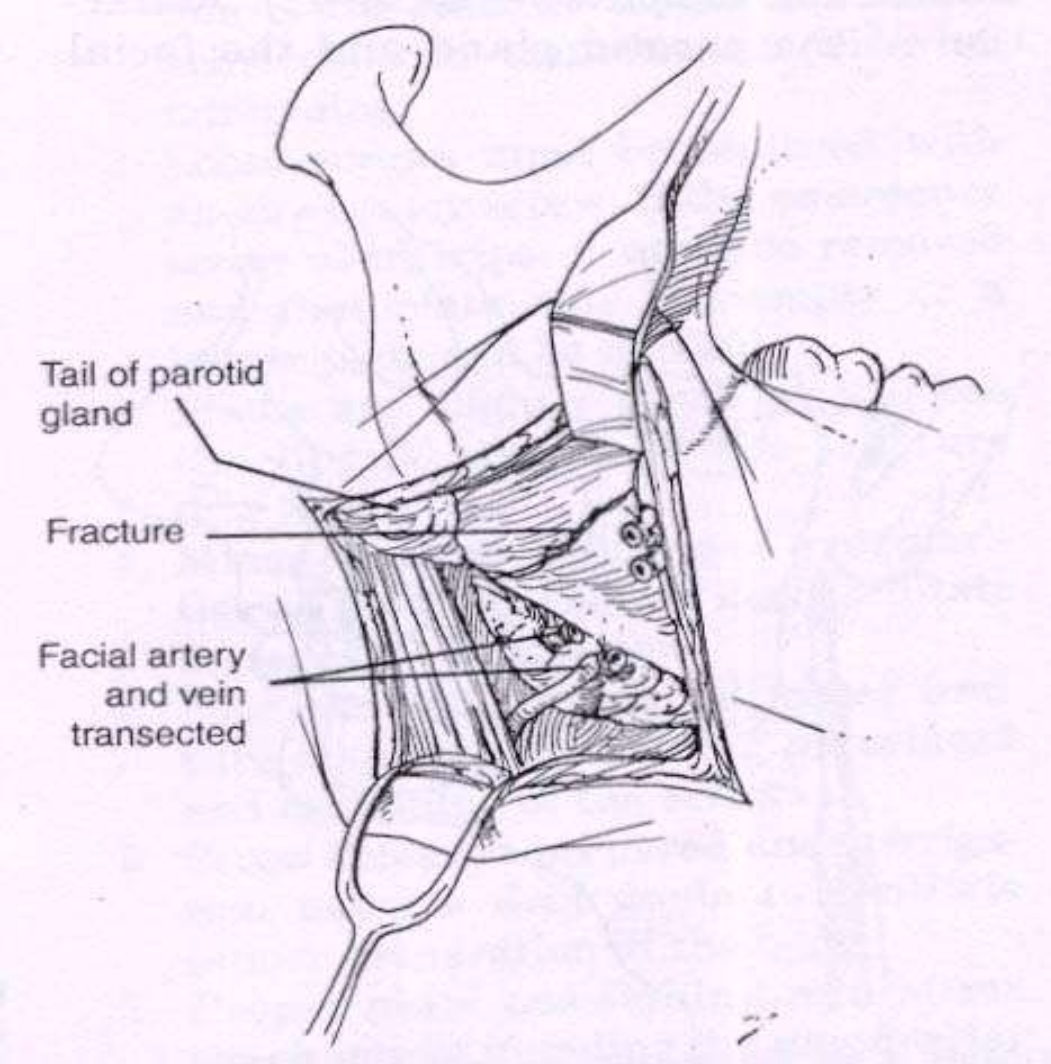
2)


Masseter m
Marginal mandibular n.
Tail of parotid gland
Facial vein
Facial a

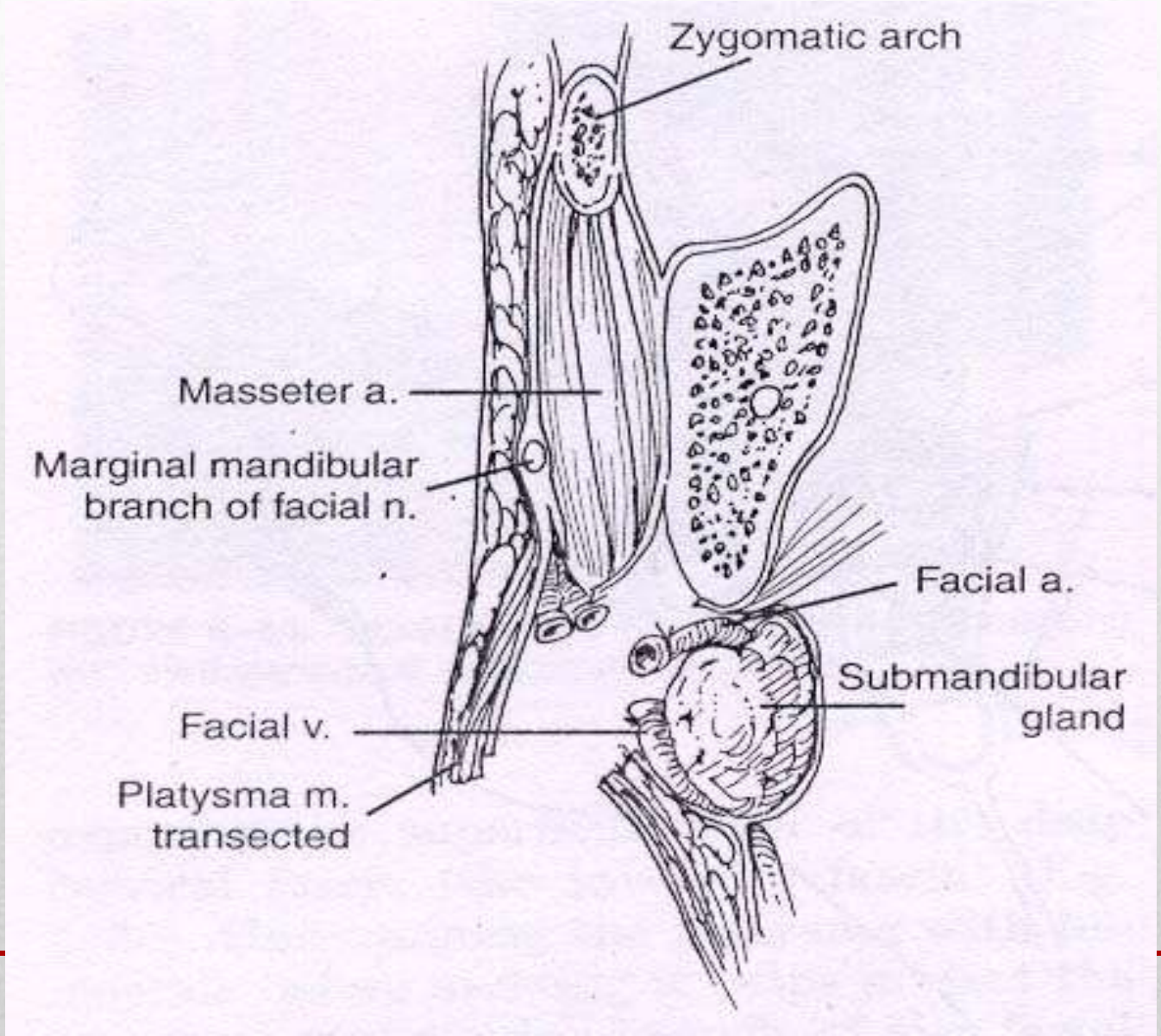
3)



4)

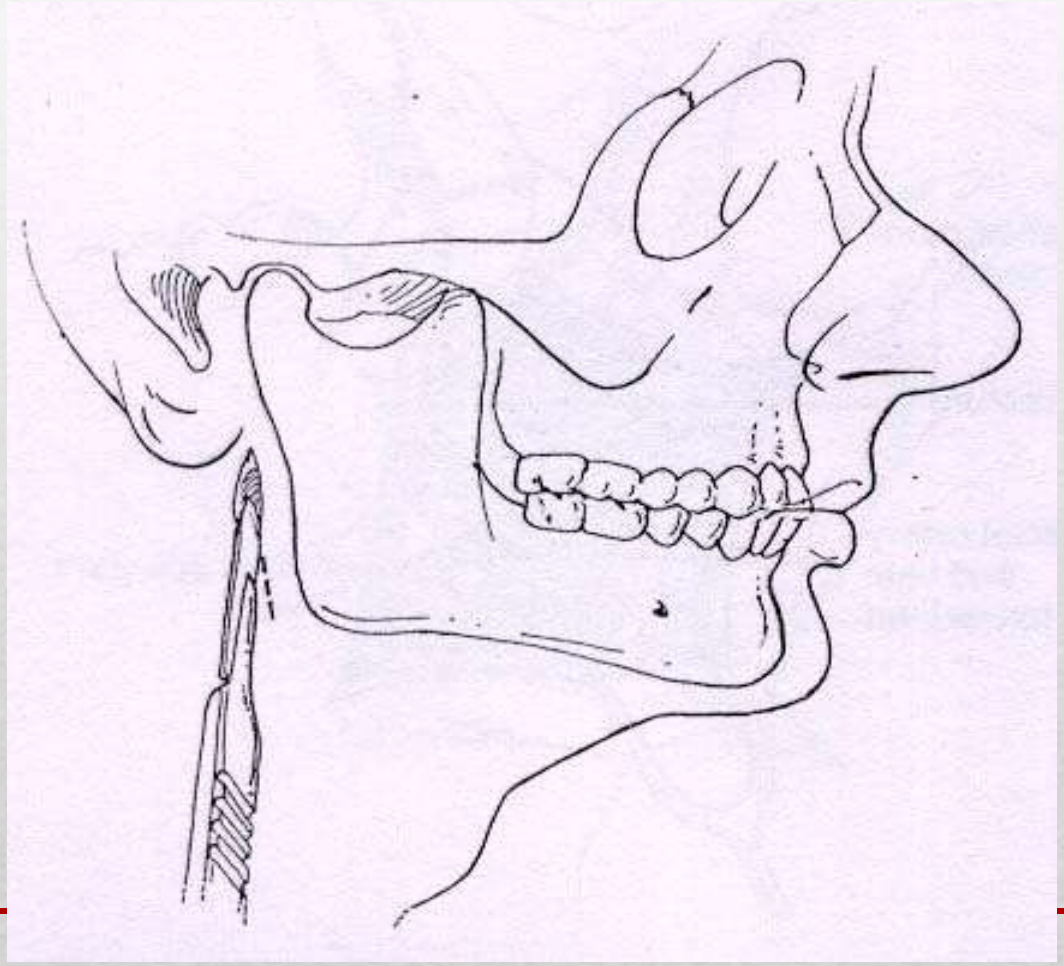

Tail of parotid gland
Fracture
Facial artery and vein transected

5)

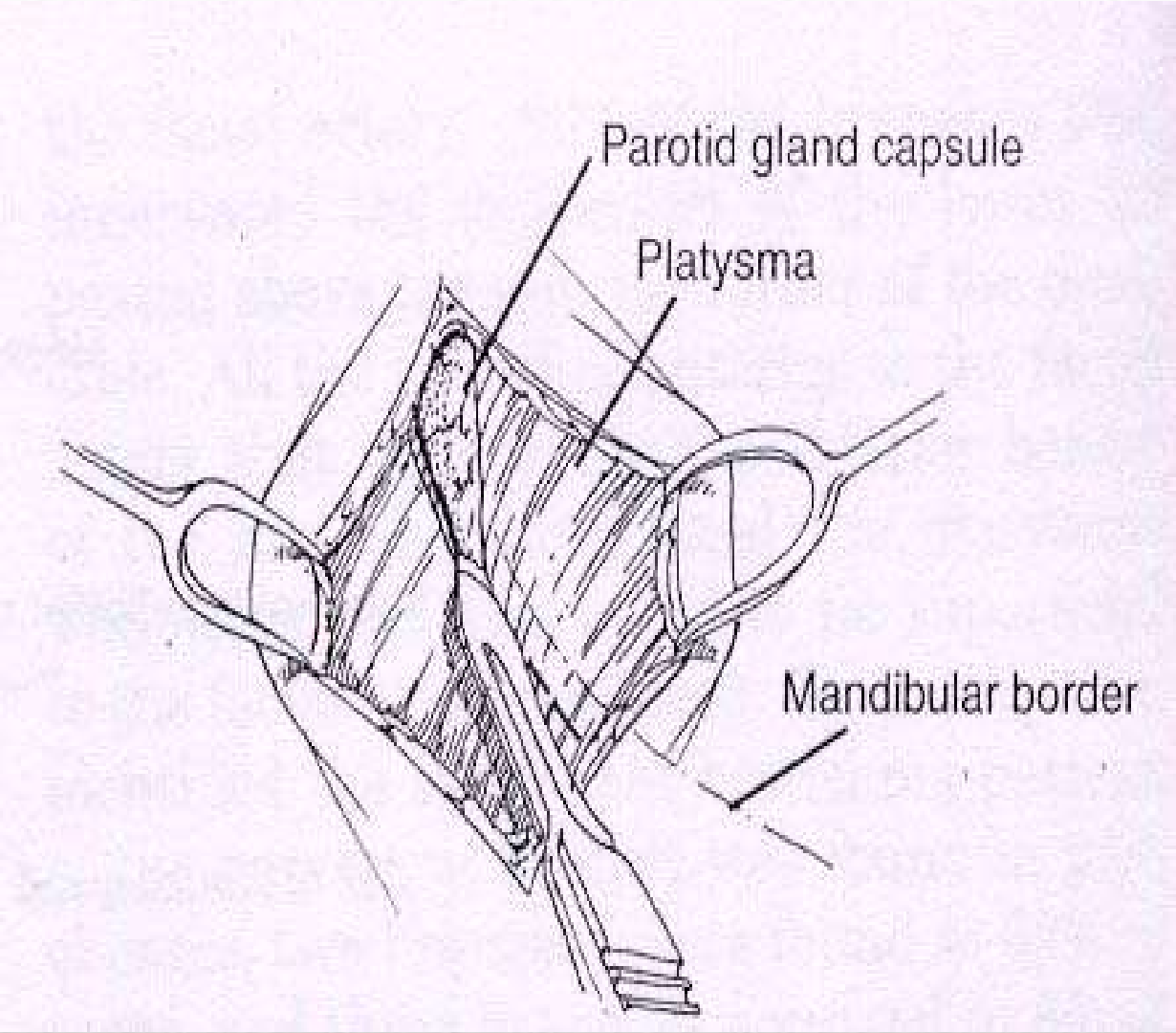

Zygomatic arch
Masseter a.
Marginal mandibular branch of facial n.
Facial a.
Submandibular gland
Facial v.
Platysma m. transected

Retromandibular Approach

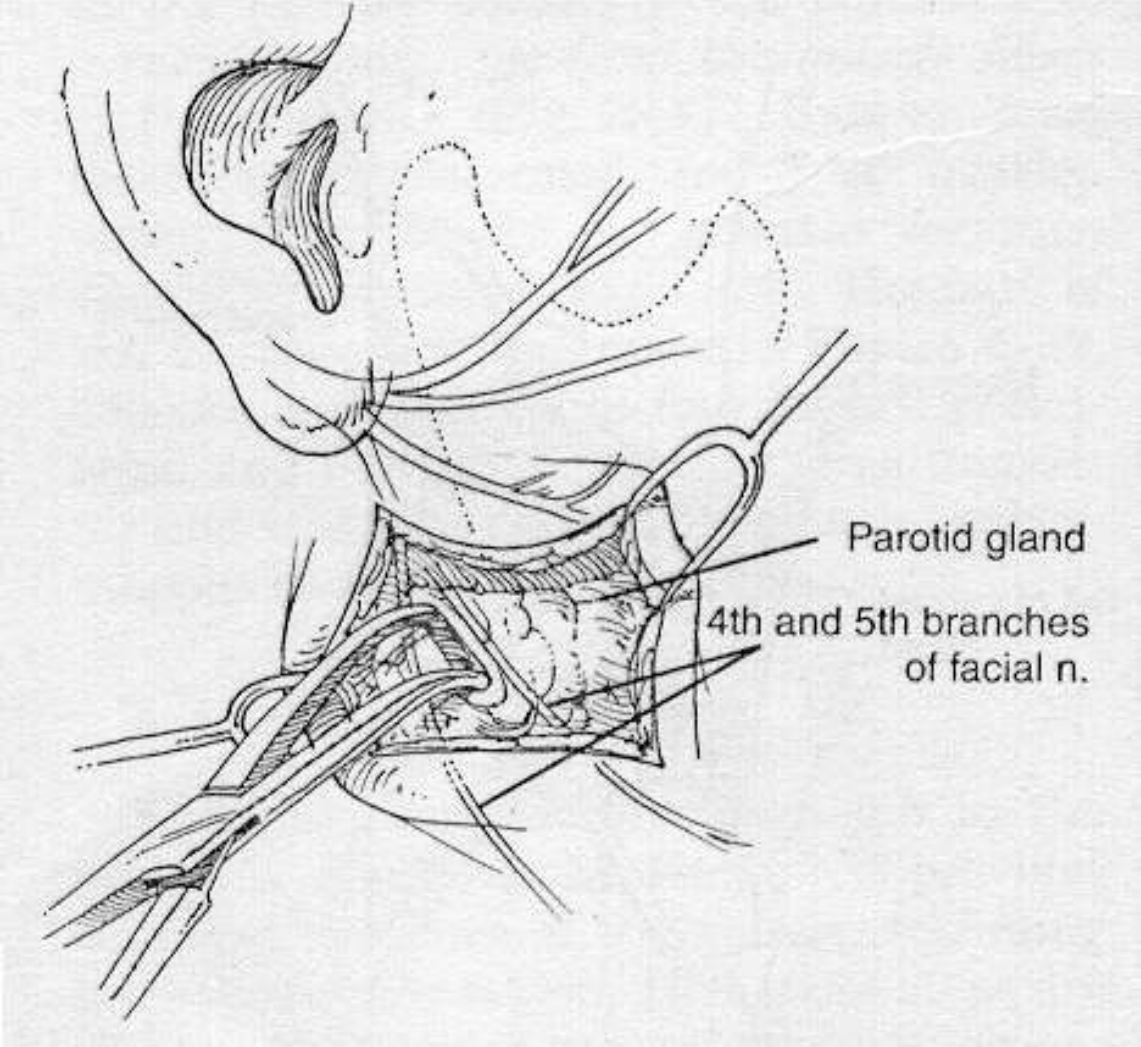
1)



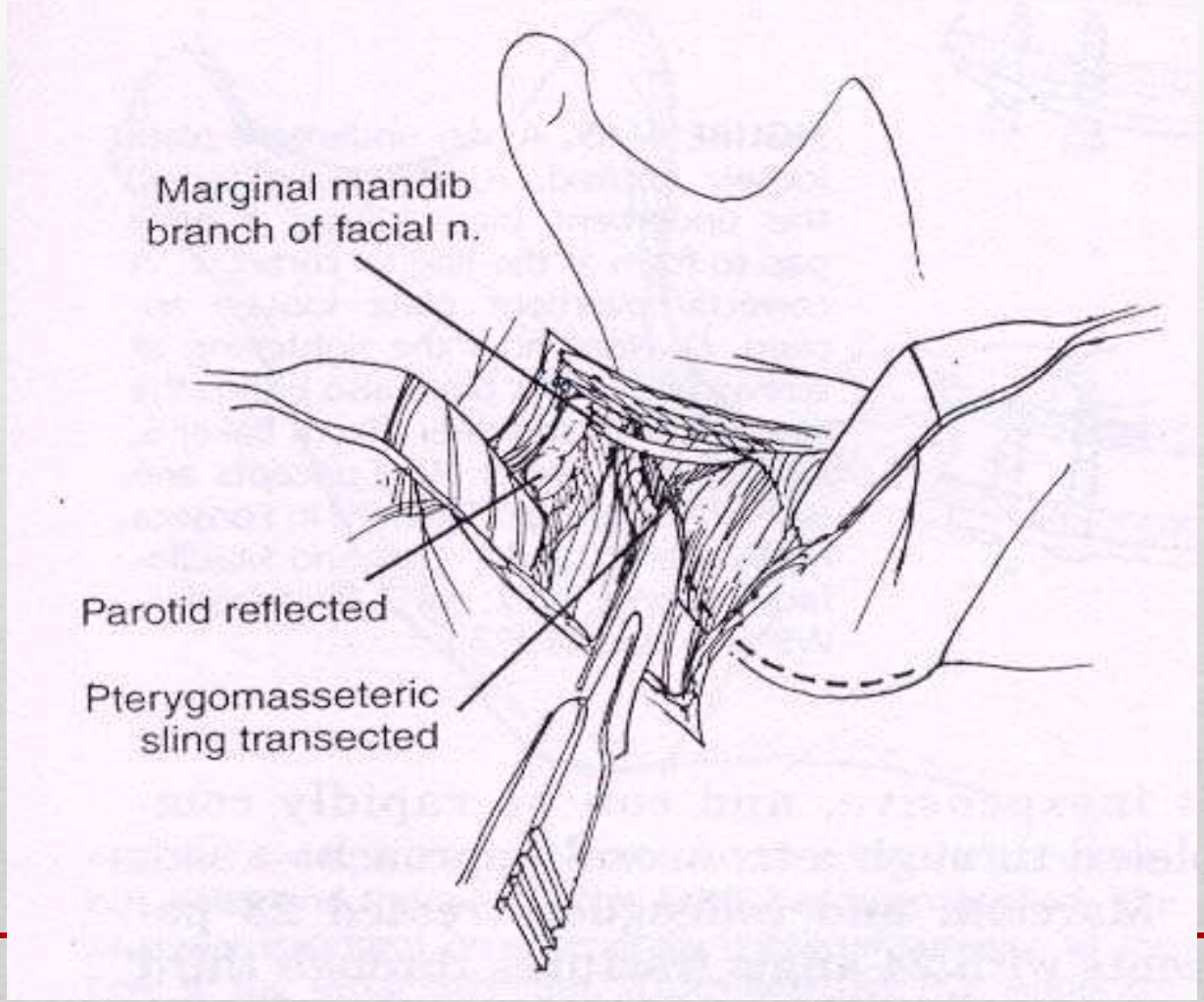
2)



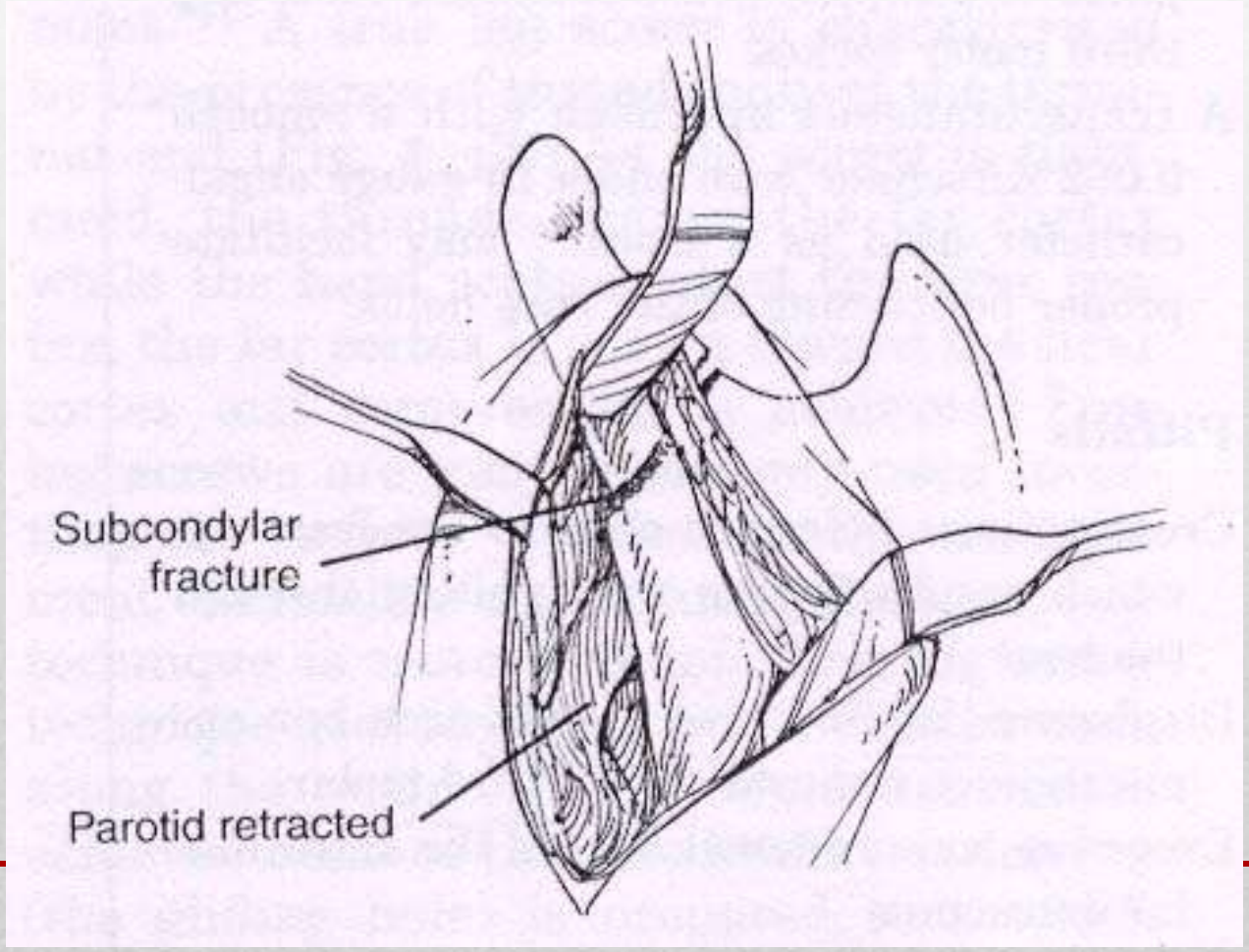
3)

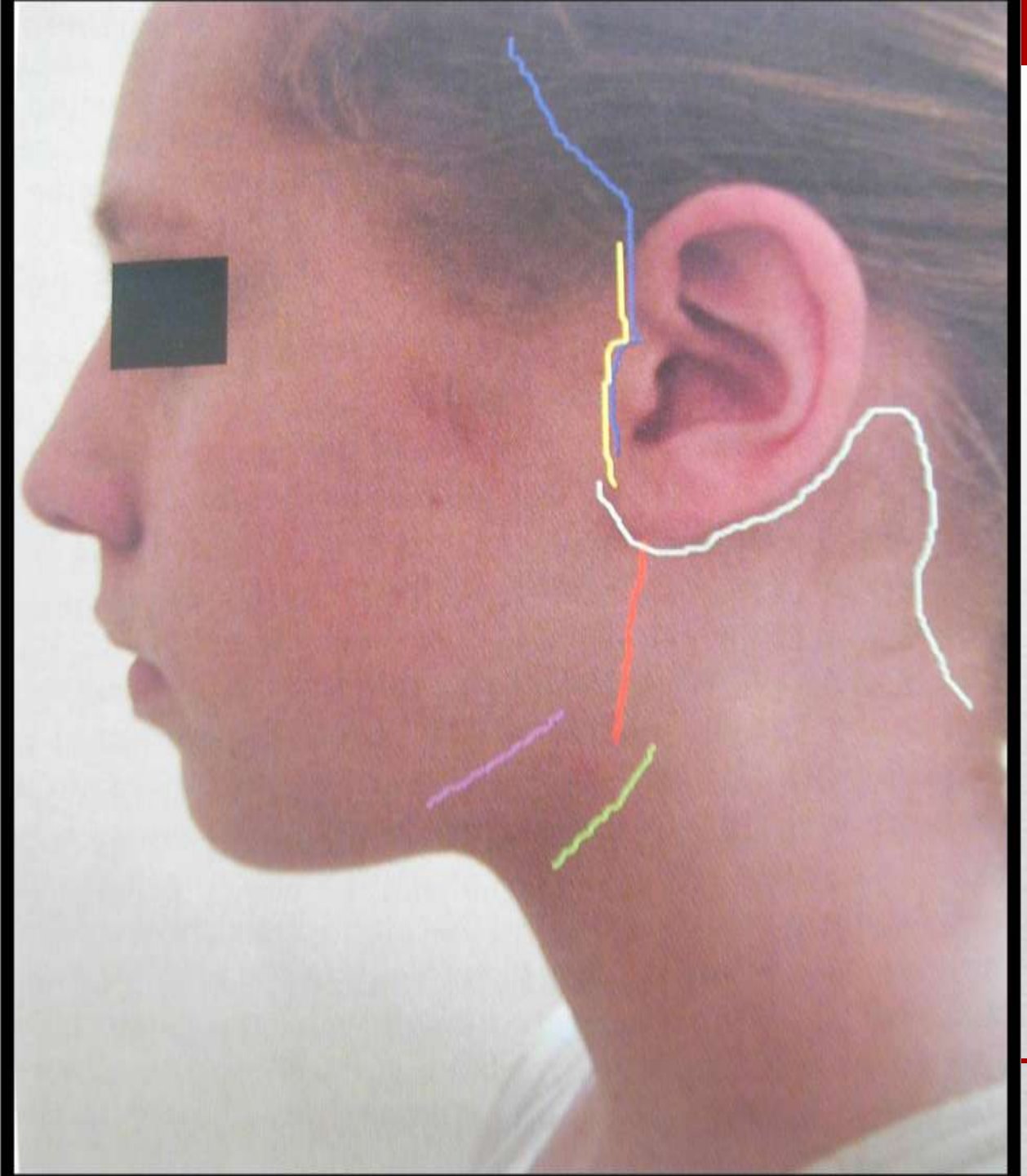


4)


Marginal mandib
branch of facial n.
Parotid reflected
Pterygomasseteric
sling transected

5)





Position of the various Incisions

Blue: bramley al quayal

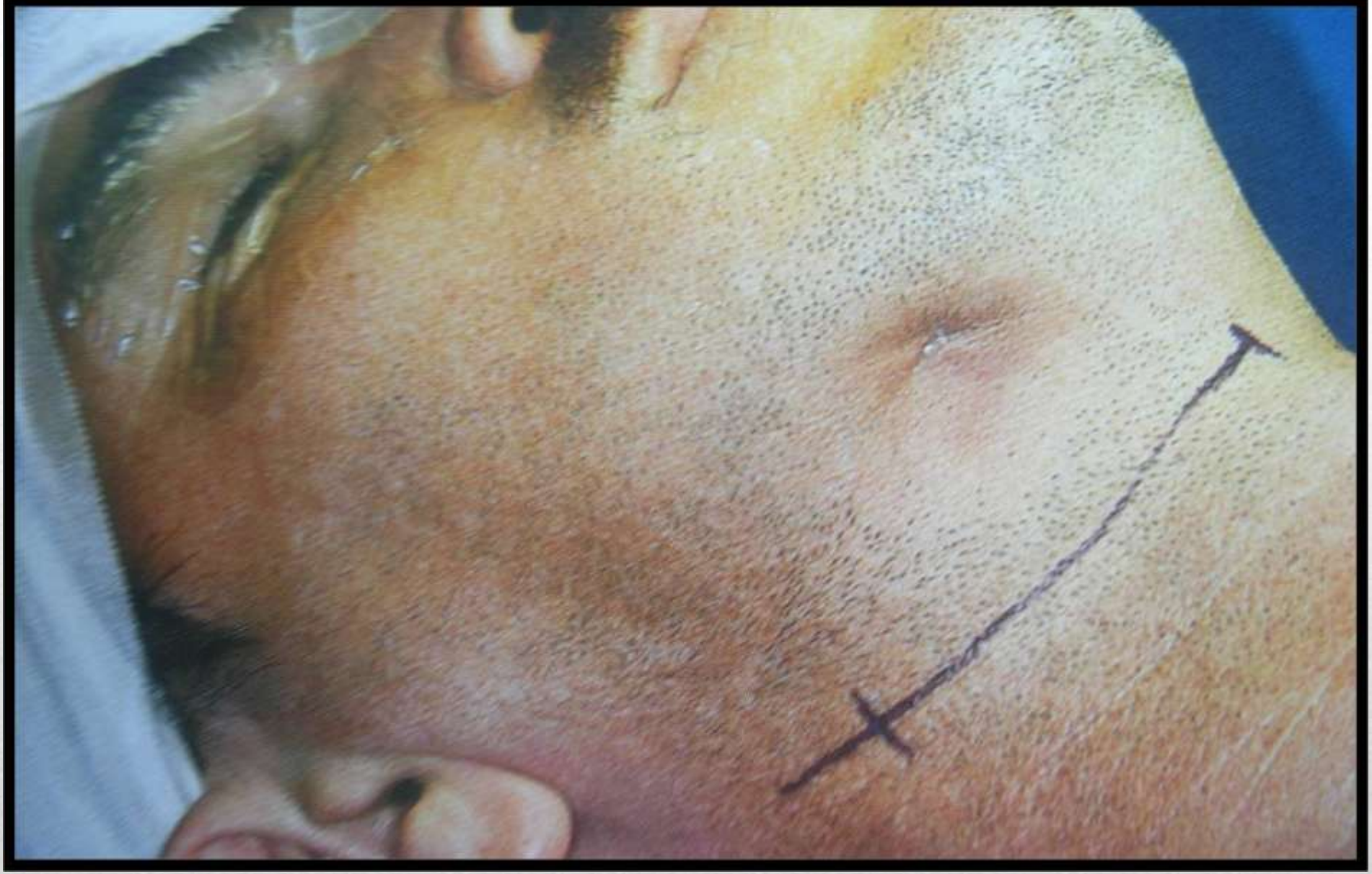
Yellow: pre-auricular

Red: retromandibular

Green: submandibular

Purple: submandibular (continontal)

Turquoise: rhytidectomy



Patient With Non Union Of Left Mandibular Body

Approached Via Submandibular Cervical Incision

Bone Plating

Bone Plating

Advantages:

- Rigid or stable fixation
- Obviates the need for immobilization of the mandible
- Early returns to home
- Soft diet to be taken
- Maintenance of oral hygiene
- Useful in mentally challenged and physically handicapped patient.
- Maintenance of airway in multiple fractures

Indication

- *In epileptic or mentally retarded patients, who are un-co-operative.*
- *Head injury in association with persistent cerebral irritation.*
- *where actual or obstruction of airway is anticipated, fixation of fragment is necessary, by bone plates.*
- *In elderly, thin atrophic edentulous mandible.*

- *Patients in whom associated fracture of zygomatic arch, condyle and coronoid are there, where early mobilisation is required to avoid chances of ankylosis.*

- *Badly displaced fractures.*

- *As a bridge across an area of extensive comminution, where transosseous wiring would be too destructive.*

- *Bone plating of mandible is useful when, fractured mandible has to be used as stable plateform or reference point, to which fracture maxilla can be reduced.*

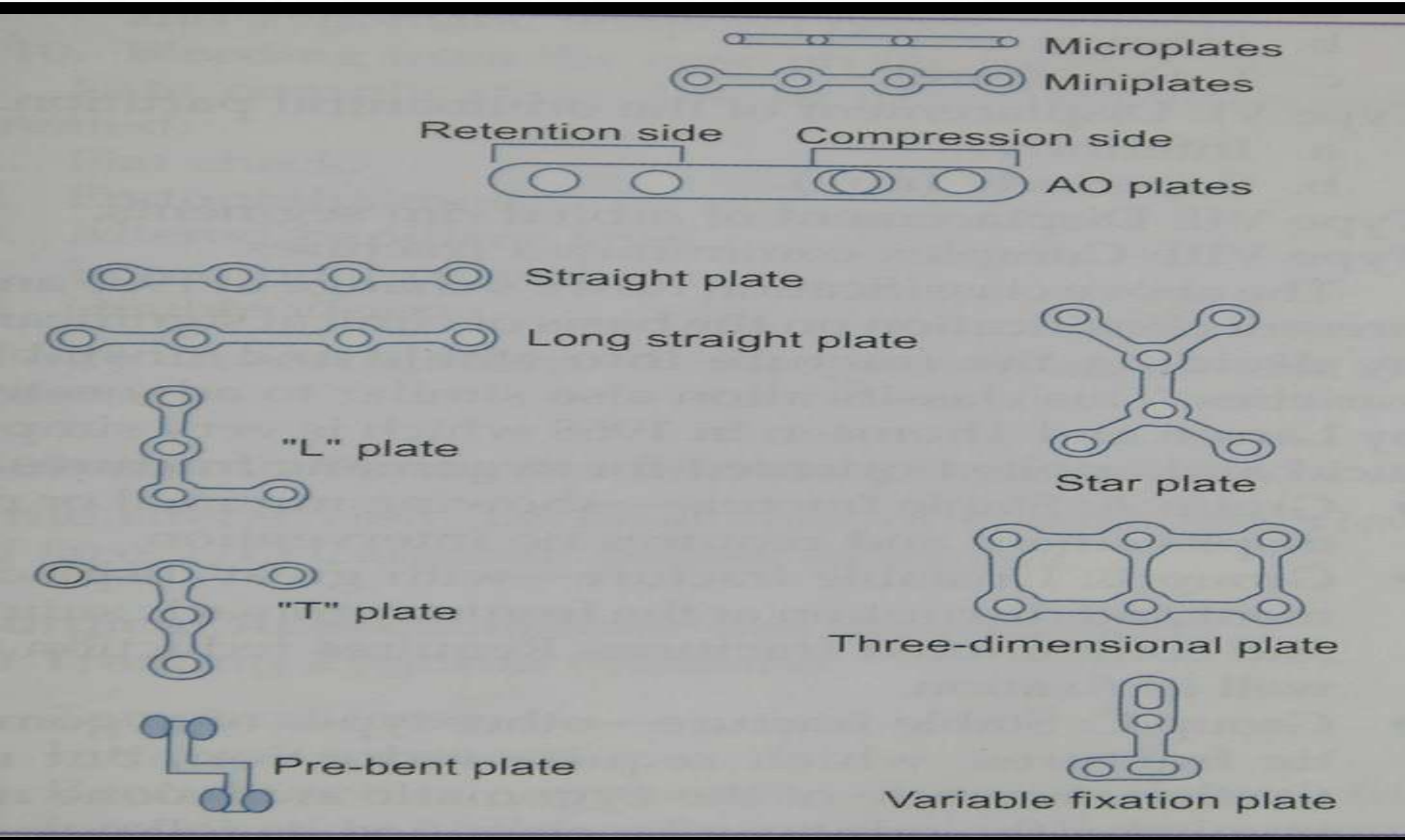
Contra indications

- *Gross contamination of the area.*
- *Extensive comminution of the bone.*
- *The presence of intra oral, or extra oral wounds not capable of immediate and complete closure following reduction of fracture.*
- *Pathological abnormalities of bone.*

Points to be considered while plating

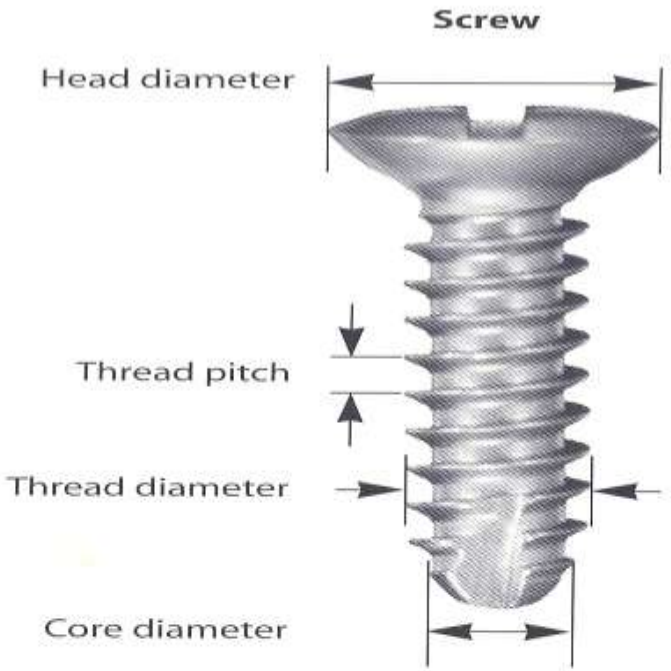
- Screws should be positioned in such away that it avoids injury to inf. alv. neuro vascular bundle and apices of teeth.
- In elderly, thin atrophic edentulous mandible, extra periosteally bone plates are applied, to avoid un necessary stripping of periosteum and to maintain the vitality of the bone.
- Plates may be bent slightly to contour of the bone. Over contouring will break the bone plate, as titanium is brittle.
- Screws can be engaged in one cortex only.

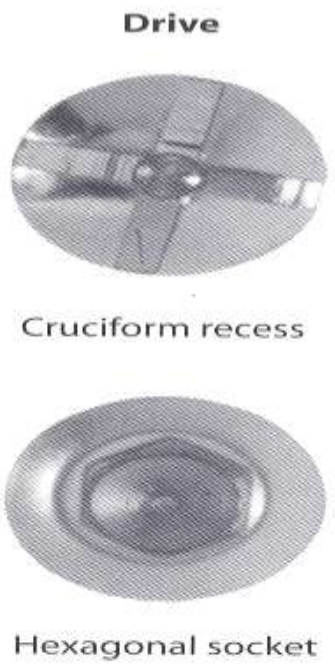
Different Shape And Size Of The Plates



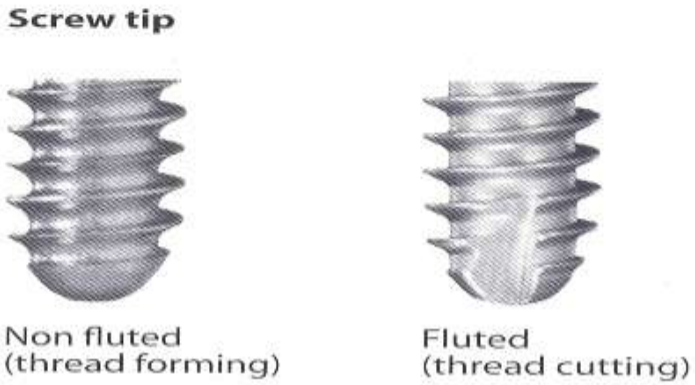
Instrumentation :

Screws (1mm – 2.7mm)





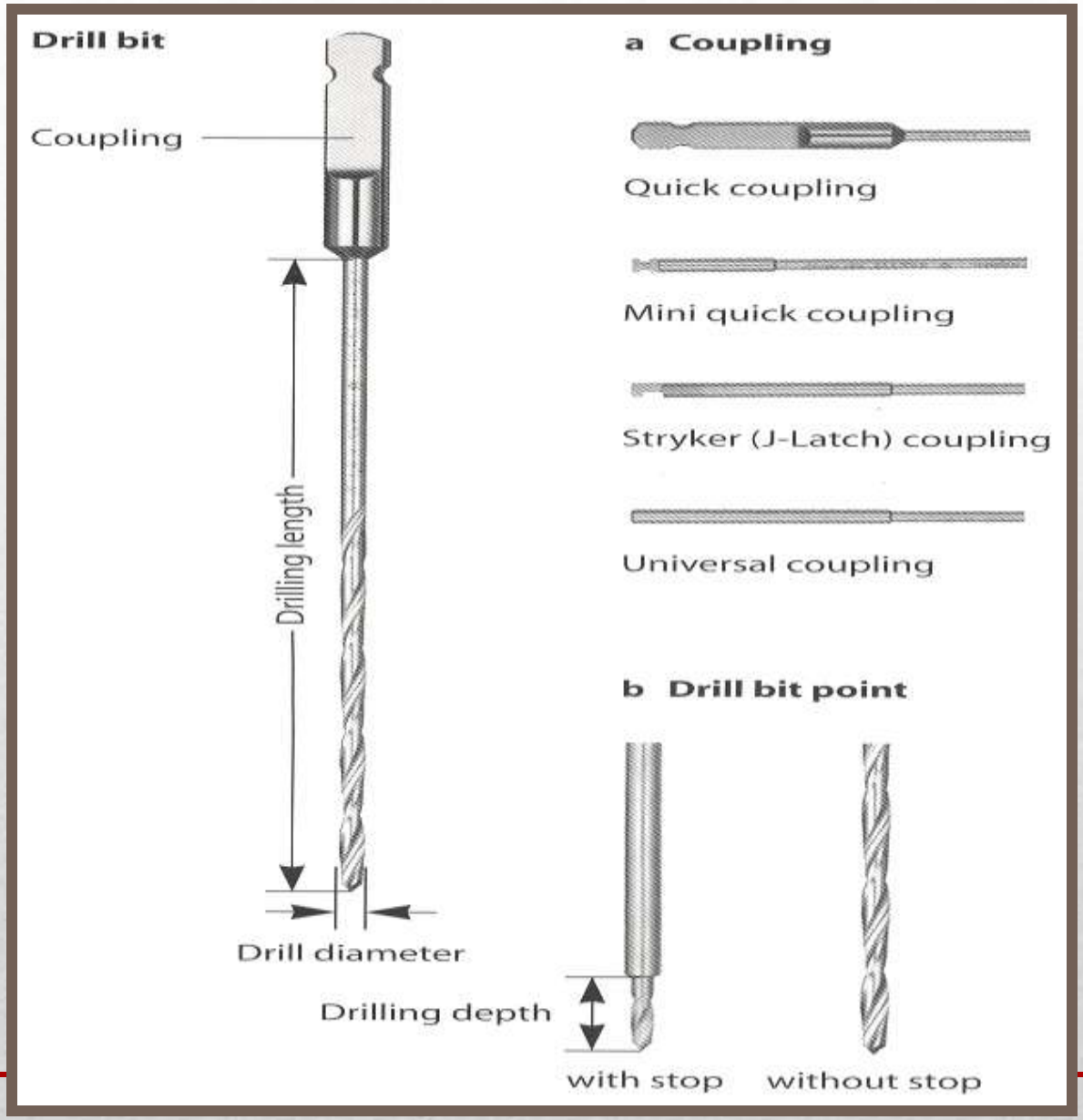

Inset



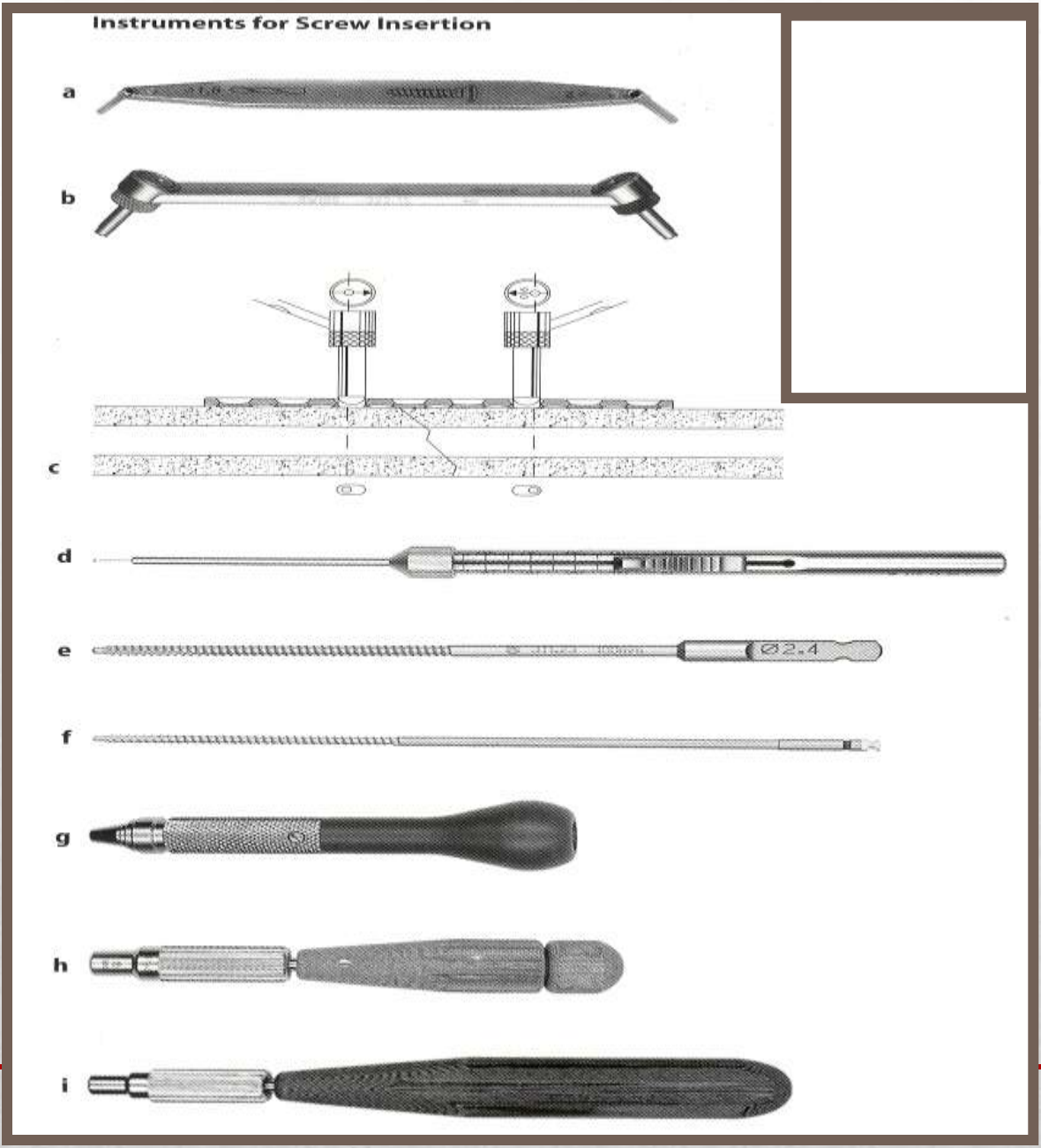
2.0 mm Locking Screw

Locking screw

Non-locking screw


Drill bit
Coupling
Drilling length
Drill diameter
Drilling depth
a Coupling
Quick coupling
Mini quick coupling
Stryker (J-Latch) coupling
Universal coupling
b Drill bit point
with stop
without stop

Instruments For Screw Insertion



Instruments For Screw Insertion

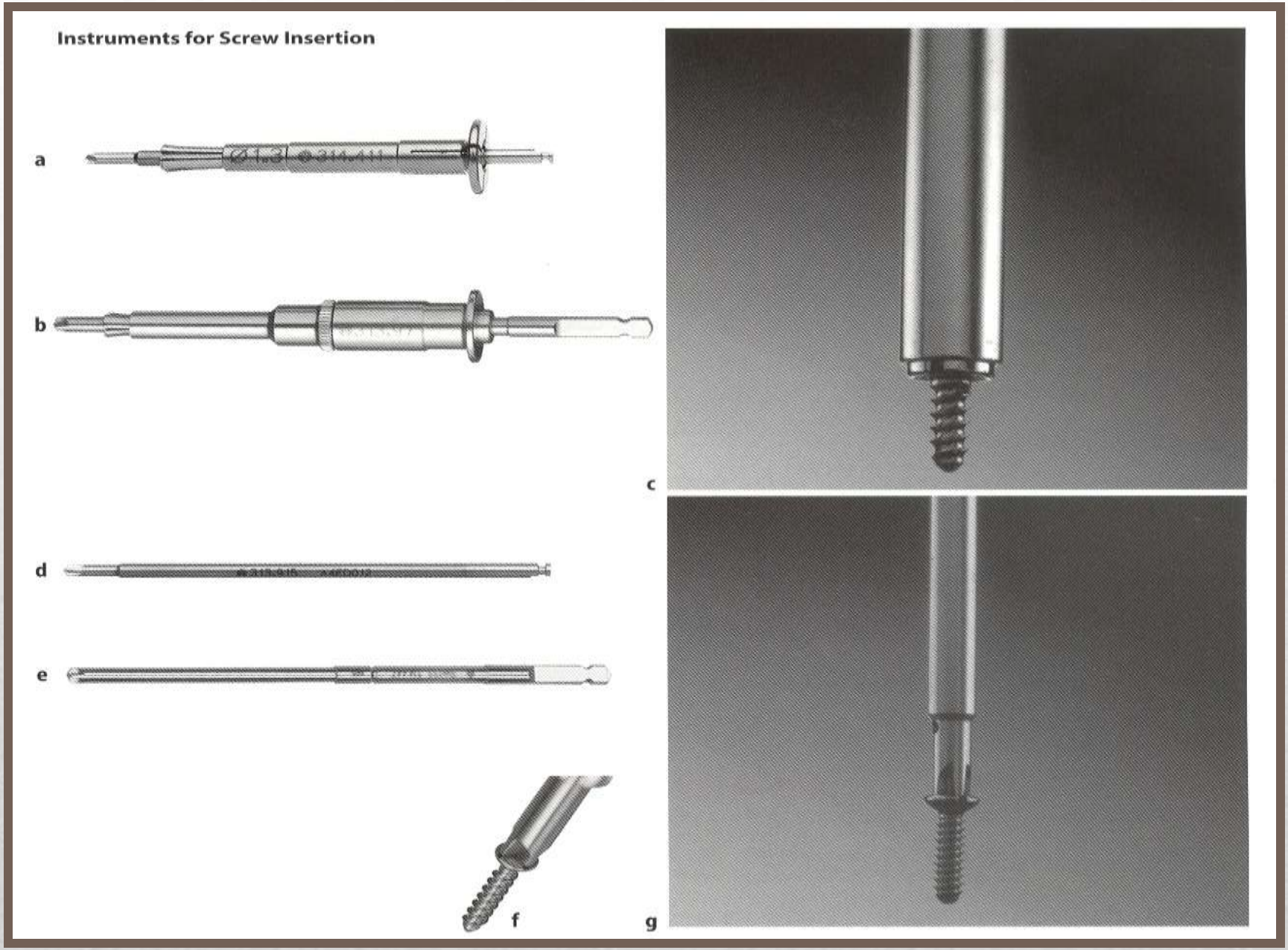
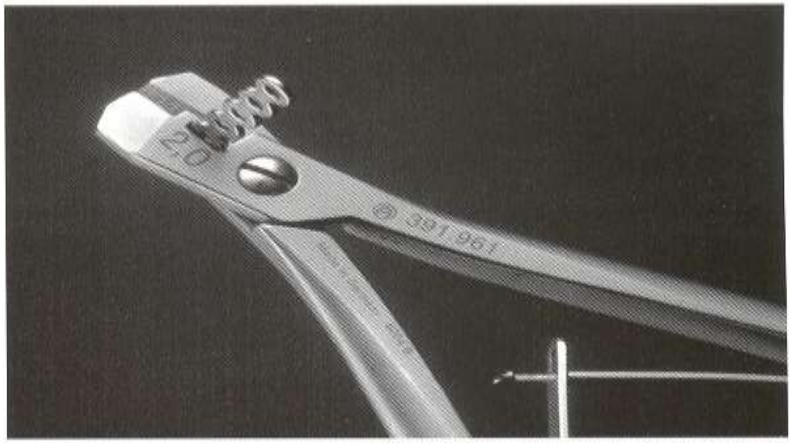
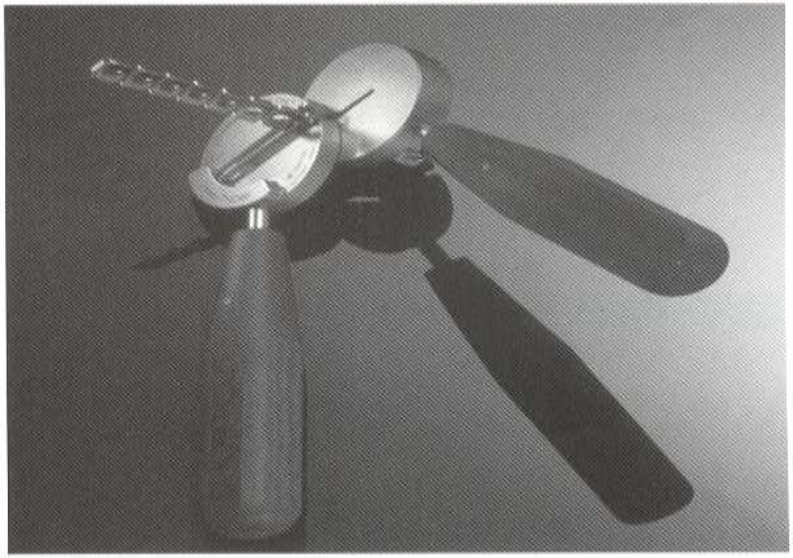


Plate Cutting Instruments



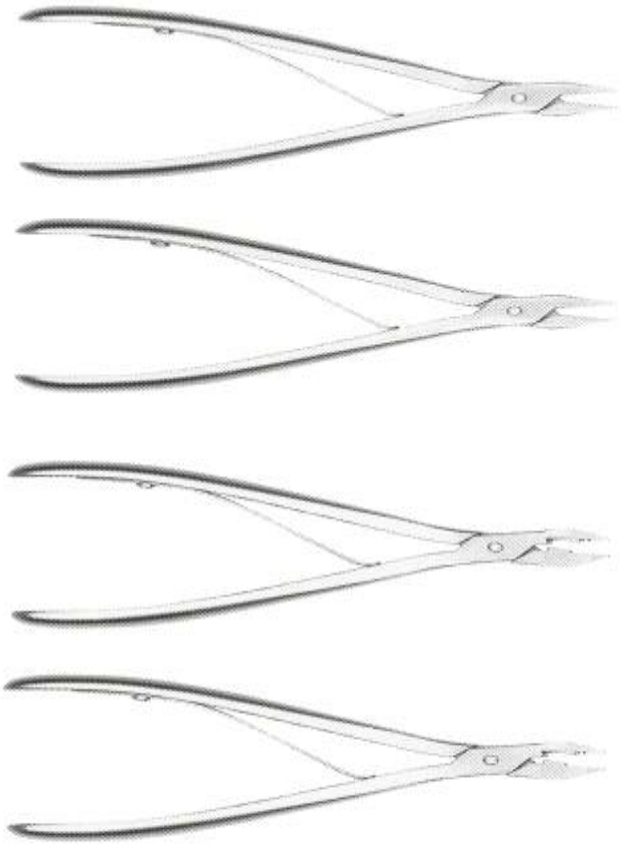
a



b

a Plate cutting forceps for all plates from 1.0 to 2.0.
b Plate cutter for 2.4 plates and THORP reconstruction plates (Shortcut™ 2.4/THORP). The device must be used in pairs.

Bending Instruments for 1.0–2.0 Plates



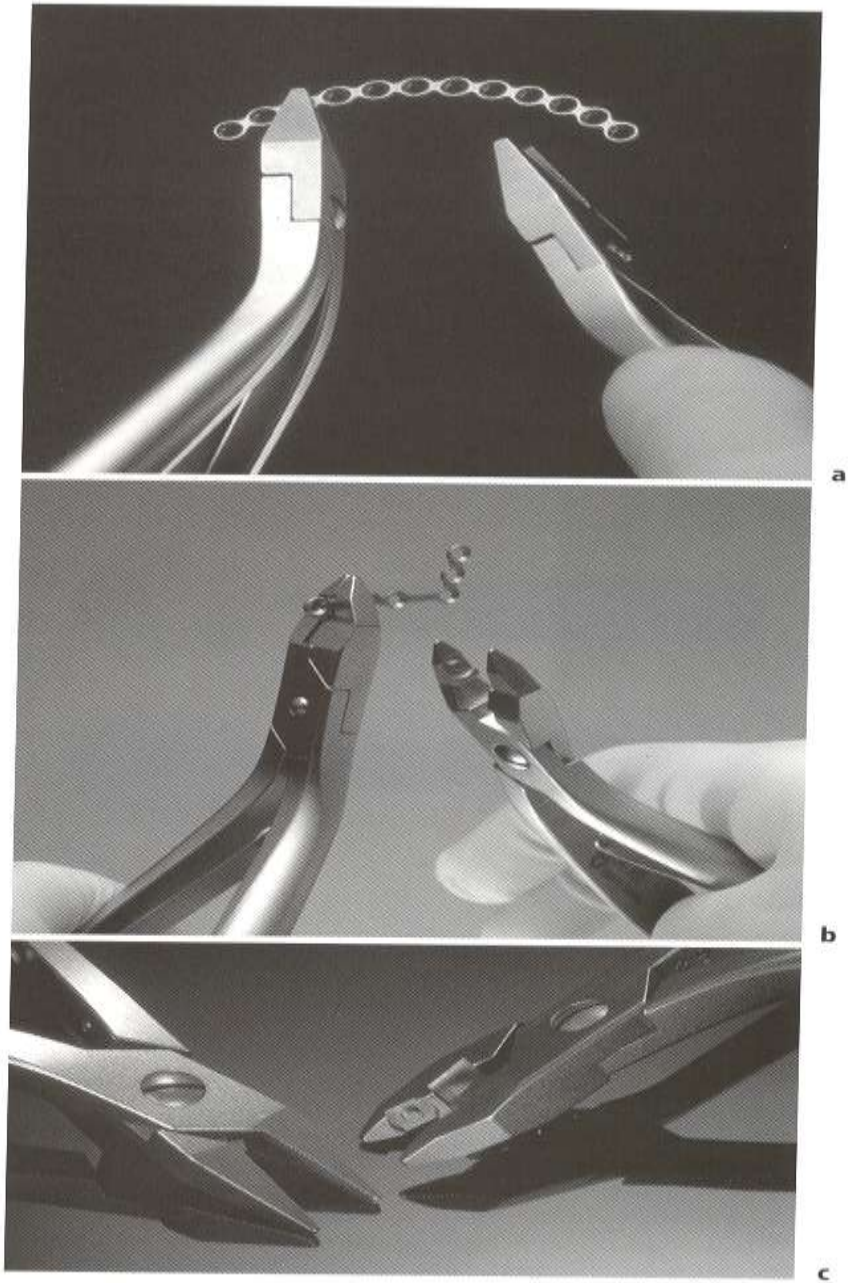
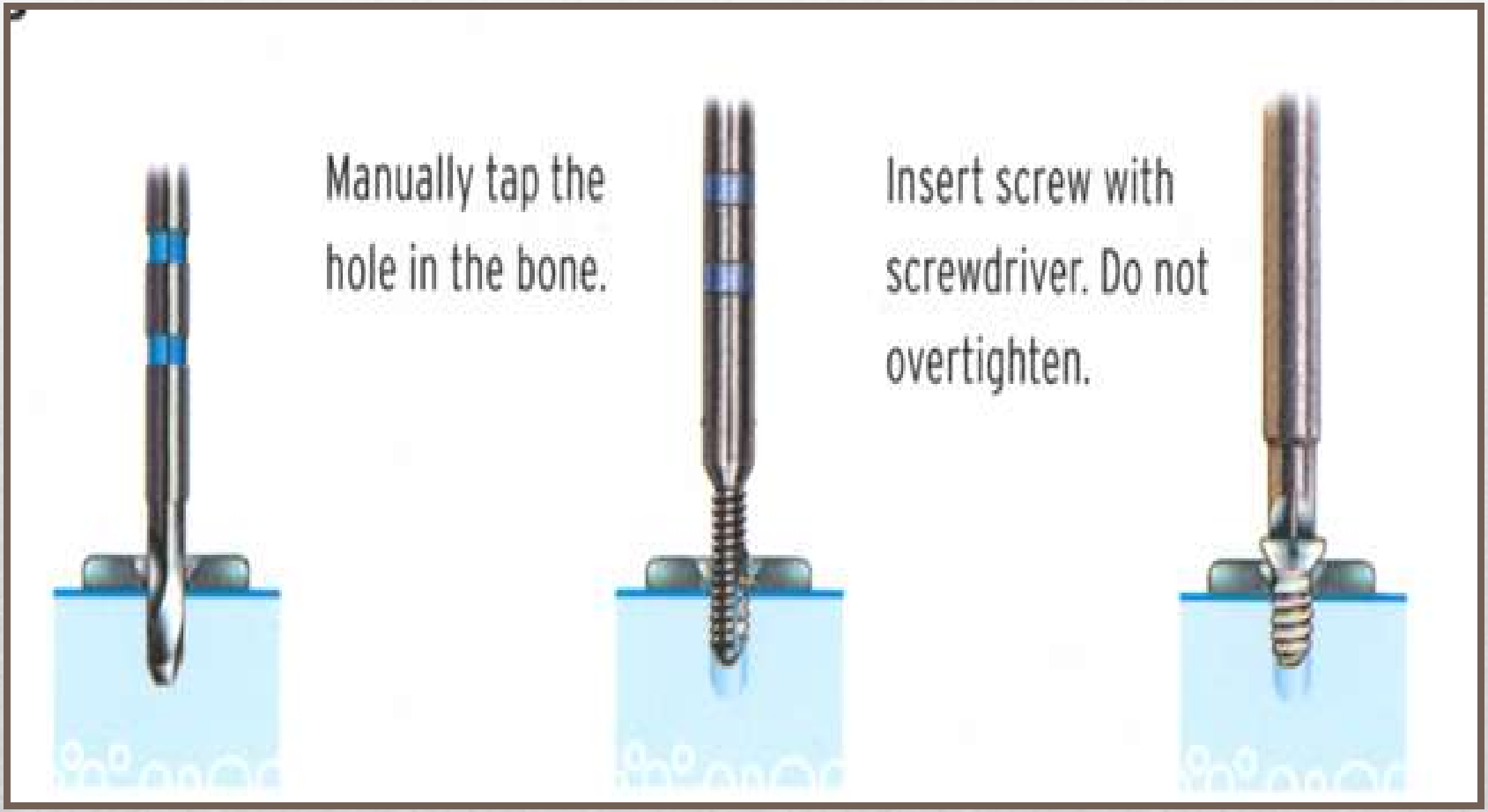


Fig. 1.31 a–c

a Pair of bending pliers, pointed, for 1.0 to 2.0 plates.
b Pair of bending pliers with special inset for the plate hole, thus preventing the deformation of the plate hole during bending.
c *Left*: close up of mouth of bending pliers shown in **a**. *Right*: mouth of bending pliers shown in **b**.

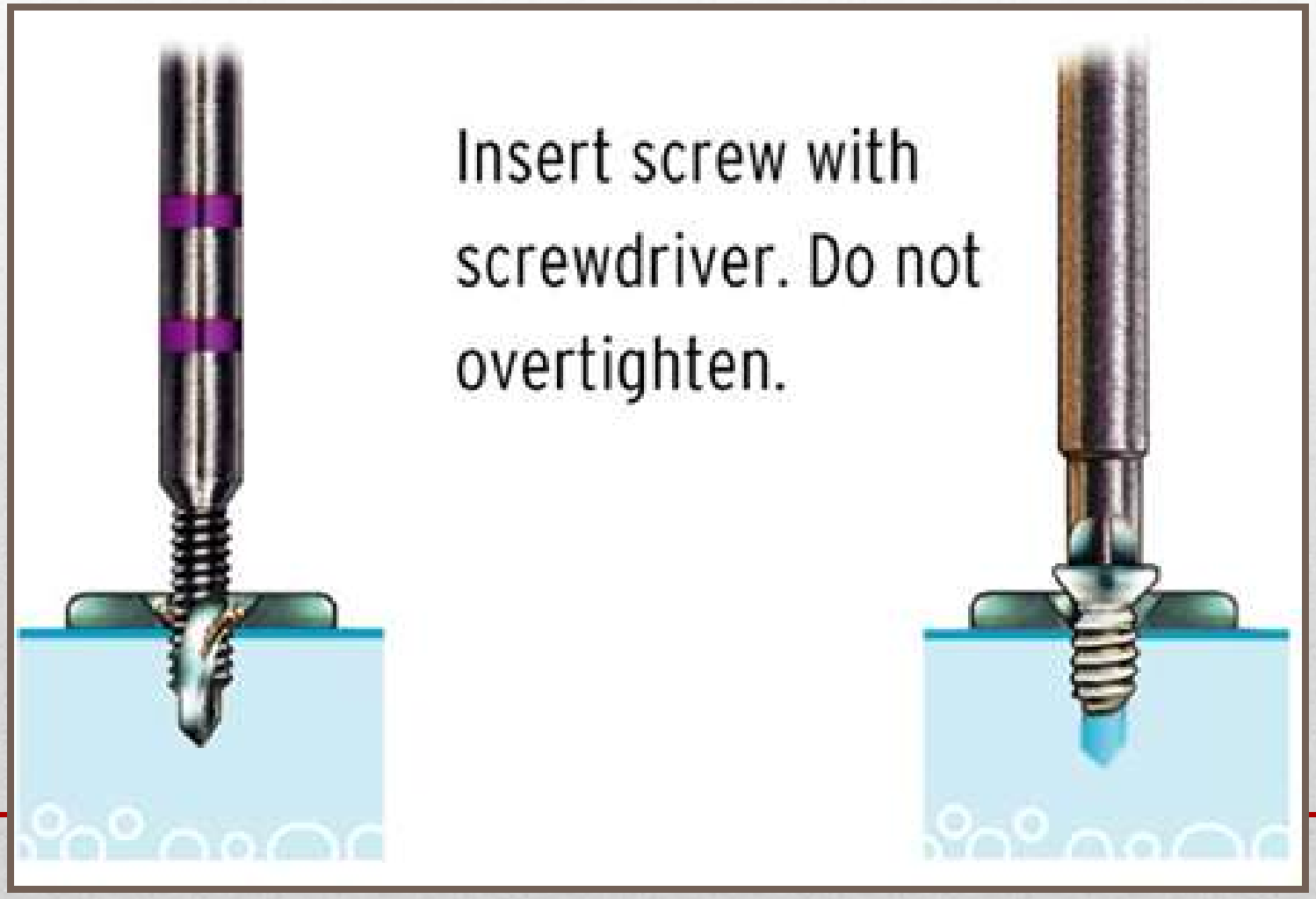
Screw Insertion Methods

- Manual Tap



Screw Insertion Methods

- *Self Tapping Drill*



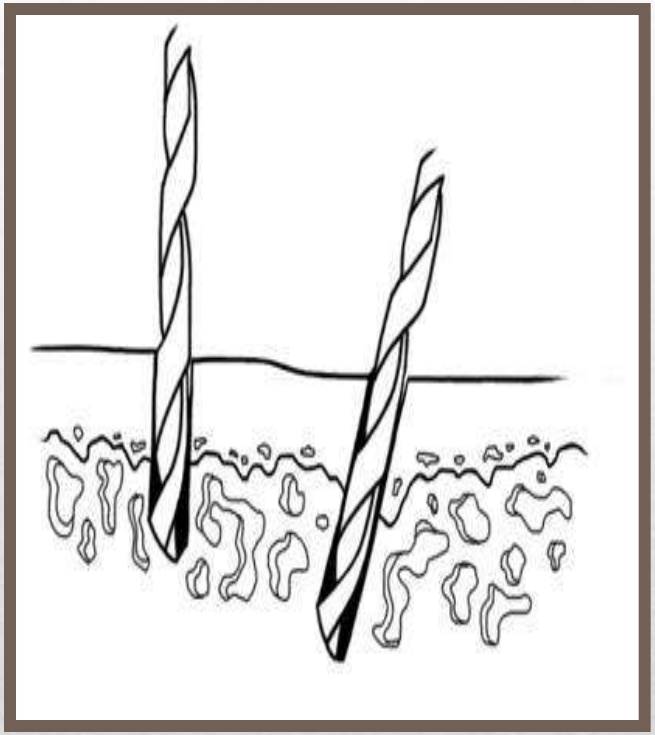
Osteosynthesis Techniques

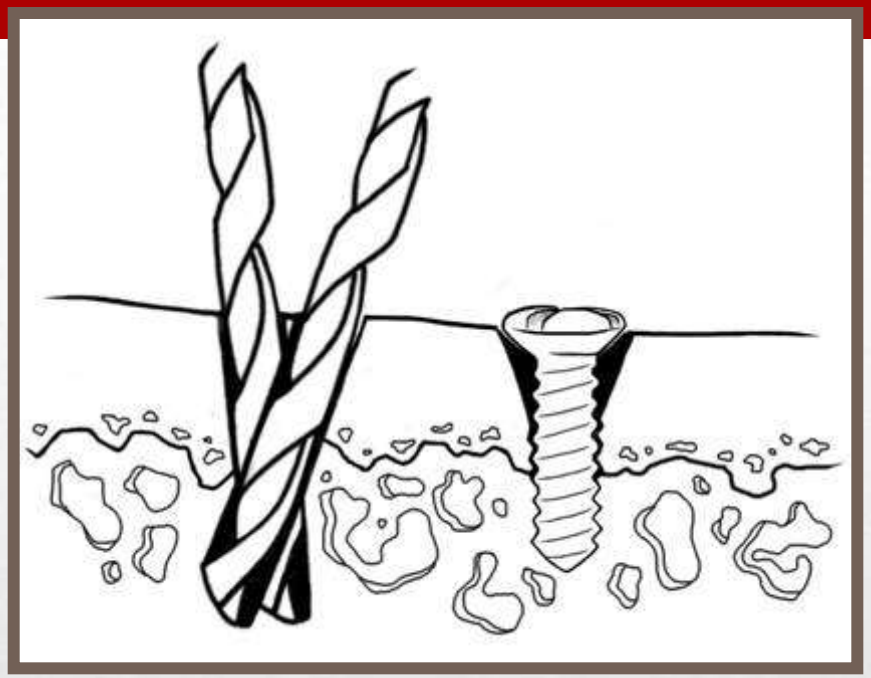
- *For Optimum Success, It Is Essential That These Are Meticulously Adhered To.*

- *Essential That Particular Attention Be Paid To Careful Drilling And Screw Insertion.*

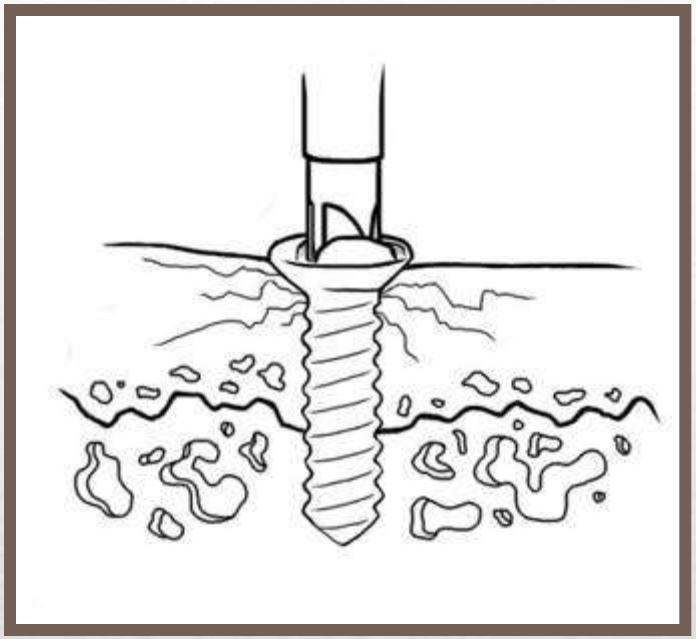
Drilling

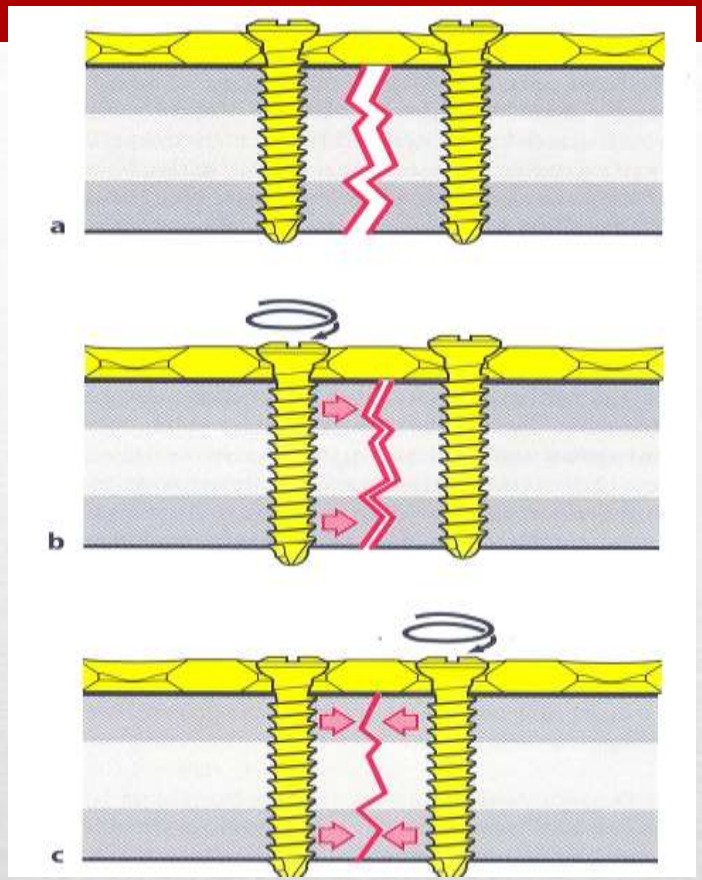
- *Successful osteosynthesis depends on the quality of the holes drilled into the bone to take the screws. Careful and accurate drilling is therefore a top priority. Though the hole need not be exactly perpendicular to the plate surface, it must be stricly monoaxial.*
- *After drilling 3 – 4mm deep into healthy bone, a decrease in resistance will be felt, indicating that the cancellous bone layer has been reached. Stop drilling.*





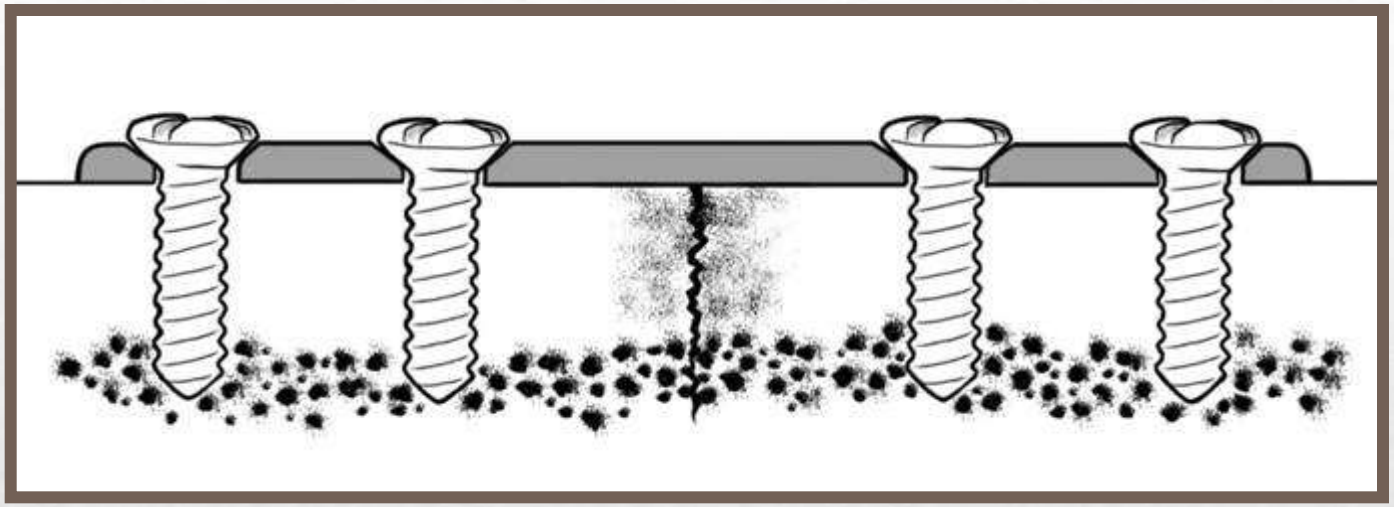
- *Any change in the drilling angle during the drilling procedure will invariably result in a conical hole and thus reduce the number of threads finding adequate purchase in the bone.*
- *During the entire drilling procedure, provide continuous irrigation to avoid thermal necrosis.*





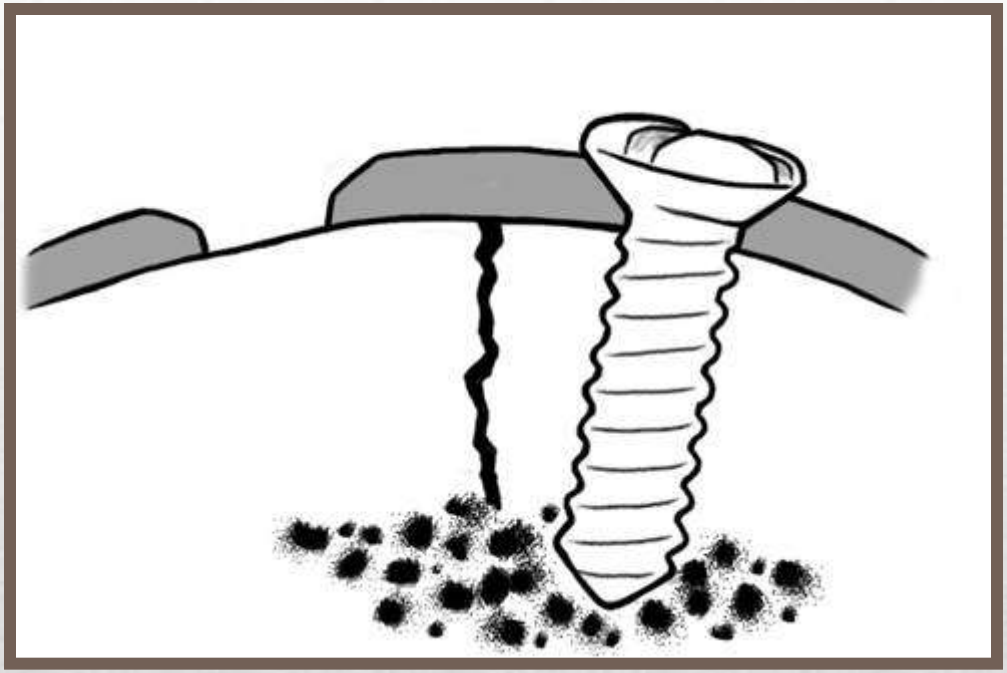
- *When tightening the screw in the bone, care must be taken to not use too much force to avoid destruction of the bone threads.*
- *Each plate must be anchored by at least 3 screws on either side of the fracture site.*

Screw Anchorage



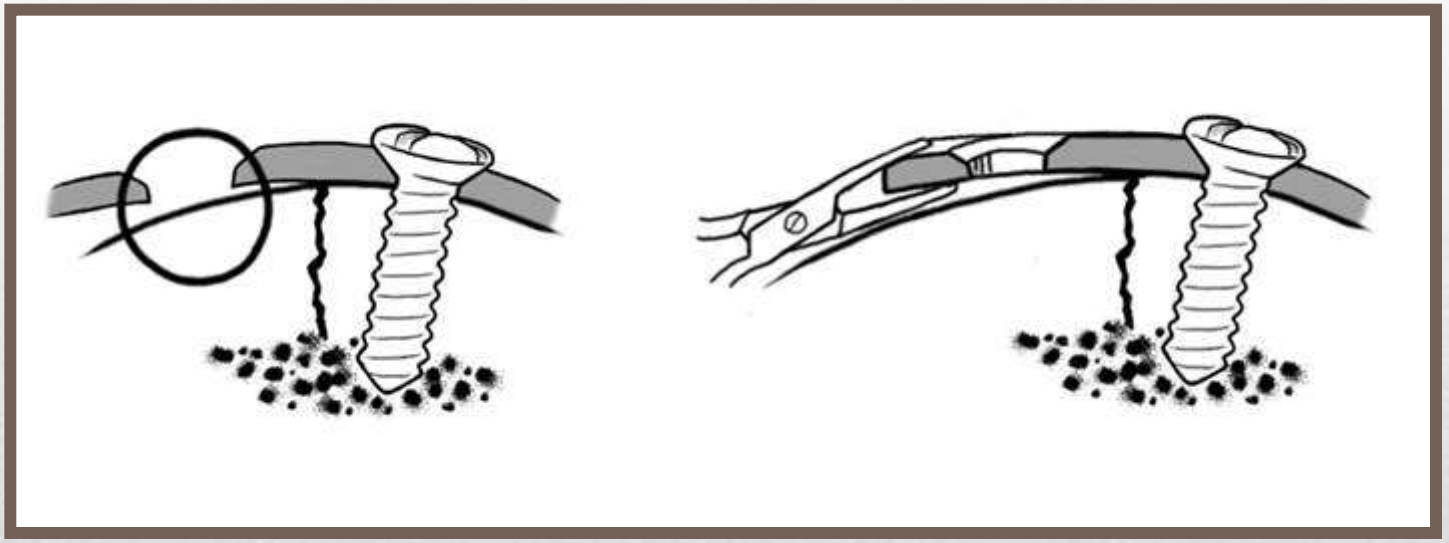
- *Should the screw anchorage in the outer cortex be suspect, the drilling should be continued though the inner cortex and a longer screw inserted for bicortical fixation.*
- *Another alternative would be to use a "spaced" plate and drill new holes as required.*

Plate Adaptation



- It is crucial that the plate be congruent to the bone surface before anchoring it by means of the screws.

Plate Adaptation



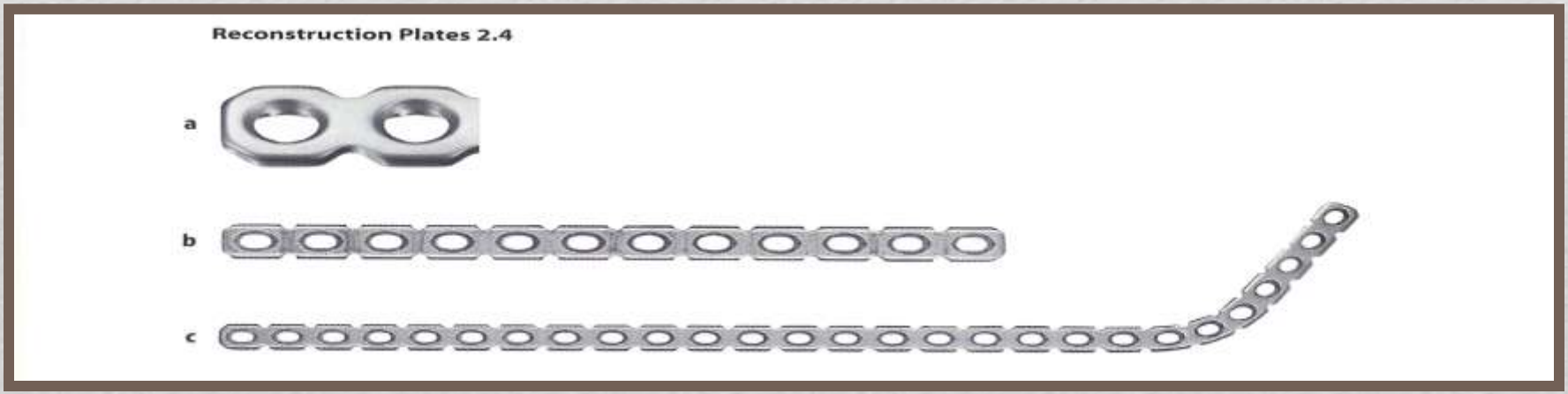
- *Once one or several screws have been inserted, no attempt should be made to improve on the shape of the plate. Such an attempt would result in the loosening of the screws already fastened.*

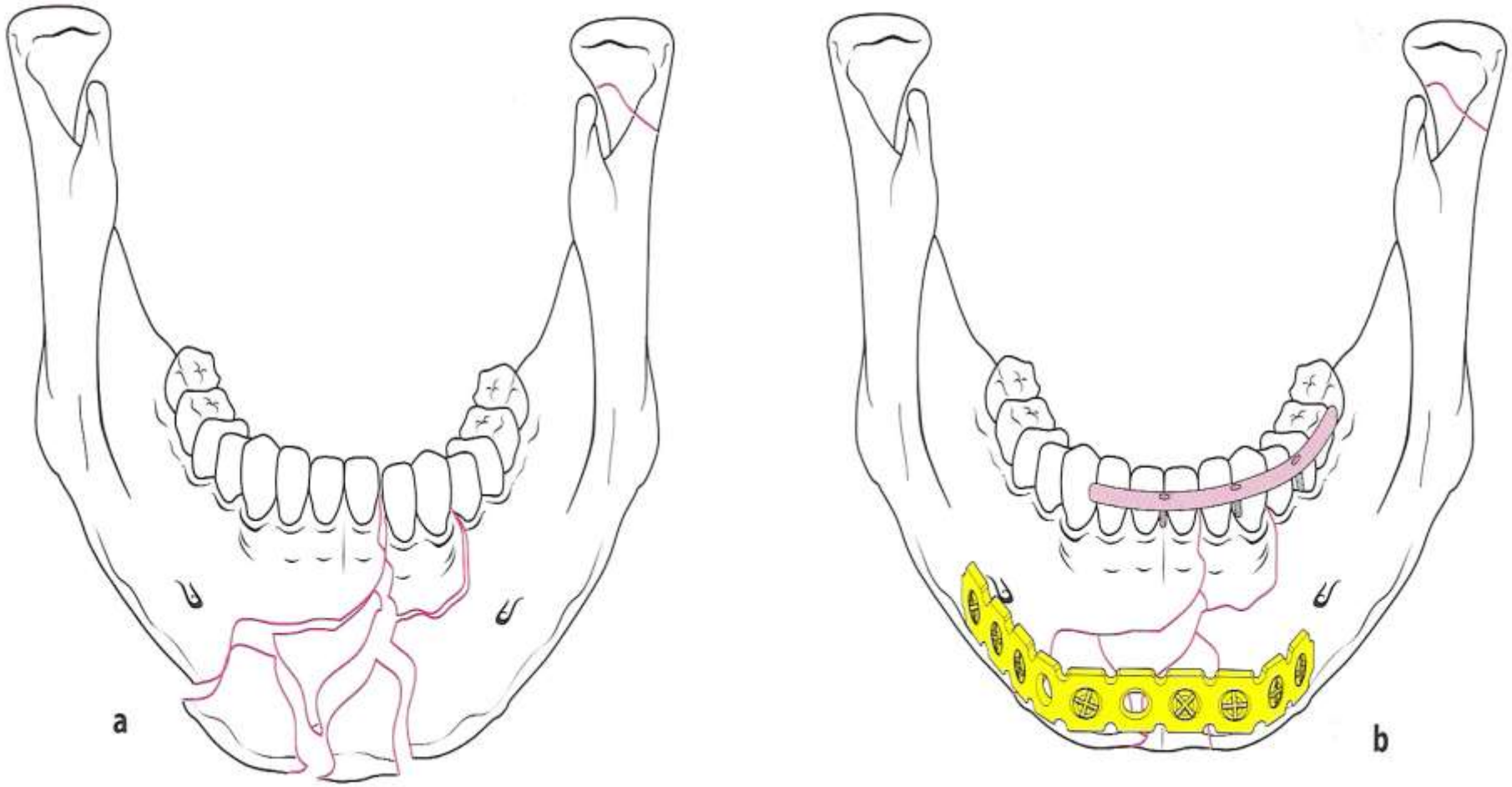
Reconstruction Plates :

2 Types- Standard And Thorp

Indications :

- *For severely oblique fractures*
- *Comminuted fractures*
- *Fractures with bone loss*
- *Non atrophic edentulous mandible*




a
b

AO/ASIF Principles For Fracture Management:

- Postulated in 1958 and have certainly withstood the test of time.

1. Accurate anatomic reduction

2. Atraumatic operative technique

3. Rigid internal fixation

4. Early pain free mobilization.

Different Manufacturers Use Diff. Materials

Champy system-stainless steel

Luhr system-Vitallium

Storz system

Most Synthes system } Titanium

Most Leibinger system }

Problems with Metal plates

- *Cranial growth restriction* Yaremchuk, 1994
- *Intracranial implant migration* Fearon et al 995, Goldberg et al 1995, Honig et al 1995, Yu et al 1996
- *Implant palpability, temperature sensitivity & even visibility in thin skin areas* Orringer et al 1998
- *Imaging & radiotherapy interference* Sullivan et al 1994, Castillo 1988

- *Too stiff for optimal healing in some surgical applications - stress shielding may result in bone atrophy and porosis* *Uhthoff 1983, 1994, Kennady 1989*

- *Accumulation of metals in tissues* *Rosenberg et al 1993, Schliephake et al 1993, Katou et al 1996, Jorgenson et al 1997, Kim et al 1997*

- *Adverse effects of metals can necessitate removal operation*

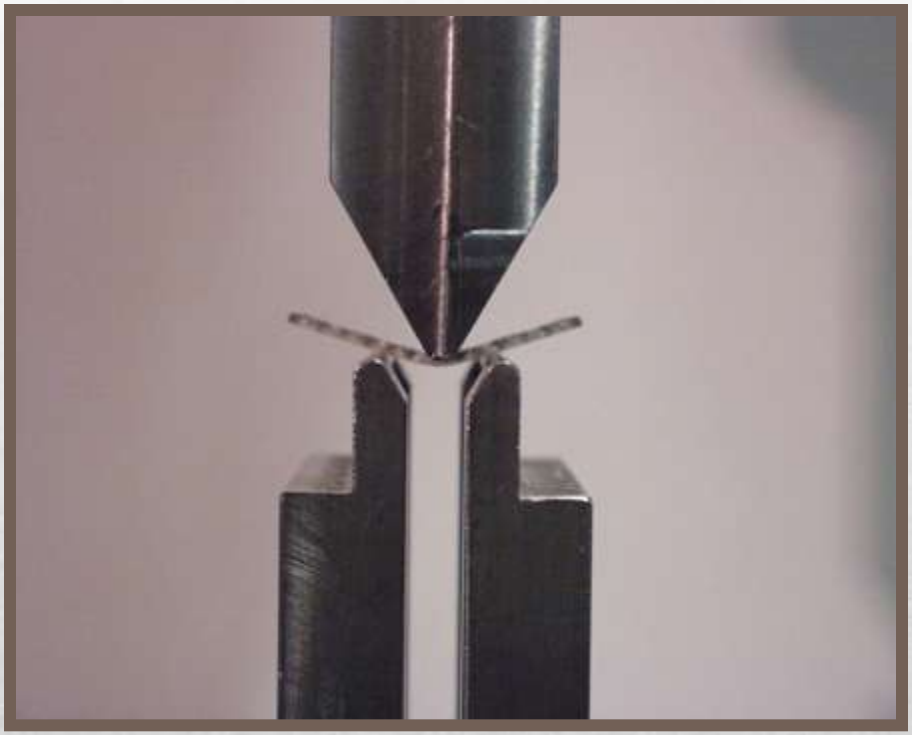
Bioresorbable Plates :

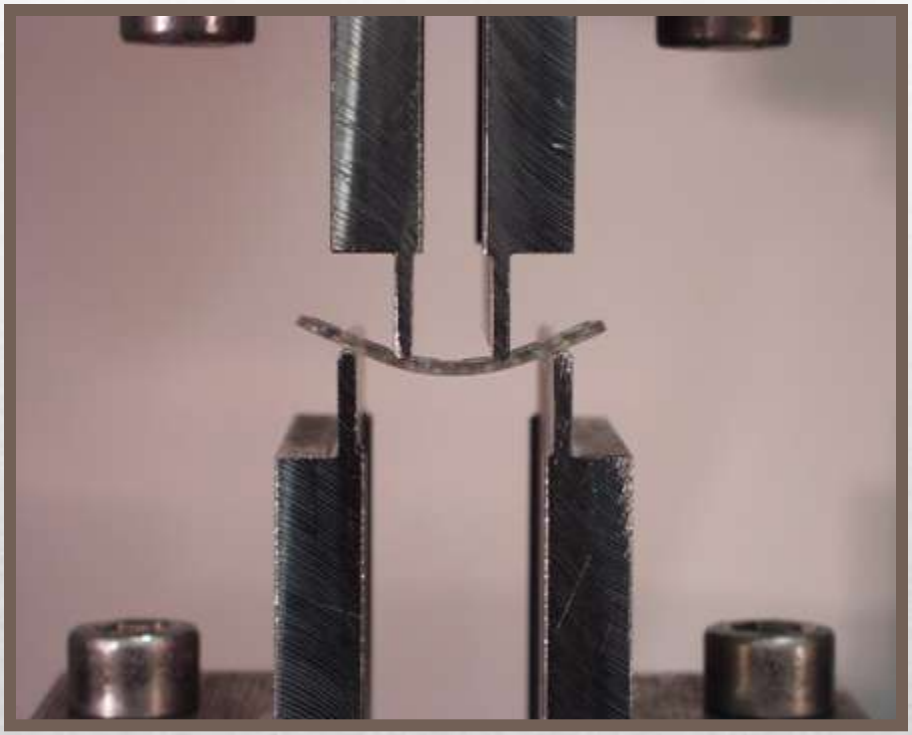
Advantages

- *No second surgery required for implant removal*
- *No long term implant palpability or temperature sensitivity*
- *Non-metallic*
- *Predictable degradation to provide progressive bone loading & no stress shielding*
- *Implants supplied sterile*

- ✓ Reduced patient trauma & cost
- ✓ Patient satisfaction
- ✓ No imaging interference
- ✓ Improved chance of bone healing
- ✓ Reduced cross infection potential

Bending Tests





Tensile Test

1.5mm CPS BABY SYSTEM

For paediatric craniofacial procedures (equivalent use to titanium 1.0 - 1.2mm)
Strength retention is 6-9 weeks

1.5mm CPS SYSTEM

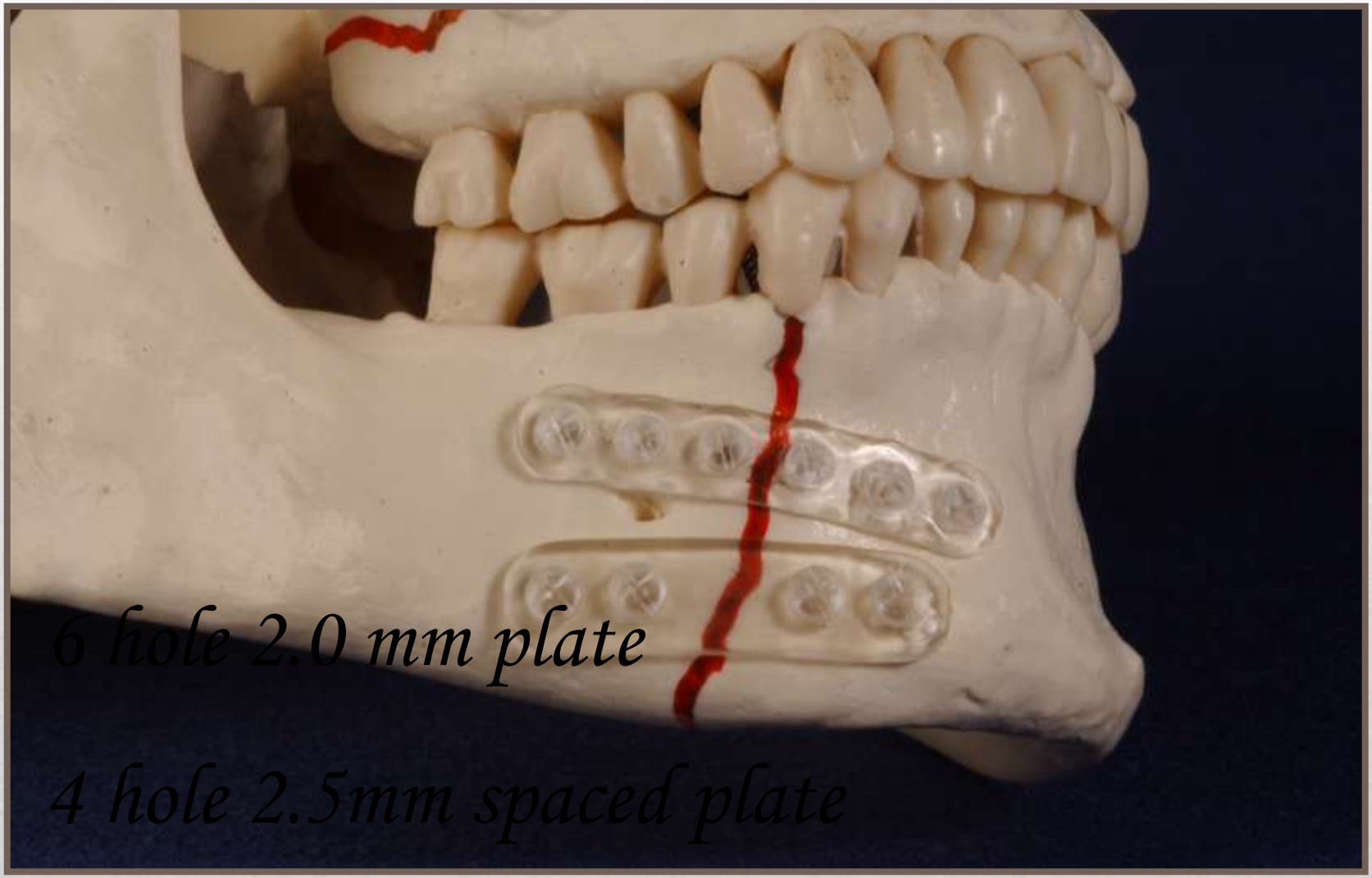
For low load-bearing cranial and midface fixation (equivalent use to titanium 1.0 - 1.2mm)
Strength retention is 9-14 weeks

For medium load-bearing midface and orthognathic fixation (equivalent use to titanium 1.5 - 1.7mm)
Strength retention is 9-14 weeks

2.0mm CPS SYSTEM

For mandibular fixation (equivalent use to titanium 2.0 - 2.4mm)
Strength retention is 9-14 weeks

2.5mm CPS SYSTEM


6 hole 2.0 mm plate
4 hole 2.5mm spaced plate

Radiograph Bioresorbable Plates :

Treatment Of Condylar Fracture

Relative Indication:

- Bilateral Conylar # In Edentulous Patient.
- Unilateral Or Bilateral Conylar #.
- In Medically Compromised Patient.
- Bilateral Condylar - With Mid Face #.
- Bilateral Subcodylar # Associated With Retrognathism, Prognathism, Openbite & Lac Of Post Teeth .

Surgical Approaches

Pre Auricular Incision

- Row!S Incision
- Row!S Incision Modification
- Al Kyat Bramley Incision

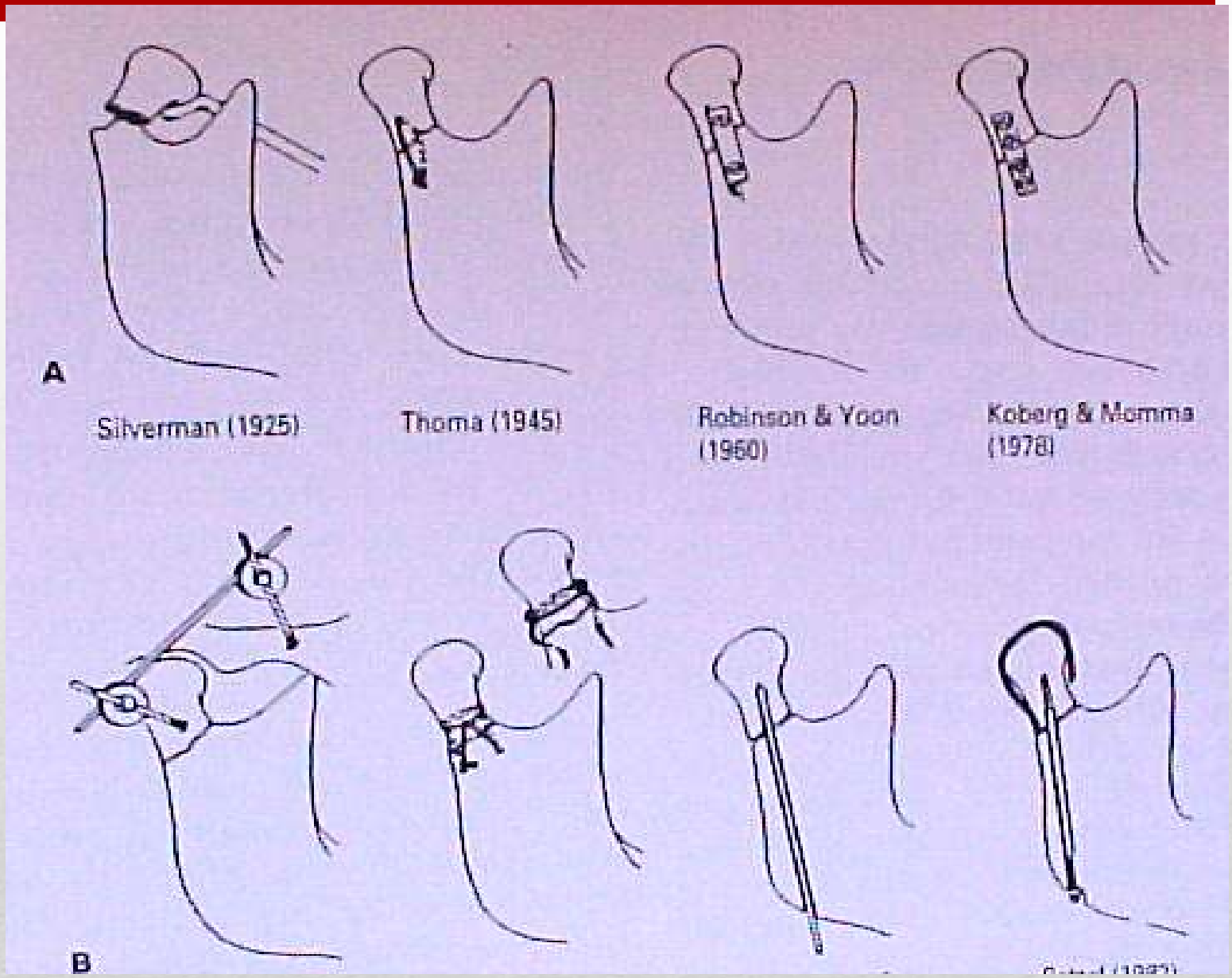
Submandibular Incision

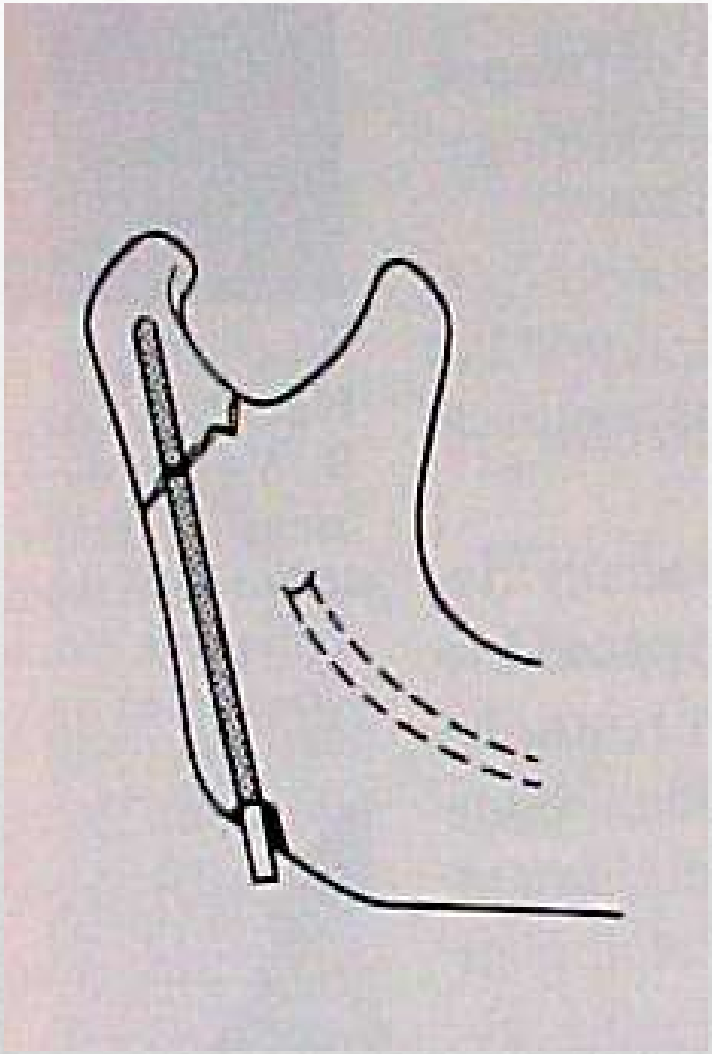
Intra Oral Incision

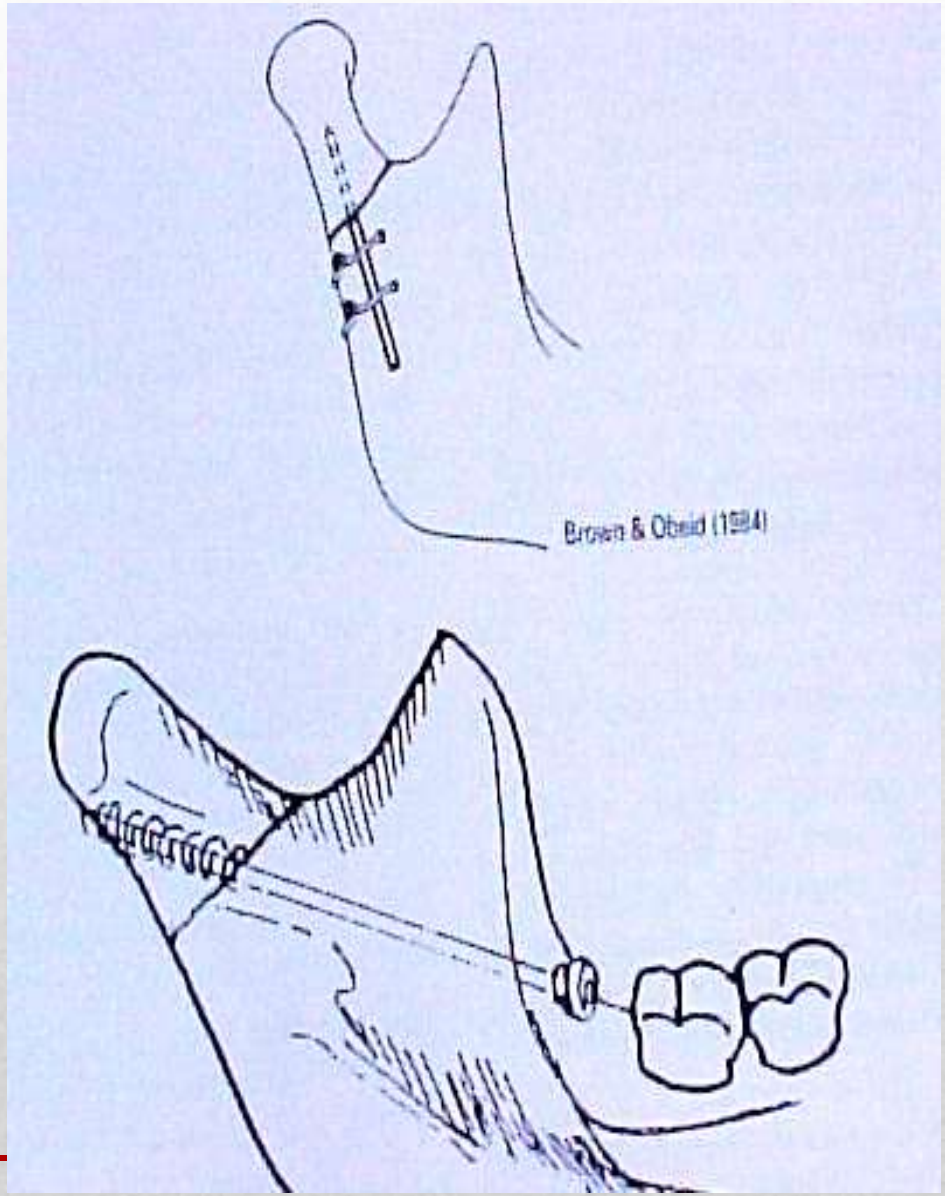
Face Lift Incision

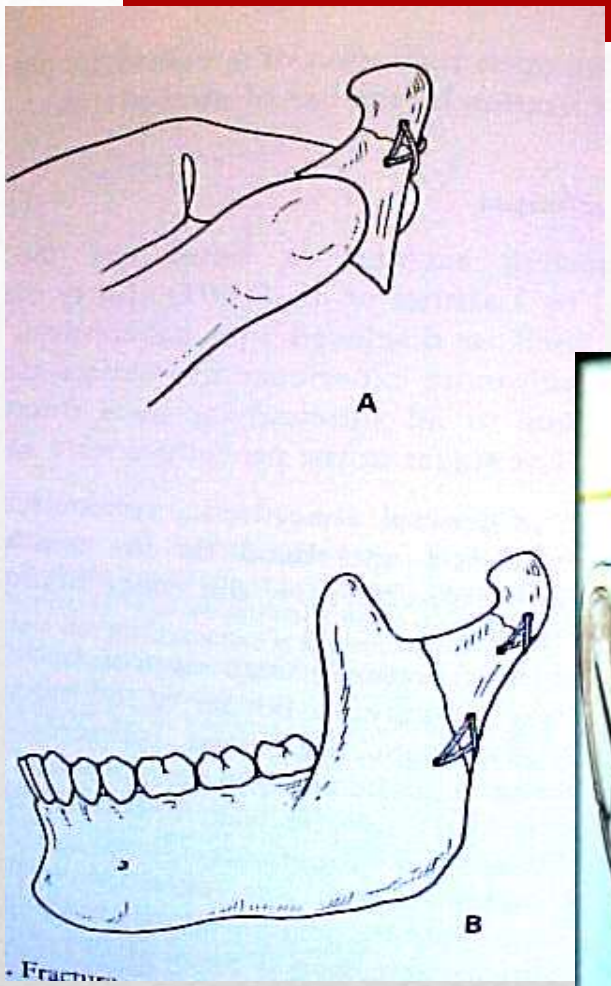
Methods Of Immoblization

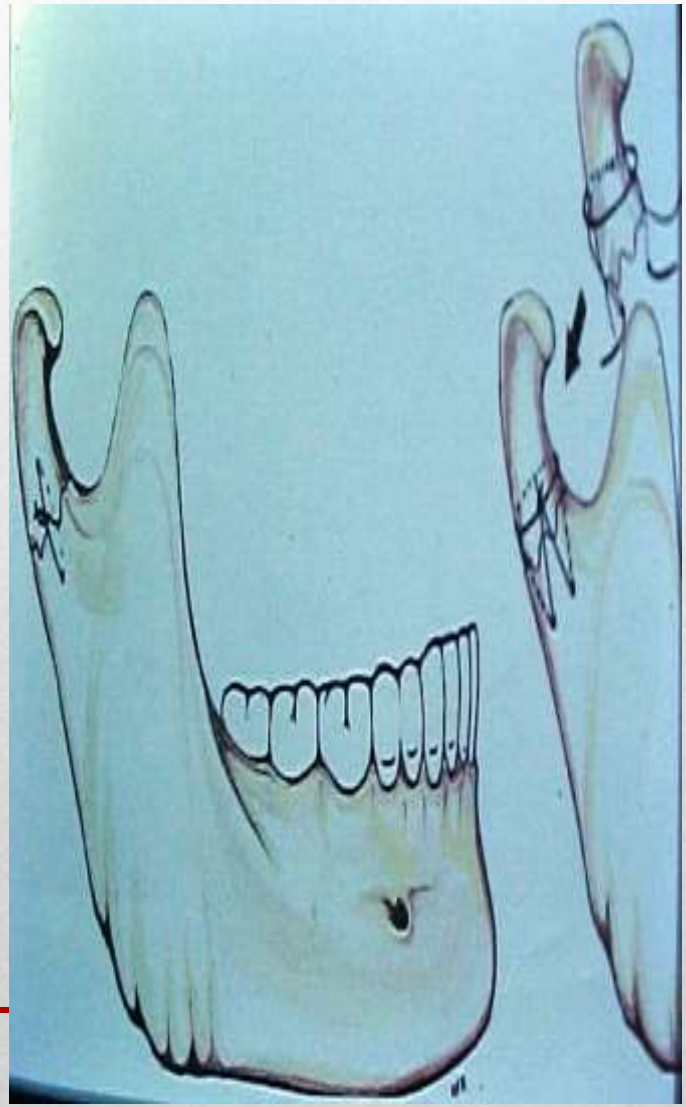
- *Transosseous Wiring*
- *Bone Pins*
- *Glenoid Fossa- Condylar Suture*
- *Kirchner Wire*
- *Intra Medullary Screws*
- *Bone Plating--- Extracorporeal Reduction*


A
Silverman (1925)
Thoma (1945)
Robinson & Yoon (1960)
Koberg & Momma (1978)
B




Brown & Obeid (1984)


A
B



General Complications

1. Metal Sensitivity

- Chrome, cobalt, and nickel – components of stainless steel

Can cause allergic response in some people

- Symptoms : Generally localized to implant area – Eczema, erythema and vessicles of overlying skin or mucosa.
- Usually occur 3 to 6 months after placement.

2. Screw Failure :

- *Indicator for screw failure :*
  - *Fracture mobility*
  - *Infection*

3. Plate Fracture :

- Uncommon complication
- Incidence 0-10%
- Causes –
  - Surgeon error
  - improper size of plate.
  - Excessive bending of plates.
  - Metal failure

4. Stress Shielding

5. Infection

Incidence – 3 to 27%

6. Sensory Nerve Injury :

Cause: Overzealous Retraction

7. Nonunion, Malunion And Malocclusion

8. Restriction To Craniofacial Growth

9. Hypertrophic Scar Formation

10. Injury To Roots

Complication Of Condylar Fracture

- *Ankylosis*

Disturbance Of Mandibular Growth

- ***References :***

- *Oral and maxillofacial trauma , Vol.2 – Fonseca R.J*
- *Manual of internal fixation in the craniofacial skeleton – J.Prein*
- *Maxillofacial surgery – Vol.1 – Peter ward booth*
- *Atlas of craniomaxillofacial fixation – Robert M.Kellman*
- *Oral and maxillofacial surgery, Vol.1 – Peterson.*
- *Biomechanical comparison of plating techniques for fractures of the mandibular condyle Alper Alkana, Murat Metina, Mehtap Muğlali BDJ 2006*