MAXILLOFACIAL TRAUMATOLOGY

Department of Oro-Maxillofacial Surgery
Semmelweis University, Budapest

Maxillofacial injuries

- isolated maxillofacial injury
- multiple injuries
- polytrauma (injury of more region or organ of the body and one of them is life threatening)

Incidence of maxillofacial injuries

- Injury of soft tissues of head and neck region (35%)
- Injury of jaws (65%)
  - Mandibular fracture (71%)
  - Fracture of middle face bones (25%)
  - Combined fractures (4%)

male – female ratio: 2-1

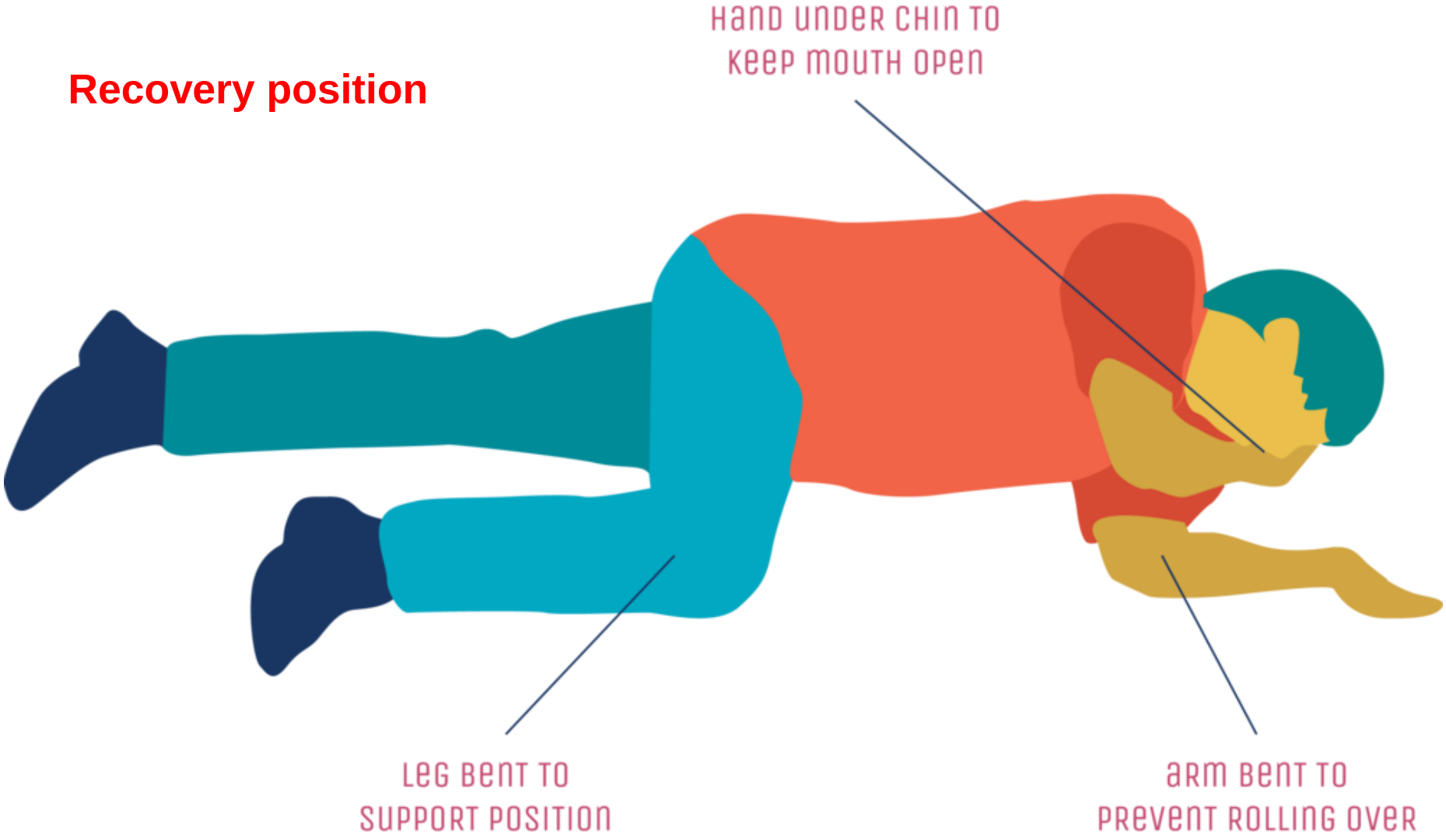
Causes of maxillofacial injuries

- Traffic accident
- Violance
- Accident at work
- Sport injury

First-aid

- **Maintenance of free respiration** (saliva, blood, prosthesis, luxated teeth, foreign body, fractured middle face, tounge stb.) - conicotomy
- **Stop bleeding**
- **Maintenance of circulation** (volumen replacement, shock -therapy)
- **Covering of wounds**
- **Fixation of fractured ends**
- **Hospitalisation**

Recovery position

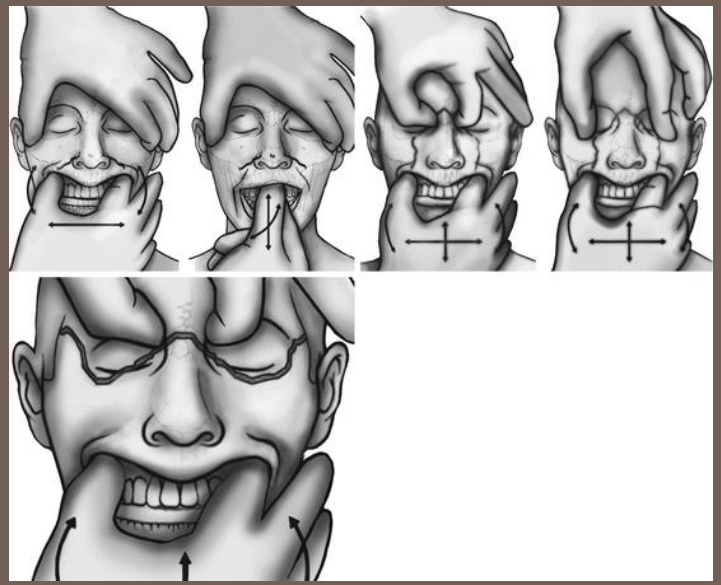


Treatment in hospital

if it is possible immediate and definitive!!!

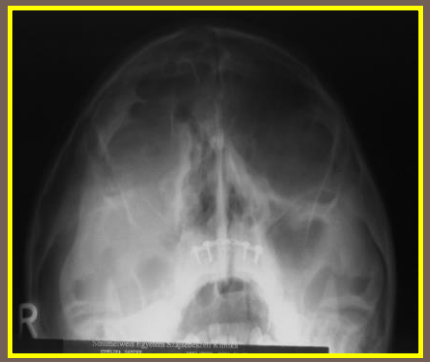
- diagnosis (clinical symptomes, rtg.)
- treatment of soft tissue injuries
- reposition of fractured bone ends, immobilisation
- antibiotic-, analgesic administration
- nutrition, rehabilitation

Physical examination



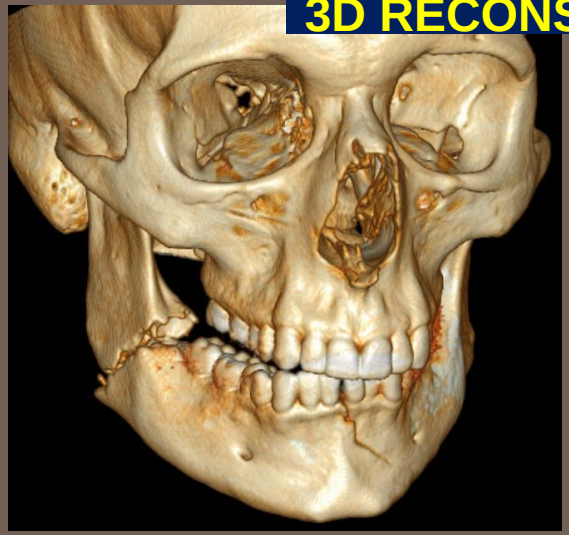
Imaging methods

- OP
- PA
- SINUS
- CT
- CBCT

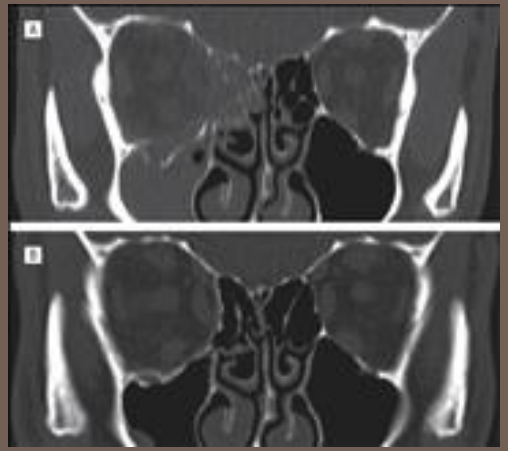


CT FORMS

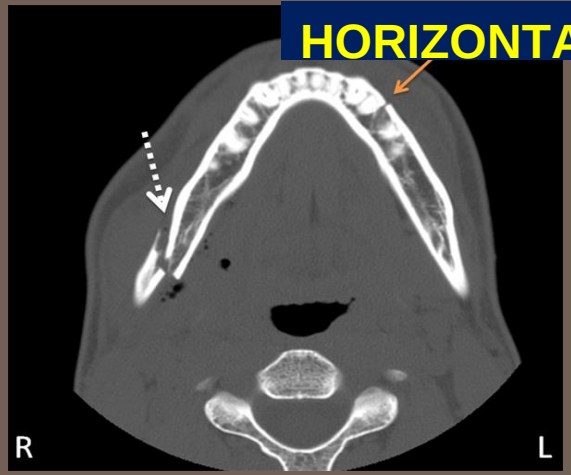
3D RECONSTRUCTION



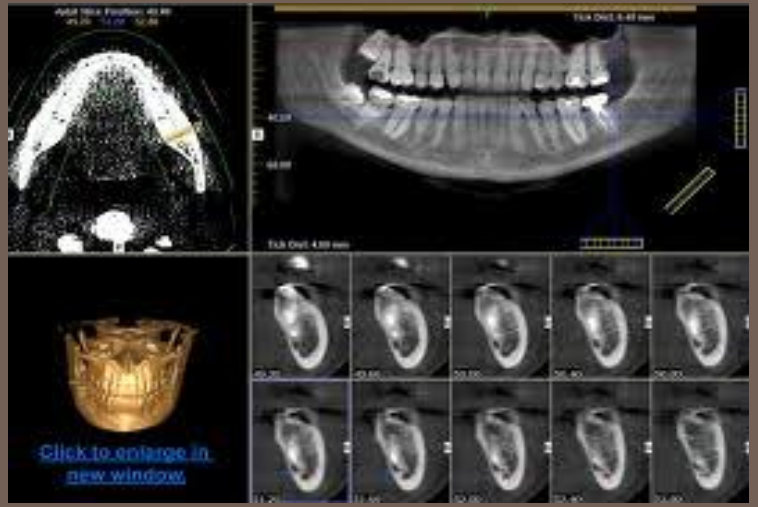
CORONAL



HORIZONTAL



CBCT



Mandibular fractures

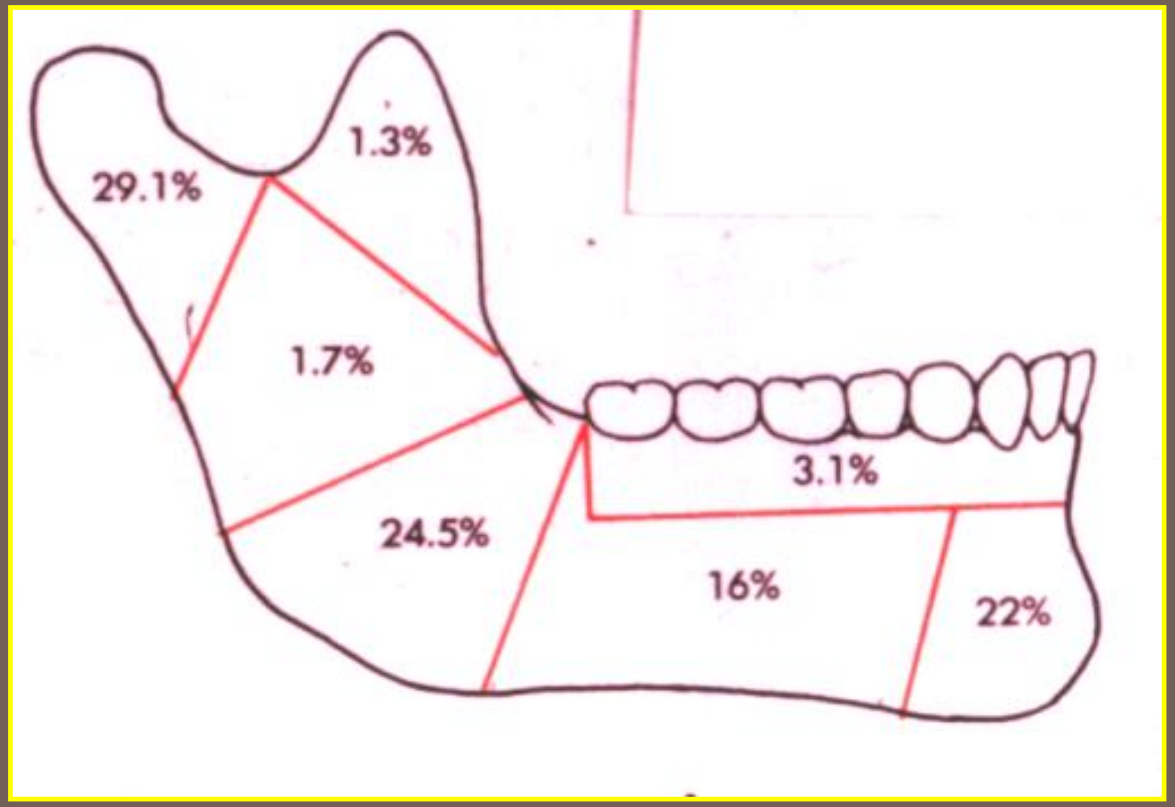
- **75 %** of jaw fractures

Classification of mandibular fractures

- open / closed, displaced / non-displaced, simple/comminuted
- type (infraction, greenstick fracture, hole width fracture, multiplex fracture)
- site
  - symphiseal /childhood/
  - in region of the canine tooth
  - body (between the canine tooth and angle)
  - mandibular angle (second in frequency, and the most often in case of single fracture)
  - ramus of the mandible
  - muscular process
  - condylar process (most often; change in the occlusion)

    forms: -intracapsular (condylar)

    -extracpsular (subcondylar)



- Condylar process
- Coronoid
- Ramus
- Angle
- Body
- Symphysis
- Alveolar process

Diagnosis

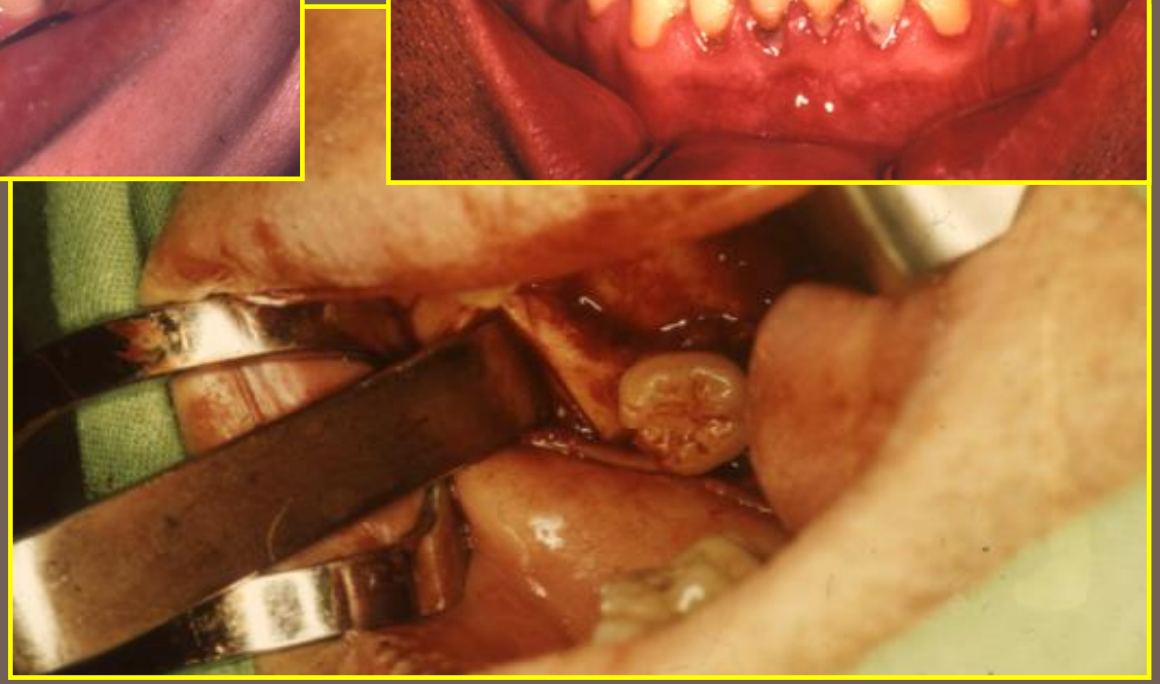
- anamnesis
- inspection
- physical examination
- imaging methods (x-ray, CT, CBCT)

General (indefinite signs) symptoms of jaw fractures

- Pain (spontenous, induced by palpation or move)
- Swelling
- Soft tissue injury
- Functional disorders (trismus, biting disorder, paresthesia of the innervation site of n. mentalis)

Certain (definite signs) symptoms of jaw fracture

- Occlusional problems
- Abnormal mobility
- Crepitation (due to moves of fractured ends)



malocclusion

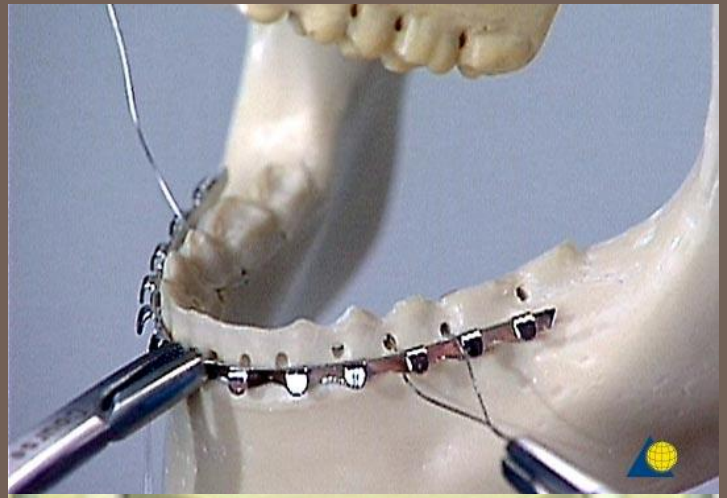
Therapy of mandibular fractures

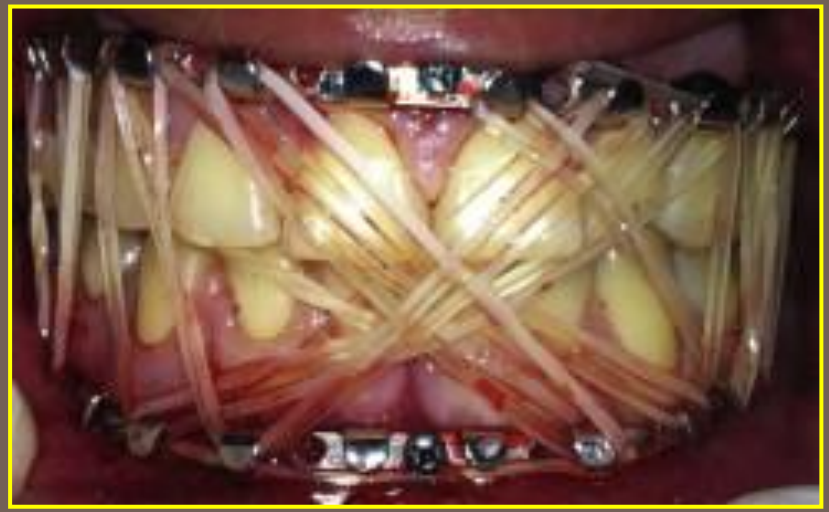
- **Aim**: to reach the orginial function and anatomic situation
- **Type of the treatment**: -Conservative
  -Surgical
  -Sugical-conservative
- **Conservative**:
  - ***intermaxillary fixation (IMF)*** with dental splints for 4-**6** weeks (Schuchardt-, Stout-, Sauer splints, *Gunning splint* in case of total toothless, circumferential fixation)
    - Problems: nutrition, oral higiene, morbus sacer, unedentoulness, mental retardation)

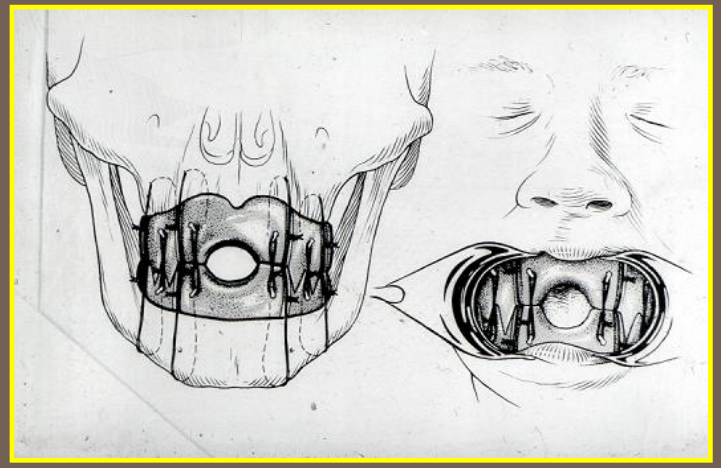
IMF

dental splint

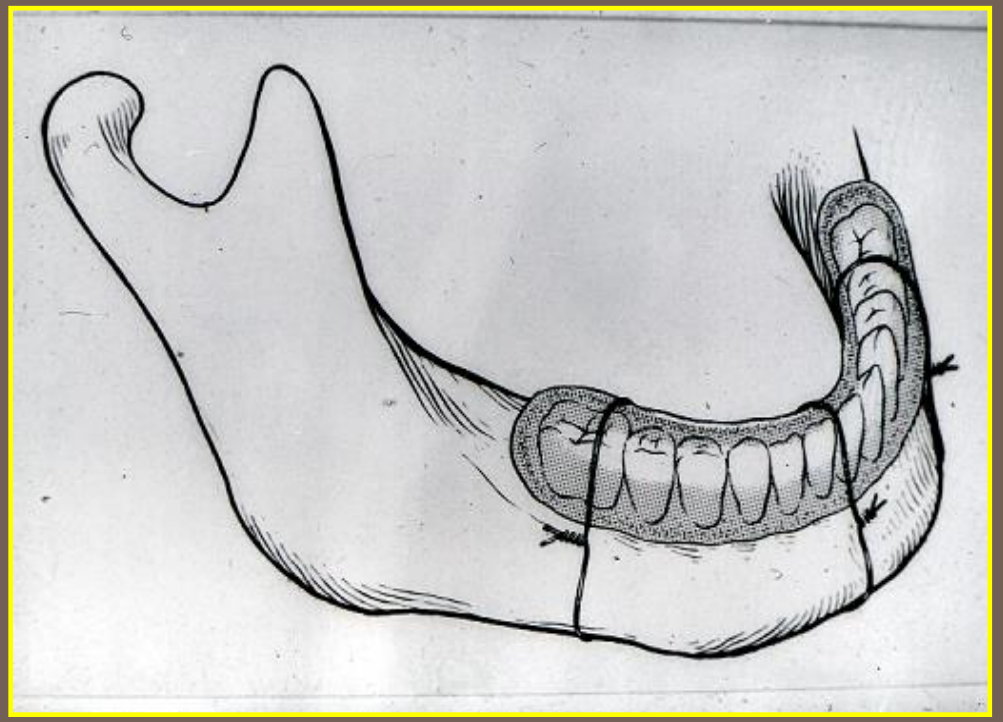
„cap splint”







Gunning splint



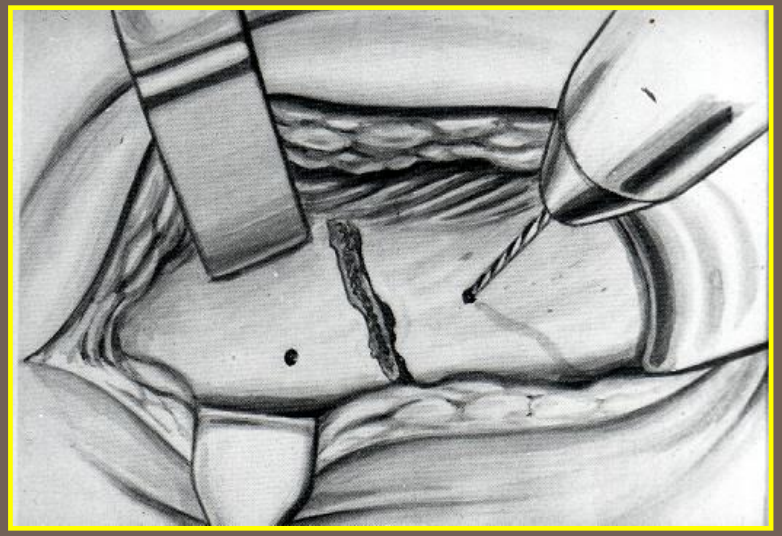
circumferencial fixation

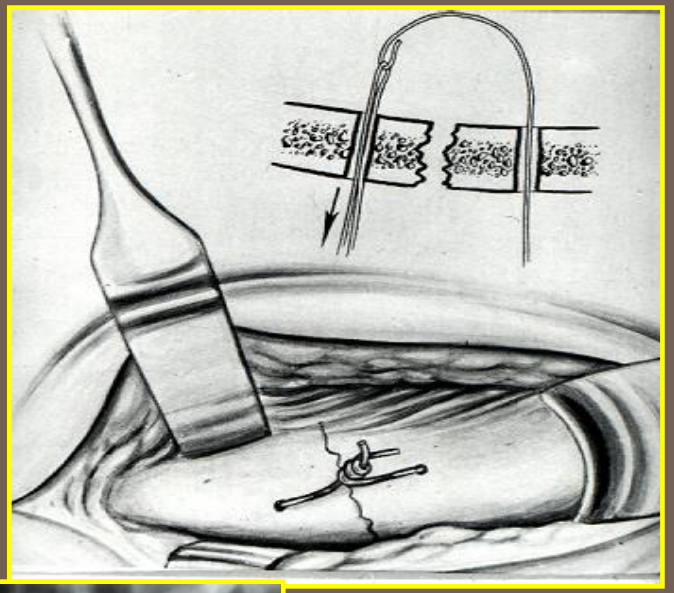
Surgical therapy of mandibular fractures

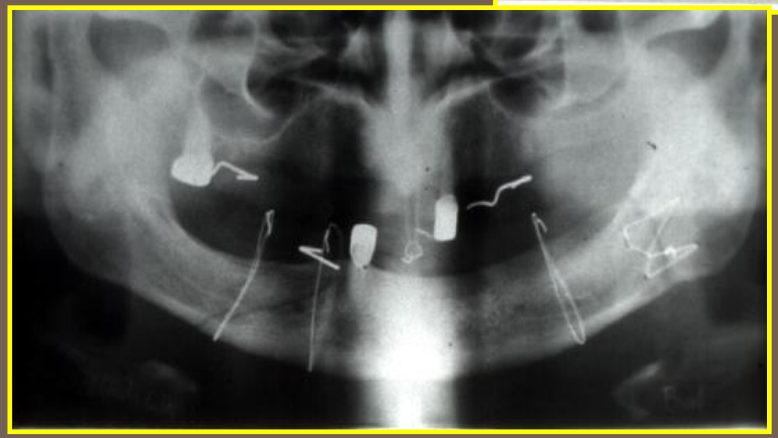
- **Osteosynthesis (extra and/or intraoral approach)**
  Types:
  -with wire (Wassmund, Neuner) + IMF
  -with pin fixation
  -with compression plates (first: Luhr in 1968; most modern)
- **-systems:**
  - **Luhr**
  - **DCP plate (Dynamic Compression Plate) – ASIF (Association for the Study of Internal fixation)**
  - **Miniplate (by Champy)– non-compression plate → selfcompression by muscles – load sharing**
  - **Reconstruction plate – load bearing**
  - **Microplate**
  - **Resorbable plate – childhood**

Surgical therapy of mandibular fractures

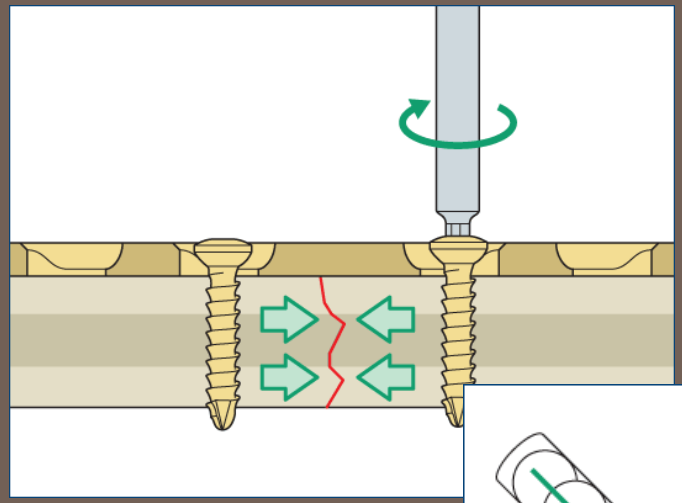
- **Indications of compression osteosynthesis**
  - **total toothless**
  - **corpus fracture together with high (intercapsular) condylar fracture**
  - **big dislocation**
  - **Open, multiple fracture**
  - **when IMF is contraindicated (epilepsia, hyperemesis, respiratory disorders, etc.)**
- **Contraindications of compression osteosynthesis**
  - **childhood (dental bulb injury)**

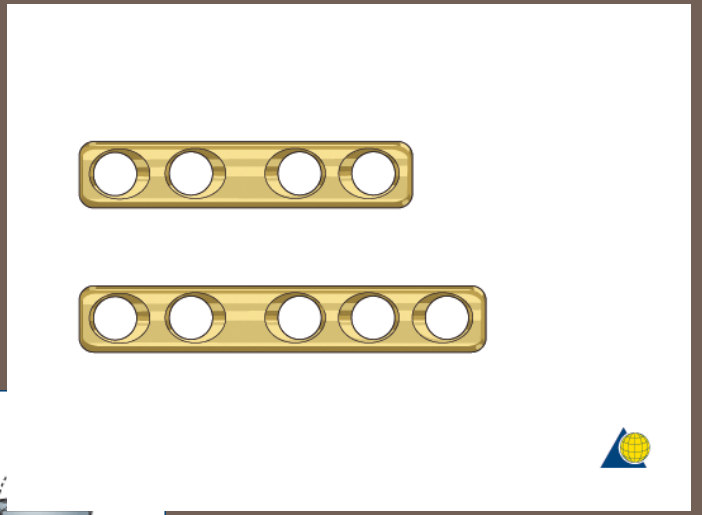


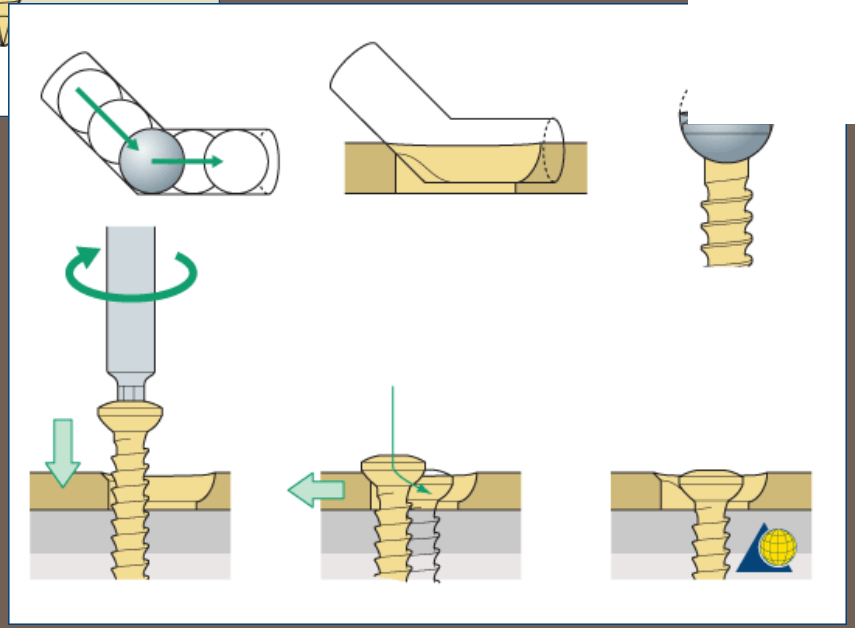




History

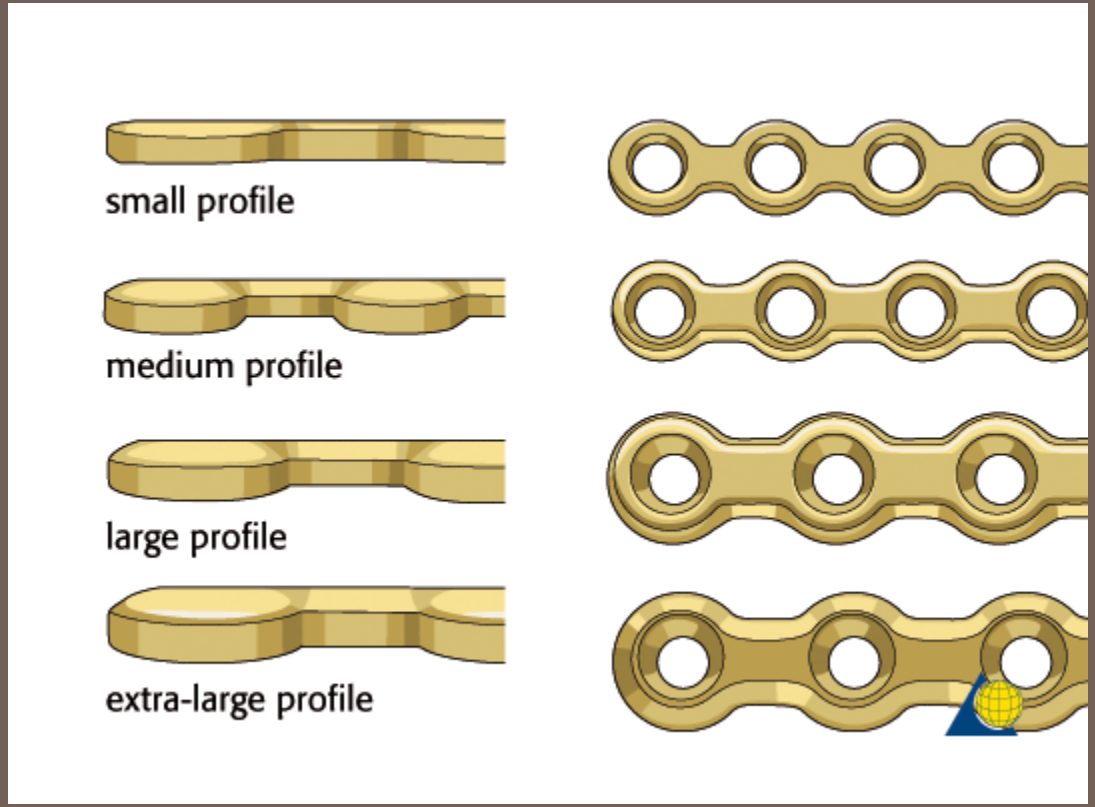




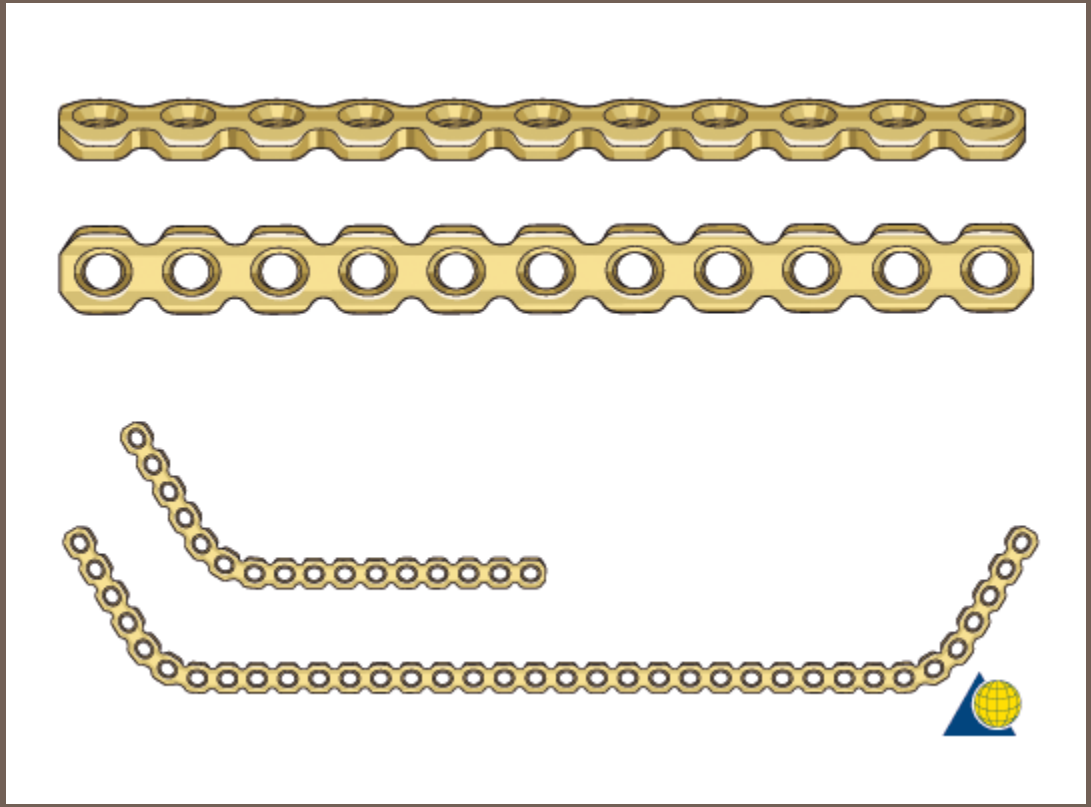


Dynamic Compression Plate

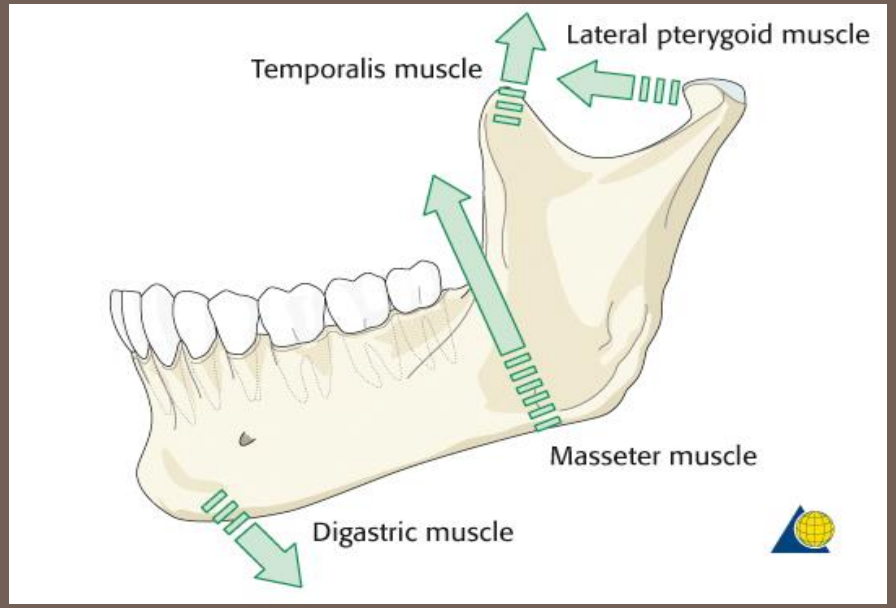
Miniplate

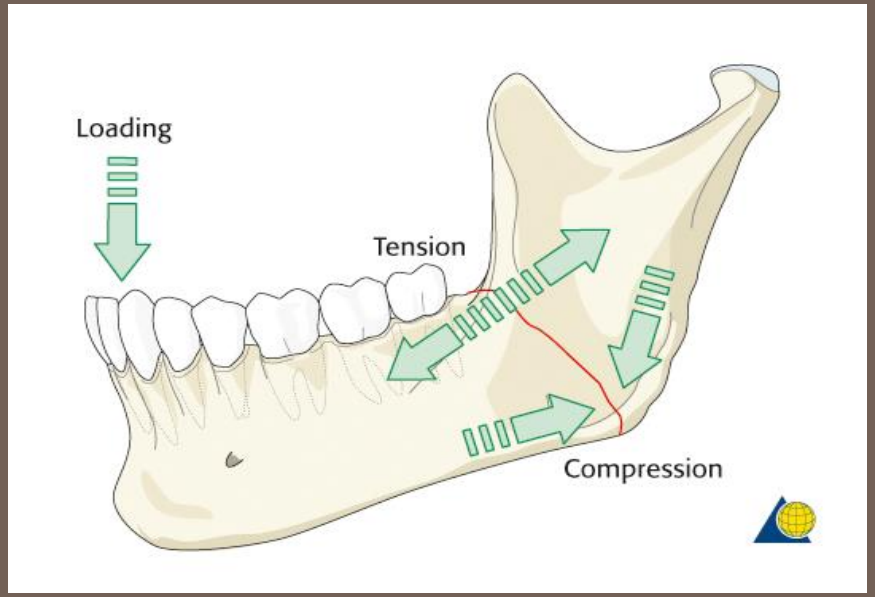

small profile
medium profile
large profile
extra-large profile

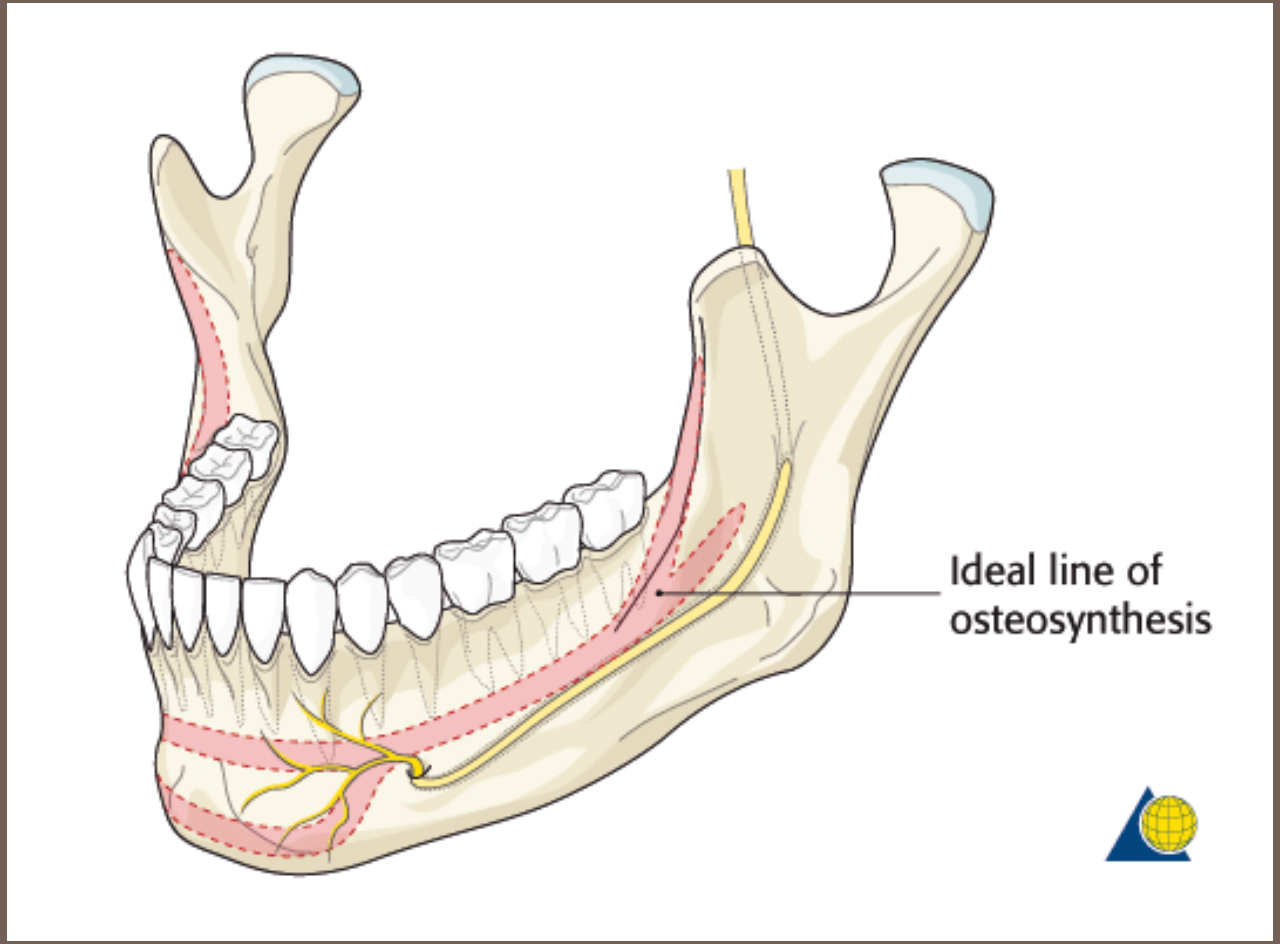
Reconstruction plate



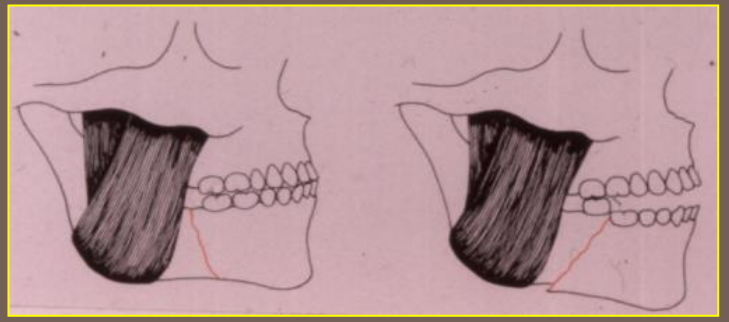
Biomechanics of the mandible

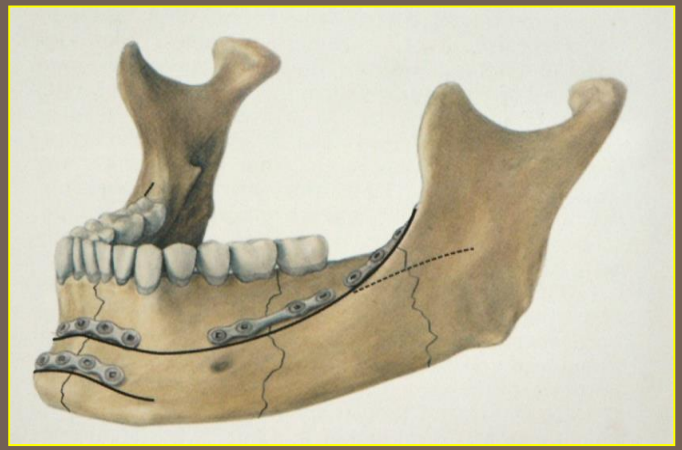


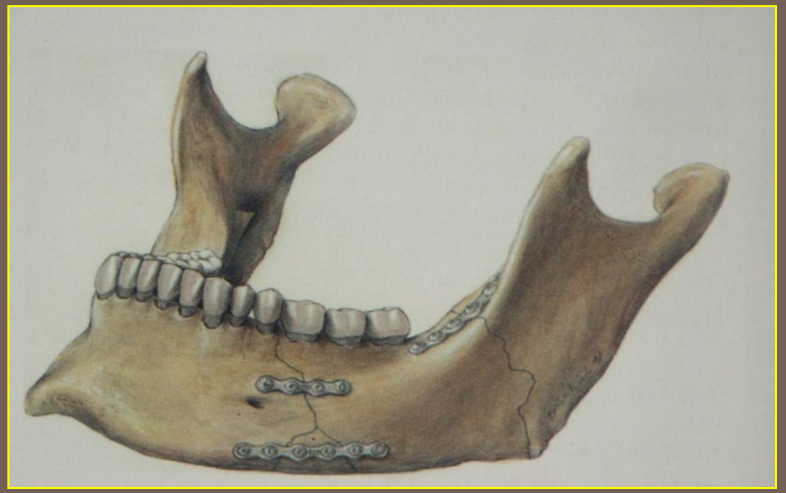



Ideal line of
osteosynthesis

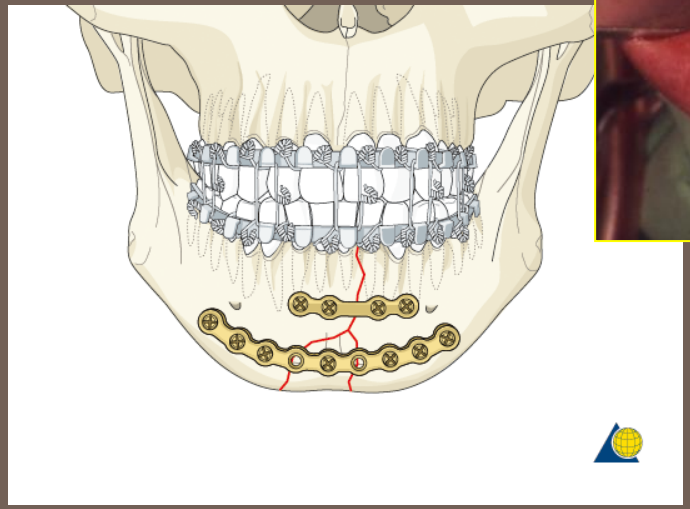
Method of miniplate osteosynthaesis

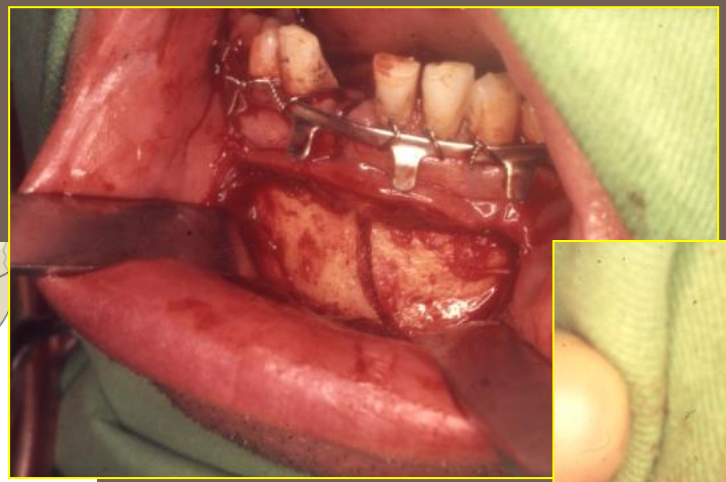




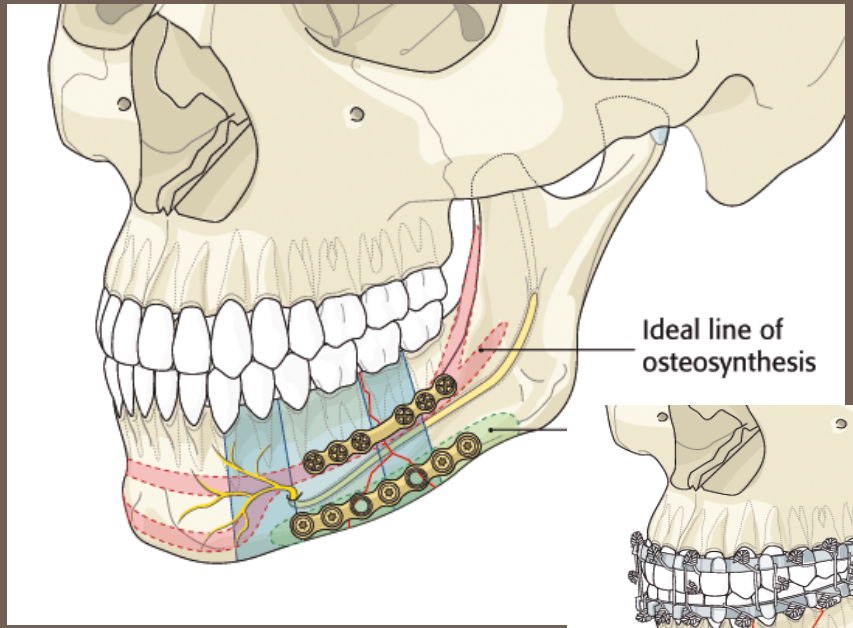


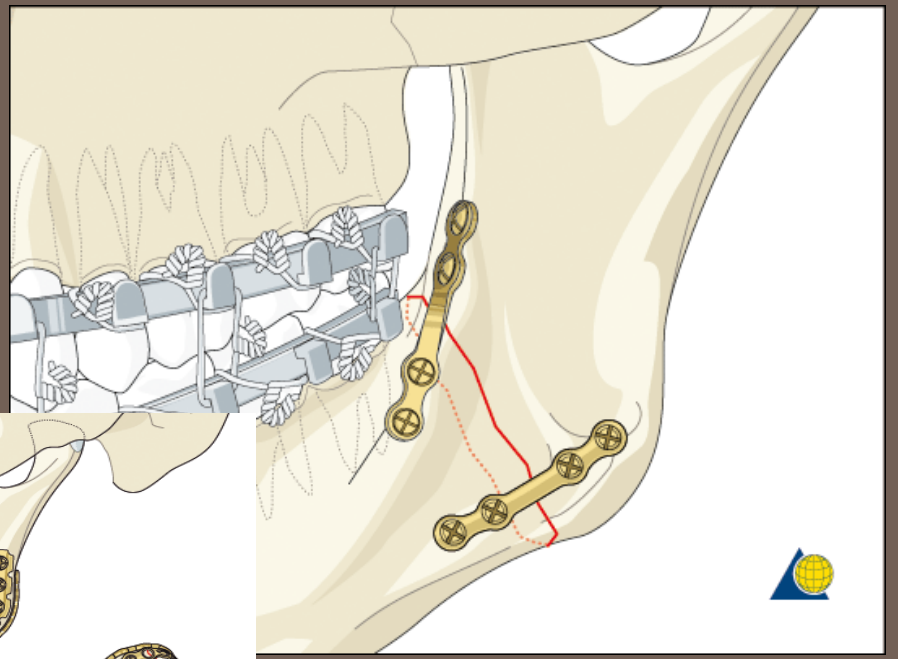
Parasymphysis and symphysis fracture

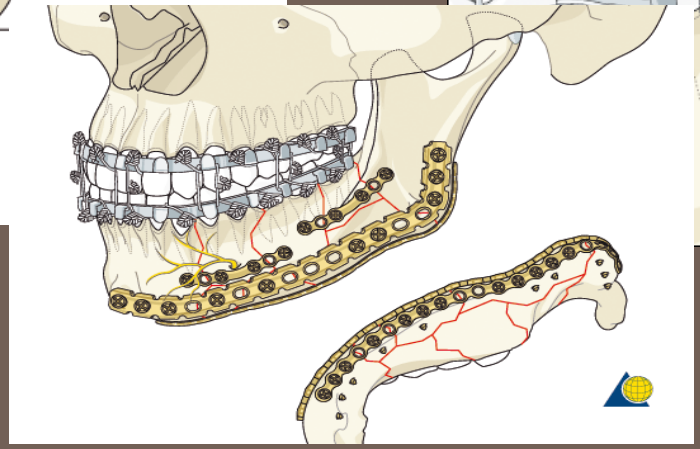




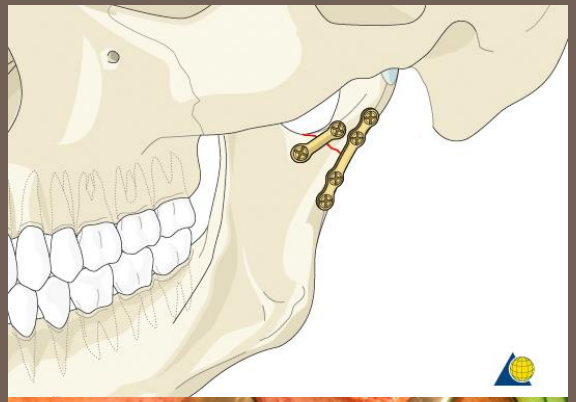
Body and angle fracture

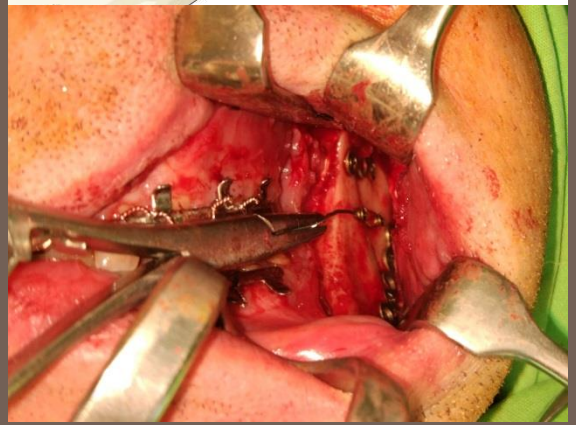


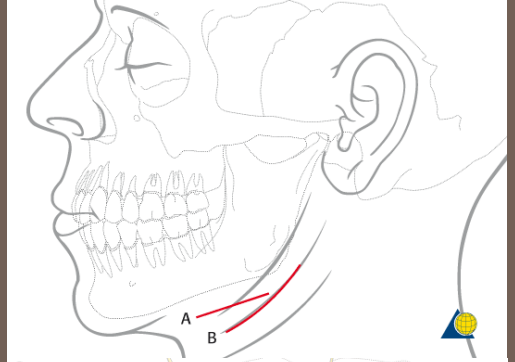


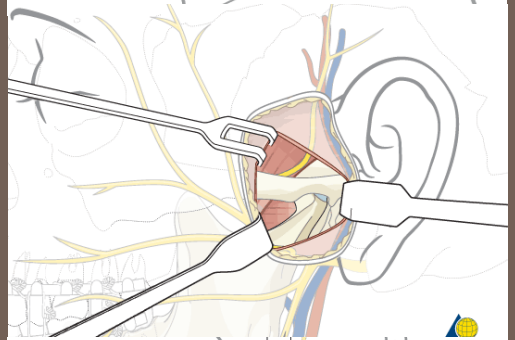


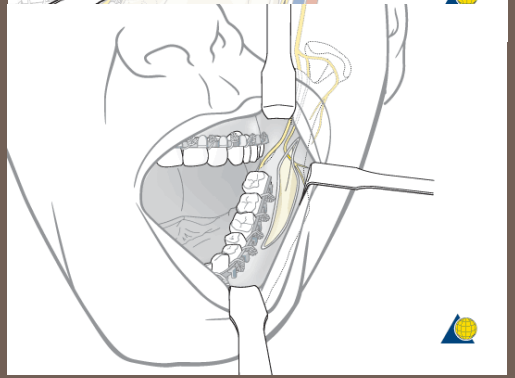
Condylar process fracture

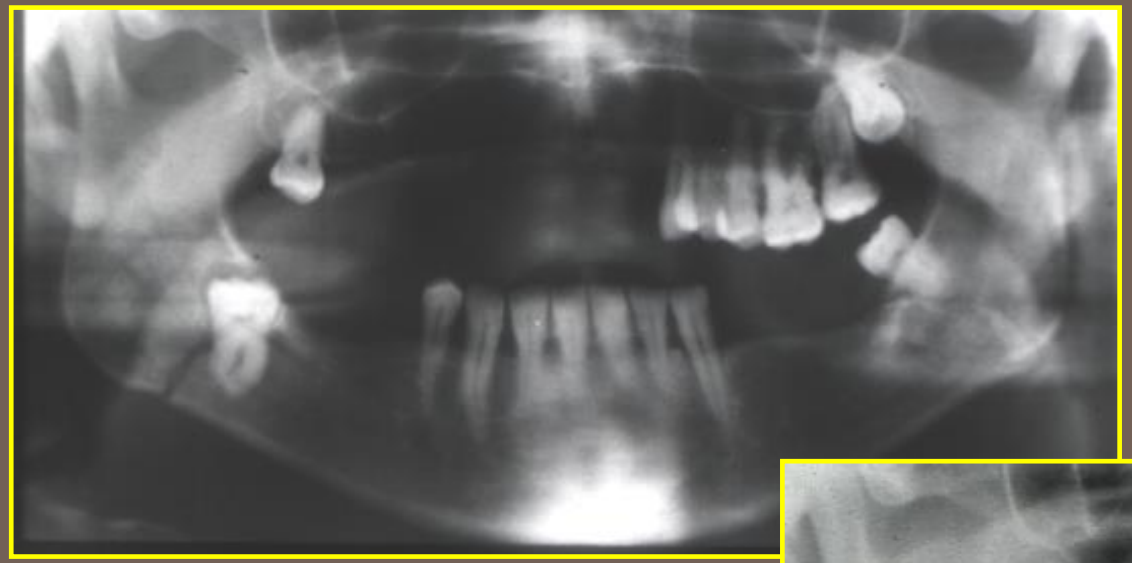


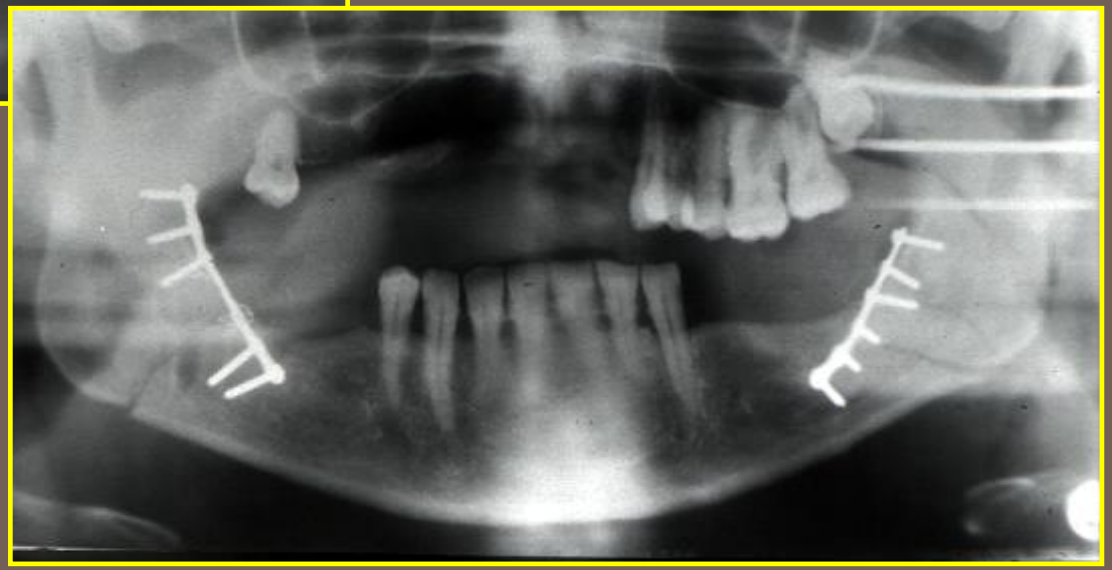






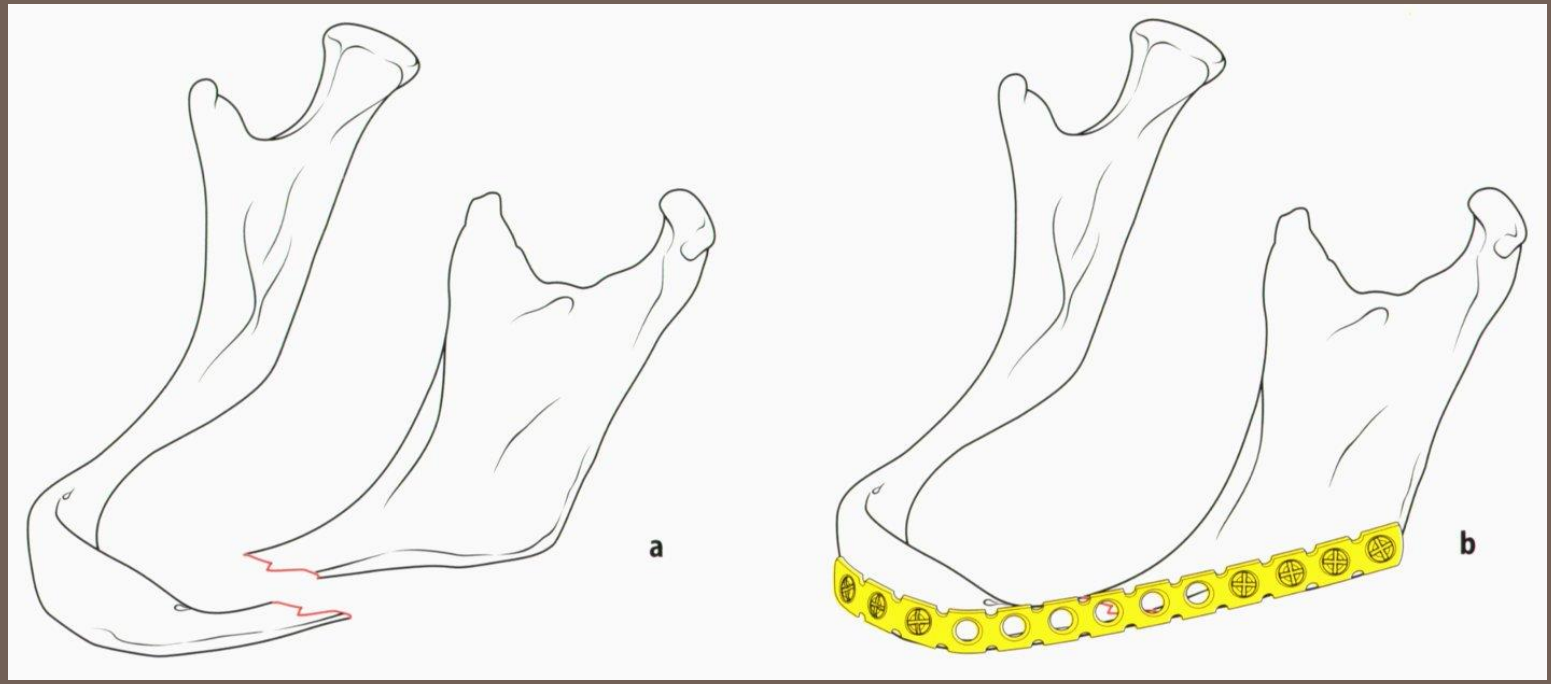




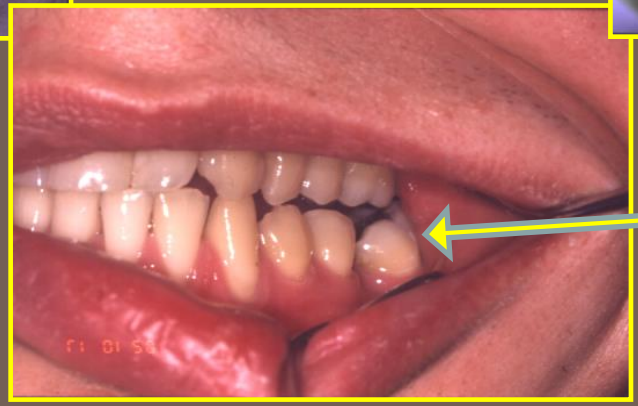


Bilateral

Toothless situation



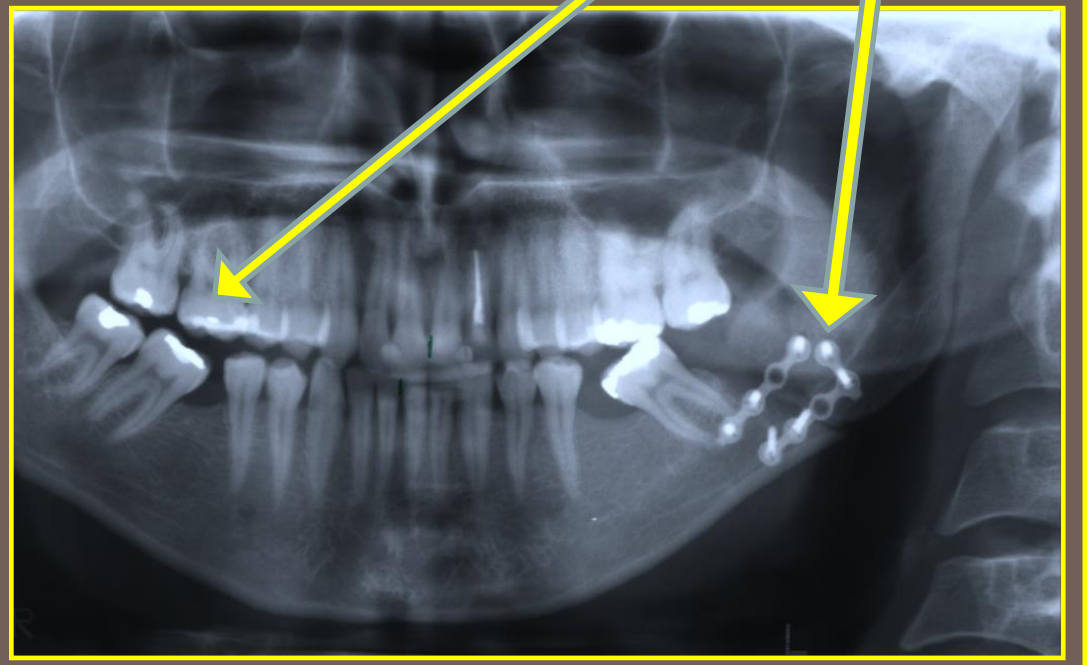
Failure

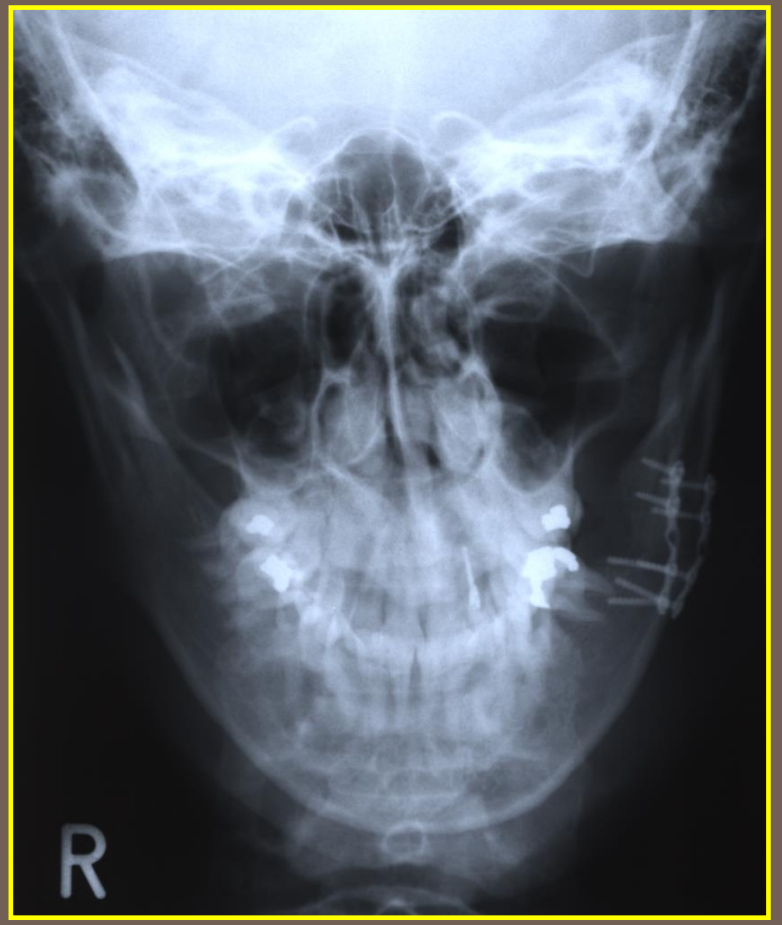


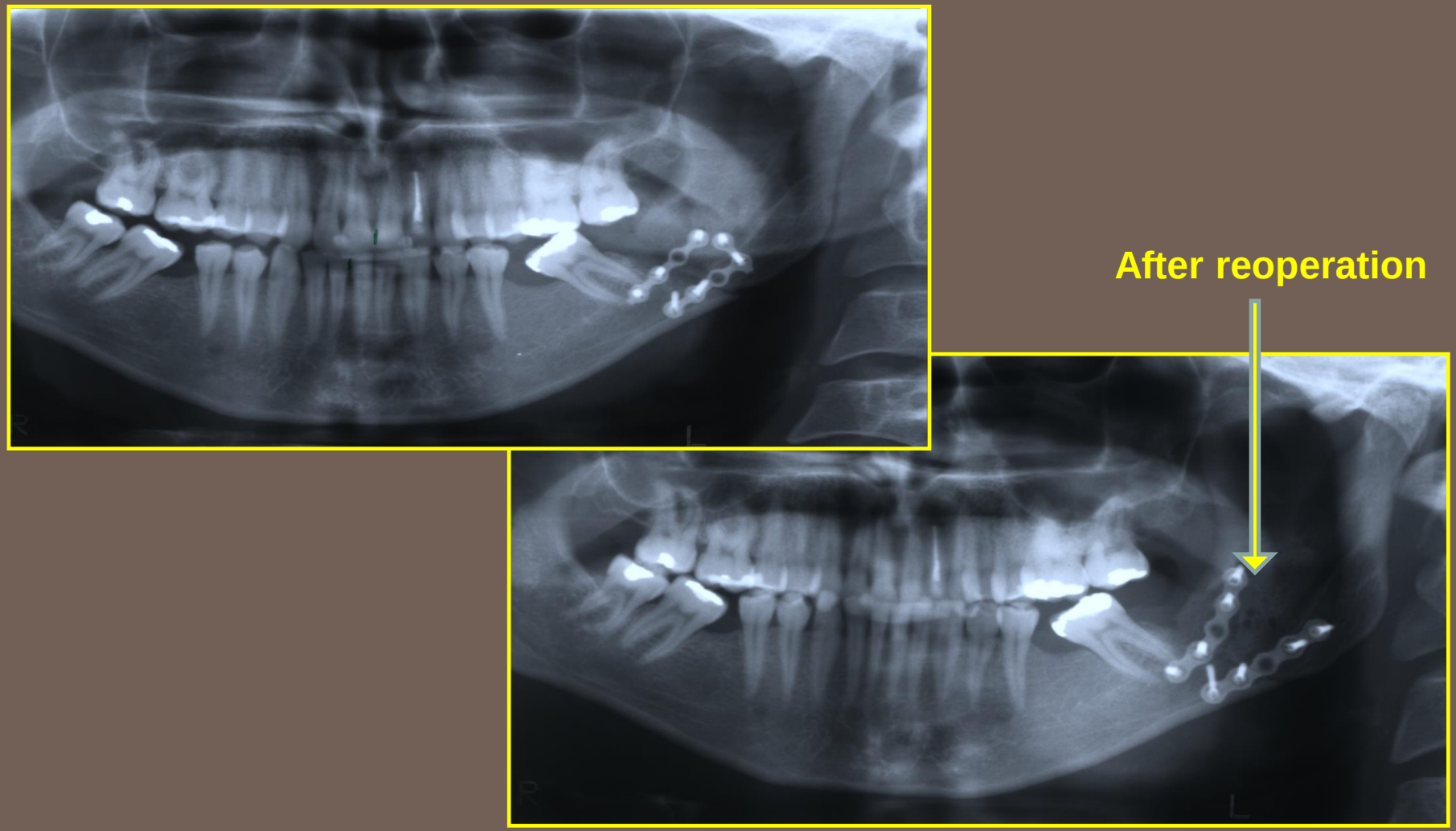
Marginal nerve injury

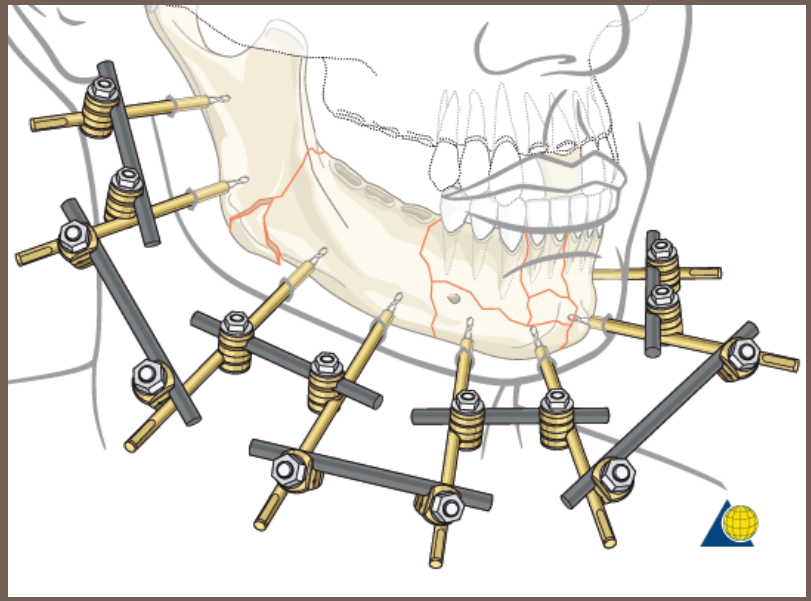
Malocclusion

MISTAKES

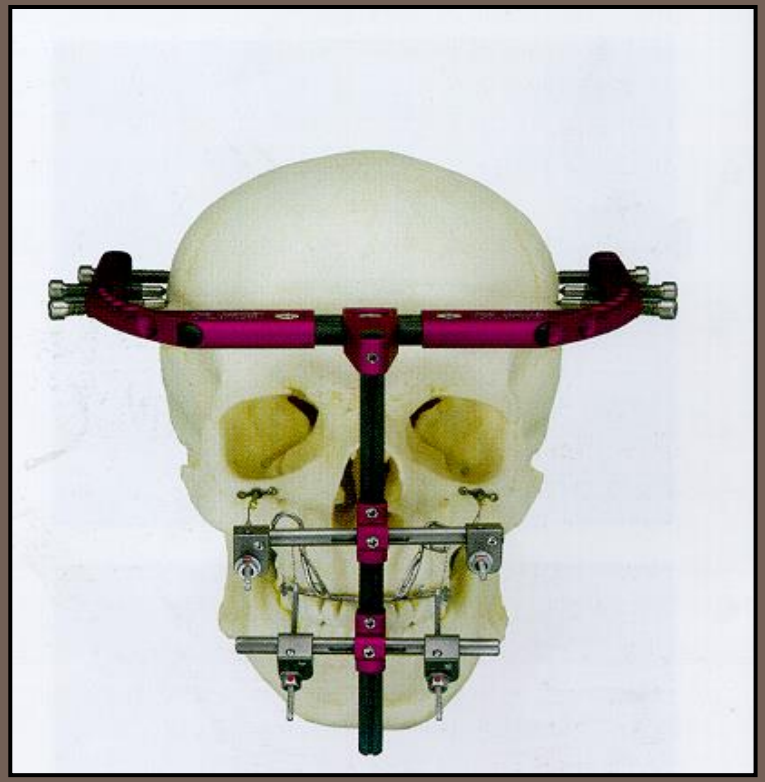





After reoperation



extraoral pin fixation



Pathologic fracture

- Bone fracture caused by disease that led to weakness of the bone structure

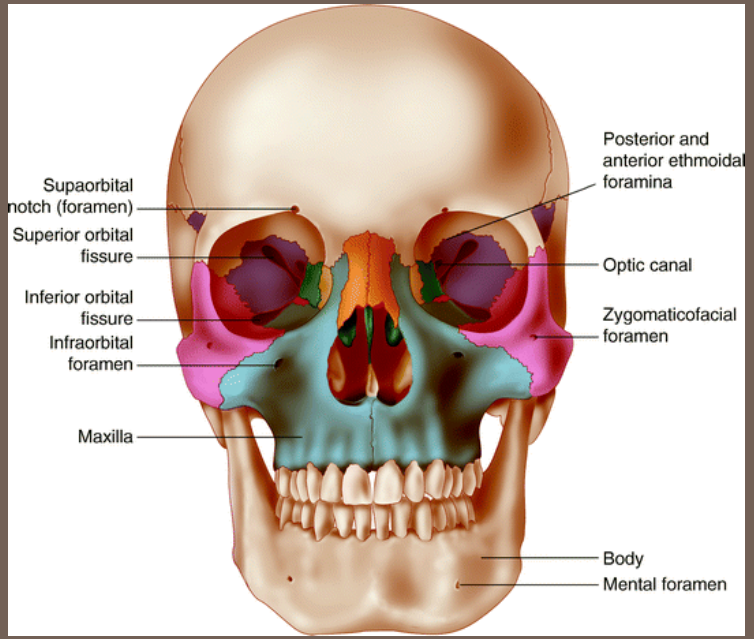
- Osteoporosis
- Osteonecrosis (radio-, medication related)
- Cyst
- Tumor

Midface fractures

Bones of the midface:

maxilla, palatine bone, inferior nasal concha, lacrimal bone, nasal bone, zygomatic bone, ethmoid bone, vomer

25% of maxillofacial region fractures



Classification of midface fractures
(by Schwenzer – 1967)

I. CENTRAL
II. CENTROLATREAL
III.LATERAL

I. Central Midface Fractures

- **Alveolar process fracture**
- **LeFort I. (horisontal maxilla fracture)**
- **Le fort II. (pyramidal) – high and deep forms**
- **Nasal bone fracture**
- **Fracture of the nasoethmoideal region - NOE**

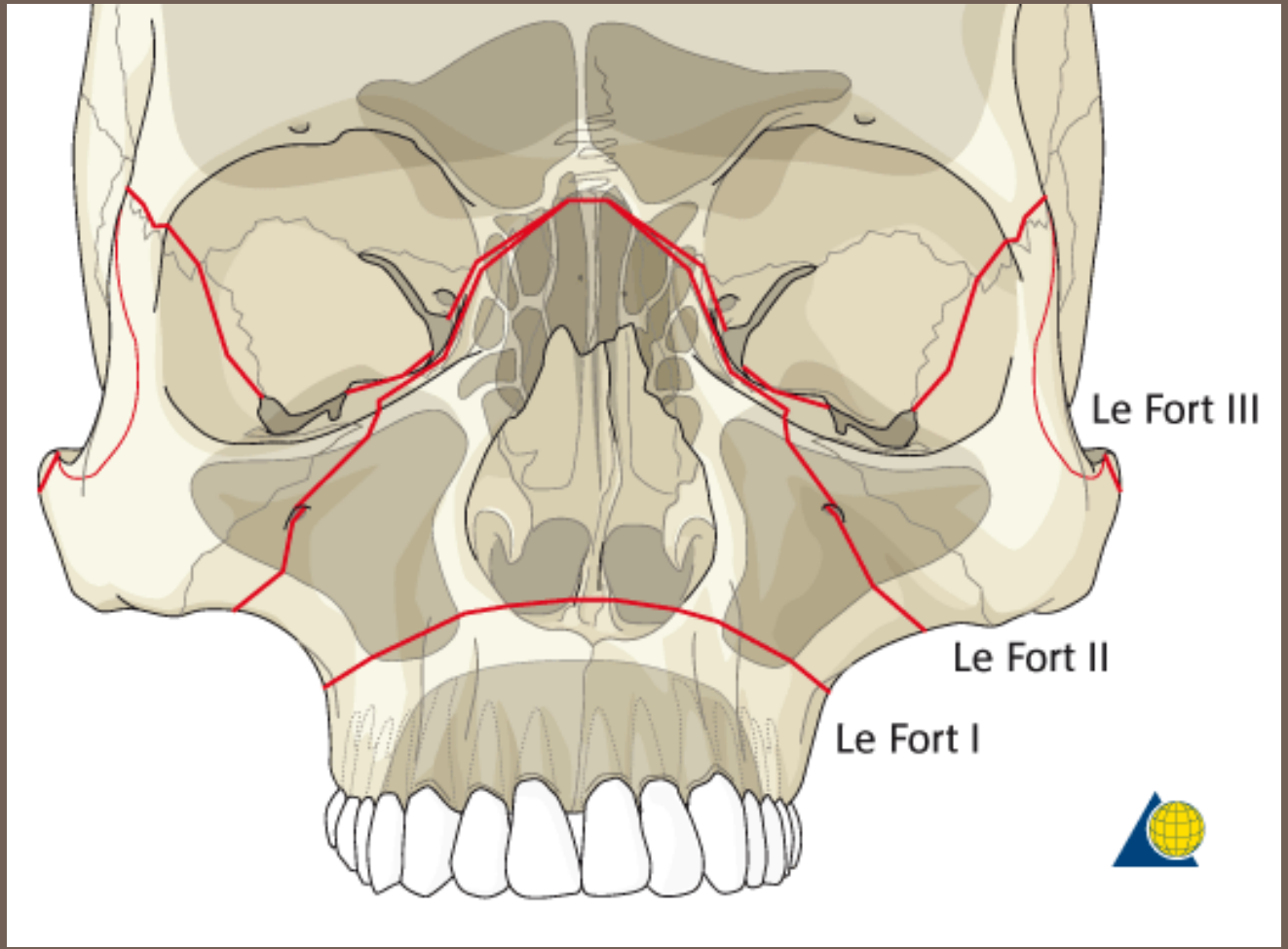
Classification of midface fractures
(by Schwenzer – 1967)

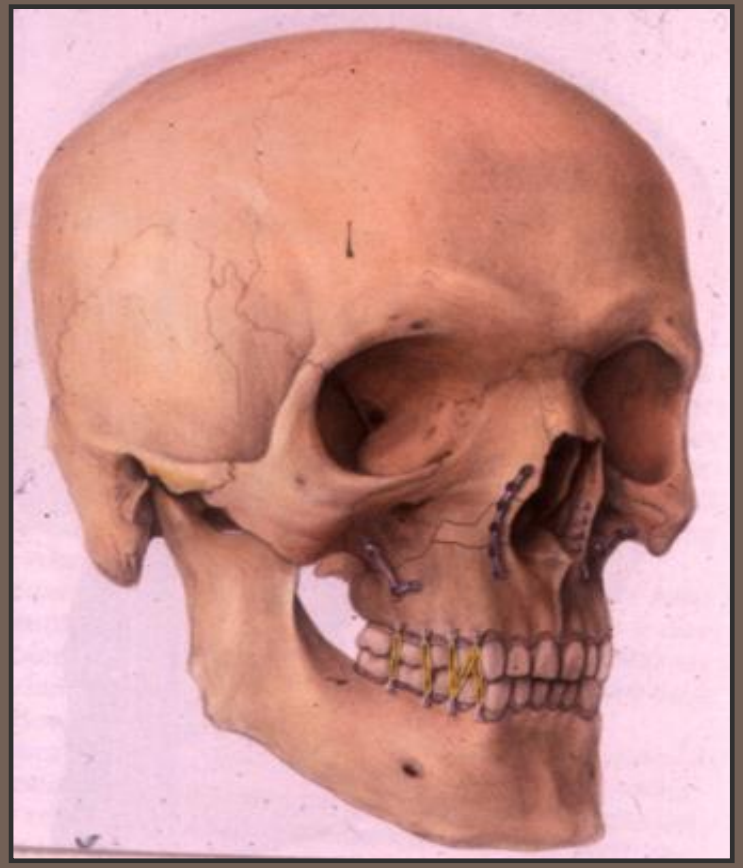
II. Centrolateral Midface Fracture

- **LeFort III.**

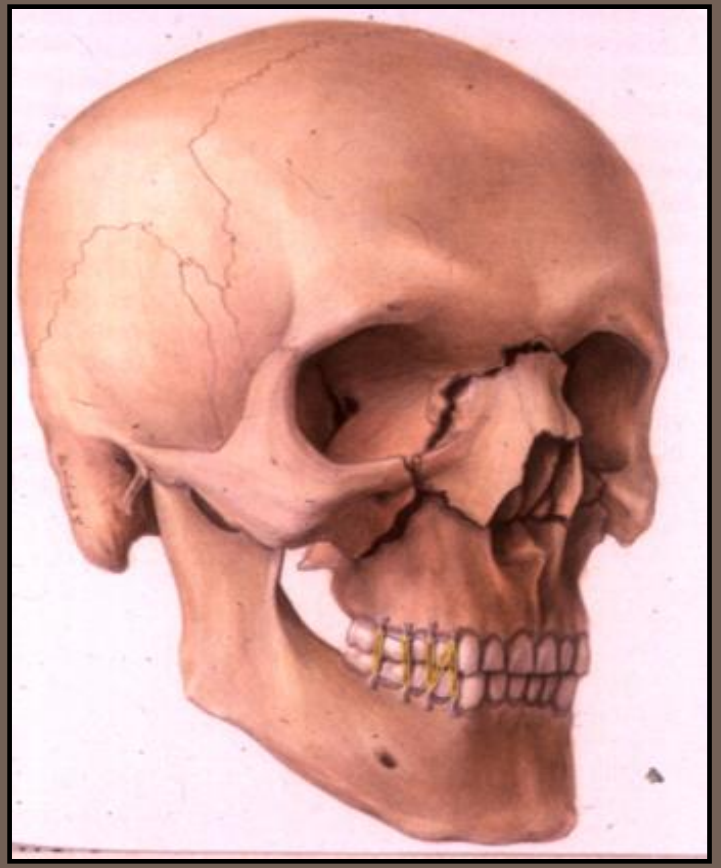
III. Lateral Midface Fractures (most often forms)

- **Zygomatic bone fracture**
- **Zygomatic arch fracture**
- **Zygomaticomaxillary fracture**
- **Orbit fracture**
  - **Blow out fracture (orbital floor) – fat or muscle (rectus inf. or obliqous int.) herniation**


Le Fort III
Le Fort II
Le Fort I



Le Fort I.



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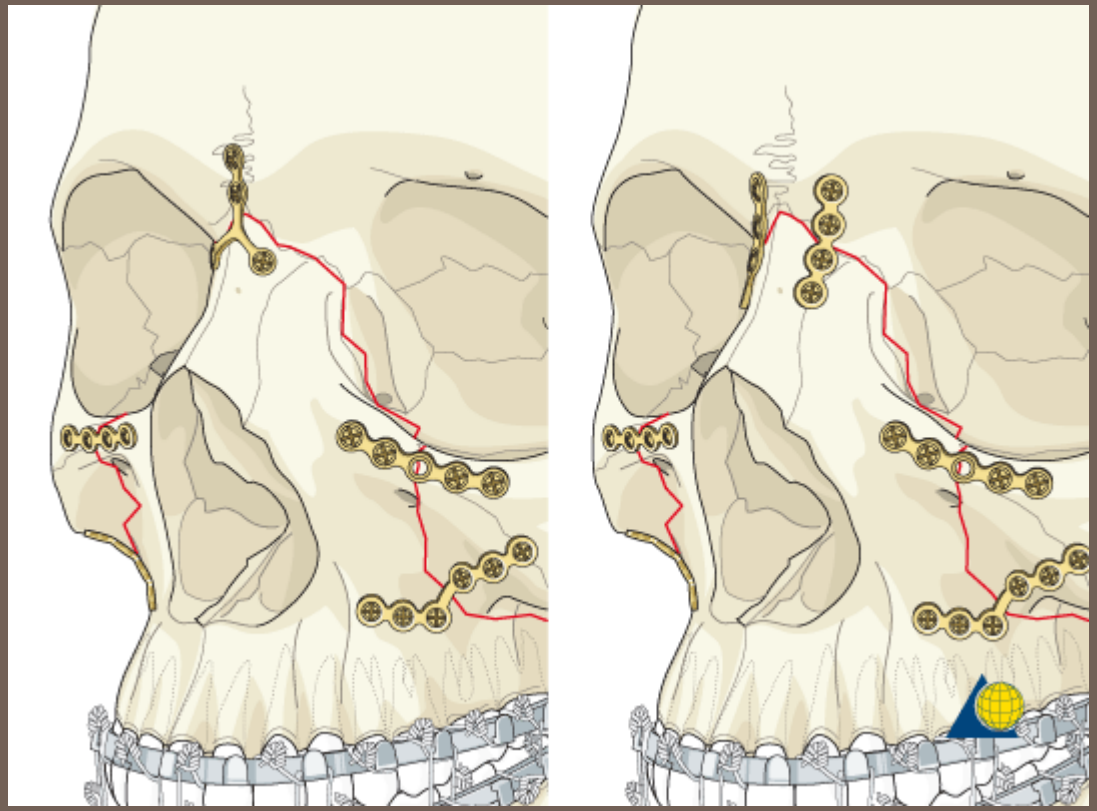
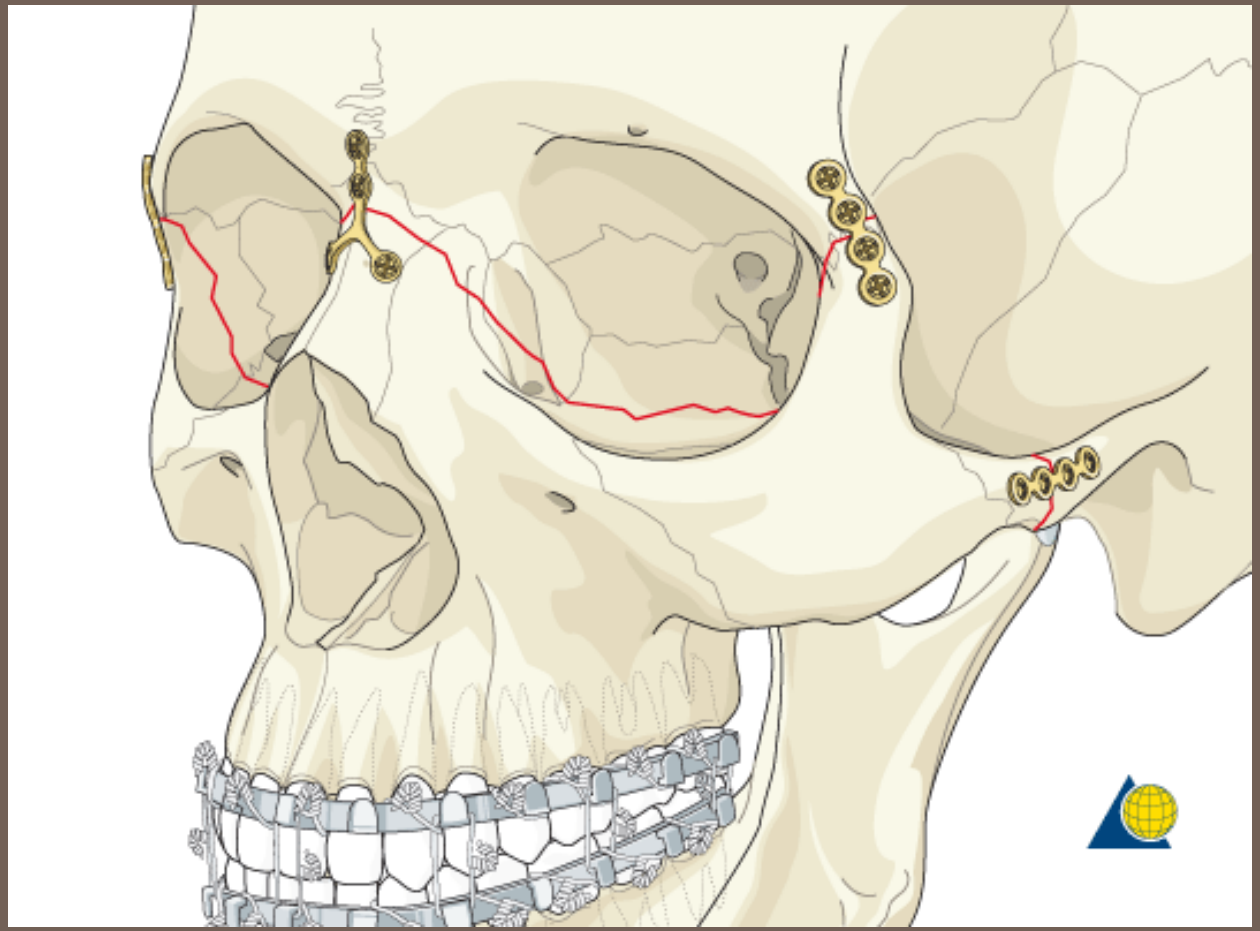
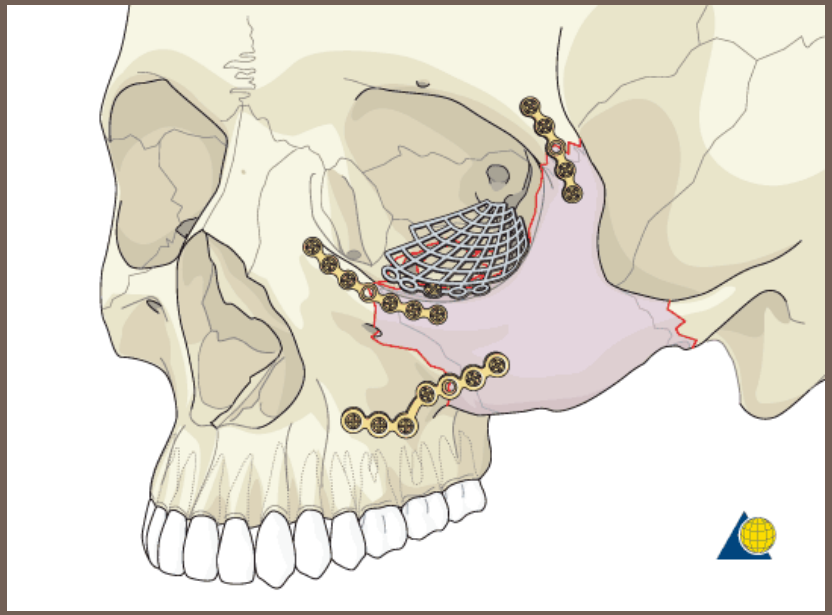


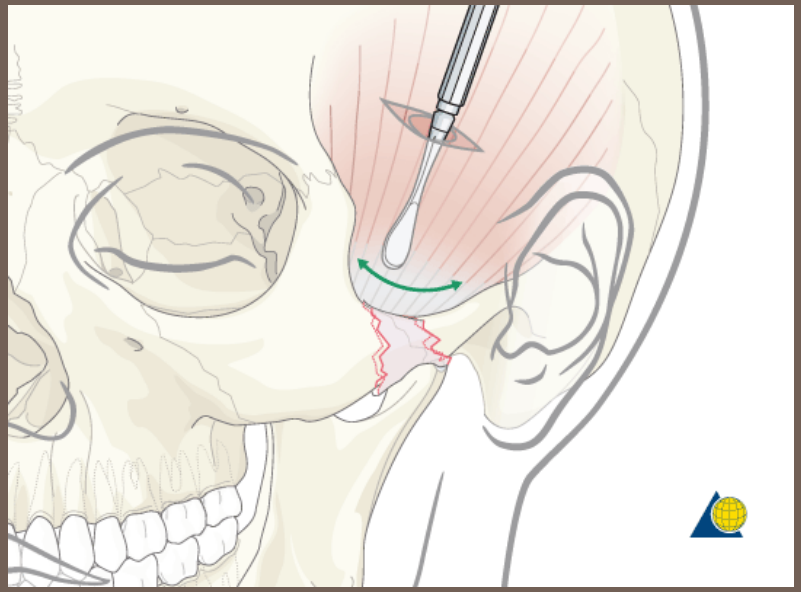
Le Fort II

Le Fort III

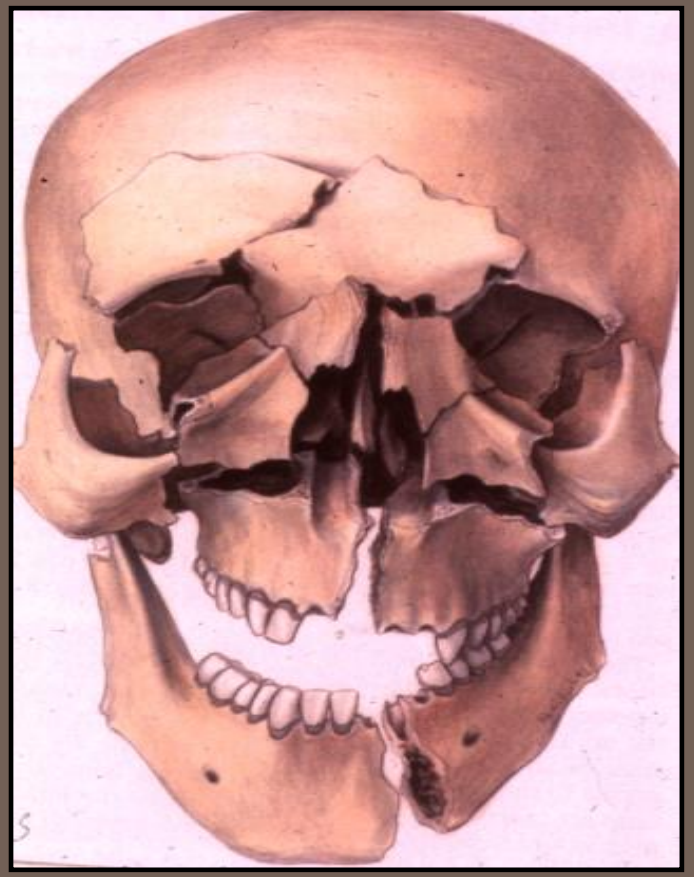




zygomatic corpus fracture



zygomatic arch fracture



multiplex midface fracture

Diagnosis of midface fractures

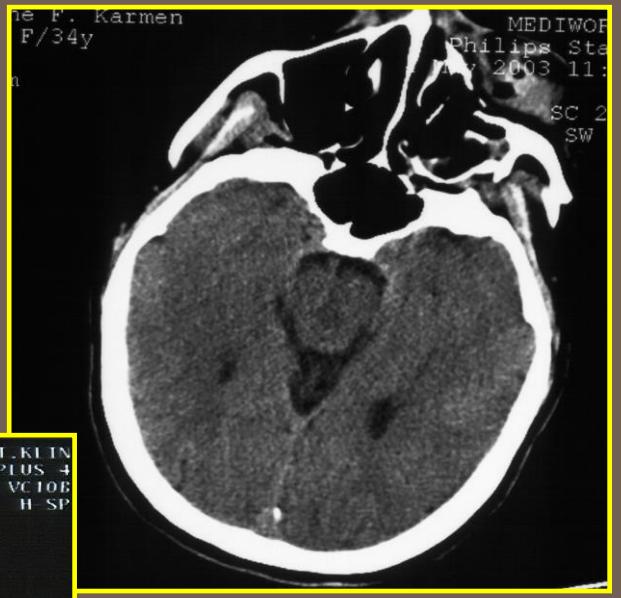
- **Physical examination (inspection, palpation)**
  - **swelling, „flat face”, pain, abnormal mobility, step formation, nose bleeding, periorbital emphysema, malocclusion, diplopia**
- **Imaging methods**
  - **X-ray. (OP, PA, zygomatic arch- sinus-, overbiting x-ray, etc.)**
  - **CT, CBCT**

Periorbital hematoma

„flat face”

Inhibited ocular motility


E Ellis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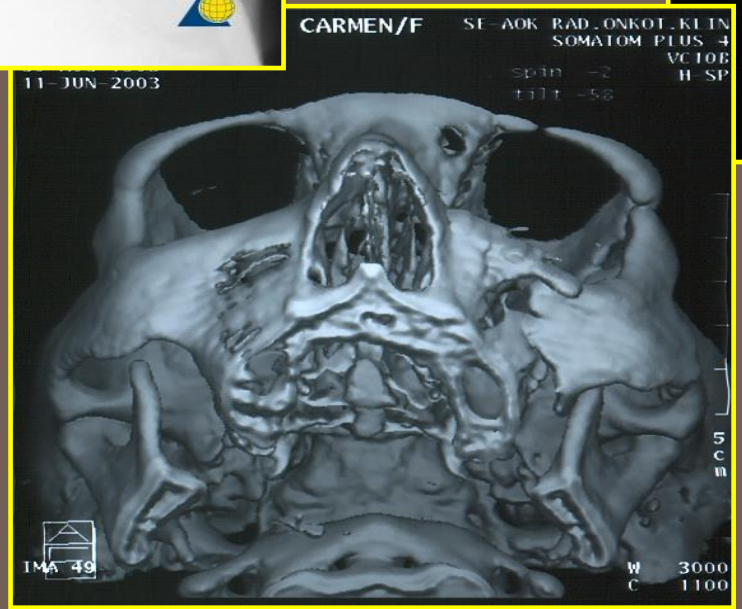
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SE-AOK RAD.ONKOL.KLIN
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11-JUN-2003
IMA 49
W 3000
C 1100

Therapy of midface fractures I.

Aim:

- Reconstruion of occlusion, functions and esthetics

Steps:

- reposition
- immobilisation (fixation)
- rehabilitation

Therapy of midface fractures II.

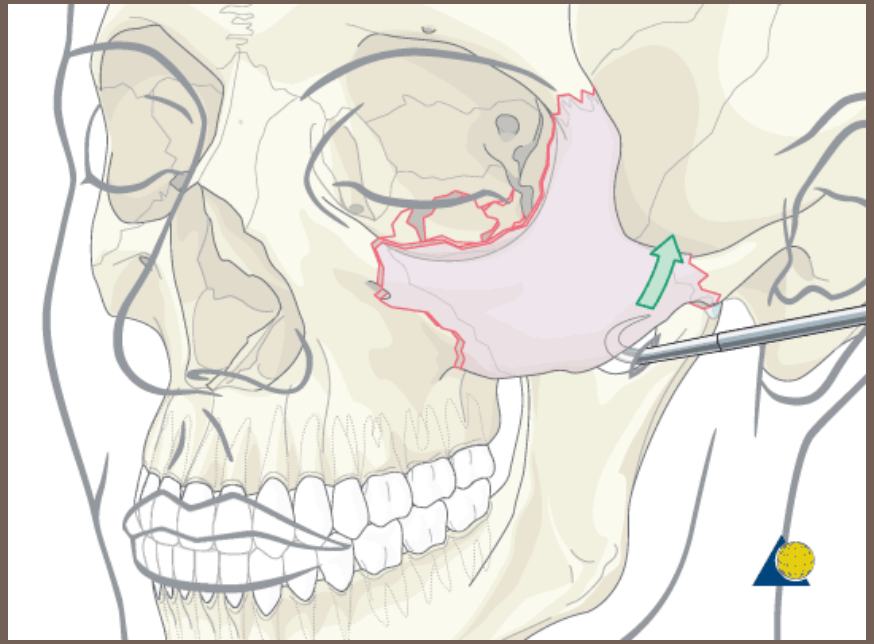
- **Observation (non-dislocated)**
- **Surgical**

  - Closed treatment: elevation with surgical hook or by elevator (Gillies) without fixation in case of zygomatic bone fracture

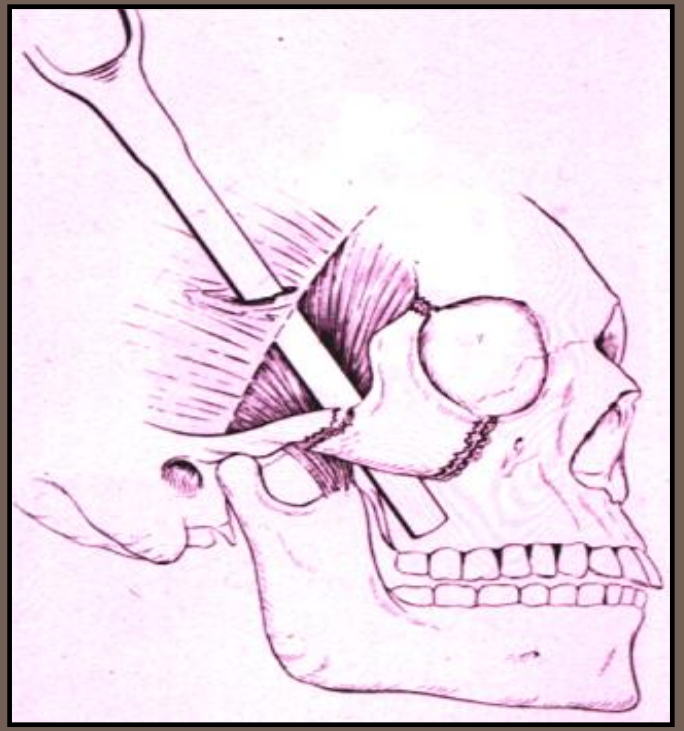
  - Open reduction and internal fixation: miniplate-, microplate-, resorbable plate osteosynthaesis

  - Orbital rim and/or floor reconstruction with titanium net or with resorbable plastic plate (PDS)

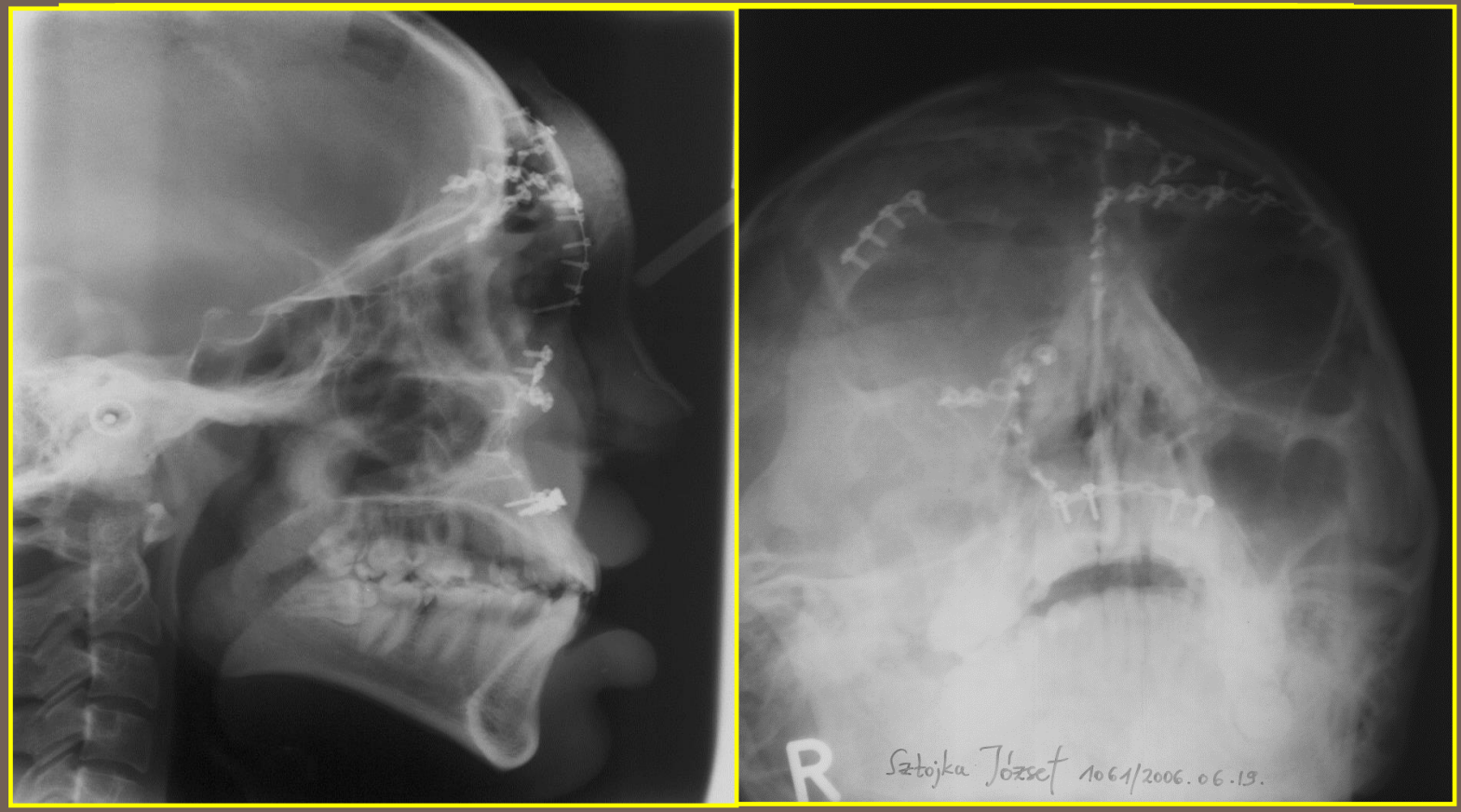
  - External fixation: pin fixation, Halo instrument



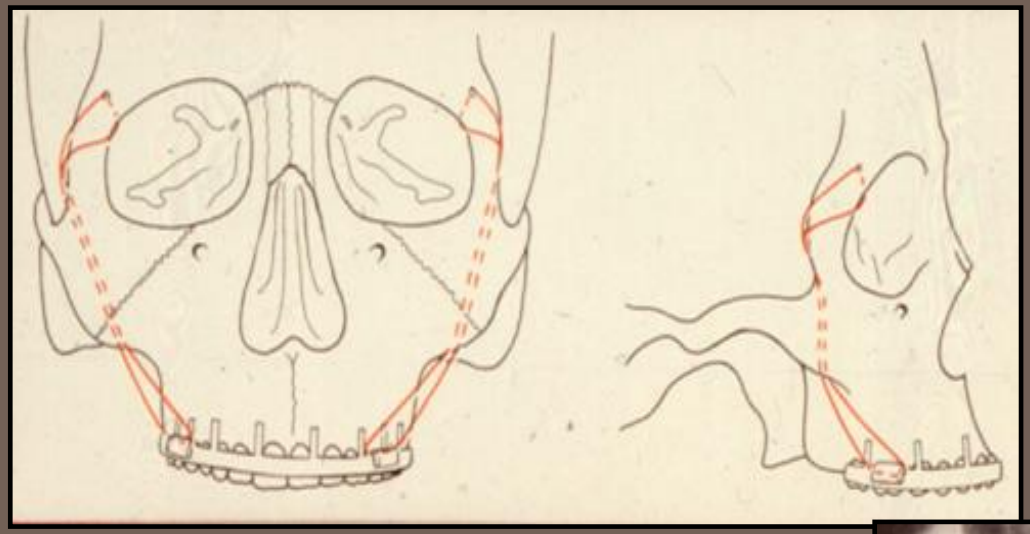
„hook elevation”



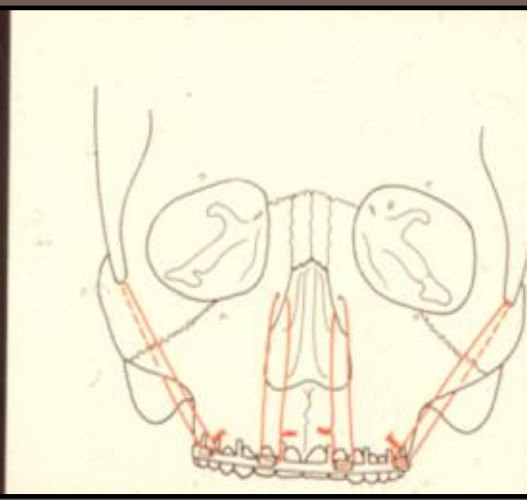
Gillies operation

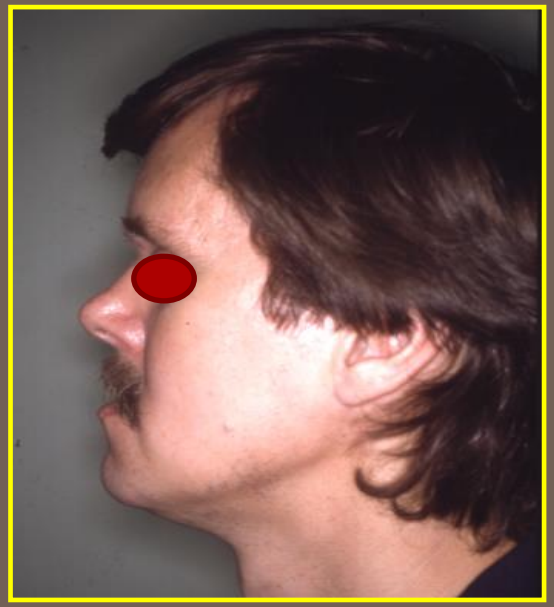


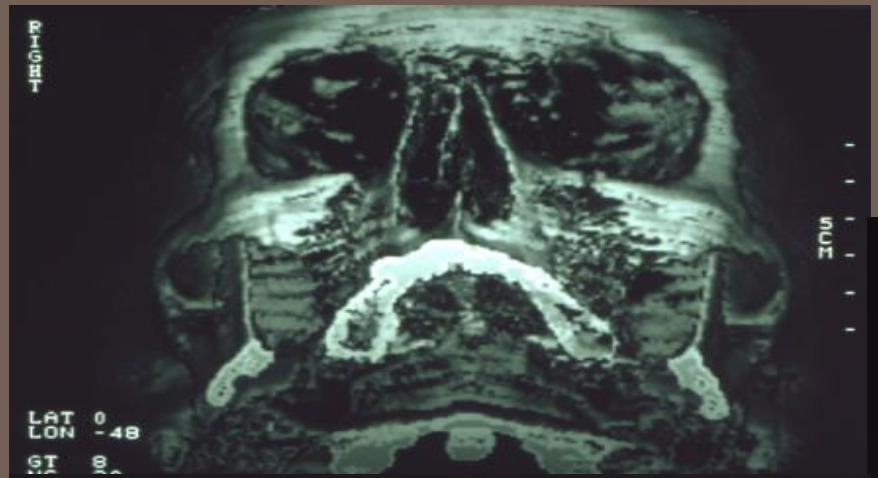
miniplate osteosnthesis



Addams like wire ligature (not used)



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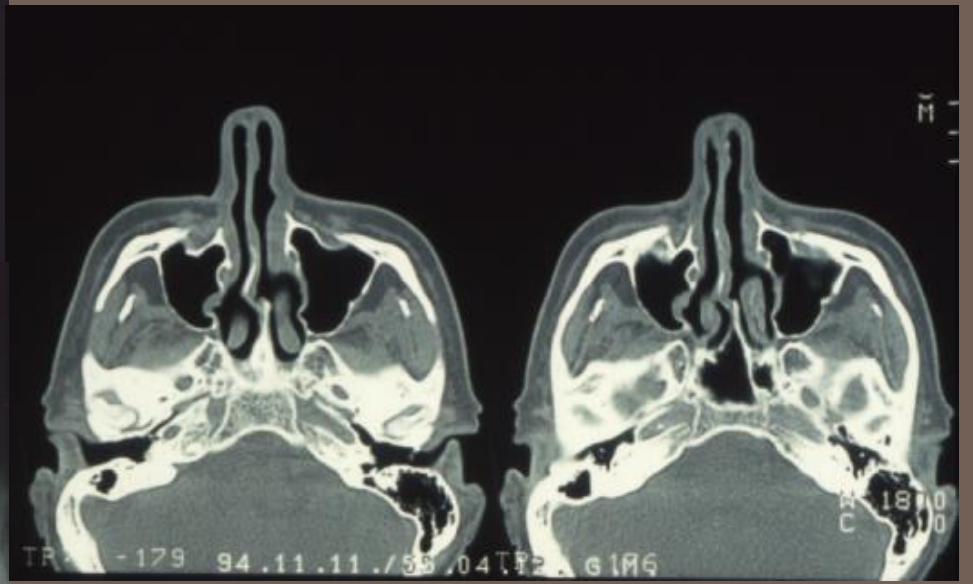
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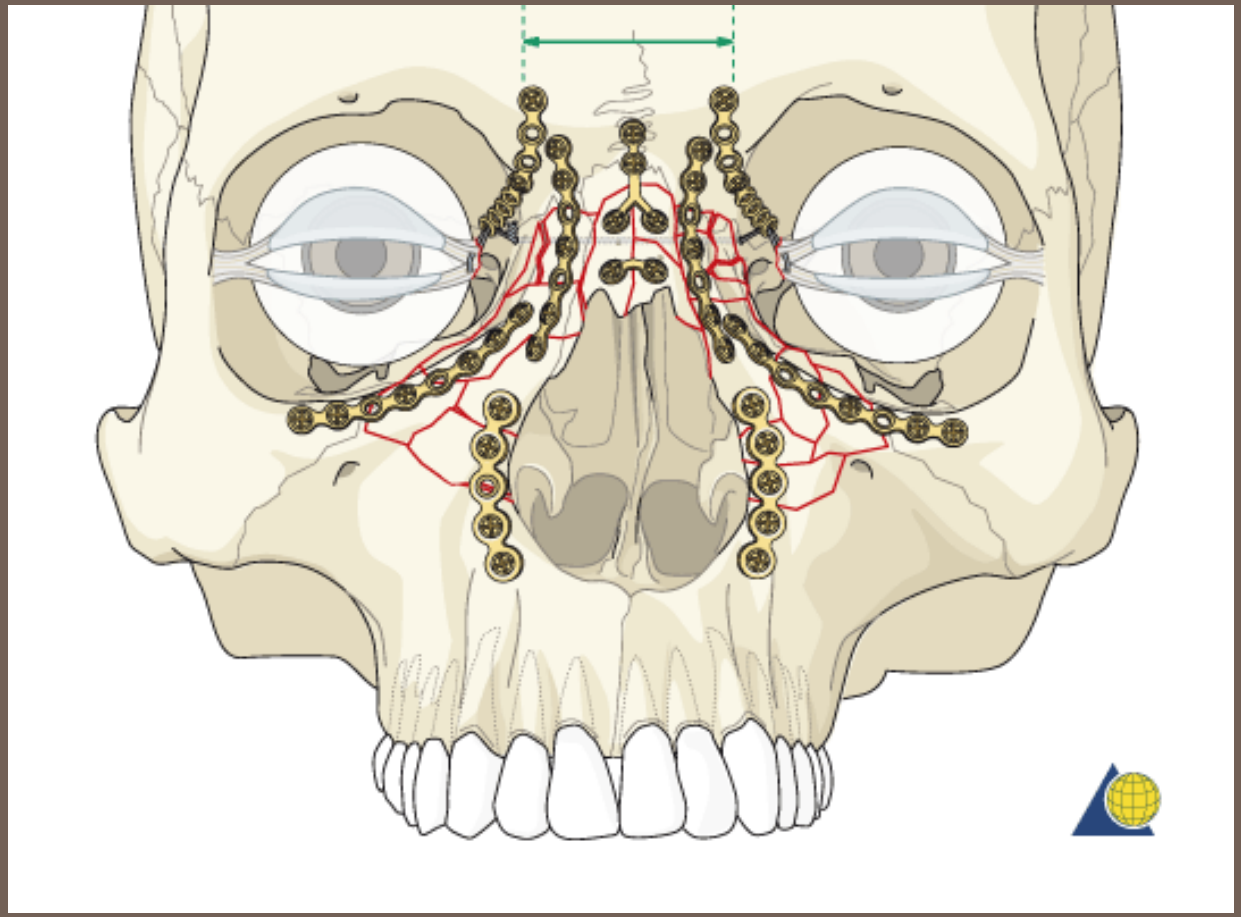
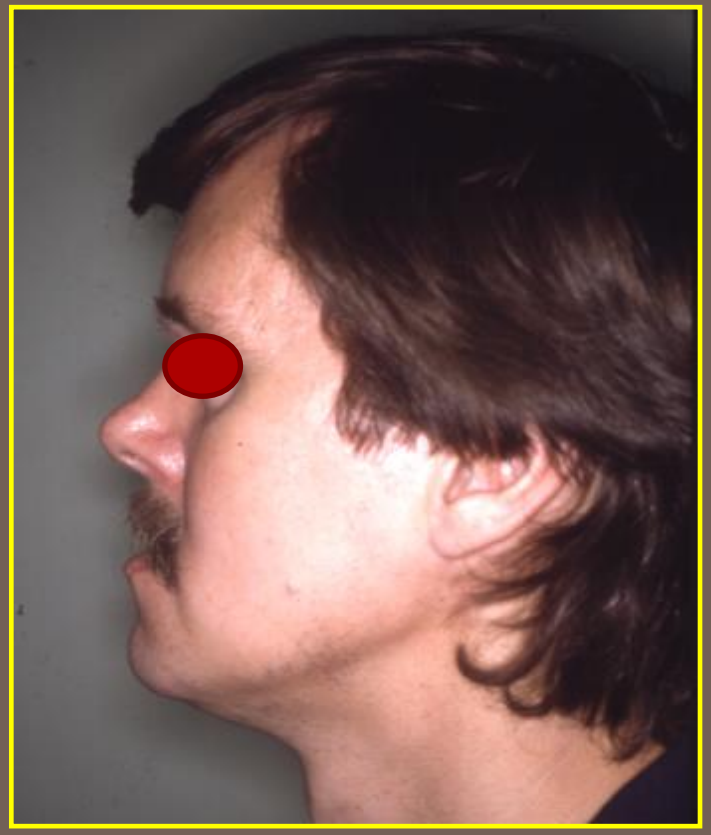


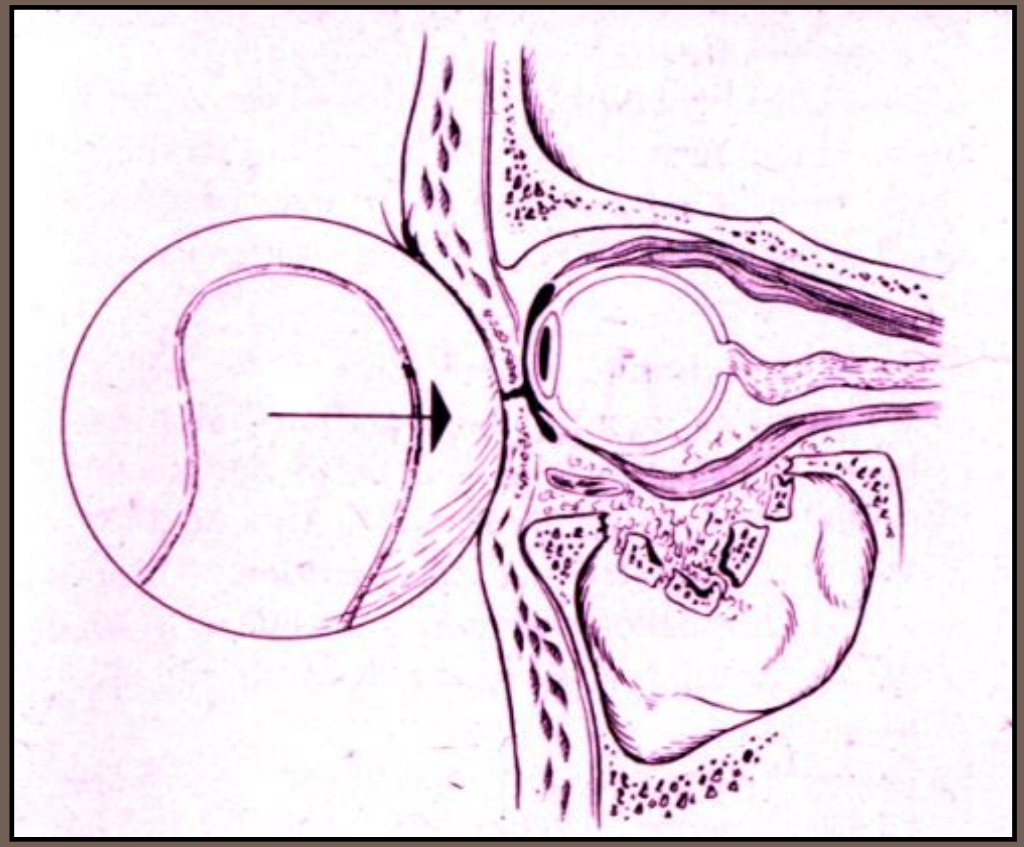


Preoperative condition

Postoperative condition

Blow- out fracture

Content of the orbita (fat or muscle /rectus inf. or obliqous int./ herniation through the orbital base impressional fracture into the sinus cavity due to sudden increase of orbital content pressure



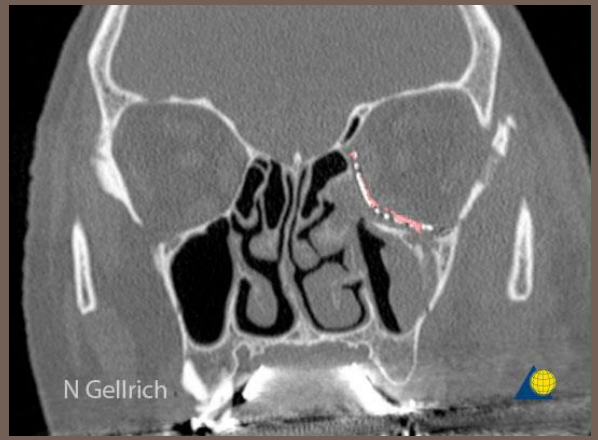
blow-out fracture

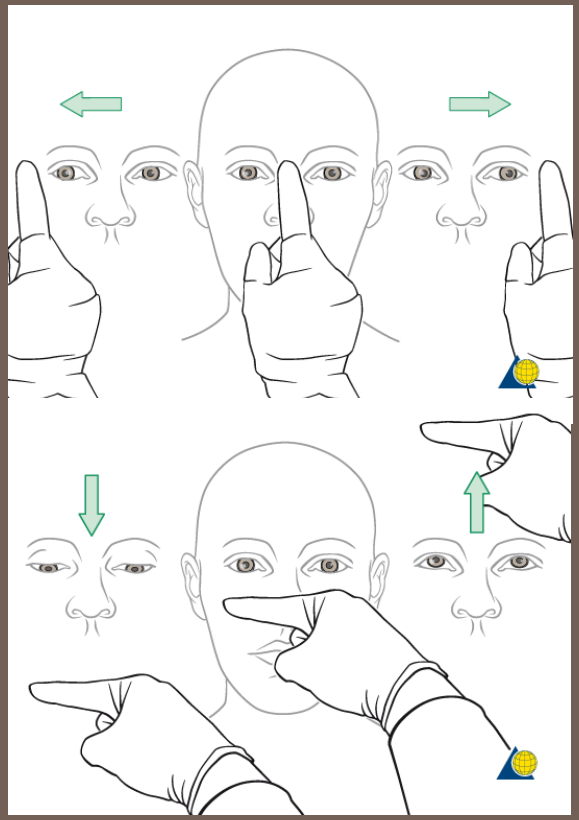
Symptoms

- decreased ocular motility
- dyplopia
- exophtalmus (later enophtalmus)

Diagnosis

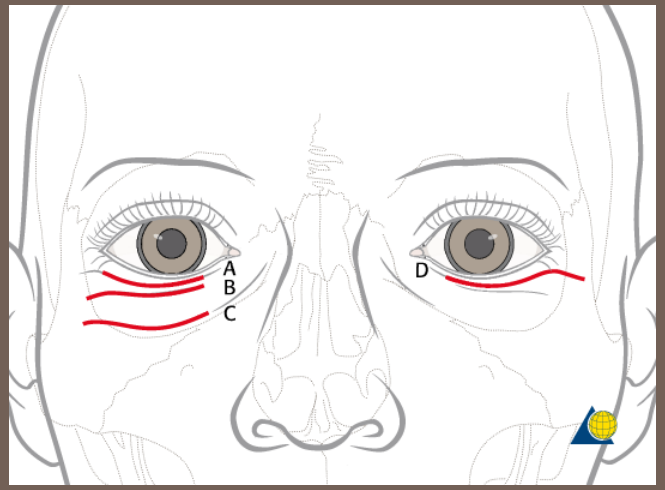
- Physical examination
- Imaging methods
  - PA skull x-ray
  - CT (coronal, saggital)

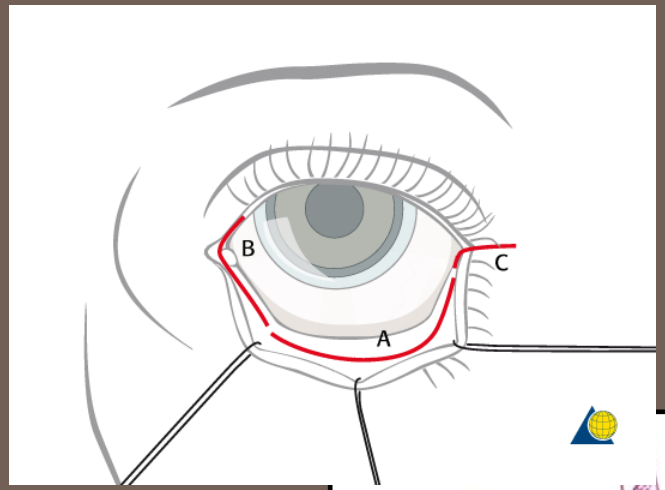


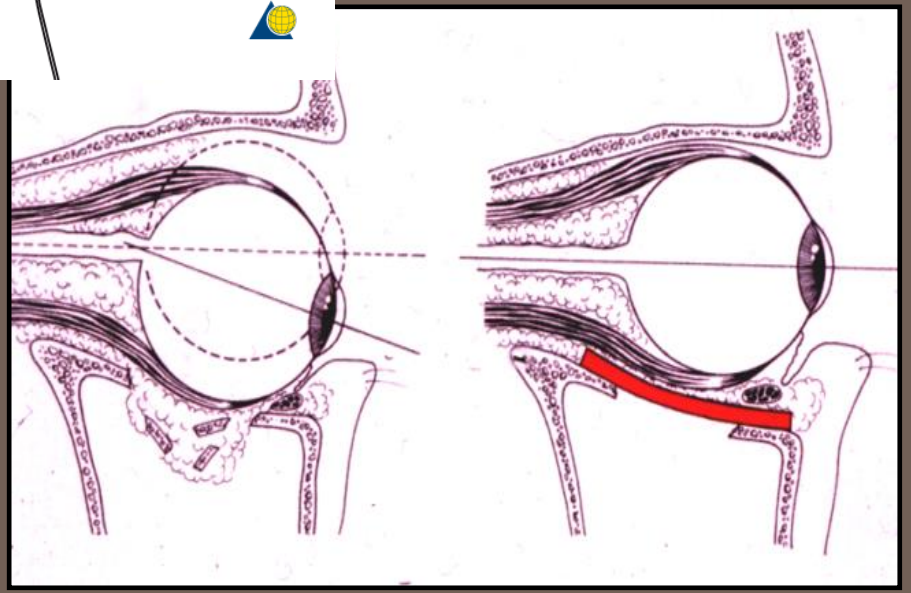


Therapy of blow-out fracture

- exploration of orbital floor
- reduction
- fixation
  - Reconstruction of orbital floor (titanium net, Lyodura, PDS membrane, autologous bone etc.
  - Support of the orbital floor through the maxillary sinus (Folley cateter) – no longer



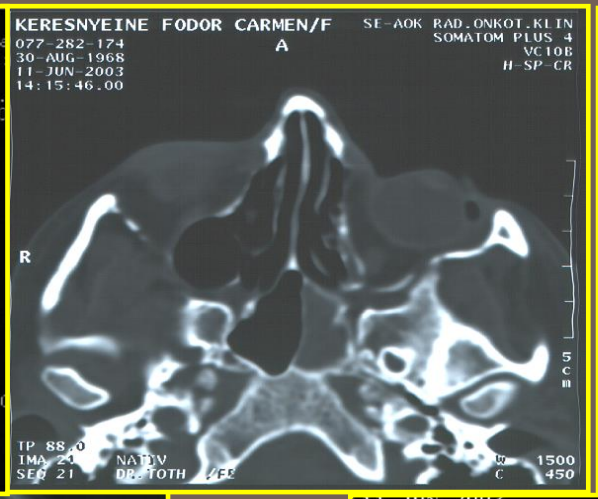




Therapy of blow-out fracture

Preoperative picture


e F. Karmen
F/34y
MEDIWORLD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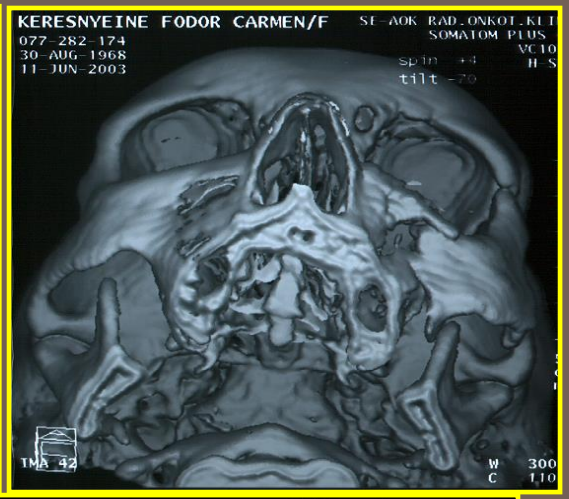
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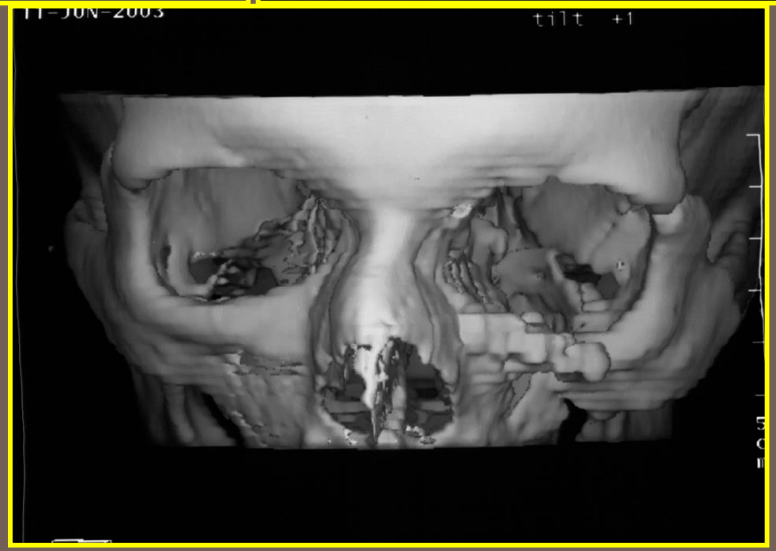
R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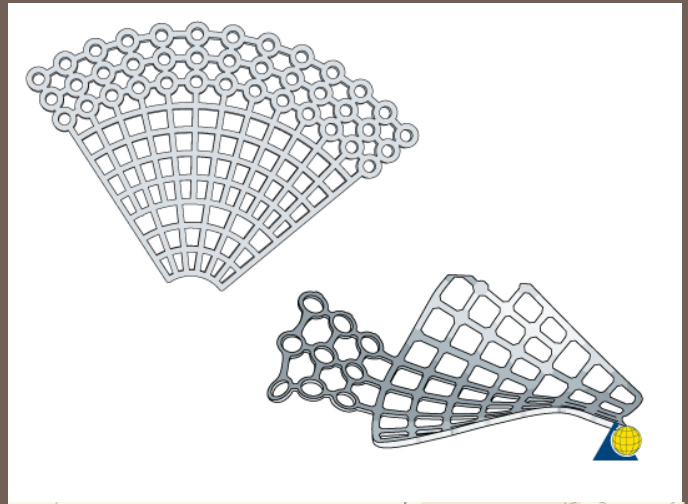
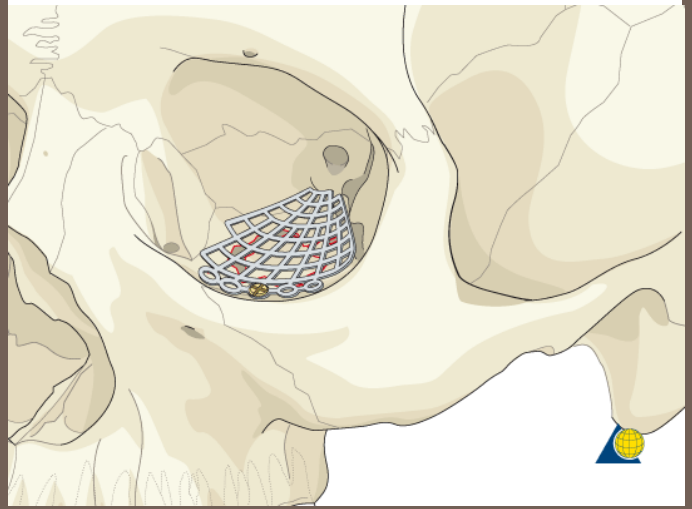
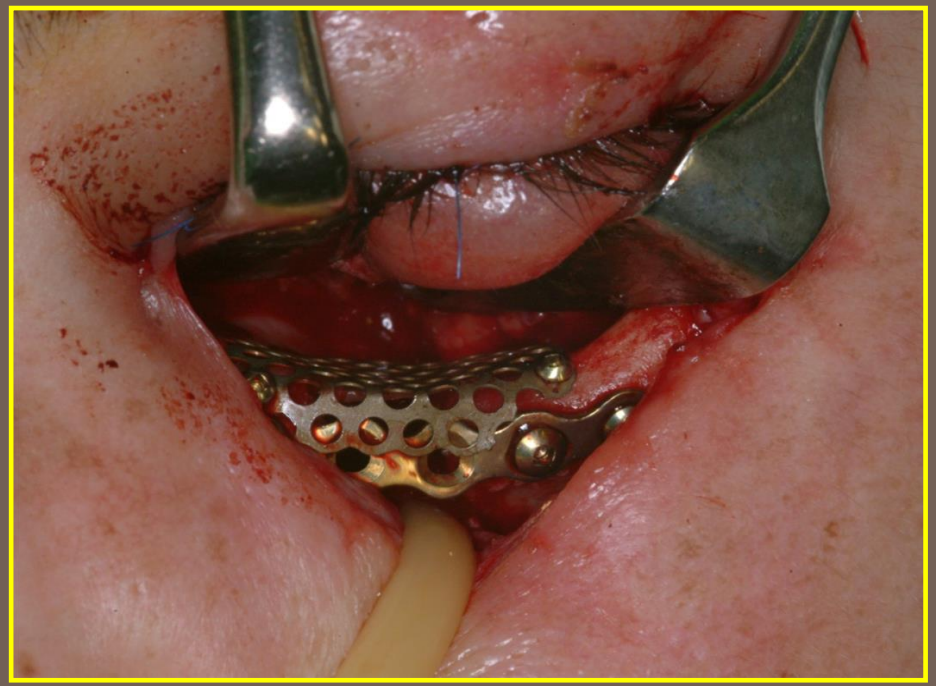






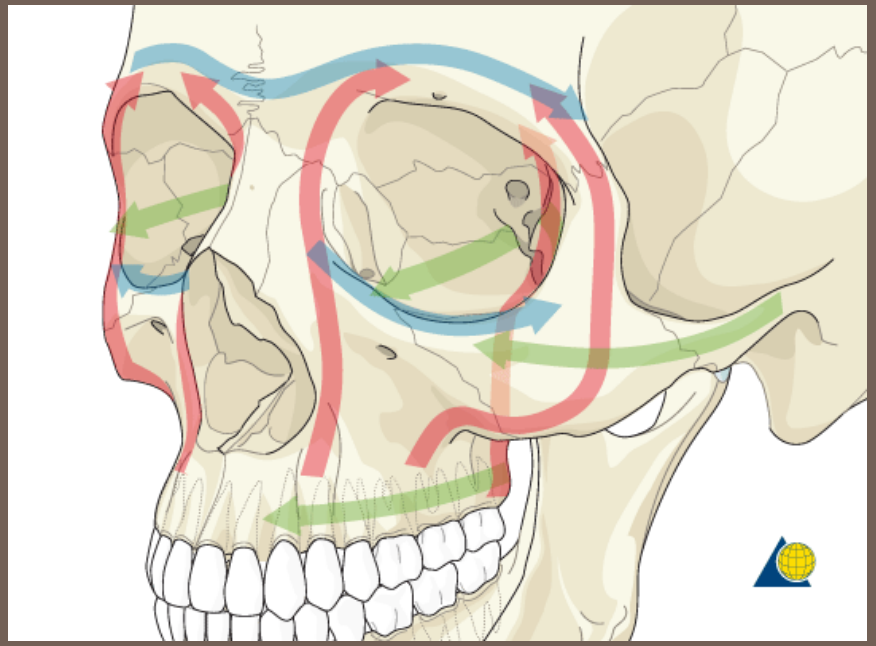
post op. 7. month

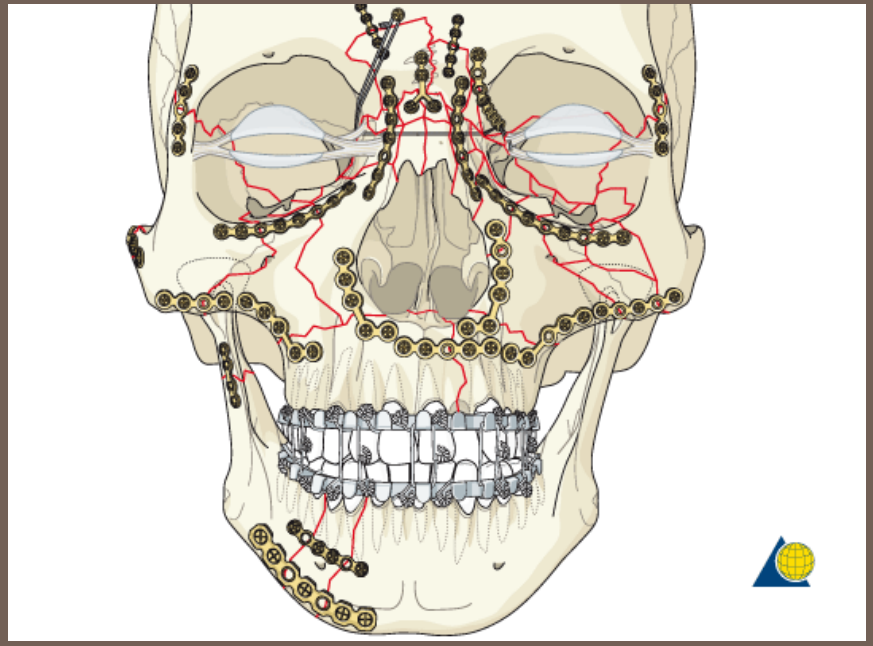
Complication

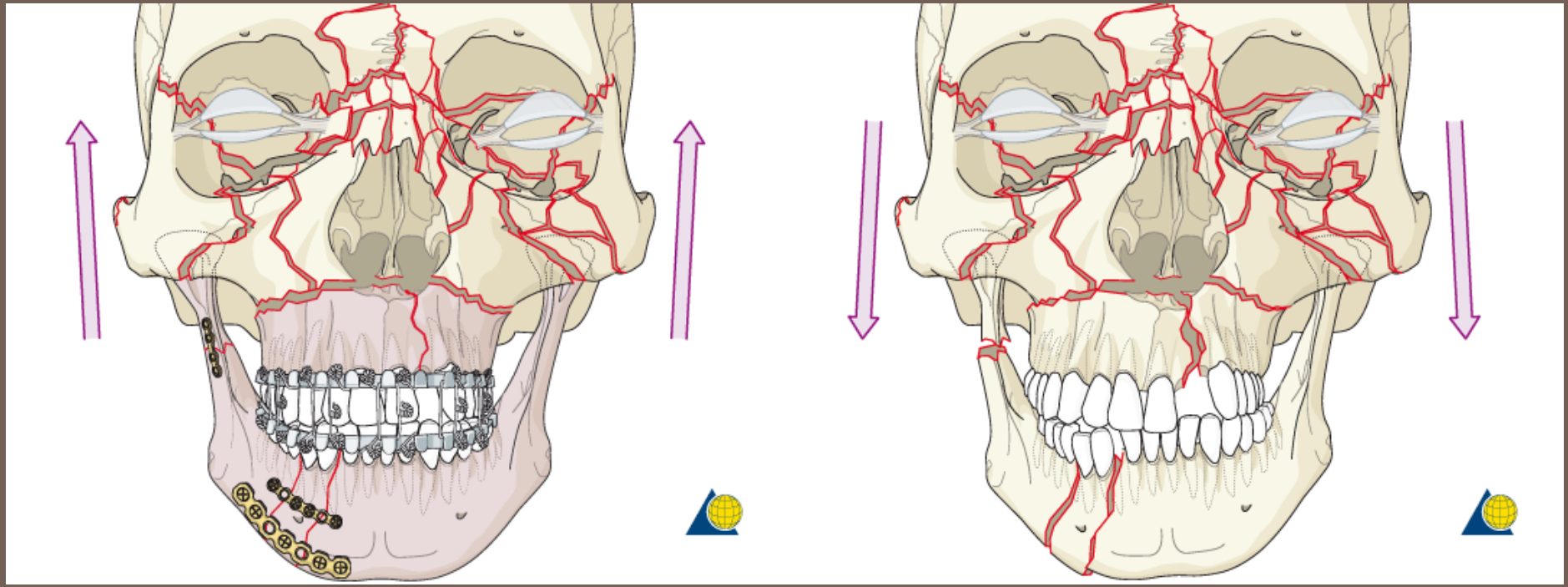
Postoperative bleeding within the orbit can result in **retrobulbar hemorrhage** (ischemic and/or compressive optic neuropathy) and blindness

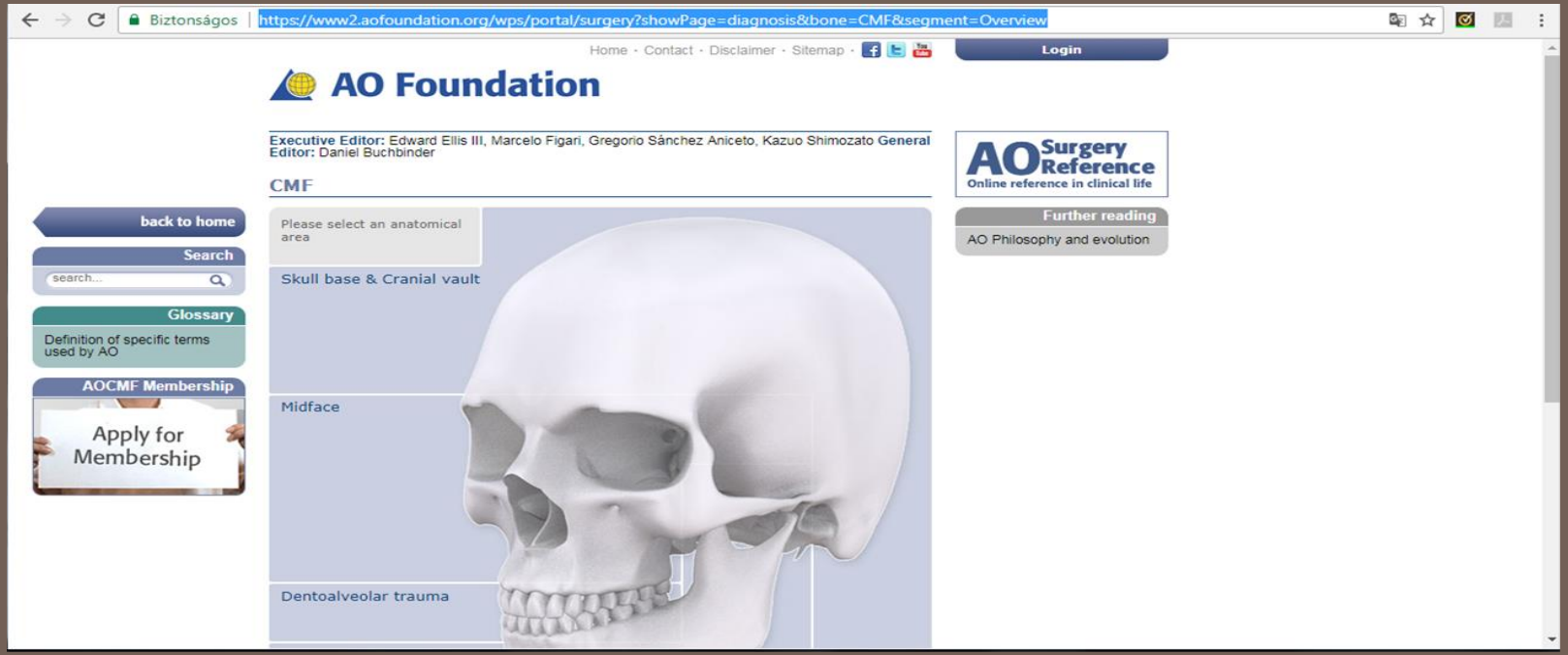
- Painful Proptosis
- Increased orbital tissue tension, increased intraocular pressure
- Ecchymosis of eyelids
- Chemosis
- Decreased Visual Field
- Decreased Visual Acuity/Loss of Vision
- Afferent Pupillary Defect (APD in swinging flash light test)

Panfacial fractures









https://www2.aofoundation.org/wps/portal/surgery?showPage=diagnosis&bone=CMF&segment=Overview