



Comparative osteology - practical training

Human remains.

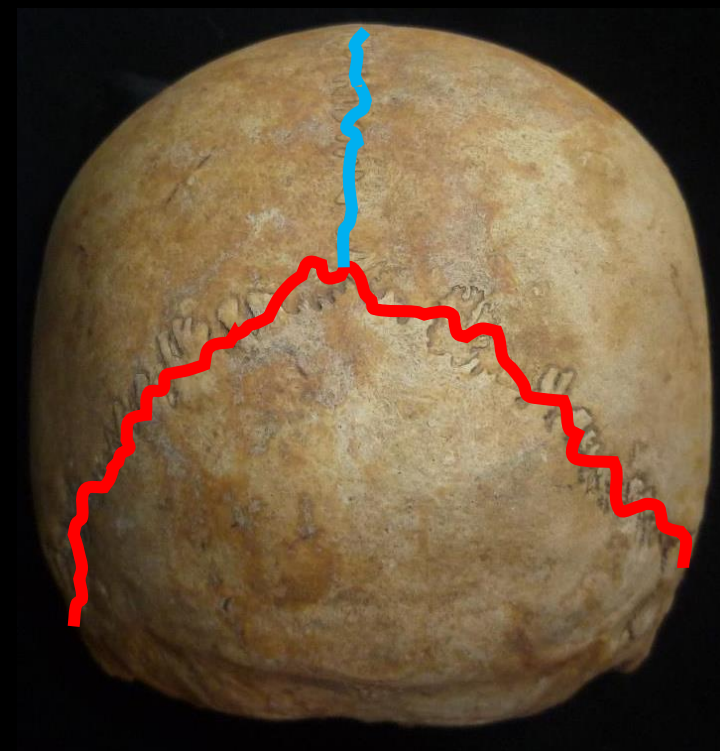
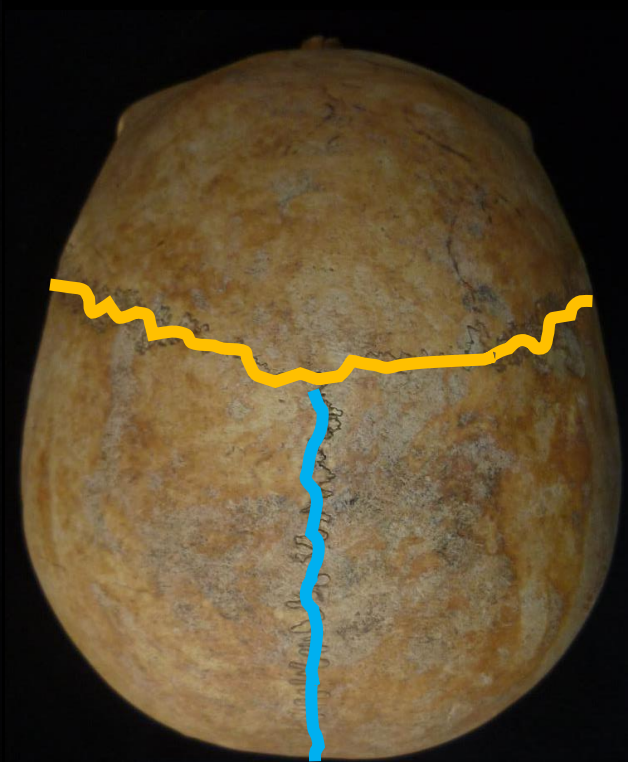
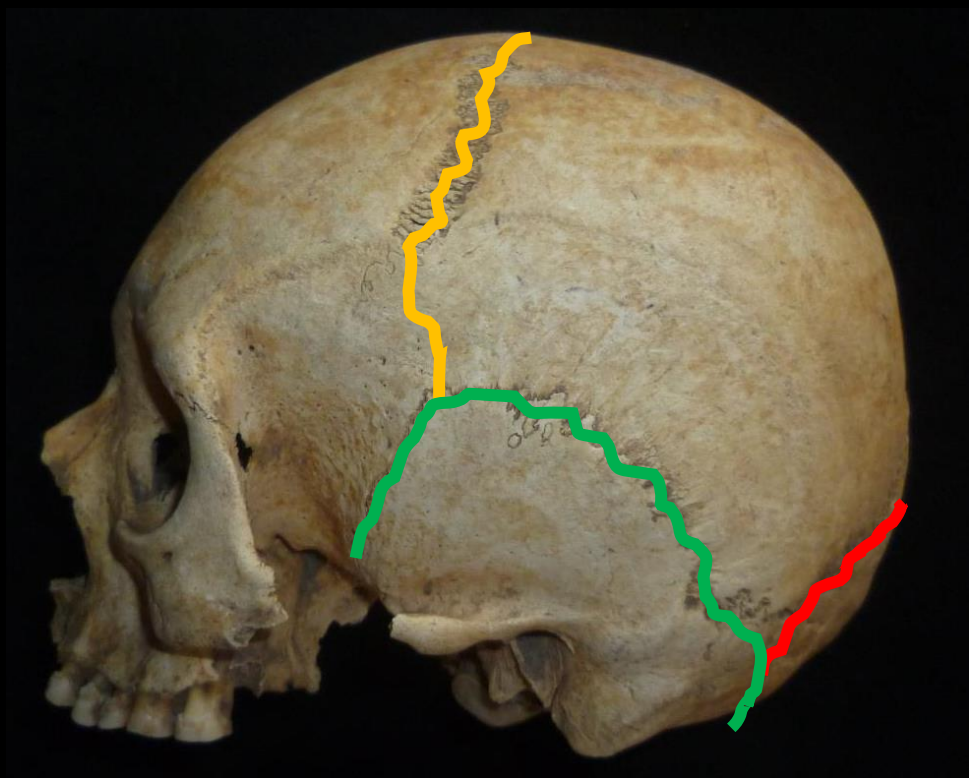
Skull sutures

Sagittal suture

Coronal suture

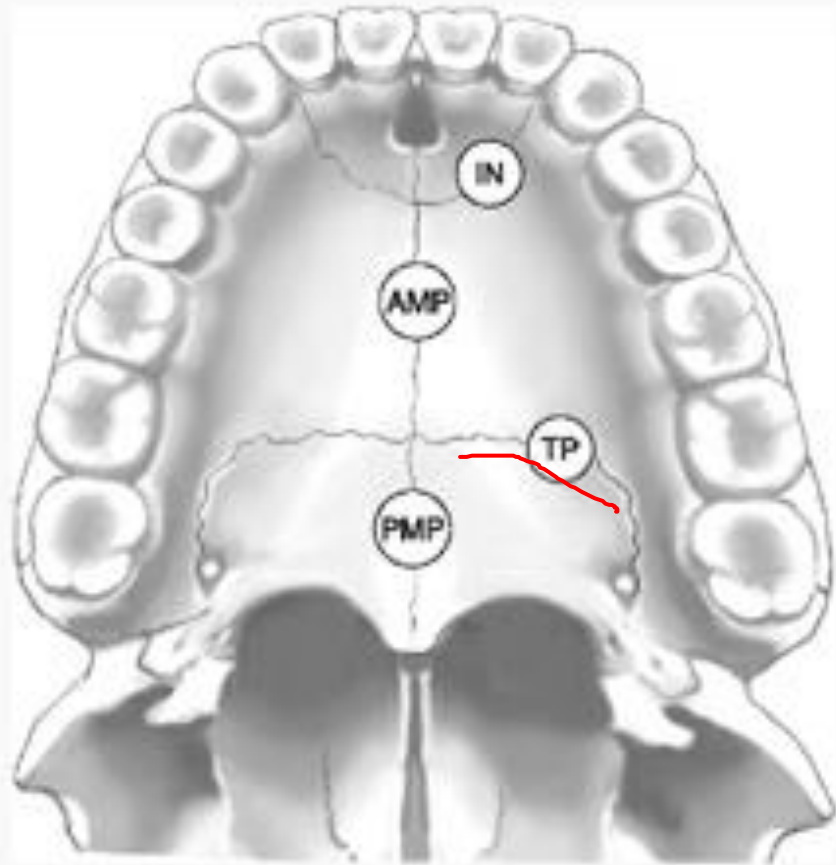
Lambdoid suture

Squamous suture





100 100 100 100

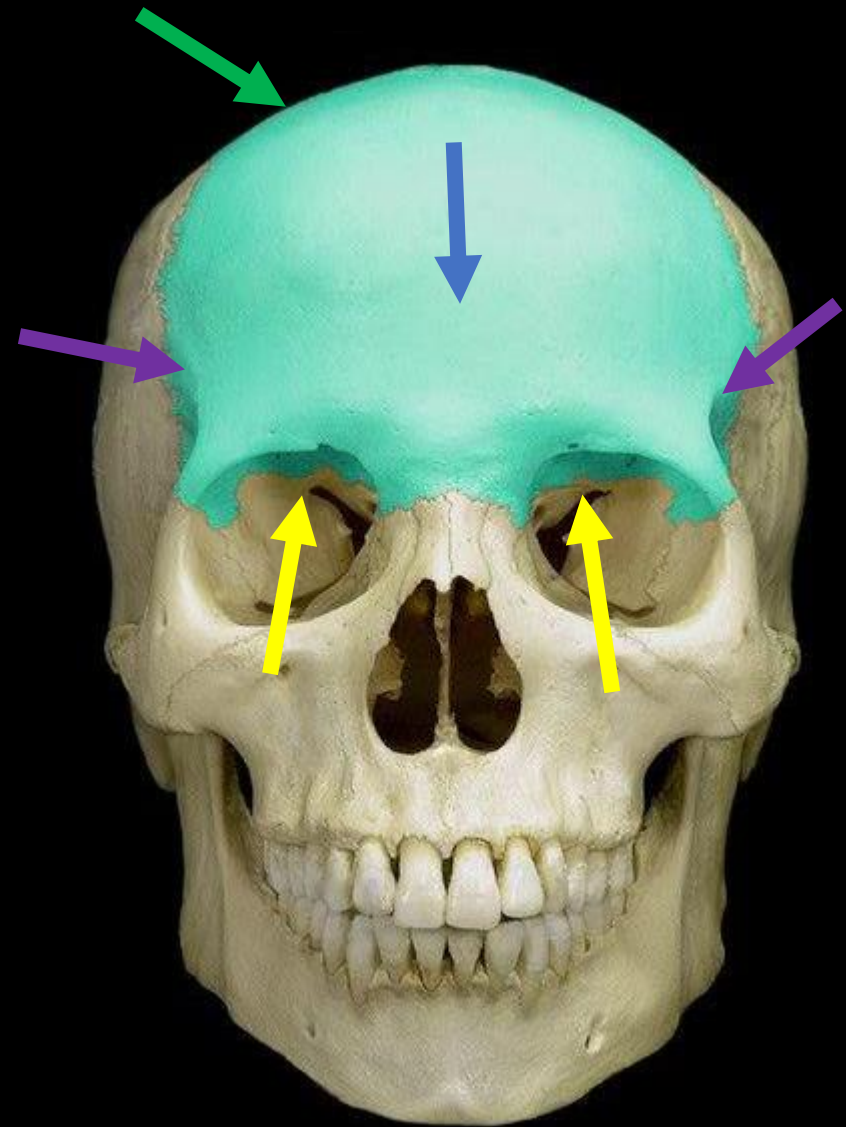


Partial to complete closure of IN PMP and partial TP < 33 years

IN PMP and TP completely fused = 33-55

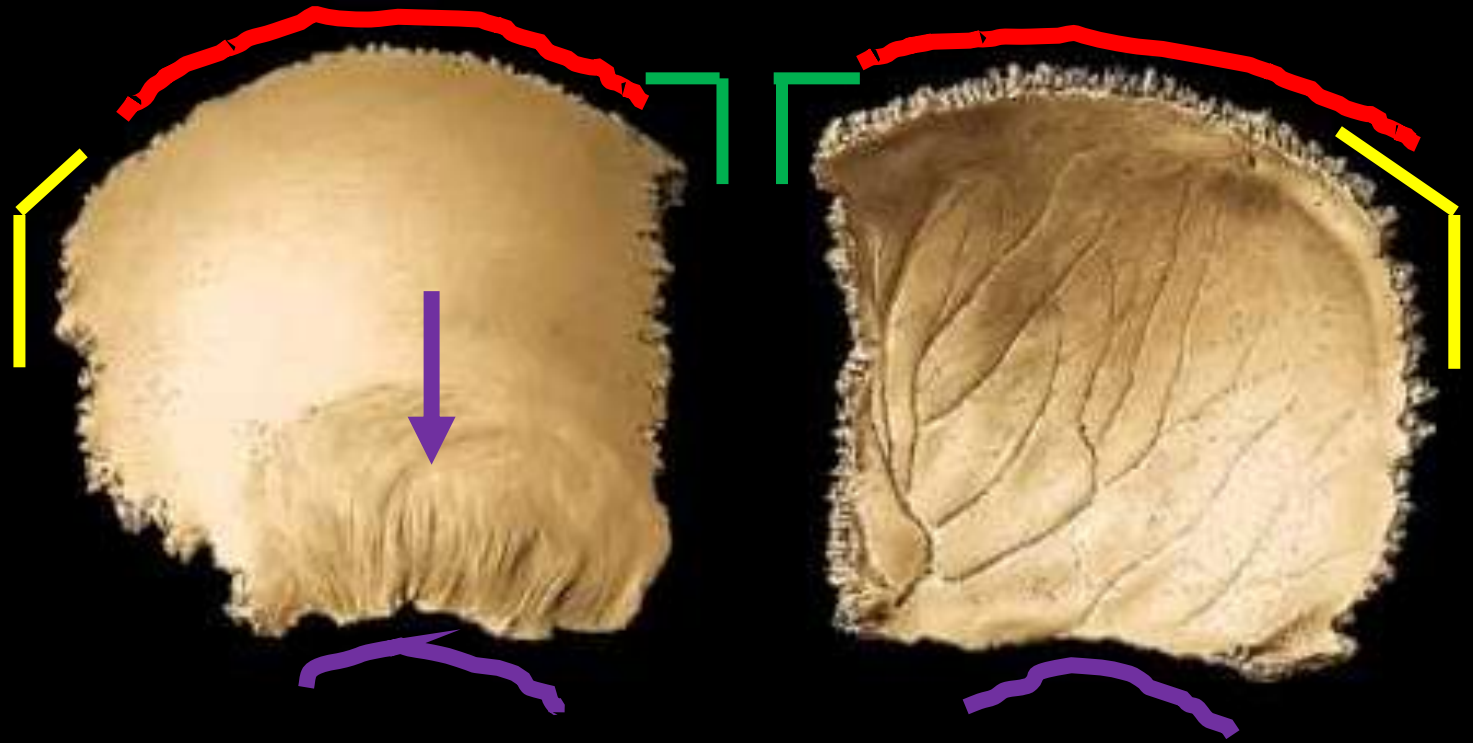
If ALL fuse > 55

(IN= incisive suture, AMP& PMP = medial suture, TP = transverse palatine)

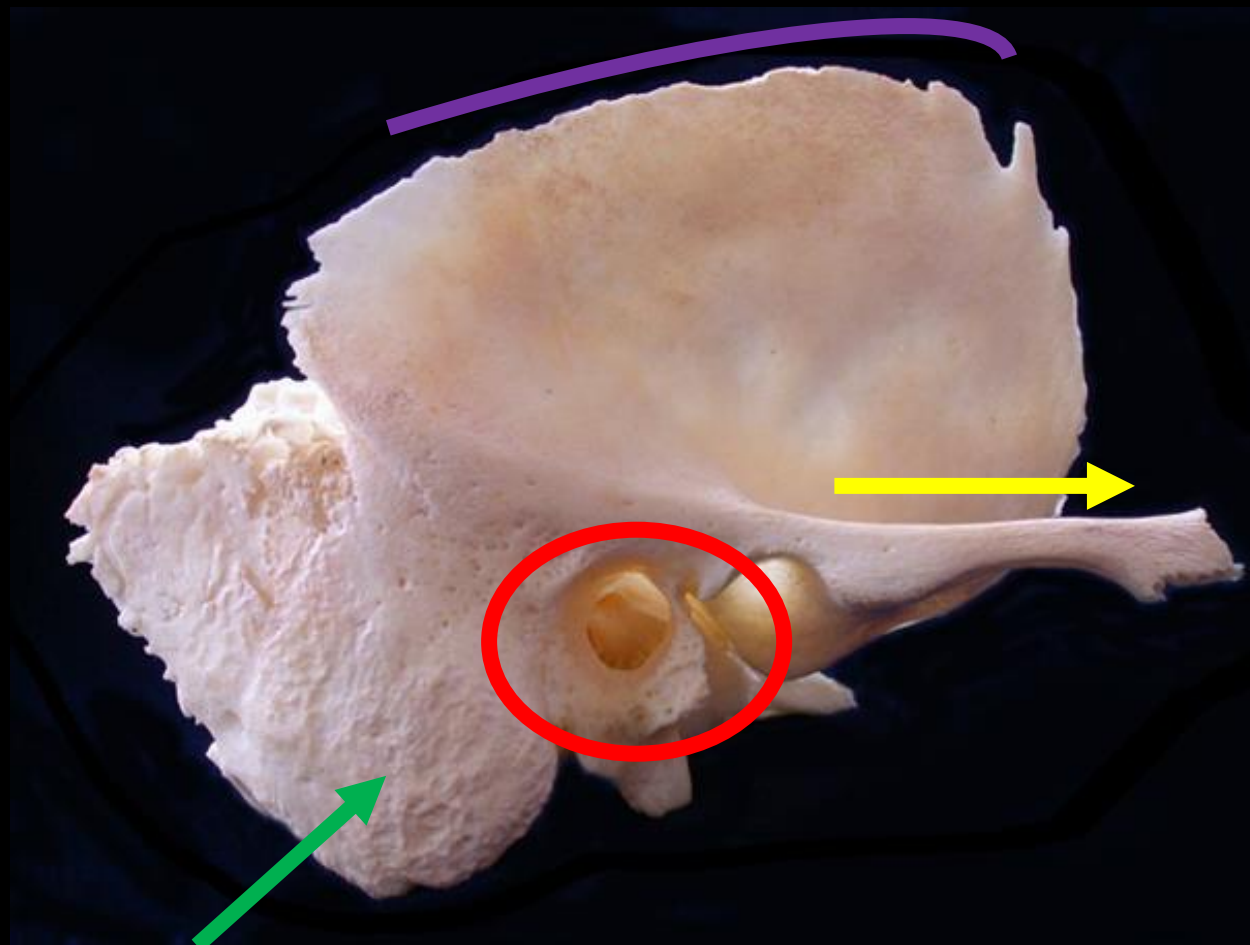


- ✓ **Coronal suture up**
- ✓ **Orbital plates down**
- ✓ **Temporal line lateral**
- ✓ **Frontal eminence anterior**

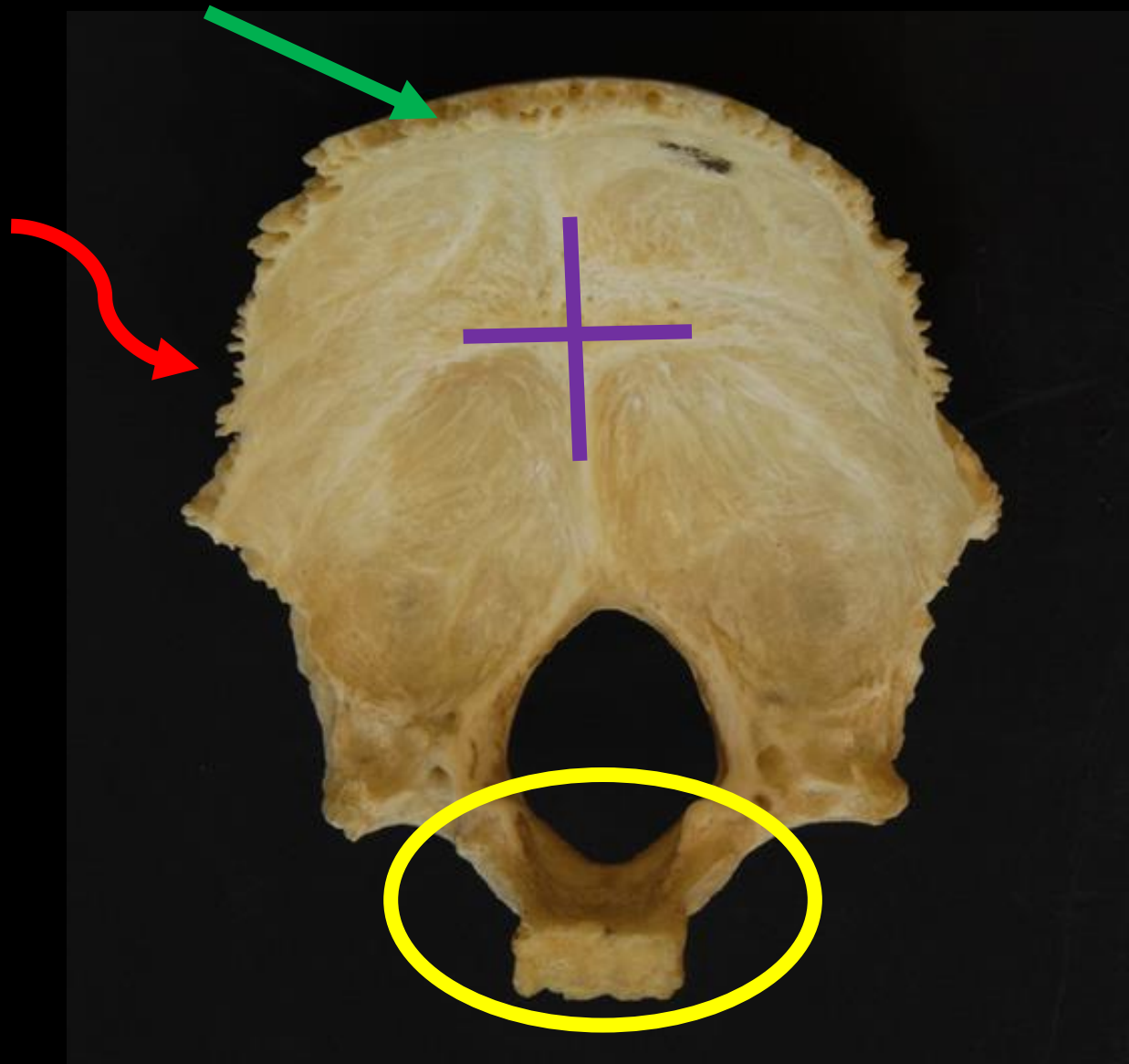
- ✓ The approximately 90° angle formed by the coronal and sagittal sutures is anterior-medial
- ✓ The > 90° angle formed by the junction of the sagittal and lambdoidal sutures is posterior-medial
- ✓ The deeply curved margin is inferior (squamosal margin)
- ✓ The gently curved margin is superior



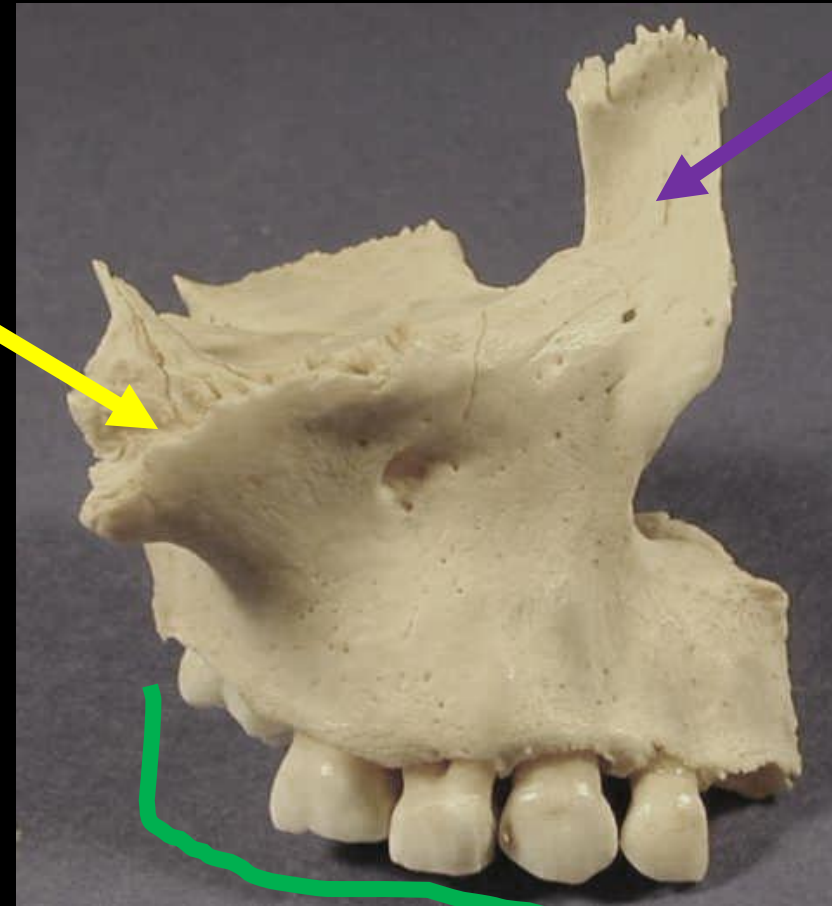
- ✓ Mastoid process inferior-posterior
- ✓ Zygomatic process anterior
- ✓ Squama superior
- ✓ External acoustic meatus lateral



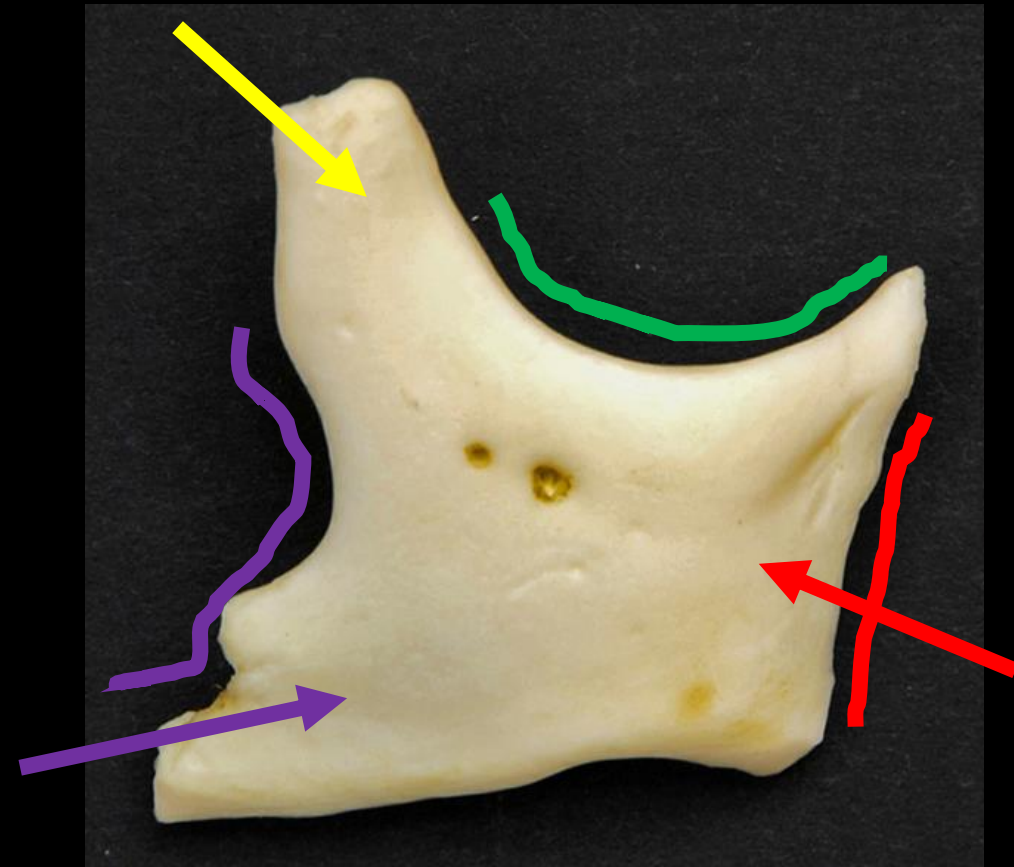
- ✓ **Lambdoidal suture superior**
- ✓ **Occipital condyles inferior-anterior**
- ✓ **Cruciform eminence anterior**
- ✓ **Nuchal crest posterior**



- ✓ Alveolar process (dentition) inferior and anterior-lateral
- ✓ Zygomatic process lateral
- ✓ Frontal proces superior-medial
- ✓ Maxillary sinus posterior-medial

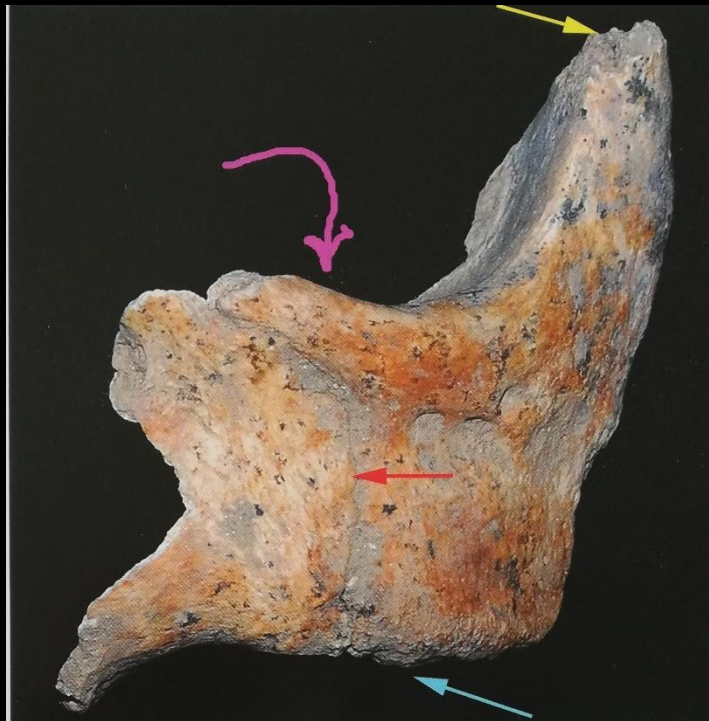


- ✓ Floor of orbit superior
- ✓ Frontal process in upward projection and lateral
- ✓ Zygomatic process lateral (irregular lateral margin)
- ✓ Maxillary process (regular medial margin)



TIPS BY Robert Mann!

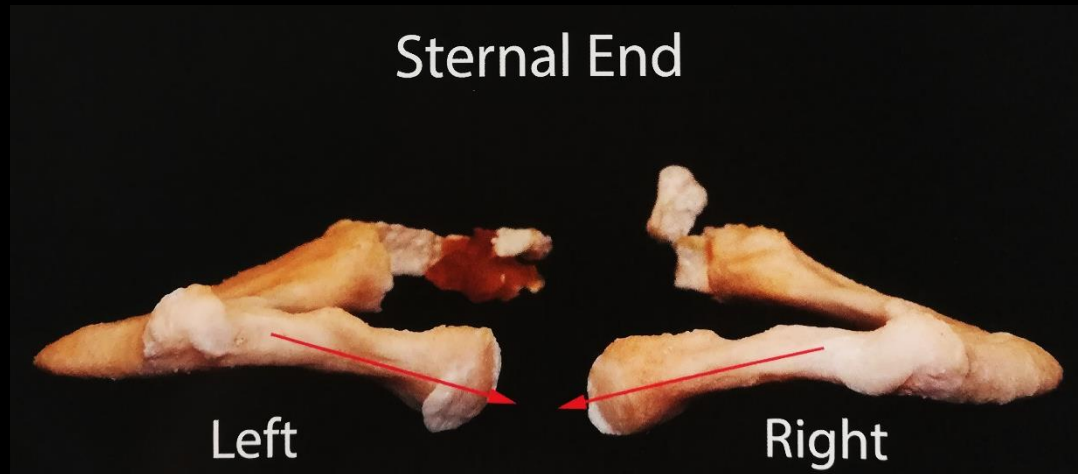
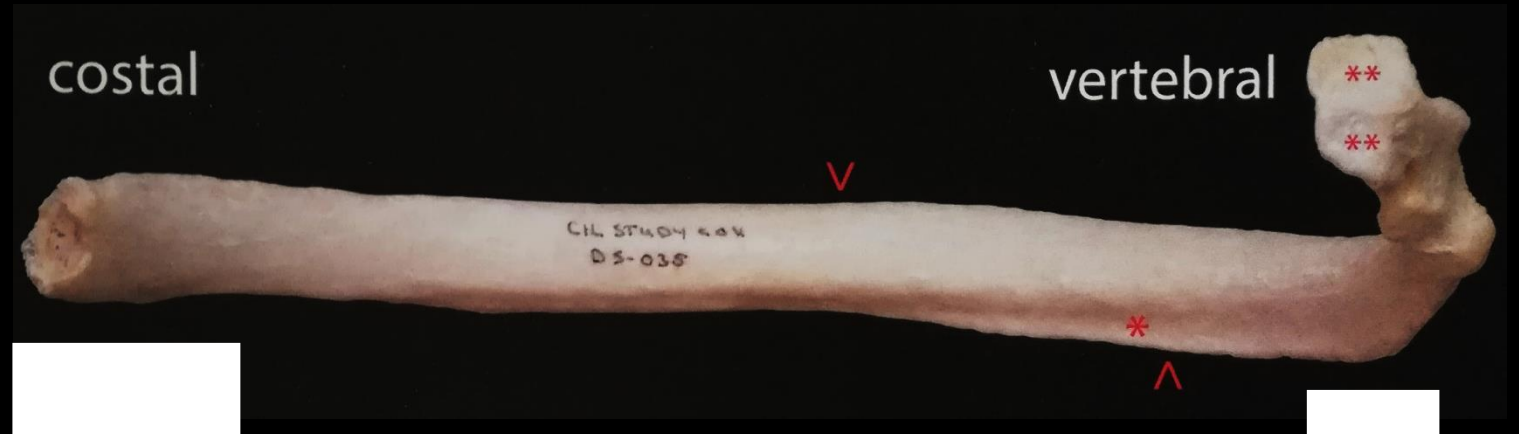
An easy way to side a zygoma is to place the zygoma so that the zygomaticomaxillary suture (medial border) faces you with the frontal process upward. Place the thumb along the lower border of the zygoma and the index finger along the inferior surface of the orbit. The hand holding the zygoma is the side the bone come from.



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Head is posterior
Sternal end anterior
The «knife-edge» border and groove are inferior

Rigth or left?

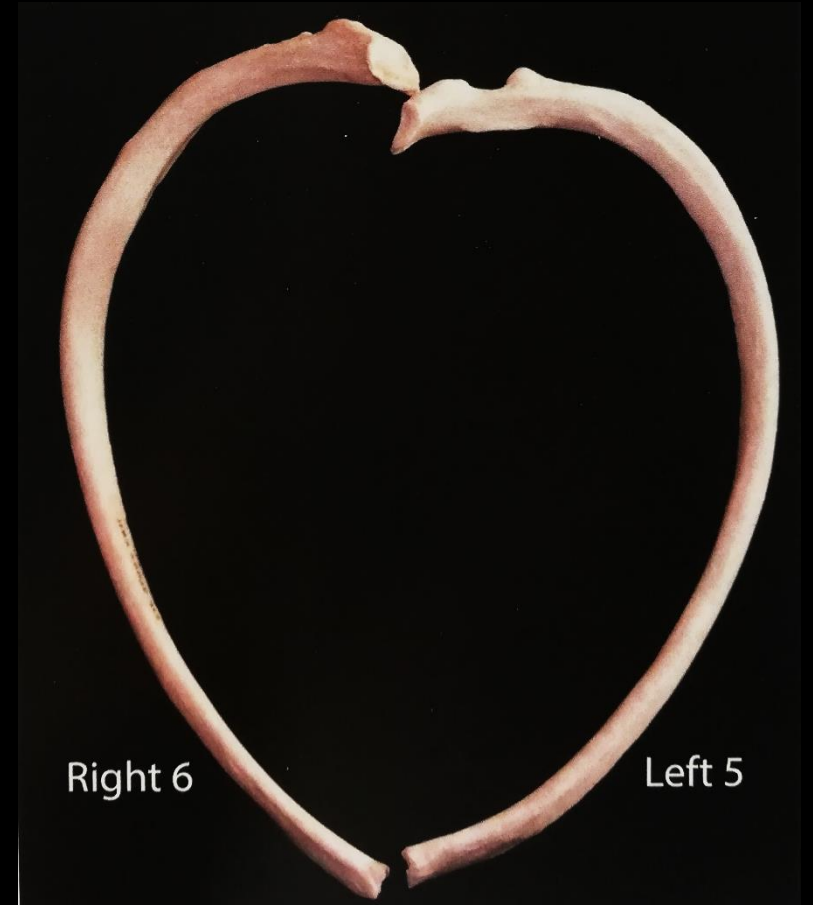
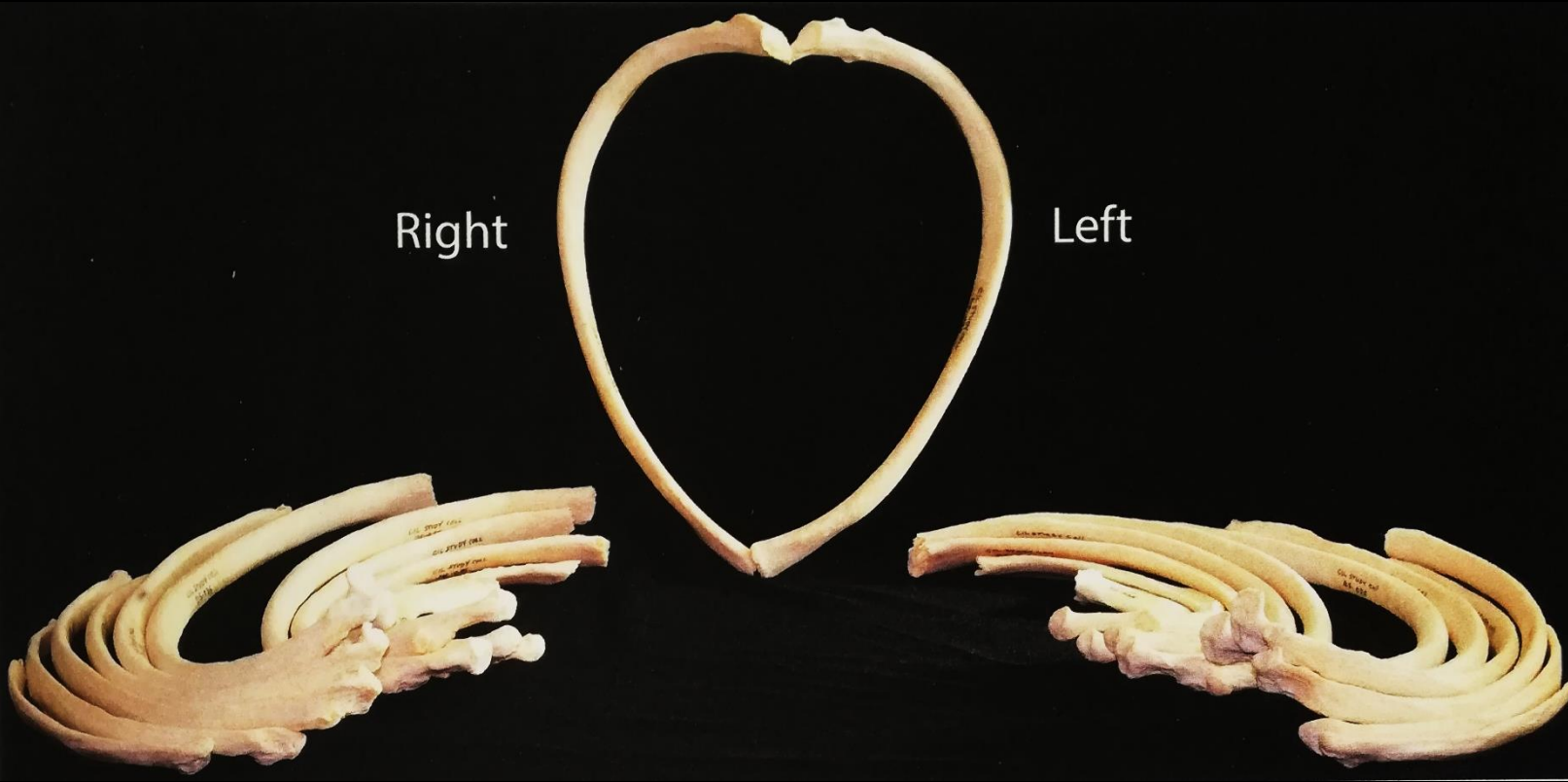


First rib:

Head is posterior and shows a downward curvature

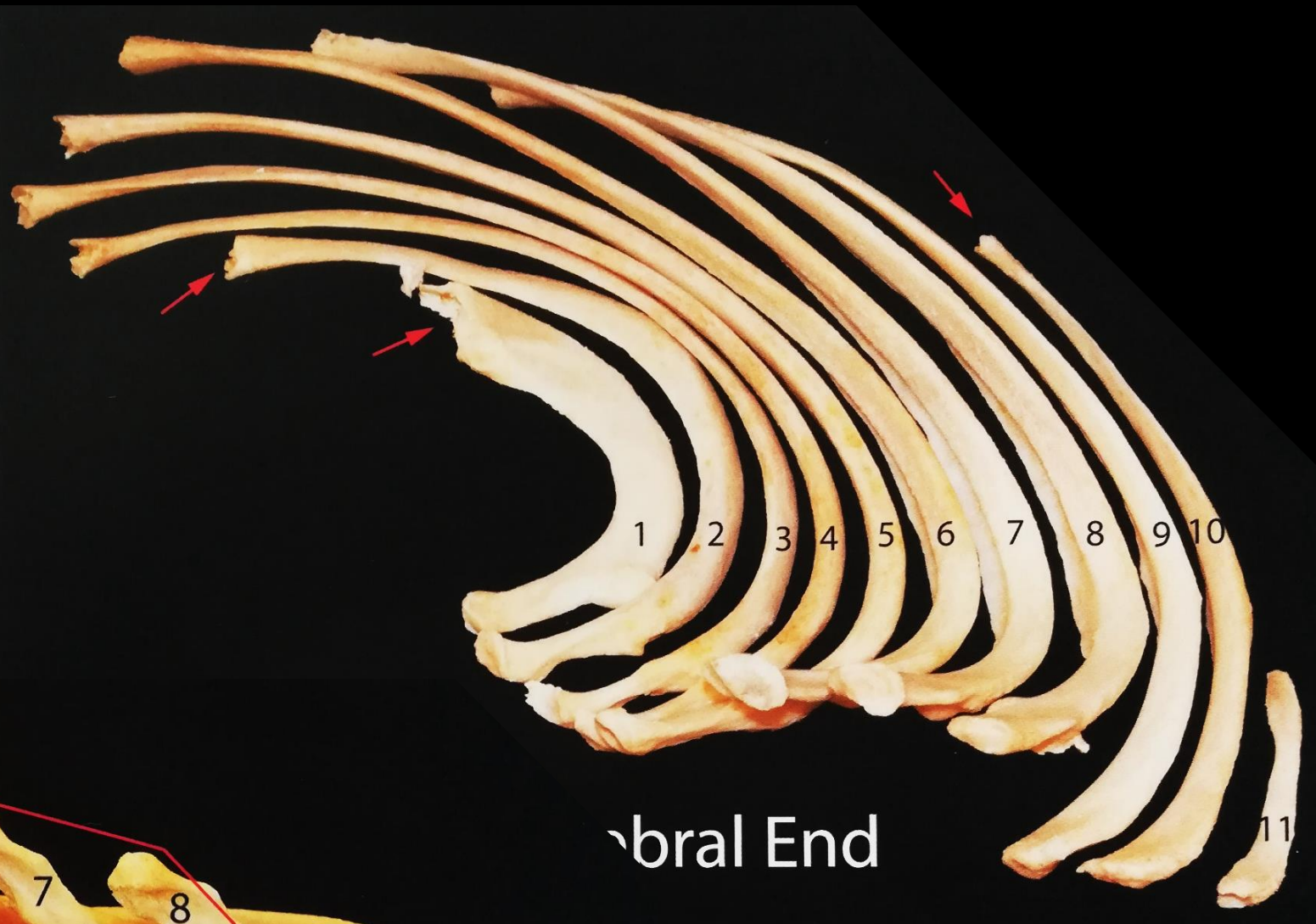
TIPS BY Robert Mann!

Size and shape of the pairs

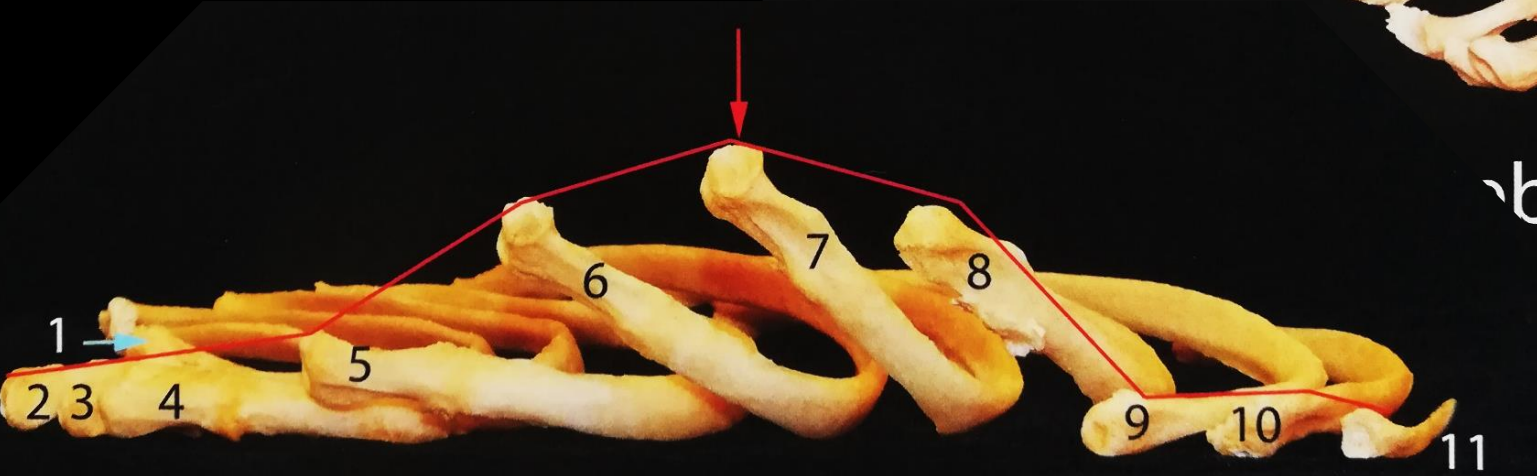


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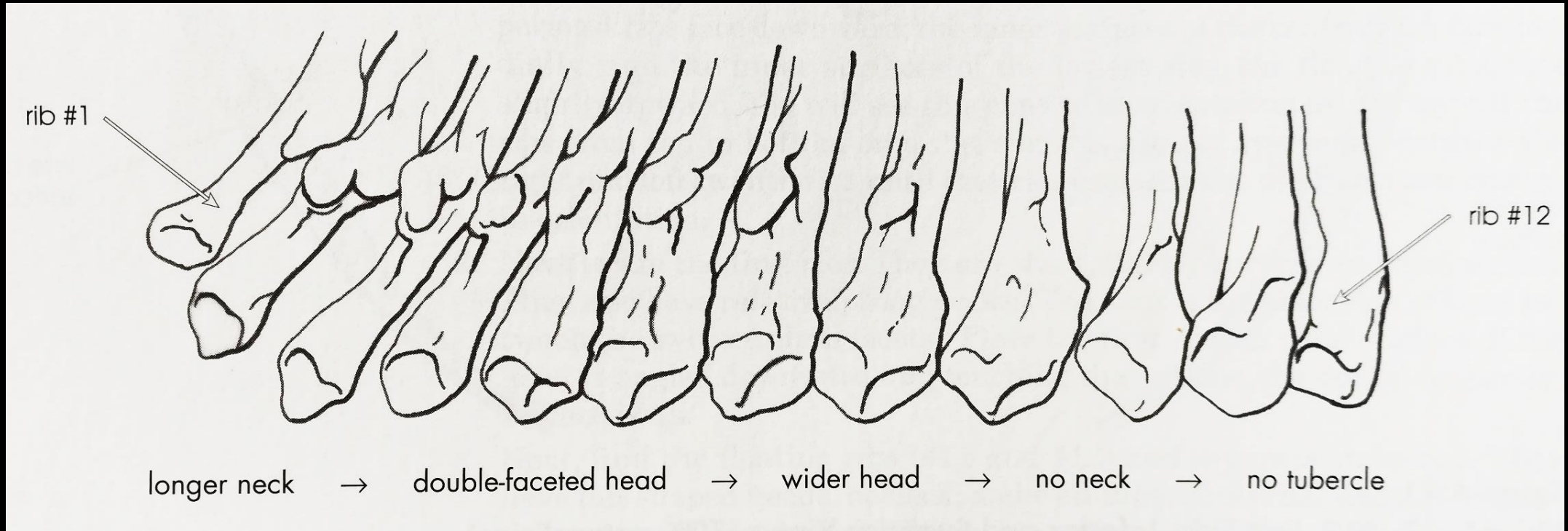
spoon role



Costal End



Head question



The first few ribs have the longest necks;

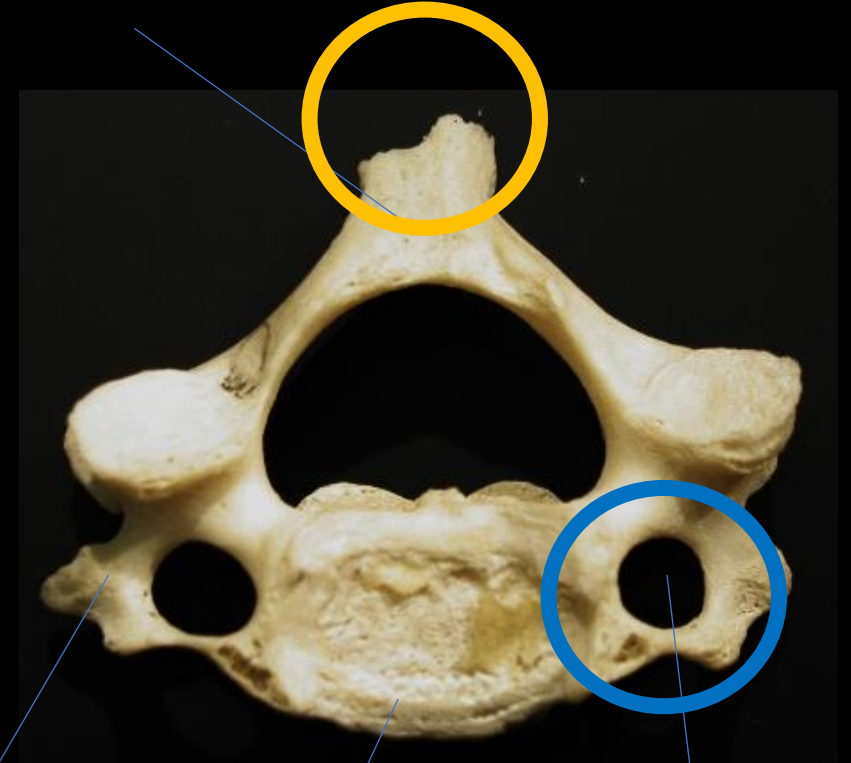
The next few have double-faceted heads;

The lowest ribs have wider heads, no neck and no tubercle with an articular facet

Cervical vertebrae



Spinous process

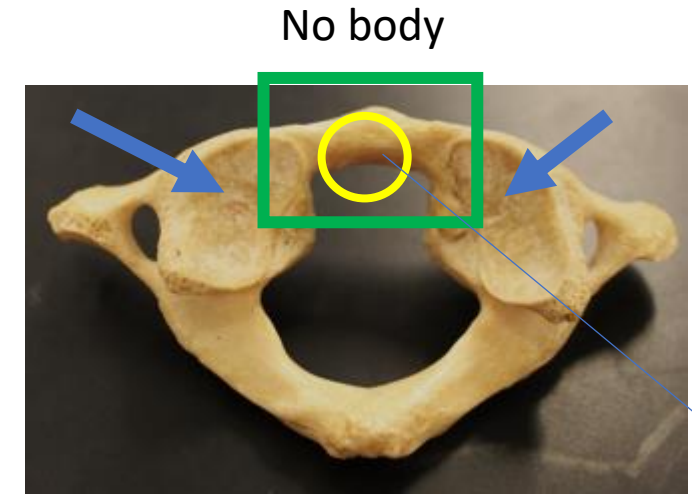


Transverse process

Transverse foramina

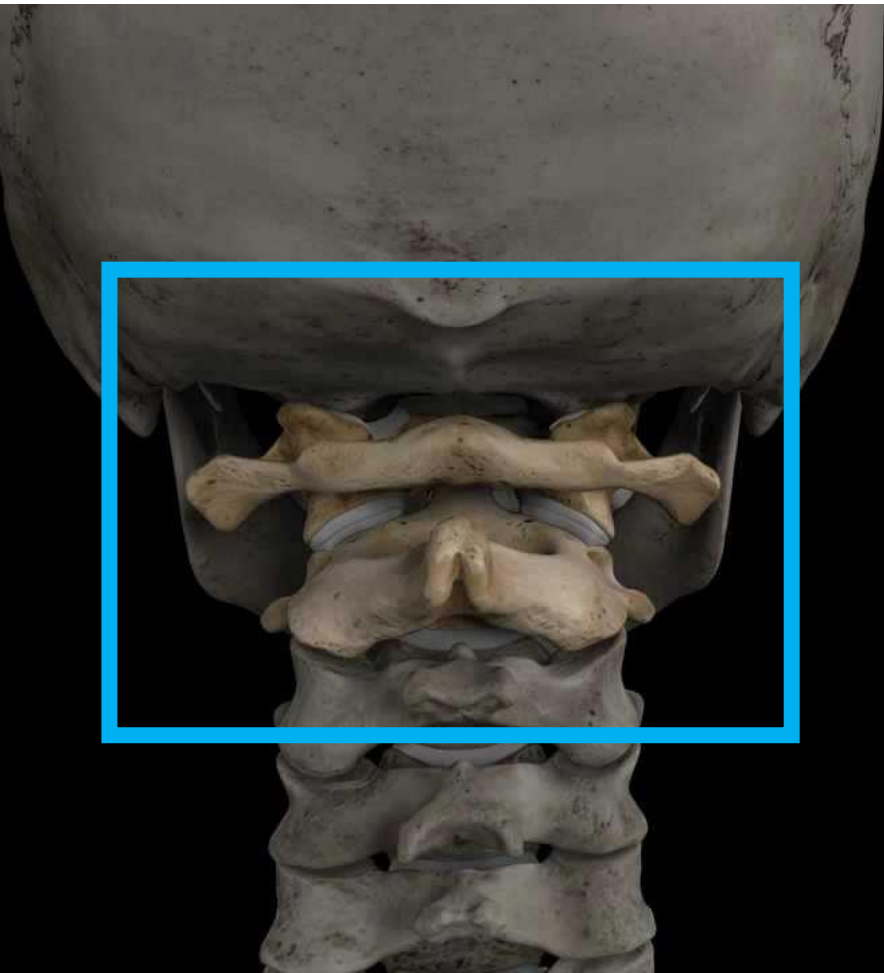
Condylar articular surface

Atlas (C1)



No body

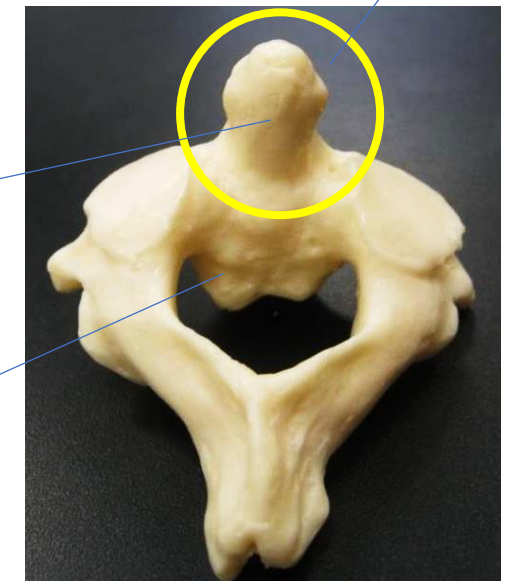
Articular surface for the axis (dens)



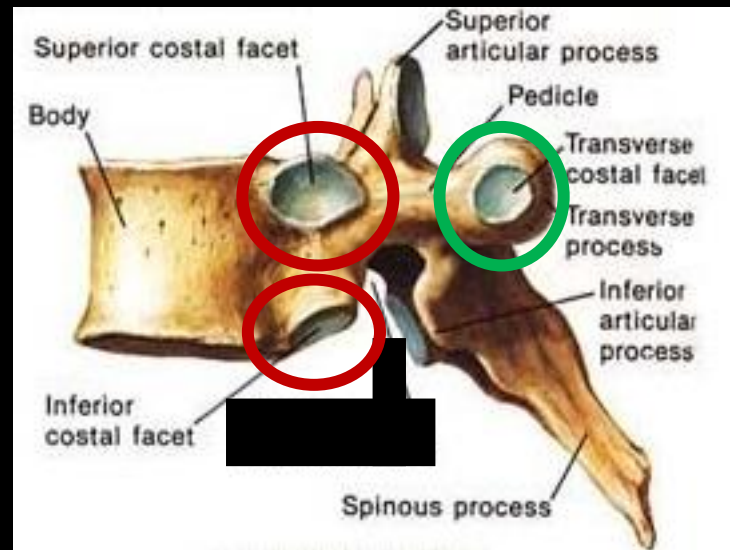
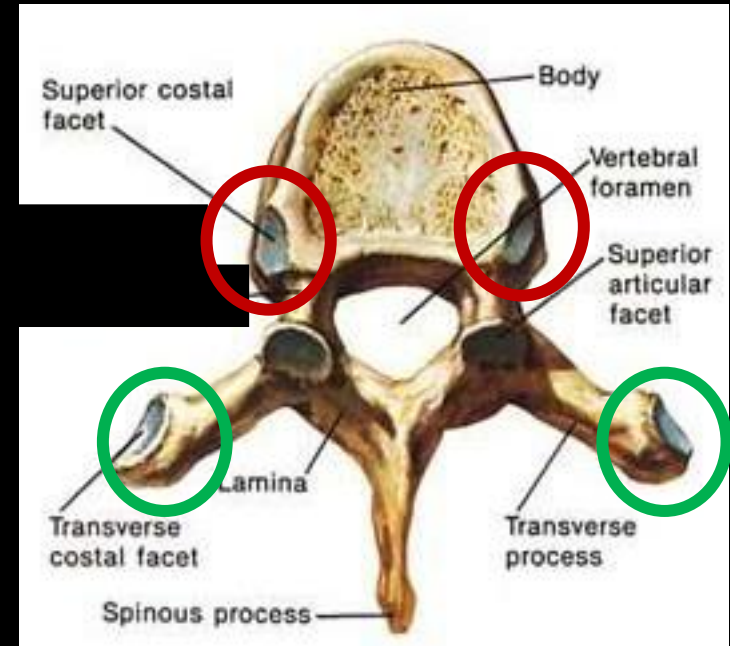
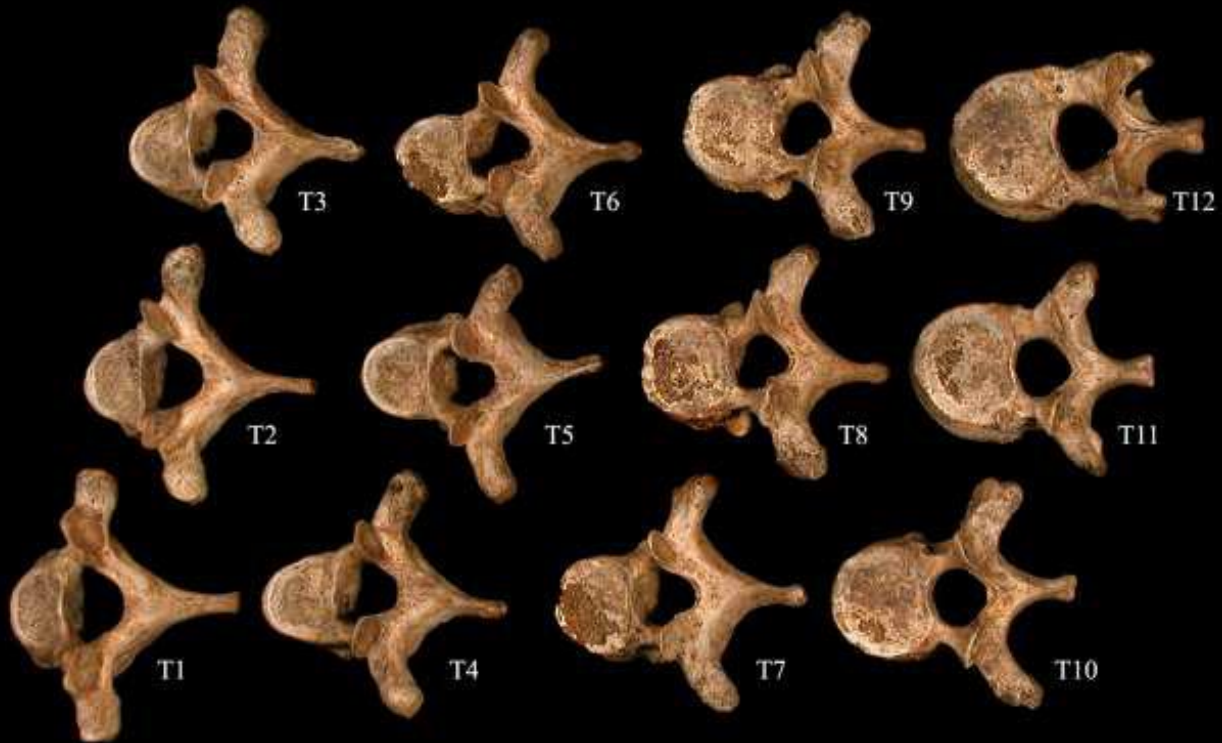
Axis (C2)

Dens or odontoid process

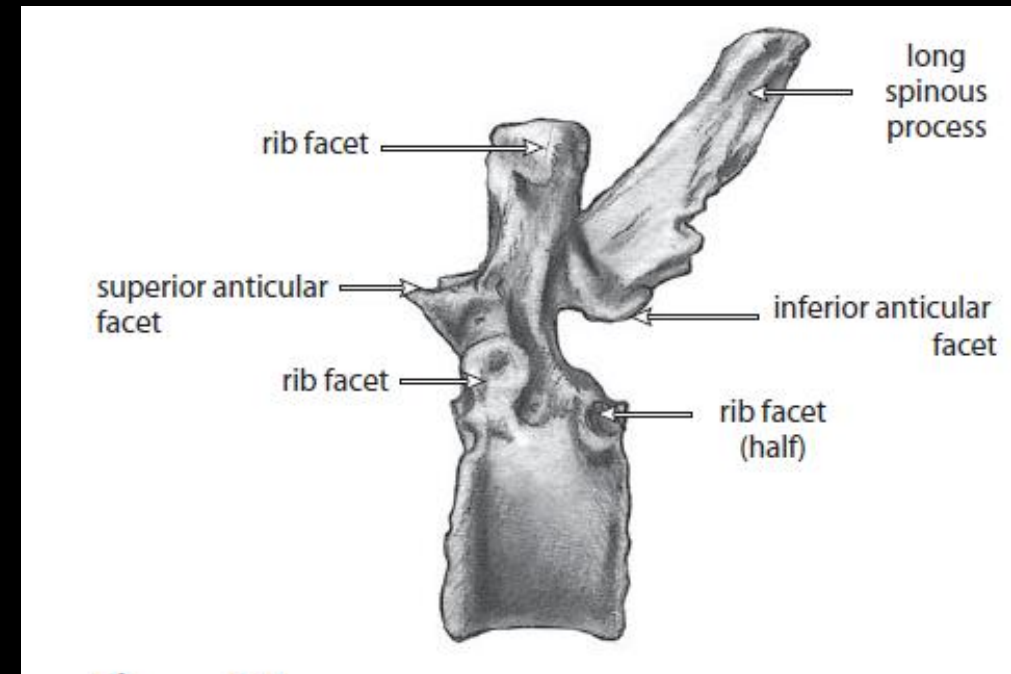
Body

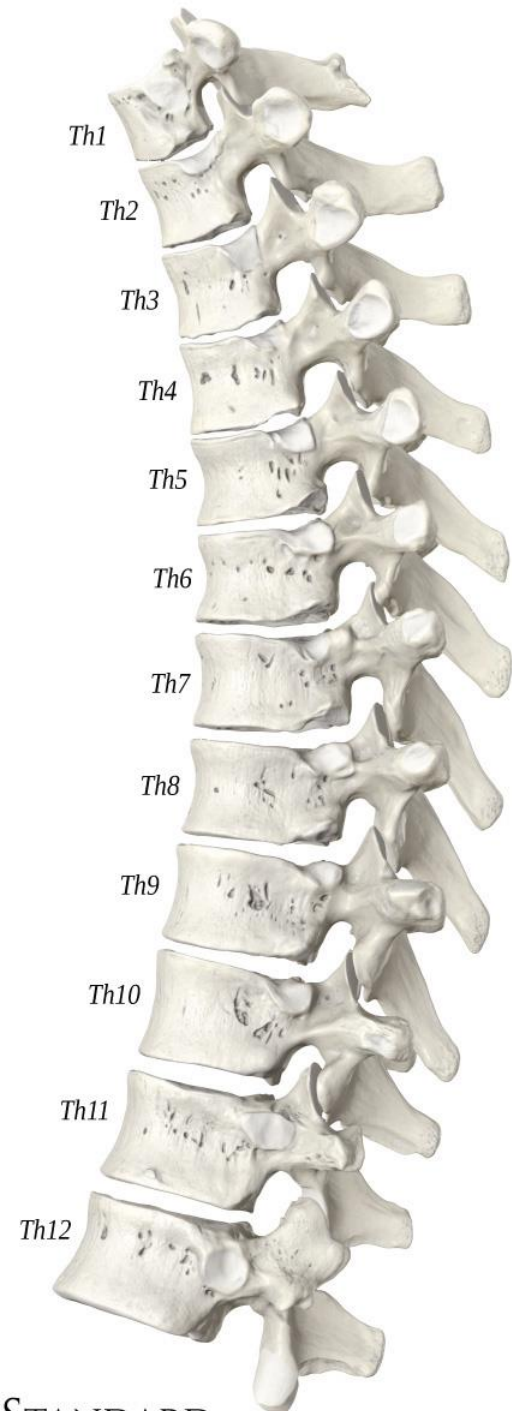
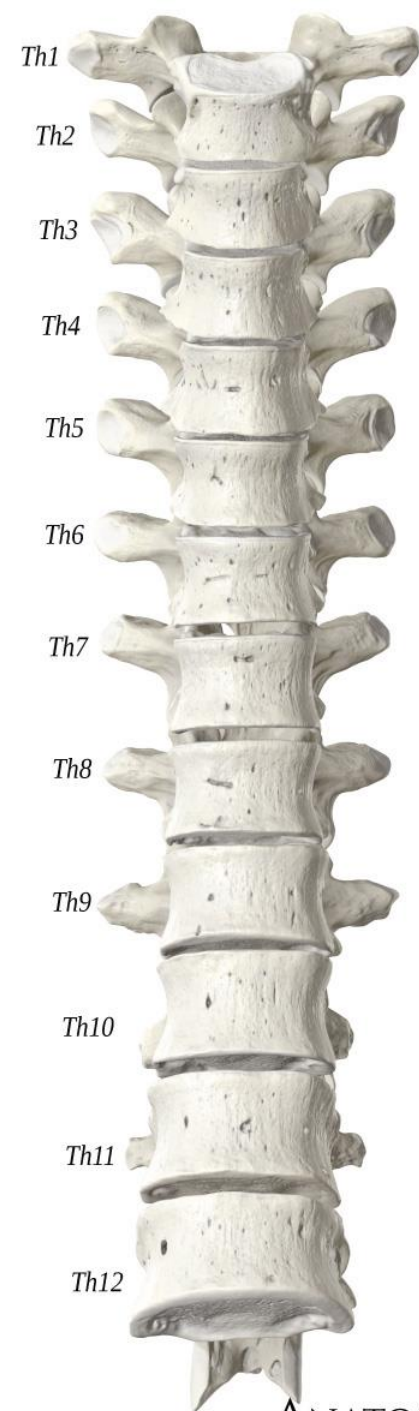


Thoracic vertebrae

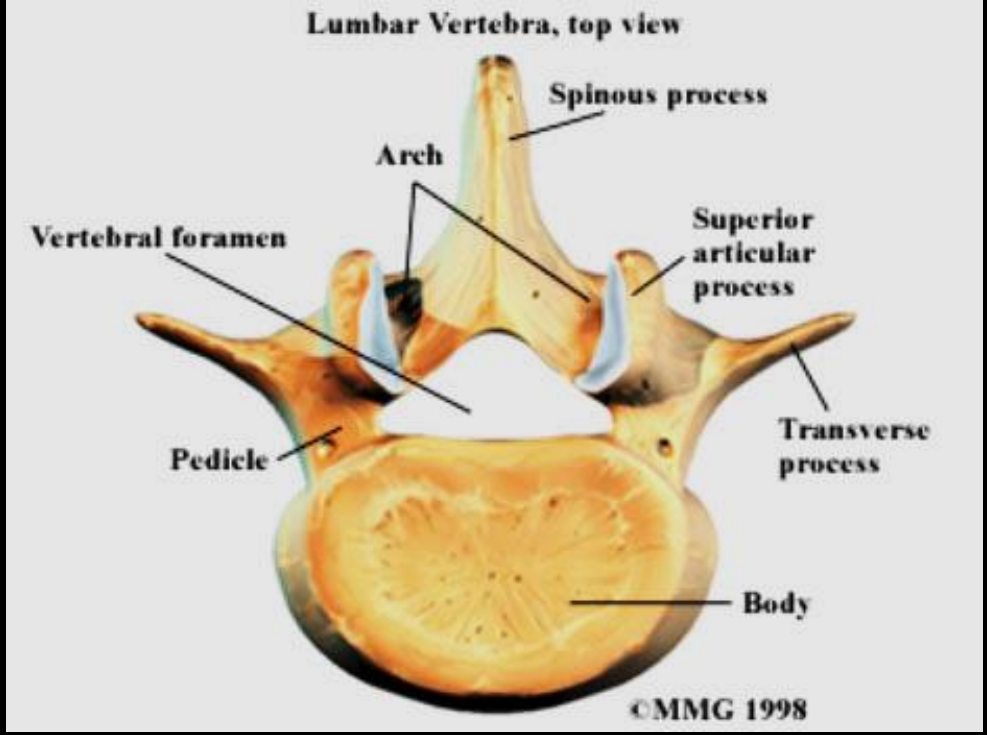


- **T1 has one complete facet, an half facet, and a facet for the rib tubercle on the transverse process**
- **T2 through T9 have two half facets, at the superior and inferior edges of the body, and a facet on the transverse process**
- **T10 has one complete facet and a facet on the transverse process**
- **T11 has one complete facet and NO facet on the transverse process**
- **T12 has one complete facet, no facet on the transverse process and a widened inferior surface of the body, matching the lumbar pattern**





Lumbar vertebrae

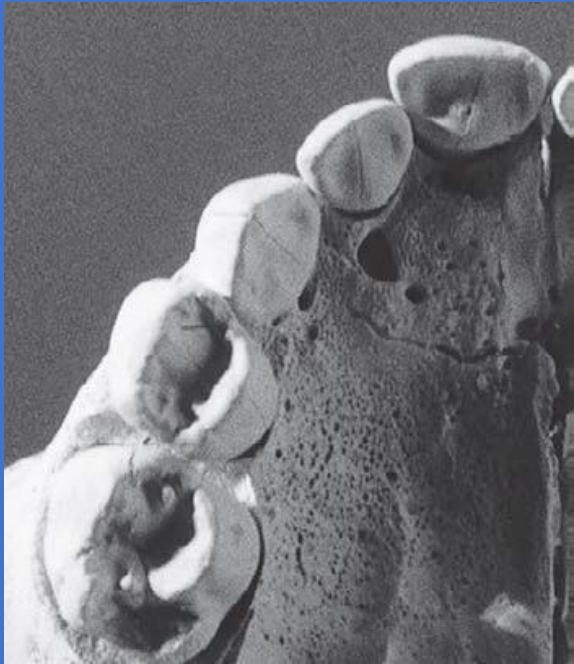




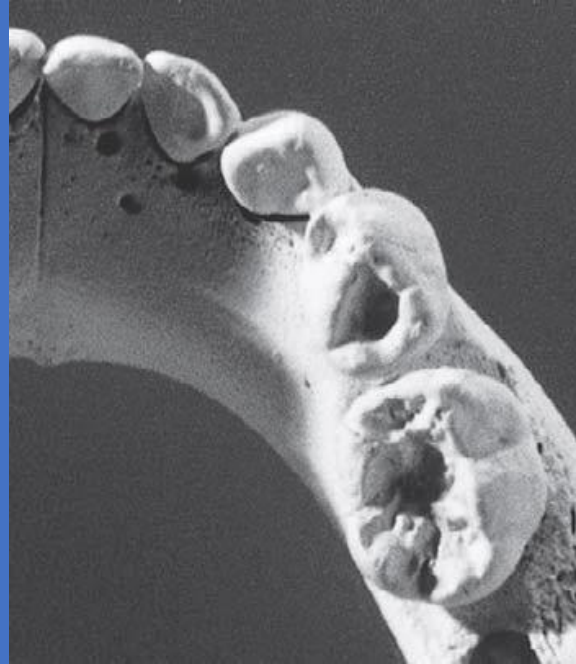


Age related
difference

Deciduous



Maxilla (right)



Mandible (right)

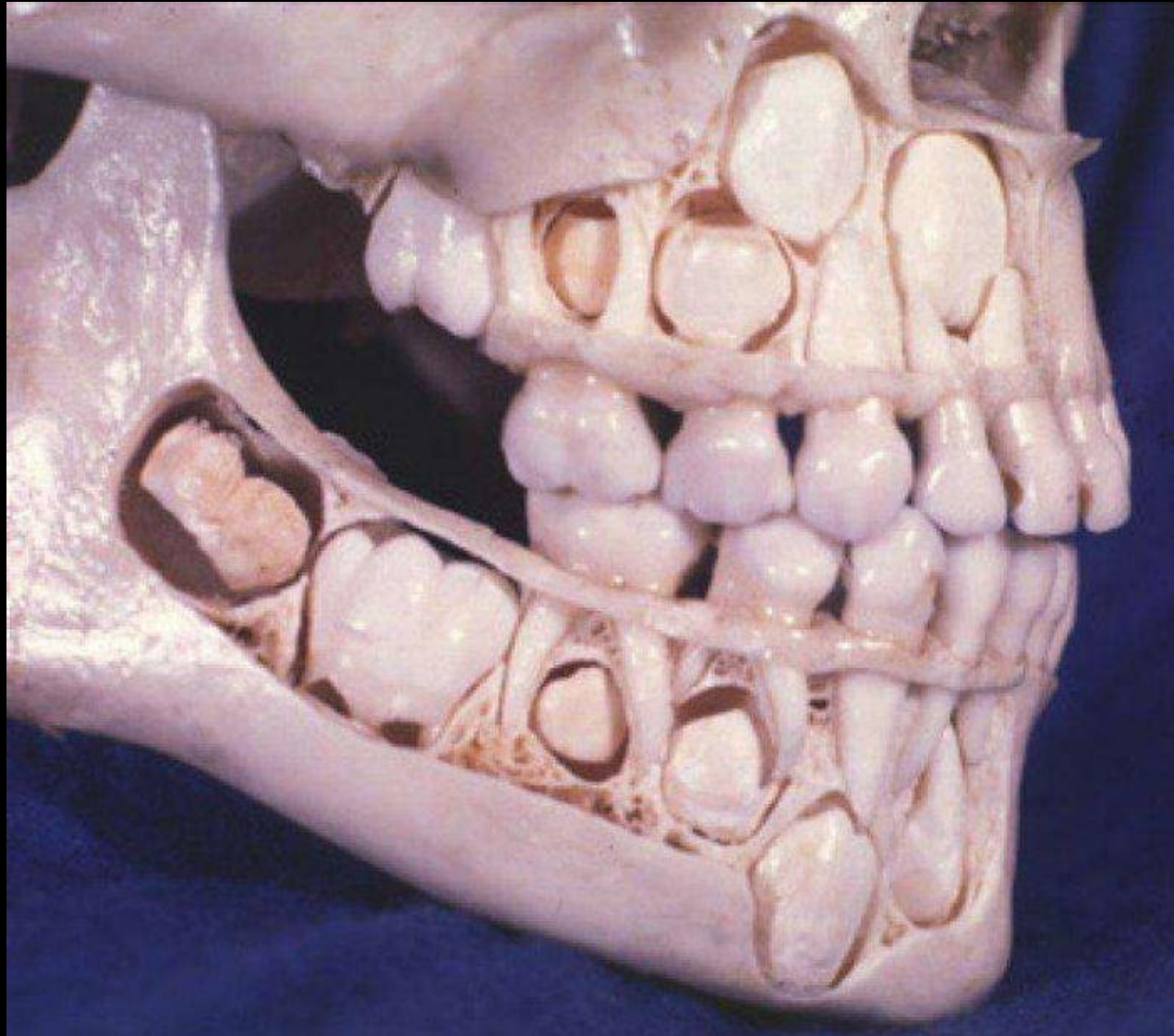
Permanent



Maxilla (right)



Mandible (right)



AGE ESTIMATION AND TEETH

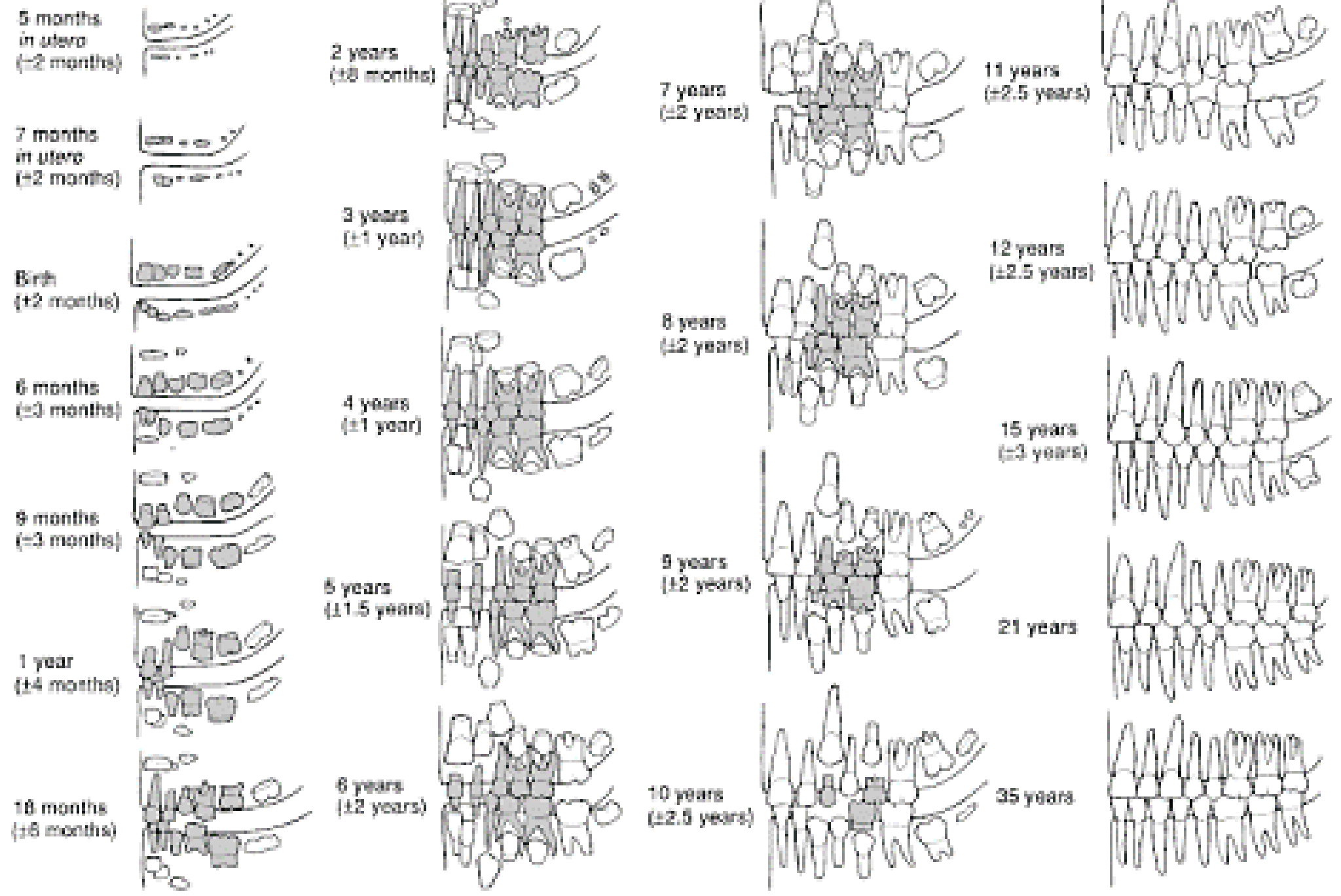
Tooth formation occurs by apposition of enamel (first) and dentin (then), starting at the crown cusps and working toward the root

Different development in different types of teeth



Age estimation methods

The method consists in comparing the dental elements present in the skeleton with the chart of tooth formation and emergence



Morphological difference between teeth

Deciduous/permanent tooth

Growing root/root in reabsorption



- ✓ Fetuses
- ✓ Infants
- ✓ Children
- ✓ Adolescents until third molar is formed

8 stages of permanent third molar formation









At each stage it is possible to attribute an age range

Mincer, 1993

Third molar as age marker in adolescences

TABLE 3—Percentile distributions of the age at attainment of stages of third molar crown-root formation in American whites.^a

Gender	Centile	Grade of Formation				
		D	E	F	G	H
Maxilla						
Males	10th	14.21	14.38	15.39	15.96	17.58
	25th	14.64	15.02	15.75	16.64	18.82
	50th	15.53	16.09	17.34	17.92	20.02
	75th	16.76	17.26	18.40	19.43	21.52
	90th	19.60	20.70	20.91	20.74	23.18
Females	10th	14.18	14.75	15.91	15.88	18.07
	25th	14.49	15.35	16.62	17.11	19.09
	50th	15.93	16.87	17.93	18.60	20.74
	75th	17.03	18.28	19.38	20.52	22.23
	90th	18.13	19.11	20.18	21.86	23.42
Mandible						
Males	10th	14.19	15.14	15.15	15.87	18.27
	25th	14.40	15.66	16.13	16.89	19.47
	50th	15.02	16.74	16.98	17.91	20.30
	75th	16.52	17.90	18.19	19.55	22.00
	90th	16.91	21.42	20.58	20.79	23.28
Females	10th	14.12	14.49	15.48	16.49	18.27
	25th	14.46	15.82	16.47	17.63	19.23
	50th	15.83	16.91	17.71	18.96	20.81
	75th	17.03	18.11	18.75	20.76	22.60
	90th	18.47	18.94	20.15	21.85	23.57

<p>A </p>	<p>Cusp tips are mineralized but have not yet coalesced.</p>	<p>E </p>	<p>Formation of the inter-radicular bifurcation has begun. Root length is less than the crown length.</p>
<p>B </p>	<p>Mineralized cusps are united so the mature coronal morphology is well-defined.</p>	<p>F </p>	<p>Root length is at least as great as crown length. Roots have funnel-shaped endings.</p>
<p>C </p>	<p>The crown is about half formed; the pulp chamber is evident and dentinal deposition is occurring.</p>	<p>G </p>	<p>Root walls are parallel, but apices remain open.</p>
<p>D </p>	<p>Crown formation is complete to the dentinoenamel junction. The pulp chamber has a trapezoidal form.</p>	<p>H </p>	<p>Apical ends of the roots are completely closed, and the periodontal membrane has a uniform width around the root.</p>

























Age span	17-25			25-35			35-45			45+
Tooth	M1	M2	M3	M1	M2	M3	M1	M2	M3	
Wear pattern	 Or  Or 	  	No dentine exposed	  	  	  	  	  	  	More advanced wear

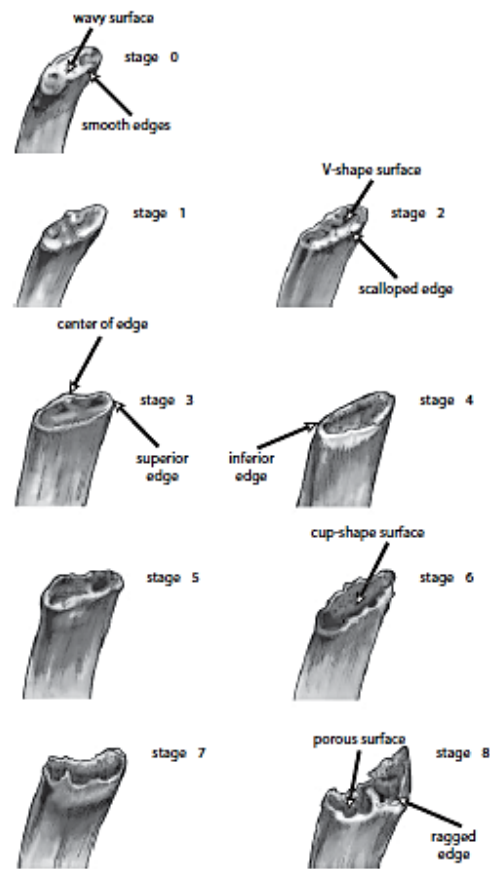
Figure 3.18 Estimated correspondence between adult age at death and molar wear phases for British material from Neolithic to medieval periods

Source: After Brothwell (1981: Figure 3.9).

THE AGING RIB CAGE

AGE CHANGES IN STERNAL RIB ENDS OF MALES

Ribs, like the rest of the skeleton, change with advancing age. The sternal end of the rib is connected to the sternum by cartilage. As the bone–cartilage interface is subjected to the normal stresses of life, the bone responds by steadily remodeling and gradually ossifying the cartilage.



Stage 0: Child (Less than Midteens)

- A fairly flat rib end (no concavity)
- Smoothly rounded edges
- A slightly wavy or undulating surface

Stages 1–2: Teenager+ (Midteens to Early 20s)

- Beginnings of a V-shaped concavity
- Slightly sharper, scalloped edges
- A less wavy surface

Stages 3–4: Young Adult (Mid-20s to Early 30s)

- Deepening V-shaped concavity
- Less regular edges
- Centers of the flat edges project more than the superior and inferior rib edges
- Total loss of wavy surface

Stages 5–6: Older Adult (Mid-30s to Mid-50s)

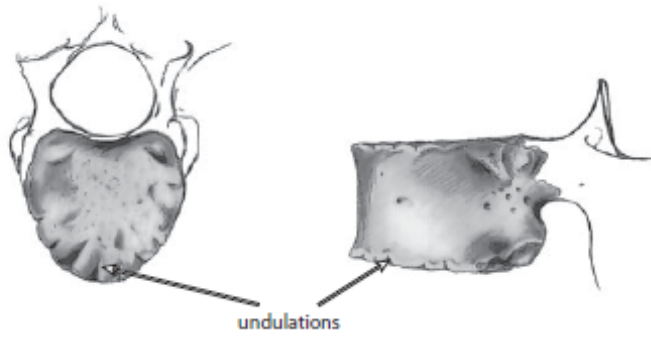
- V-shaped concavity expands into a cup-shaped concavity
- Sharper edges
- Superior and inferior edges project as far as centers of edges

Stages 7–8: Elderly Adult (Older than Mid-50s)

- A deep, porous and irregular concavity
- Sharp, thin edges, increasingly ragged-looking
- Superior and inferior edges project more than the centers of the flat edges
- Development of “crab-claw” appearance

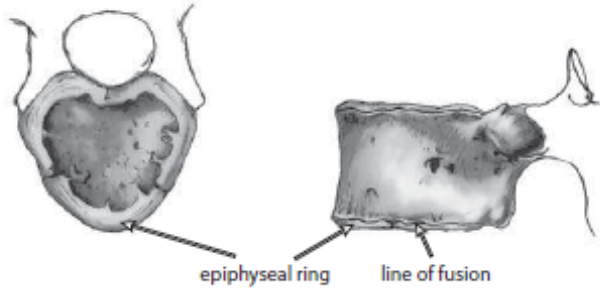
Figure 4.17
Sternal Rib End Aging, Stages 0–8, with Abbreviated Descriptions

İşcan and colleagues (1985) describe rib age changes by nine stages (beginning with Stage 0). The series of ribs illustrated here is simplified from the İşcan examples. It provides an overview of the basic changes in rib ends of males. For more detail, refer to the original publication and practice with casts of the original material available through France Casting. See page 300 for further information.



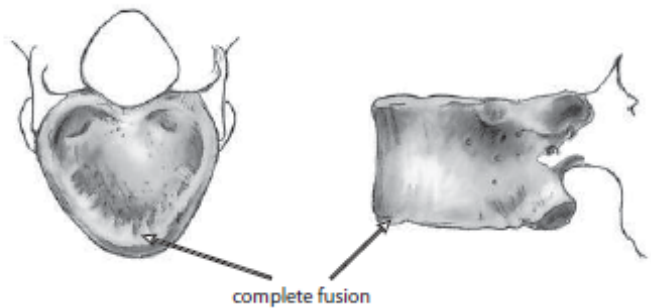
STAGE 1: CHILD (LESS THAN 16 YEARS)

- The epiphyseal ring is absent.
- Regular undulations are present on edges of vertebral body.



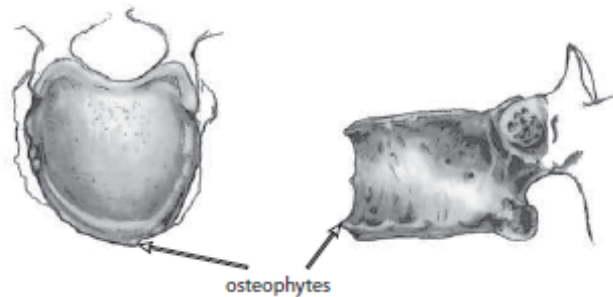
STAGE 2: LATE TEENAGER (16-20 YEARS)

- The epiphyseal ring is in the process of fusing.
- The line of fusion is clear.
- The epiphyseal ring chips off easily.



STAGE 3: YOUNG ADULT (20-29 YEARS)

- The epiphyseal ring is completely fused.
- The line of fusion is not visible.
- No osteoarthritis is visible.
- The bone is smooth and solid.



STAGE 4: OLDER ADULT (OVER 30 YEARS)

- The epiphyseal ring is obliterated.
- Osteophytic growth is progressing on the edges of the vertebral bodies.
- The bone (particularly the intervertebral surface) is increasingly porous.

Age changes (vertebrae)