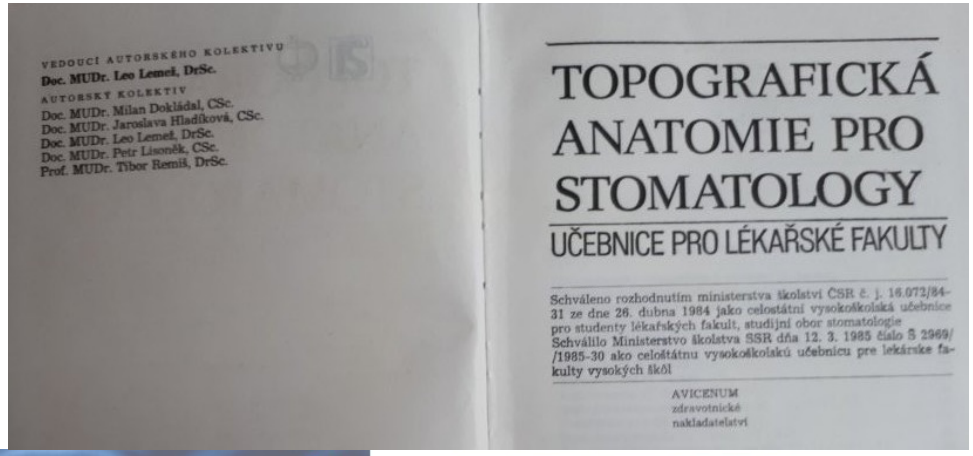
Fractures of the skull

Omid Moztarzadeh

Literature:



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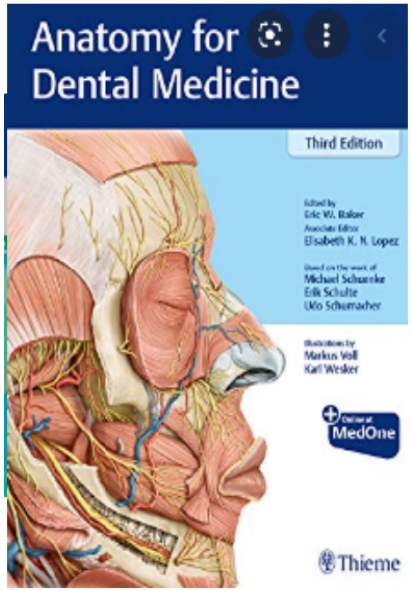
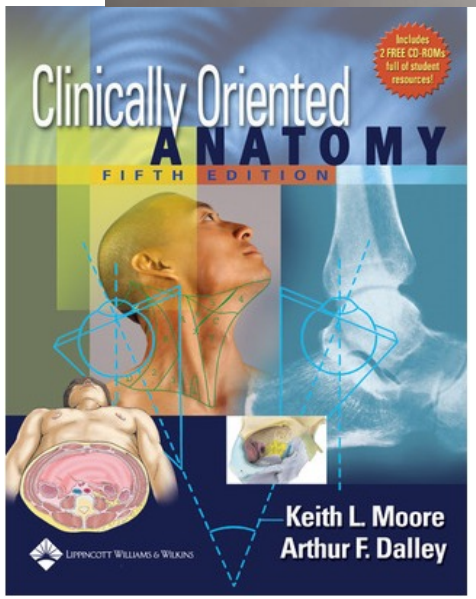
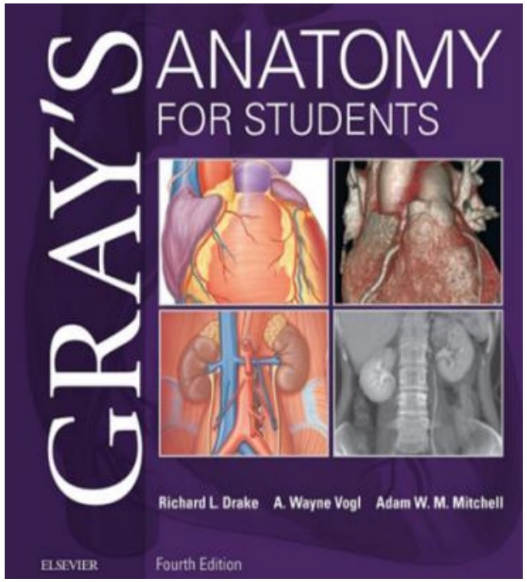
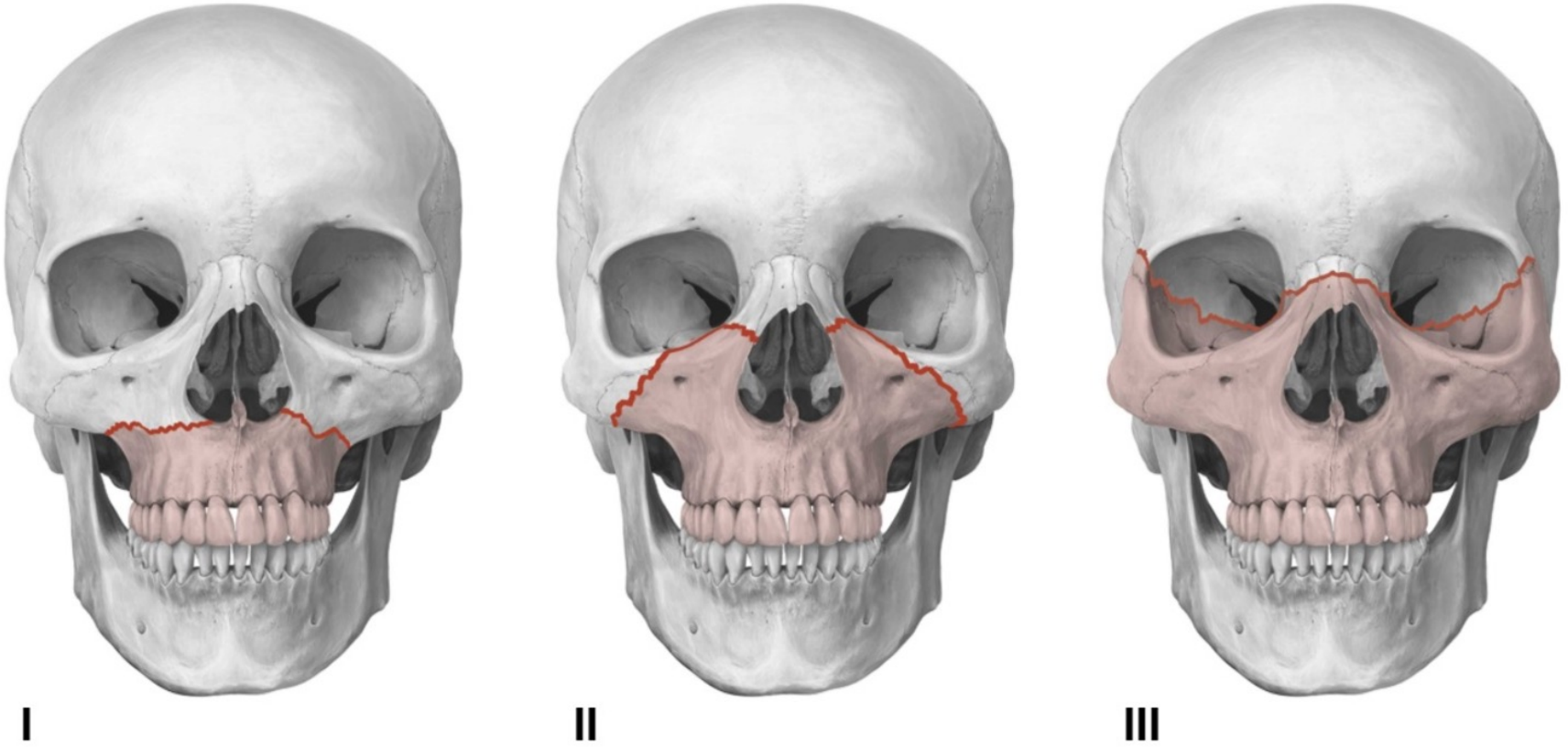




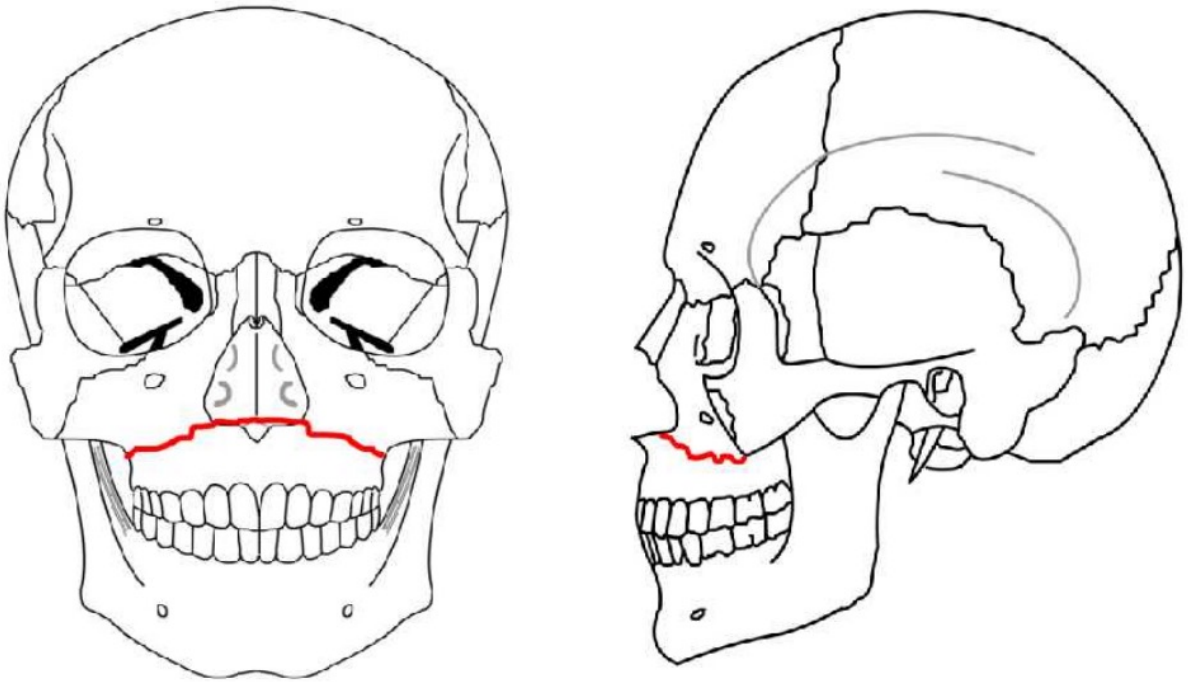


The framelike construction of the facial skeleton leads to characteristic patterns of fracture lines in the midfacial region (Le Fort I, II, and III).

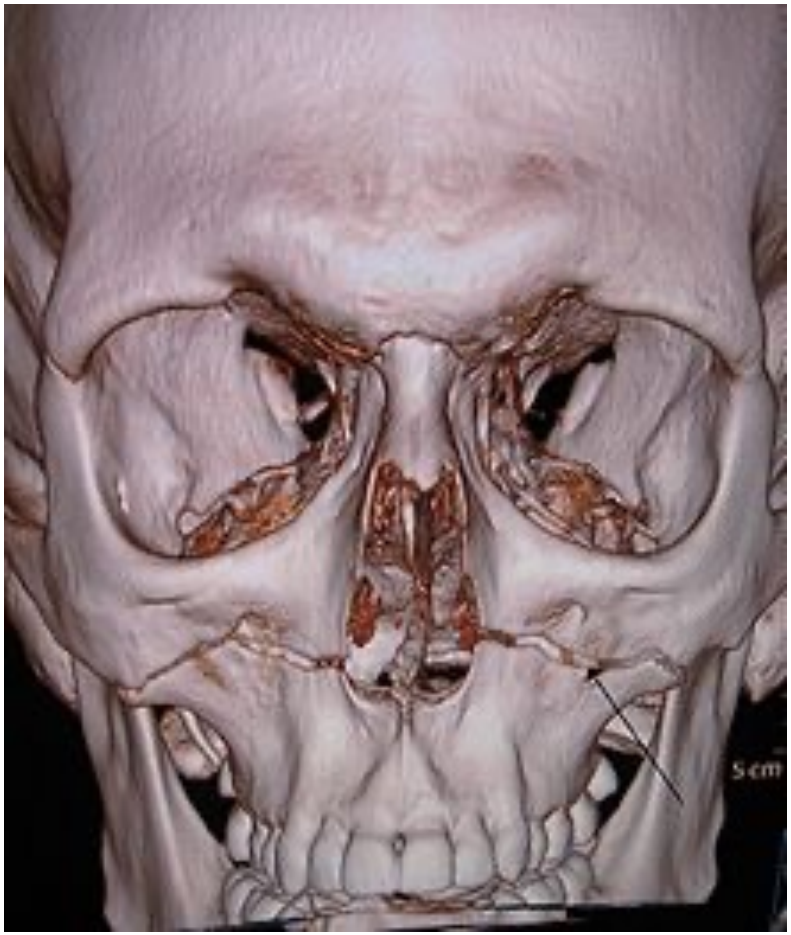


Le Fort I (lower subzygomatic): This fracture line runs across the maxilla and above the hard palate above the apexes of the upper teeth at the floor of nasal cavity. The maxilla is separated from the upper facial skeleton and alveolar process, disrupting the integrity of the maxillary sinus (*low transverse fracture*).The fracture line laterally directed to the maxillary tuberosity and continue to the pterygoid processes about in the lower third of their length.

Le Fort I.

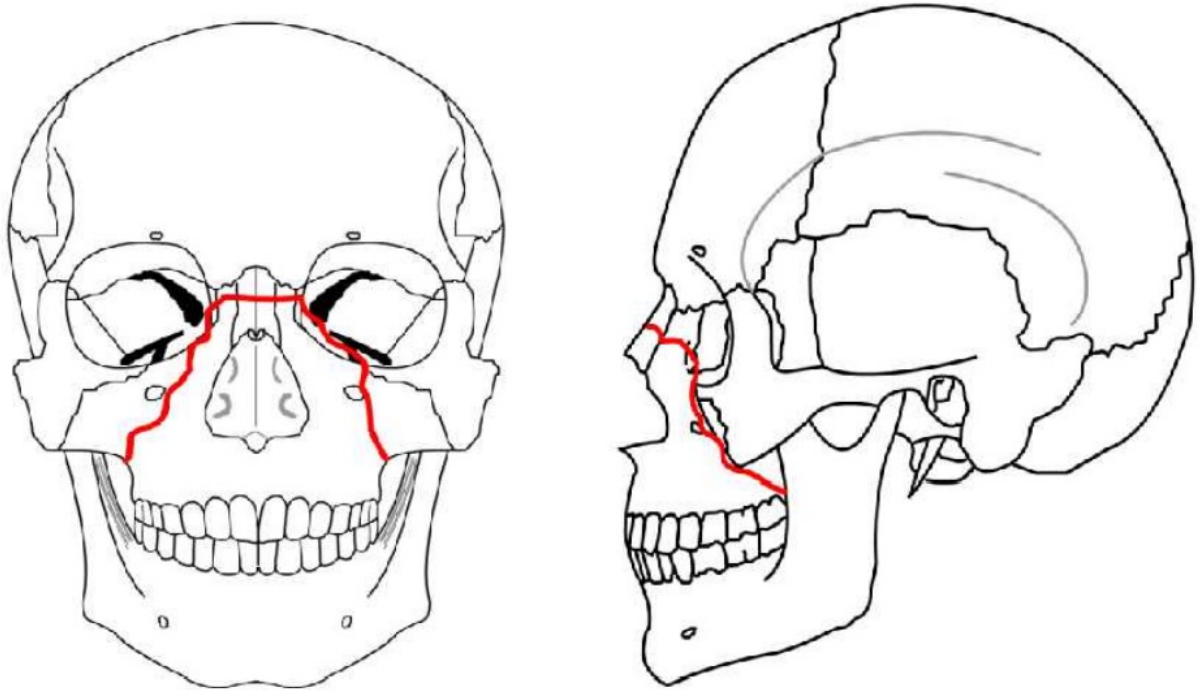


Le fort I



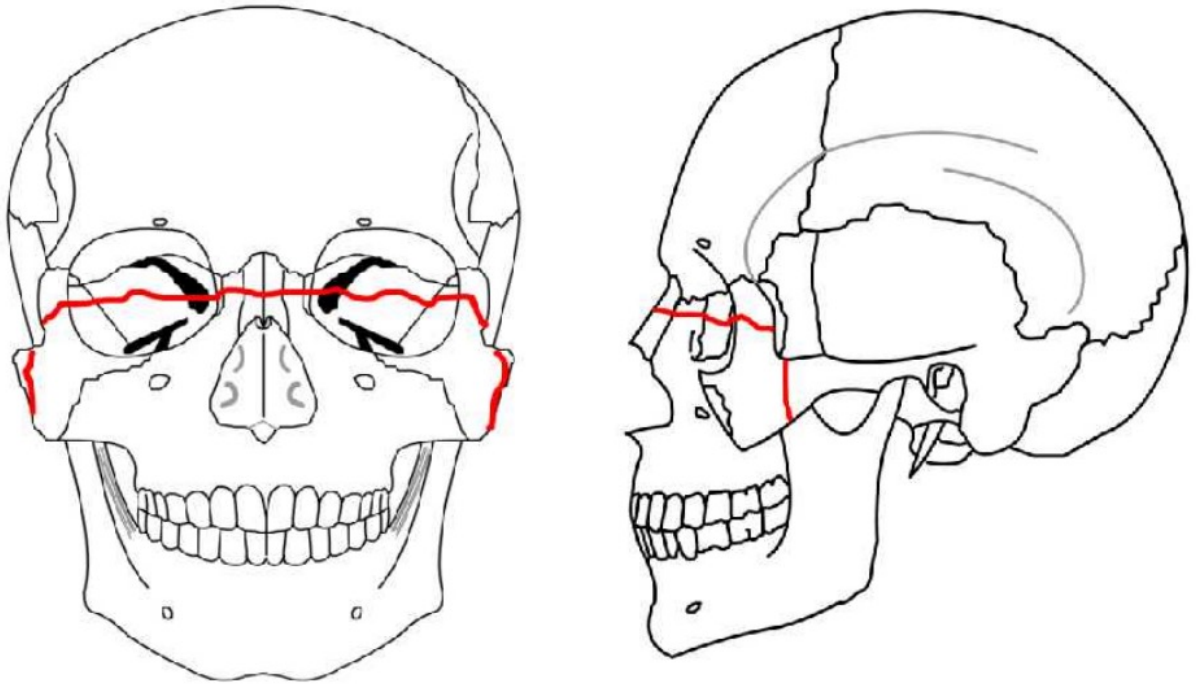
. Le Fort II (pyramid of upper or lower subzygomatic): The fracture line passes across the nasal root, to the medial wall of the orbit through lacrimal and ethmoid bones, toward floor of the orbit to the inferior orbital fissure, continue toward zygomaticomaxillary fissure, distally to the pterygoid proces approximately in half of their length. creating a *pyramid fracture* that disrupts the integrity of the orbit.

Le Fort II.

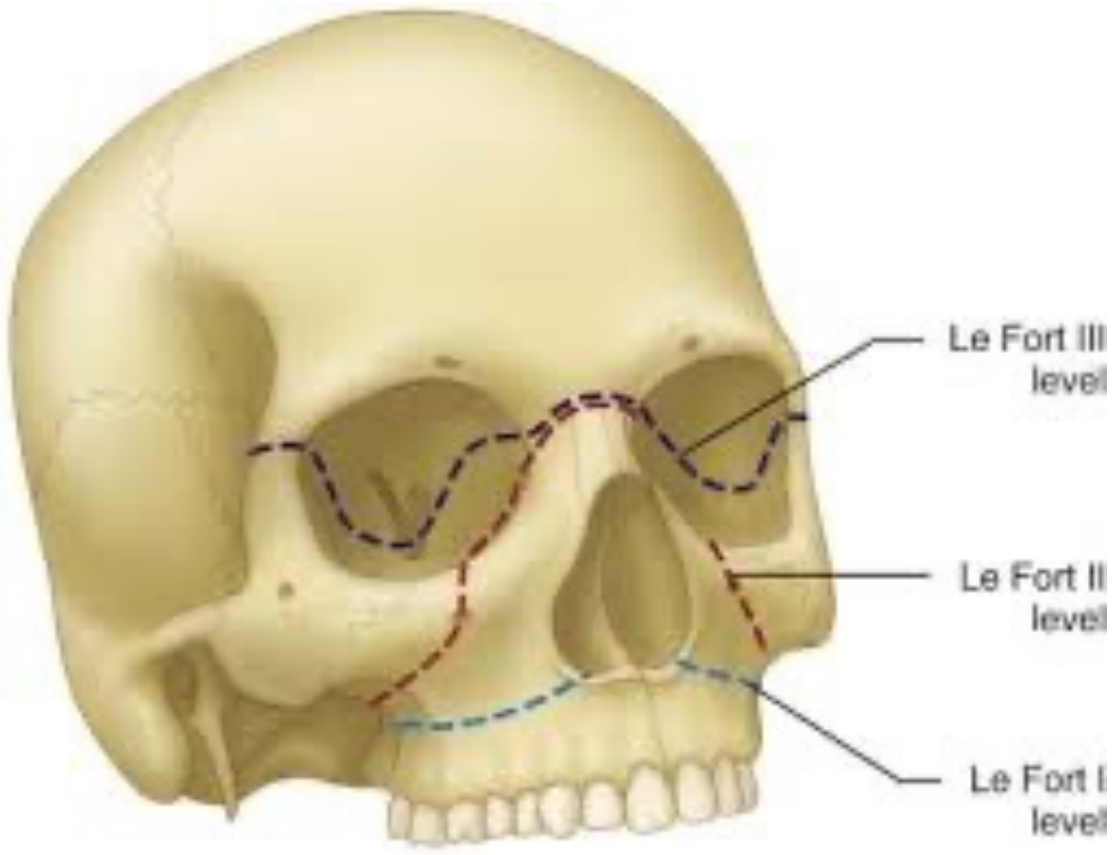


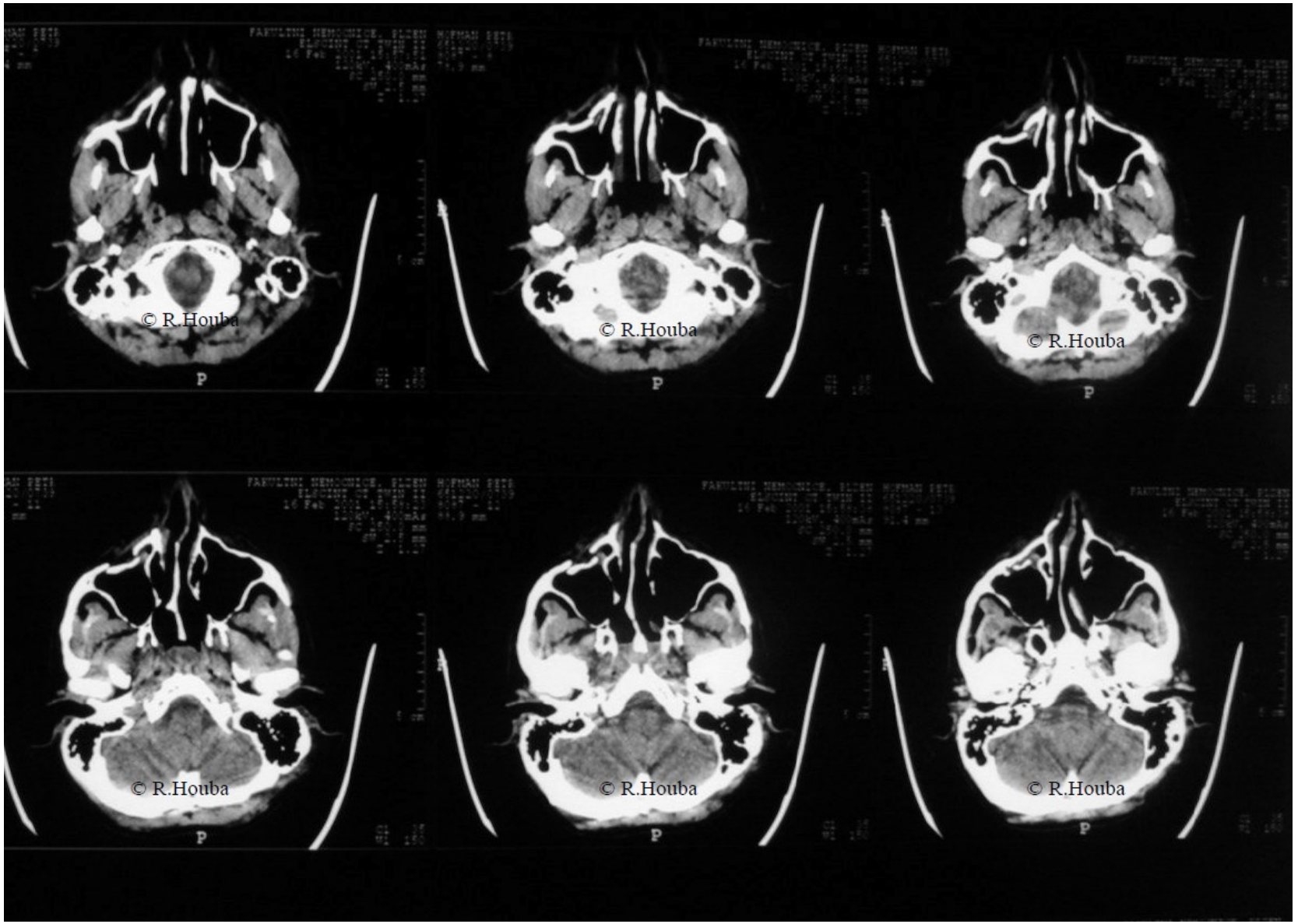
Le Fort III (suprazygomatic): The facial skeleton is separated from the base of the skull. The main fracture line passes through the root of the nose toward the medial wall of orbits, continue to the dostal part of the inferior orbital fissure the divided as follow: one line goes toward pterygopalatine fossa and lower third of the pterygoid proces, second line continue toward the lateral wall of the orbit to the zygomaticofrontal suture.Another line intterupts the zygomatic arch near the zygomaticotemporal suture. The fracture may additionally involve the ethmoid bones, frontal sinuses, sphenoid sinuses.

Le Fort III.



The thin walls of the maxillary sinus are often broken in fractures of the Le Fort I and II

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The inner table of the calvaria is very sensitive to external trauma and may fracture even when the outer table remains intact.

- Fractures of the skull are common in the adult but much less so in the young child.
- In the adult, the inner table of the skull is particularly brittle.
- The type of fracture that occurs in the skull depends on the age of the patient, the severity of the blow, and the area of skull receiving the trauma.
- The adult skull may be likened to an egg- shell in that it possesses a certain limited resilience beyond which it splinters. Blows to the vault often result in a series of linear fractures, which radi- ate out through the thin areas of bone. The petrous parts of the temporal bones and the occipital crests strongly reinforce the base of the skull and tend to deflect linear fractures.
- In the young child, the skull may be likened to a table-tennis ball in that a localized blow produces a depression without splin- tering. This common type of circumscribed lesion is referred to as a “pond” fracture.

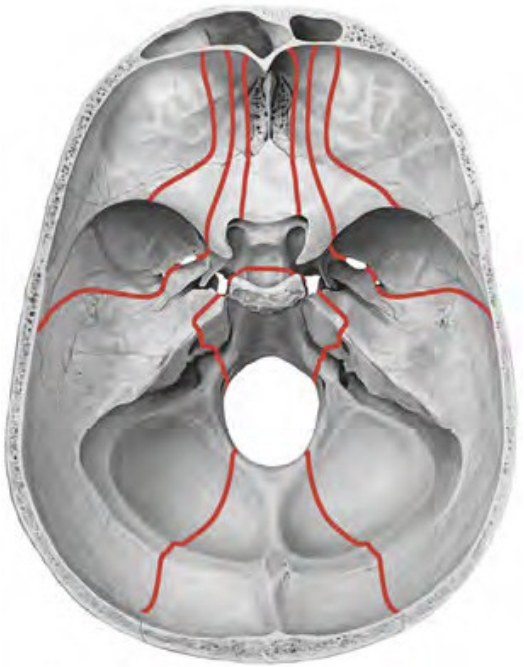
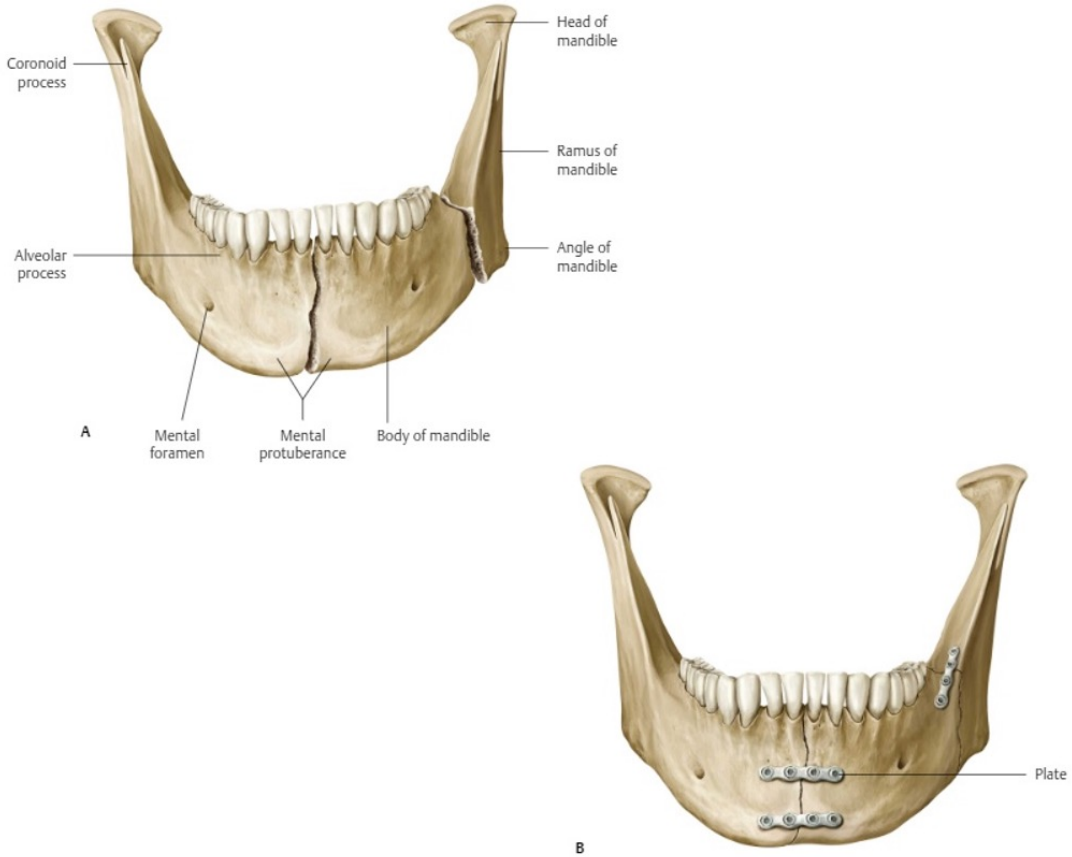


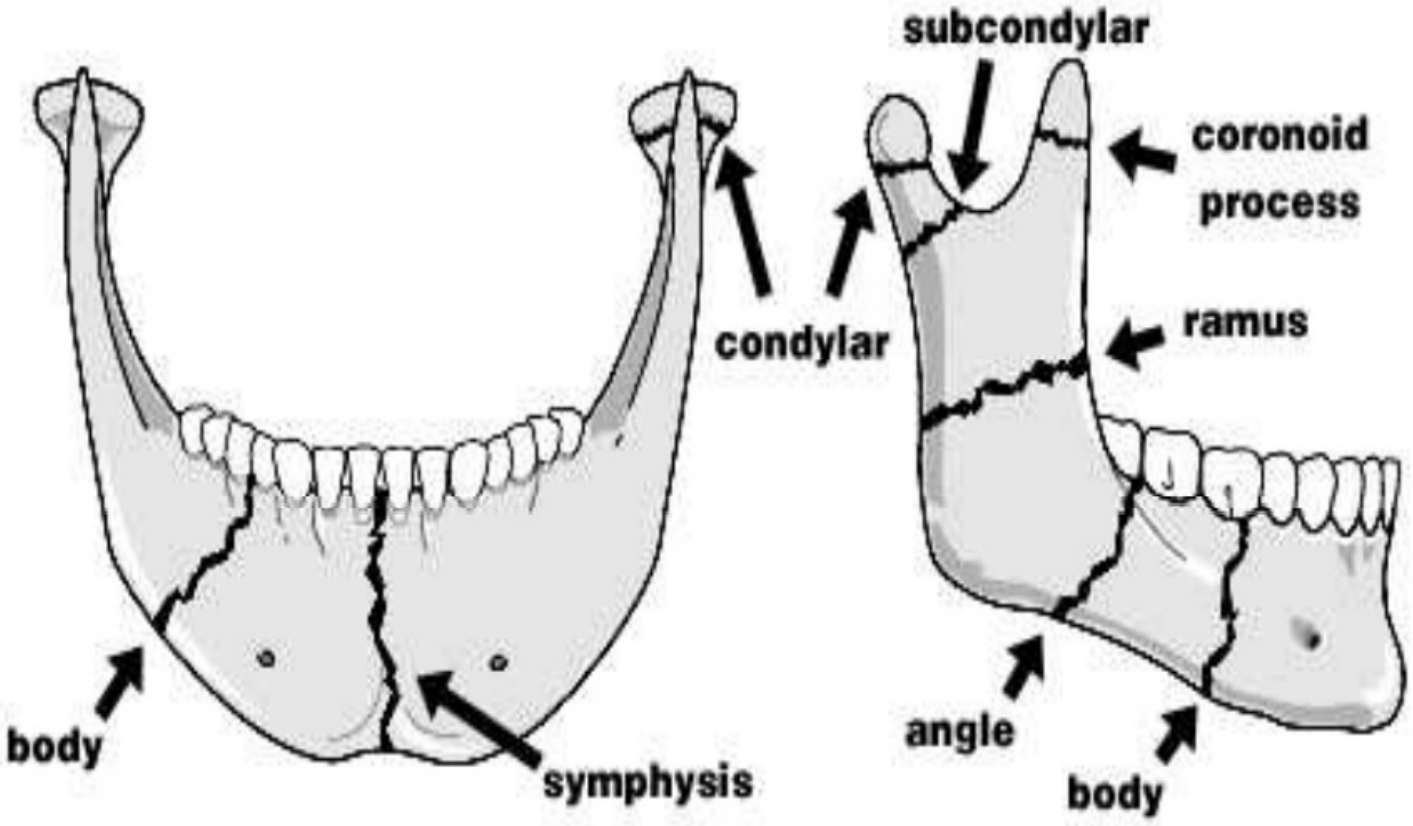
Fig. 2.22 Common fracture lines of skull base*Fig. 2.22*
Internal surface, superior view. In response to masticatory pressures and other mechanical stresses, the bones of the skull base are thickened to form “pillars” along the principal lines of force. The intervening areas that are not thickened are sites of predilection for bone fractures, resulting in the typical patterns of skull base fracture lines shown here in red. An analogous phenomenon of typical fracture lines is found in the midfacial region (see the anterior views of Le Fort fractures on).

Source: Skull Base: Interior. In: Baker E, Lopez E, Schünke M, Schulte E, Schumacher U, Voll M, Wesker K, ed. Anatomy for Dental Medicine. 3rd Edition. New York: Thieme; 2020. doi:10.1055/b000000284

- Fractures of the Anterior Cranial Fossa
- In fractures of the anterior cranial fossa, the cribriform plate of the ethmoid bone may be damaged. This usually results in tearing of the overlying meninges and underlying mucoperiosteum. The patient will have bleeding from the nose (epistaxis) and leakage of cerebrospinal fluid into the nose (cerebrospinal rhinorrhea). Fractures involving the orbital plate of the frontal bone result in hemorrhage beneath the conjunctiva and into the orbital cavity, causing exophthalmos. The frontal air sinus may be involved, with hemorrhage into the nose.
- Fractures of the Middle Cranial Fossa
- Fractures of the middle cranial fossa are common, because this is the weakest part of the base of the skull. Anatomically, this weakness is caused by the presence of numerous foramina and canals in this region; the cavities of the middle ear and the sphenoidal air sinuses are particularly vulnerable. The leakage of cerebrospinal fluid and blood from the external auditory meatus is common. The 7th and 8th cranial nerves may be involved as they pass through the petrous part of the temporal bone. The 3rd, 4th, and 6th cranial nerves may be damaged if the lateral wall of the cavernous sinus is torn. Blood and cerebrospinal fluid may leak into the sphenoidal air sinuses and then into the nose.
- Fractures of the Posterior Cranial Fossa
- In fractures of the posterior cranial fossa, blood may escape into the nape of the neck deep to the postvertebral muscles. Some days later, it tracks between the muscles and appears in the posterior triangle, close to the mastoid process. The mucous membrane of the roof of the nasopharynx may be torn, and blood may escape there. In fractures involving the jugular foramen, the 9th, 10th, and 11th cranial nerves may be damaged. The strong bony walls of the hypoglossal canal usually protect the hypoglossal nerve from injury.


Coronoid process
Head of mandible
Ramus of mandible
Alveolar process
Angle of mandible
Mental foramen
Mental protuberance
Body of mandible
A
Plate
B

Mandibular fracture is a common injury, for example, following motor vehicle accidents, fights, or sporting accidents, due to the prominence of the mandible and its relative lack of support. Most fractures occur in the body (~30%), condyle (~25%), angle (~25%), and symphysis (~17%).



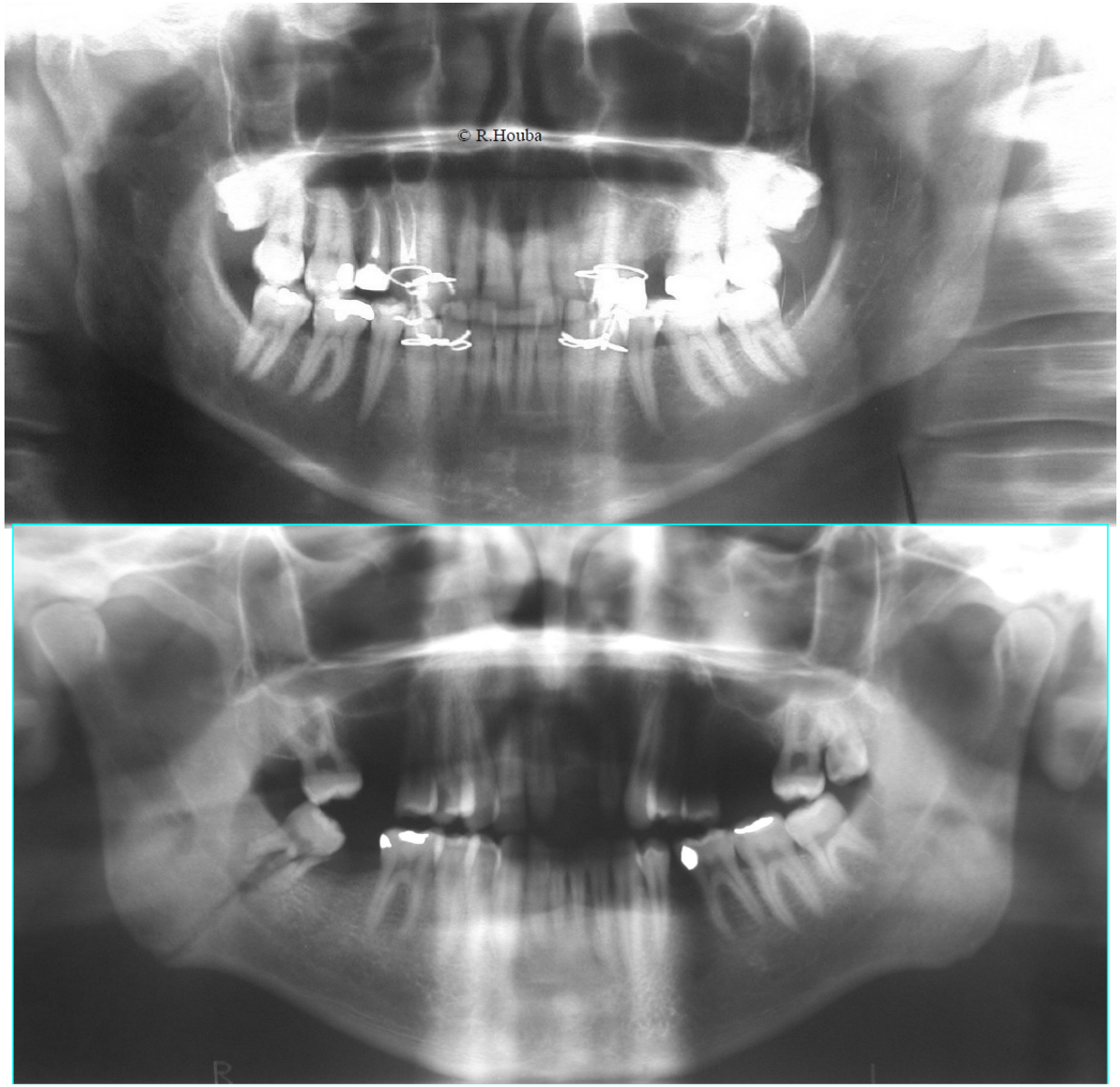
Four predilection sites of fracture

1. Ve střední čáře v bradové krajině probíhá linie lomu svisle. Toto místo na dolní čelisti je vlastně nejsilnější, avšak (úder) náraz ze strany na jednu polovinu dolní čelisti (je-li druhá polovina opřená) vede ke zlomenině mechanismem podobným zlomení prutu ohnutého ve tvaru písmene U.

2. V místě alveolu dolního špičáku je dolní čelist oslabena poměrně dlouhým a silným kořenem zubu. Zlomenina je buď jednostranná nebo při přímém nárazu na bradu zepředu je symetricky oboustranná

3. V angulus mandibulae je další predilekční místo. Zde je kost nejplošší, její kompakta nejslabší a trámčina nejřidší.

4. nárazu zepředu na bradovou část může působit na krček mandihuly. Z hlavice mandibuly se náraz může přenést na kloubní jamku, v krajním případě může hlavice prorazit fossa mandibularis a octnout se ve střední lebeční jámě.

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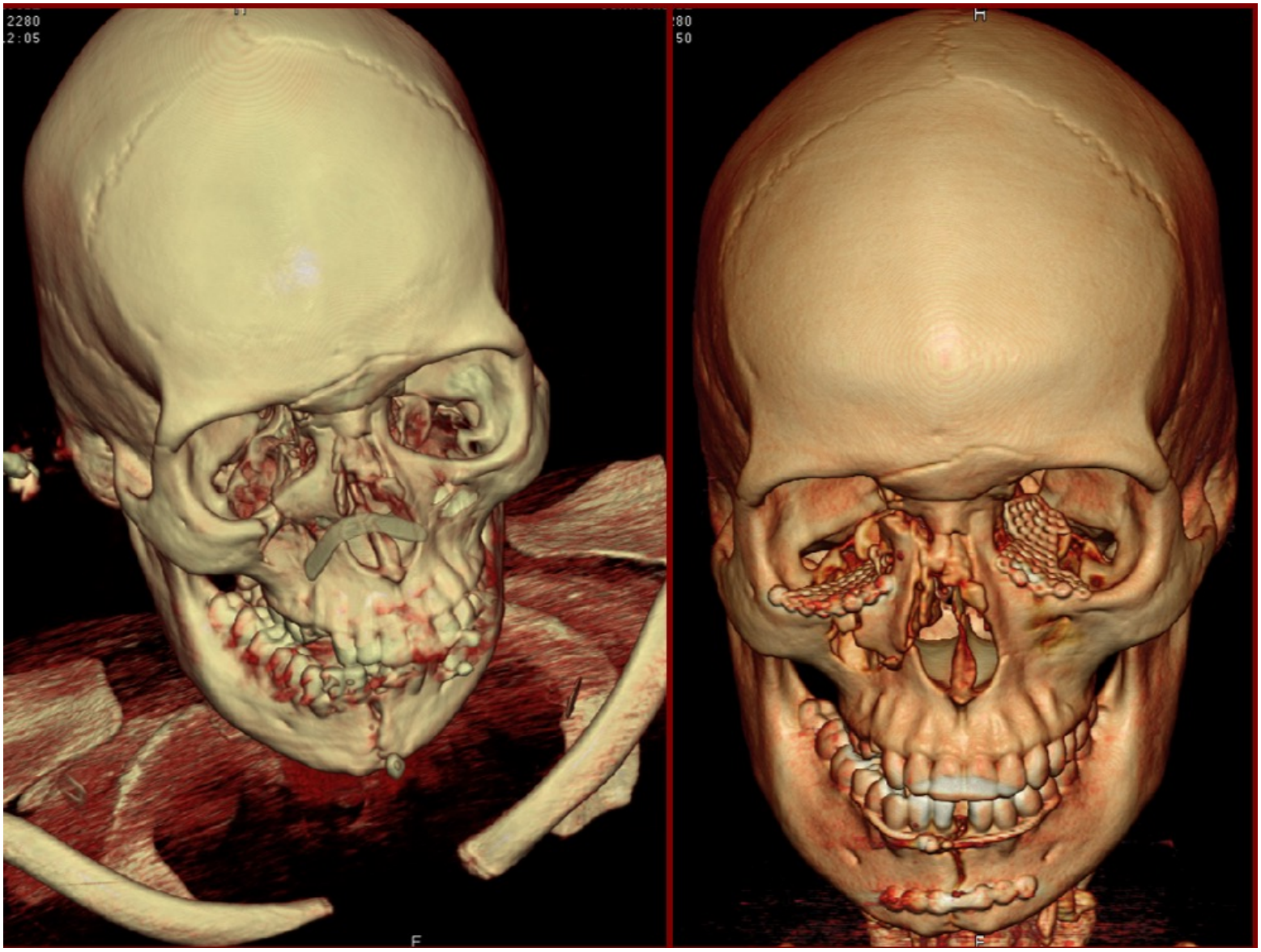
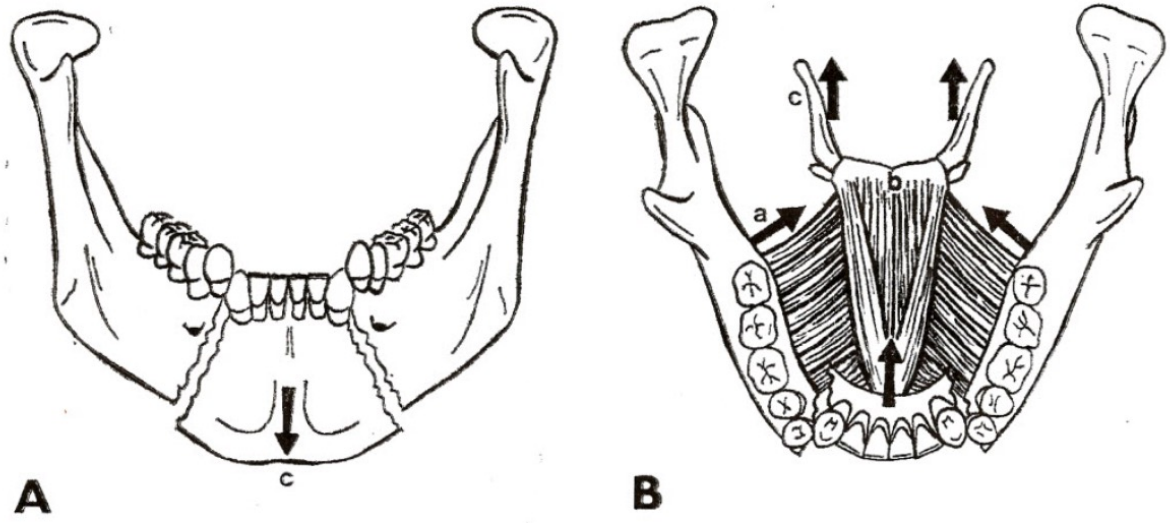


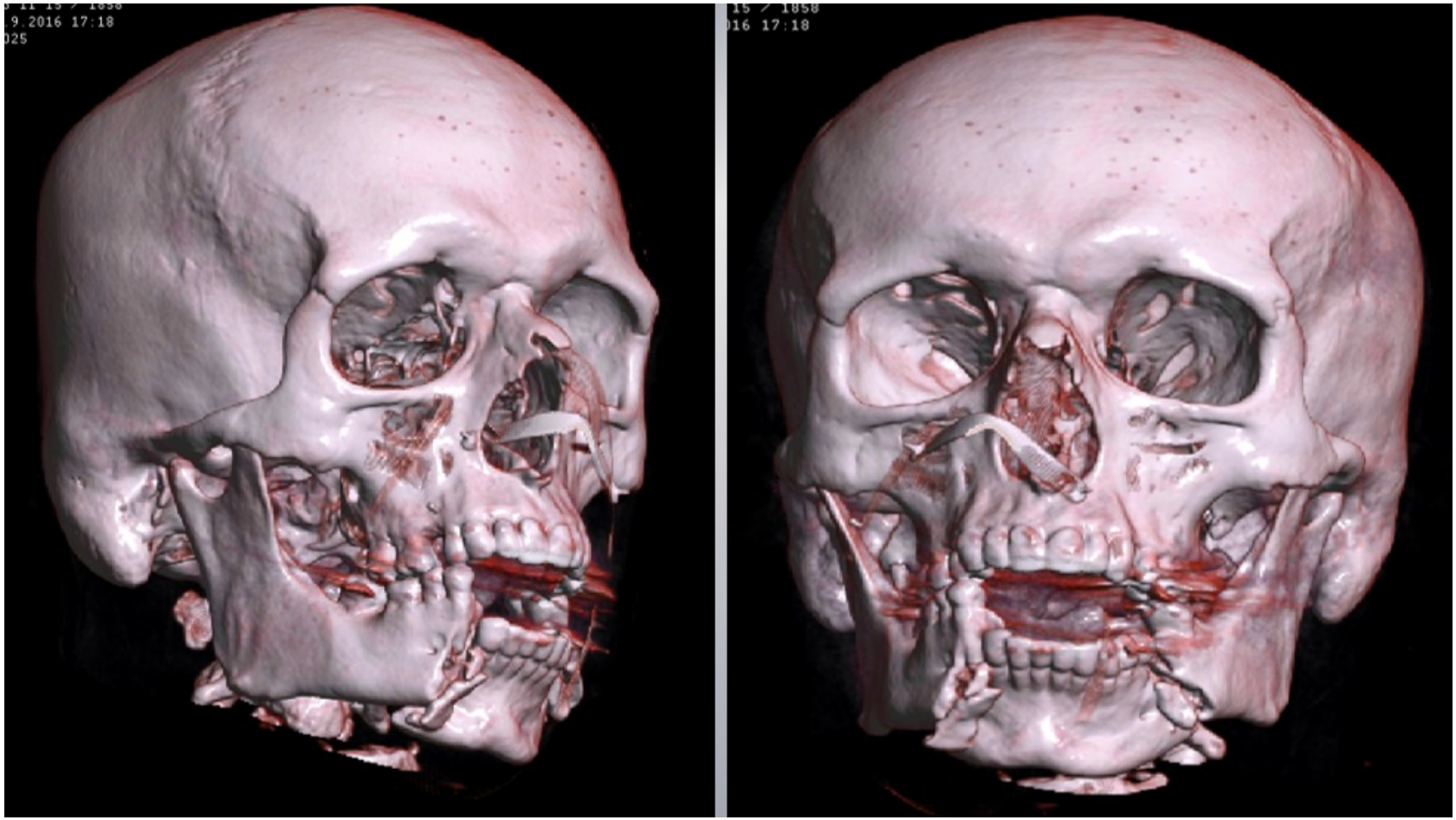
Diagram of the course of bilateral fracture of the lower jaw passing through the sockets of the lower canines

Pro dislokaci úlomků má u mandibuly hlavní význam směr tahu svalů upínajících se na úlomky.

Zvlášť nebezpečné dislokace mohou vzniknout při oboustranné zlomenině bradové části dolní čelisti (tah m. genioglossus, m. geniohyoideus, předního bříška m. digastricus a zčásti m. mylohyoideus dislokuje odlomenou bradovou část směrem dorsokaudálním. Tím přestane na jazylku působit ventrální tah, takže tato společně s kořenem jazyka, v jehož basi je uložena, zapadá tahem m. styloglossus, pars glossopharyngea horního svěrače hltanu a tahem pars chondro-, cerato-pharyngea středního svěrače směrem dorsokraniálním. Kořen jazyka může vyplnit oropharynx a hypopharynx (laryngopharynx) a nemocnému hrozí udušení.

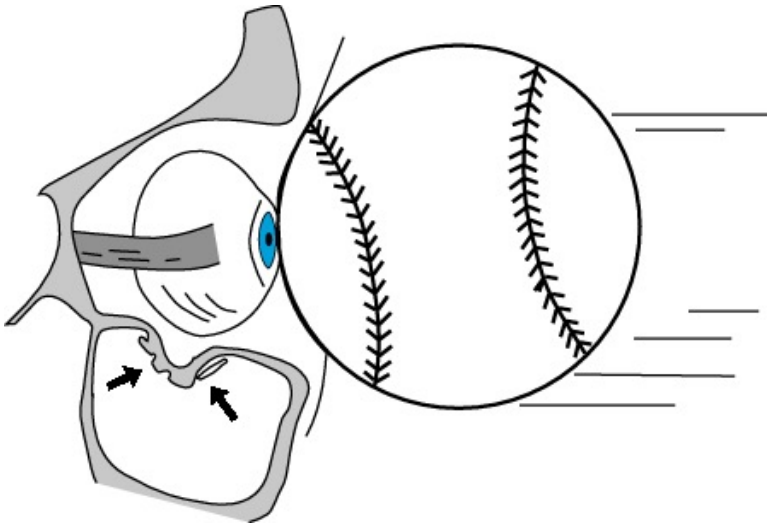


Obr. 71. **Schéma průběhu lomných štěrbin u oboustranné zlomeniny dolní čelisti procházející lůžky dolních špičáků.** A — dislokace bradové části mandibuly (při pohledu zpředu) tahem suprahyoidních svalů (c). B — úlomek je tažen dolů a dozadu k jazylce. Jazylka s kořenem jazyka (šipky) je dislokována dozadu do hypopharyngu. a — m. mylohyoideus, b — m. geniohyoideus, c — os hyoideum. (Podle Urbana a Sazamy.)

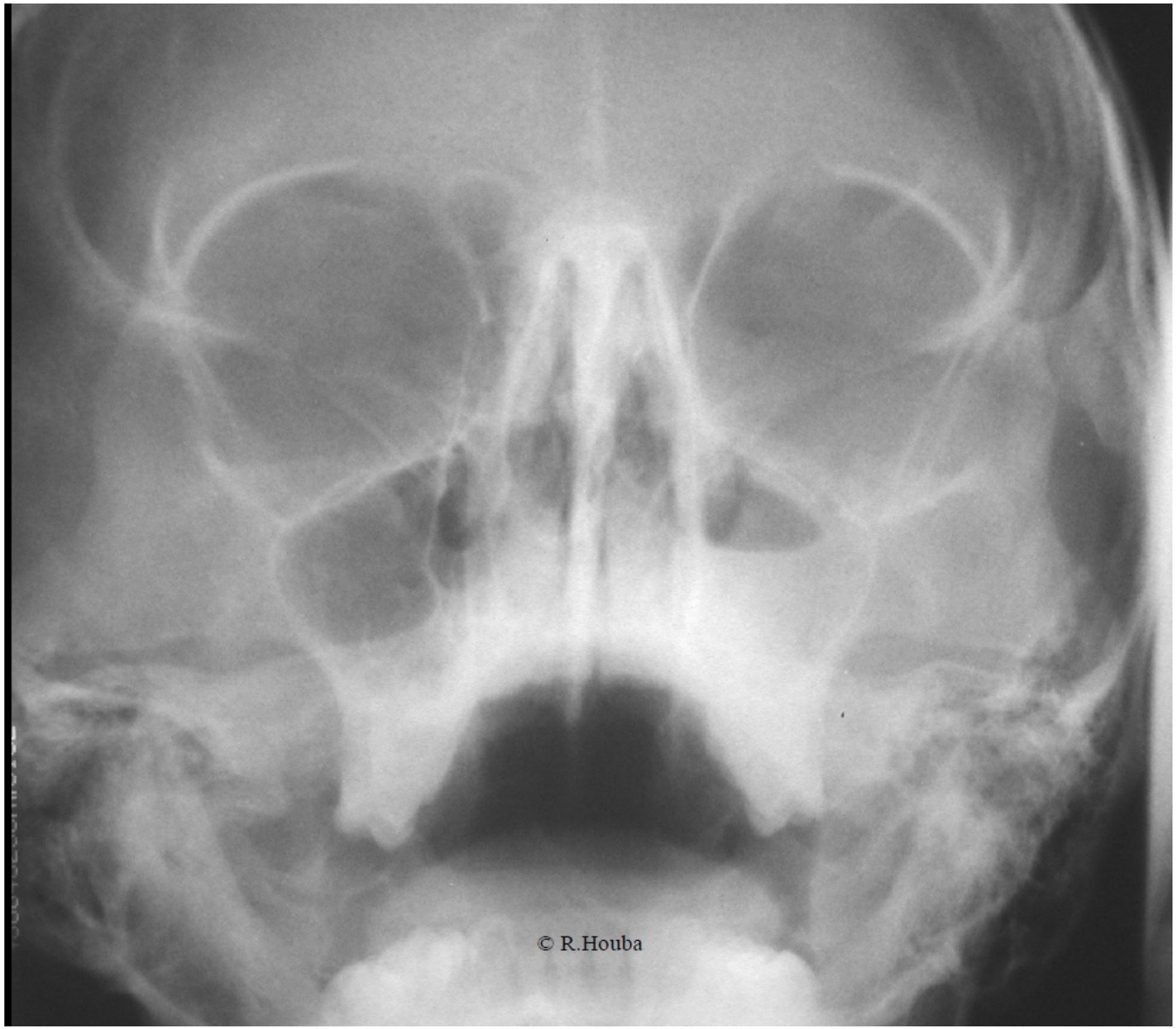


- Nasal Fractures: Fractures of the nasal bones, because of the prominence of the nose, are the most common facial fractures. Because the bones are lined with mucoperiosteum, the fracture is considered open.
- Blowout Fractures of the Maxilla: A severe blow to the orbit (as from a baseball) may cause the con- tents of the orbital cavity to explode downward through the floor of the orbit into the maxillary sinus. Damage to the infraorbital nerve, resulting in altered sensation to the skin of the cheek, upper lip, and gum, may occur.
- Fractures of the Zygoma or Zygomatic Arch: The zygoma or zygomatic arch can be fractured by a blow to the side of the face. Although it can occur as an isolated fracture, as from a blow from a clenched fist, it may be associated with multiple other fractures of the face, as often seen in automobile accidents.

Blow-out fracture: in the event of an impact from the front on the contents of the orbit, a hydraulic fracture of the lower wall behind the edge of the orbit (orbital surface of the maxilla) may occur.)



Usually the lower wall of the orbit and / or medial wall of the orbit is included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Omid Moztarzadeh