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Examination of Bones

SKILL STATION: Examination of skull for sex determination



Type of Station: Procedural station

Domain: Cognitive, psychomotor

Introduction:

Examination of skeletal remains of a dismembered or mangled or a part of body, is an essential part of crime investigation while performing medicolegal autopsy which can help the investigating officer to fulfill the various objectives. Occasionally, the investigating officer may bring a bone or part of bone or complete or part of skeleton and ask for the sex determination. Difficulty may arise in case of smaller bones from some animals, cylindrical segments of central shaft and burnt bone fragments. Sex can be better identified from skull and pelvis up to 98%, from long bones up to 80%. Sex determination is an important aspect of identification of an individual and it can help as it narrows down the field of search by investigating officer to 50%. Other physical parameters that can be determined are like, race, age, stature, occupation, etc. which may help for complete or partial identification.

Expected from Students:

The student should be able to know:

1. The importance of skeleton examination.
2. How to determine the sex of given bone.
3. To interpret the sex differentiating features of skull bone.
4. To describe the importance of sex determination in skull bone.
5. The medicolegal implications.

Procedure: The student should hold the skull:

- In a standard anatomical position in such a way that upper margins of ear canals, lower margins of orbits should lie in the same horizontal plane and front of skull bone facing the examinee.
- Student should observe the various morphological features in the skull, like supraorbital ridges, glabella, external occipital protuberance, zygomatic arch, orbit, palate and forehead.

Based on these features, he should interpret and opine regarding sex of given skull bone.

Checklist:

Duration: 5 minutes

Total marks: 5

Sr. No.	Parameters	Maximum marks	Roll nos.							
			1	2	3	4	5	6	7	8
1.	Proper anatomical positioning of skull bone	1								
2.	Any two observation findings	2								
3.	Interpretation and opinion based on findings	2								
Total		5								
Global rating: 1. Poor 2. Unsatisfactory 3. Satisfactory 4. Good 5. Excellent										
Observer's feedback:										

Name of observer

Signature

QUESTIONS AND ANSWERS

Q. 1. What is the importance of sex determination?

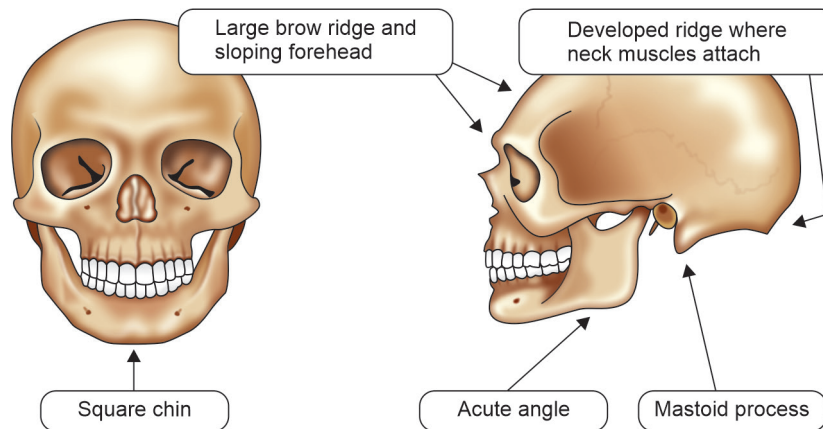
Ans. Sex determination is an important aspect of identification. It will narrow the field of search of investigating to approximately 50%.

Q. 2. How will you differentiate male and female skull bone?

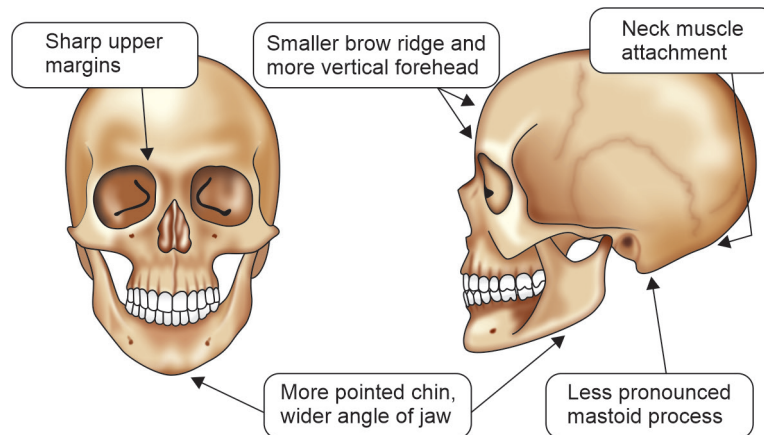
Ans. We can differentiate between male and female skull bone based on general morphological characters, specific features and from soft tissue parts if available.

Q. 3. What are the features of male skull?

Ans. In male, supraorbital ridges, glabella, external occipital protuberance, zygomatic arch are more prominent and frontal and parietal eminence is less prominent. Mastoid process is large, round and blunt. Shape of the orbit is rectangular. Palate is larger and U-shaped. Forehead is steeper and less rounded.

**Q. 4. What are the features of female skull?**

Ans. In female, supraorbital ridges, glabella, external occipital protuberance, zygomatic arch are less prominent and frontal and parietal eminence is more prominent. Mastoid process is small, smooth and pointed. Shape of the orbit is round. Palate is smaller and parabolic. Forehead is vertical and round.



SKILL STATION: Examination of skeletal remains (skull bone)

Type of Station: Response station

Domain: Cognitive, affective

Introduction:

Skeletal examination is an essential part of crime investigation that can assist in the fulfillment of various objectives of medicolegal autopsy. Occasionally, the investigating officer may bring a bone or part of bone and ask for sex determination. Difficulty may arise in case of smaller bones from some animals, cylindrical segments of central shaft and burnt bone fragments. Sex determination is important and has taken precedence over age estimation as it narrows down the field of search by investigating officer to 50%. We can also determine the race, cause of death, time since death and manner of separation.

Expected from Students:

The student should be able to:

1. Know the age of person from given skull bone.
2. Know the sex of given bone.
3. Determine the race from the skull bone.
4. Determine the time since death from skull bone.
5. Determine the cause of death from skull bone.

Checklist:**Duration:** 5 minutes**Total marks:** 5

Sr. No.	Parameters	Maximum marks	Roll nos.							
			1	2	3	4	5	6	7	8
1.	Opine on age of person.	1								
2.	What is cephalic index?	1								
3.	Two differentiating features of sex of person from skull bone.	1								
4.	How will you opine on cause of death?	1								
5.	Name any two tests to opine time since death.	1								
Total		5								
Global rating: 1. Poor 2. Unsatisfactory 3. Satisfactory 4. Good 5. Excellent										
Observer's feedback:										

Name of observer

Signature

QUESTIONS AND ANSWERS**Q. 1. How to identify whether it is a bone or not?**

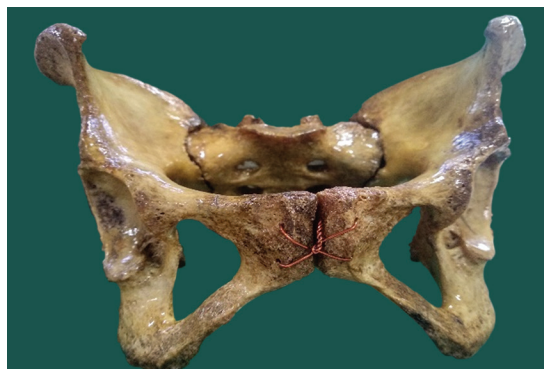
- Ans.**
- Gross anatomical structure.
 - Microscopic examination.
 - Chemical examination.

Q. 2. How to identify whether it is male or female skull bone?**Ans.** By looking at general characteristics, examination of soft parts if available.**Q. 3. How is the race of the individual determined?****Ans.** By using cephalic index, the race can be determined.**Q. 4. Determine the time since death.**

- Ans.**
- Soft tissue remnants: 1–3 months.
 - Joint capsule and ligaments: 3–5 months.
 - Recent bone: Greasy, heavy, odor.
 - Completely dry but has putrid smell: 3 months–1 year.
 - Completely dry and no putrid smell: More than 1 year.
 - Periosteum: Several months.

Q. 5. What is the cause of death of the individual?

- Ans.**
- If any injury or fracture is present.
 - Chemical analysis for poisoning.
 - Foreign body like bullet, if present.
 - Neutron activation analysis.

SKILL STATION: Examination of pelvis**Type of Station:** Response station**Domain:** Cognitive**Expected from Students:**

The student should be able to know:

1. The age of person from given pelvis.
2. The sex of given bone.

Checklist:**Duration:** 5 minutes**Total marks:** 5

Sr. No.	Parameters	Maximum marks	Roll nos.							
			1	2	3	4	5	6	7	8
1.	Opine on age of person.	1								
2.	Opine on sex of person.	1								
3.	What are the different ossification centers?	1								
4.	How will you opine on cause of death?	1								
5.	Name any two tests to opine time since death.	1								
Total		5								
Global rating: 1. Poor 2. Unsatisfactory 3. Satisfactory 4. Good 5. Excellent										
Observer's feedback:										

Name of observer

Signature

QUESTIONS AND ANSWERS**Q. 1. What are the characteristics of male pelvis?**

- Ans.**
- a. Contour is rough, rugged and impressions for muscular attachments are well marked.
 - b. Brim is heart-shaped.
 - c. The body of pubis is narrower and triangular in shape.
 - d. The margins of the pubic arches are everted.
 - e. Subpubic angle is less than 90° and V-shaped.
 - f. Pre-auricular sulcus is not prominent.
 - g. Obturator foramen is oval in shape.
 - h. Ischial tuberosities are closer and inverted.

Q. 2. What are the characteristics of female pelvis?

- Ans.**
- a. Contour is smooth and impressions for muscular attachments are not well marked.
 - b. Brim is circular.
 - c. The body of pubis is narrower and triangular in shape.
 - d. The margins of the pubic arches are round.
 - e. Subpubic angle is more than 90° and U-shaped.
 - f. Pre-auricular sulcus is more prominent.
 - g. Obturator foramen is triangular in shape.
 - h. Ischial tuberosities are wide apart and everted.

Q. 3. What are the ossification centers of pubic bone?

- Ans.**
- a. Iliac crest:
Appearance: 14 years; fusion: 20 to 21 years
 - b. Triradiate cartilage:
Appearance: 13 years; fusion: 14 years
 - c. Ischial tuberosity:
Appearance: 16 years; fusion: 20 to 21 years

Q. 4. What are the characteristics of male sacrum?

- Ans.**
- a. Contour is rough, rugged and impressions for muscular attachments are well marked.
 - b. It is long and narrow with evenly distributed anterior curvature.
 - c. Body of the sacral vertebra is large and sacral promontory is well marked.
 - d. Sacro-iliac articular surface extends up to $2\frac{1}{2}$ to 3 sacral segments.

Q. 5. What are the characteristics of female sacrum?

- Ans.**
- a. Contour is smooth and impressions for muscular attachments are not well marked.
 - b. It is shorter and anterior curvature is more or less straight up to 3rd sacral segment and curves abruptly forwards.
 - c. Body of the sacral vertebra is small and sacral promontory is not well marked.
 - d. Sacro-iliac articular surface extends up to 2 to $2\frac{1}{2}$ sacral segments.

Q. 6. What are the ossification centers of sacrum ?

- Ans.**
- a. Appearance:
 - i. Upper segment: Third month of IUL
 - ii. Middle segment: Fourth month of IUL
 - iii. Lower segment: Eighth month of IUL
 - b. Fusion: Fusion of intervertebral disc starts from below upwards and fusion is completed by 20 to 25 years.