Osteology – Sex Estimation

Osteology – Sexual Dimorphism

- Hormonally controlled
- Evident in adults, not children (sex hormones increase around time of puberty, leading to secondary sexual characteristics)
- Varies within a population, and between populations

Osteology – Sexual Dimorphism

- Reference collections:

1. Terry collection – Smithsonian
2. Hammon-Todd – Cleveland
3. Forensic Data Bank (Fordisc)

Osteology – Sexual Dimorphism – Basic Principles

- Size: males usually larger
- Childbirth: unique female pelvic characteristics
- Robusticity and muscularity – usually more evident in males

Sex Estimation - Prepubertal

- Skeletal sex of prepubertal individuals can not generally be determined: no constant secondary characteristics
- X-rays taken during life may be used in some techniques to determine subadult sex
- Mittler and Sheridan, 1992: pre-adult Nubians (birth to 18) – some females could be identified (auricular surface morphology)

Sex Estimation – Adult - General

- Usually related to size in adult long bones
- Male bones: usually larger, longer in a single population – be cautious if different populations are involved
- Maximum diameter of head of humerus and head of femur may be used (Bass)

Sex Estimation – Adult – Non-metric

- Pelvis morphology: Stewart (1979), Krogman (1986), Ubelaker (1989), Bass (1995)
- Pubic bone morphology: Phenice (1969)
- Cranial morphology: Stewart (1979), Krogman (1986), Ubelaker (1989), Bass (1995)

Sex Estimation – Adult - Metric

- Univariate and multivariate analyses
- Giles (1970), Stewart (1979), Moore-Jansen (1986, 1994), Krogman (1986), Ubelaker (1989), Bass (1995)
- Fordisc 2.0: Dr. Richard Jantz, Department of Anthropology, University of Tennessee, Knoxville, Tennessee

Sex Estimation - Cranial

Sex Estimation – Skull - General

- Good area for sex determination
- Generalization: male skull more robust, muscle-marked than female: ABSOLUTE DIFFERENCES SELDOM EXIST

  (Bass)
- Sex estimation: face, mandible, vault

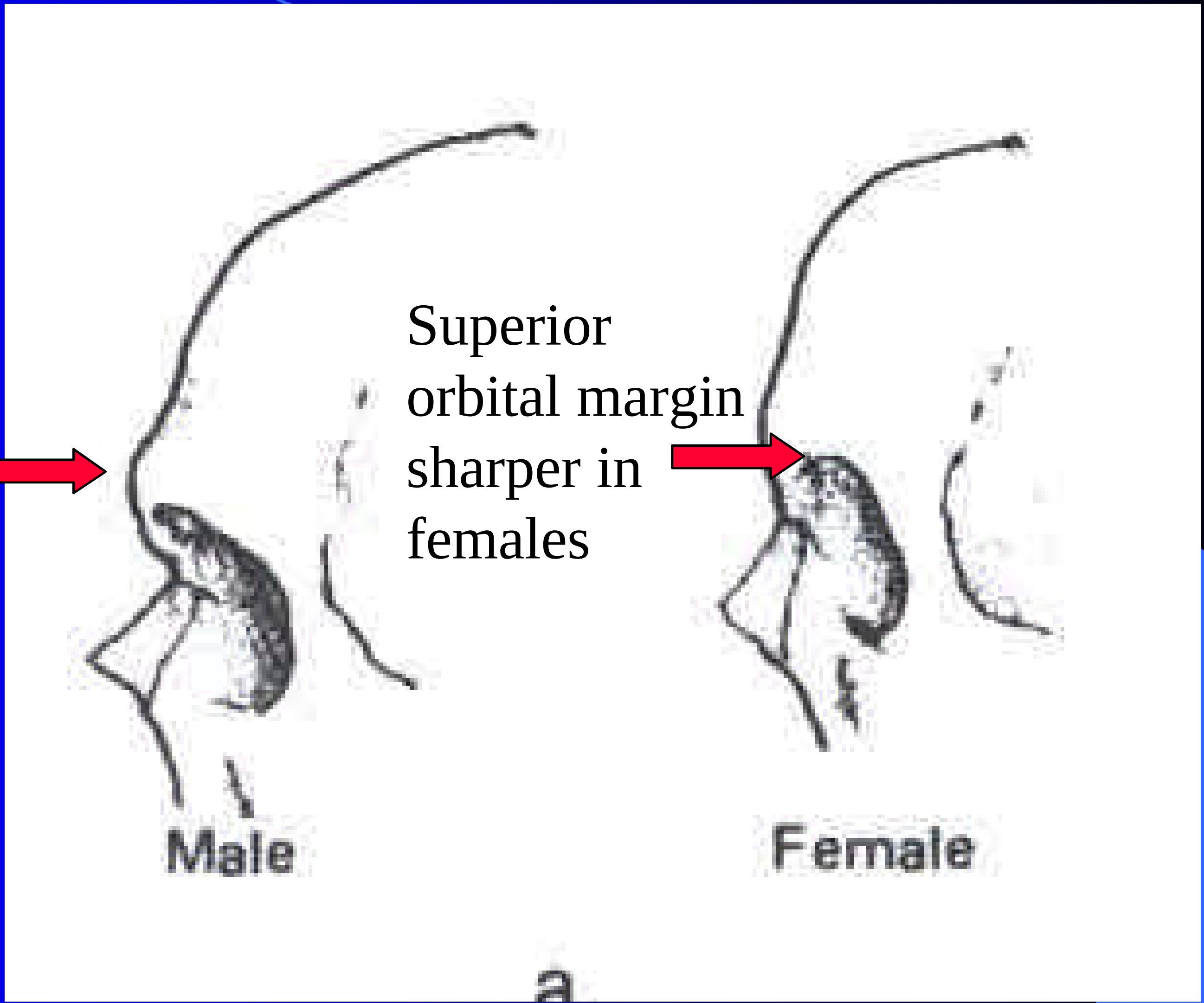
Sex Estimation – Skull - Face

1. Supraorbital ridges: more prominent in males
2. Superior orbital margin: sharper in females
3. Palate: larger in males
4. Teeth: larger in males

(Bass)

Sex Estimation – Skull - Face

Supraorbital ridge more marked in males



Superior orbital margin sharper in females

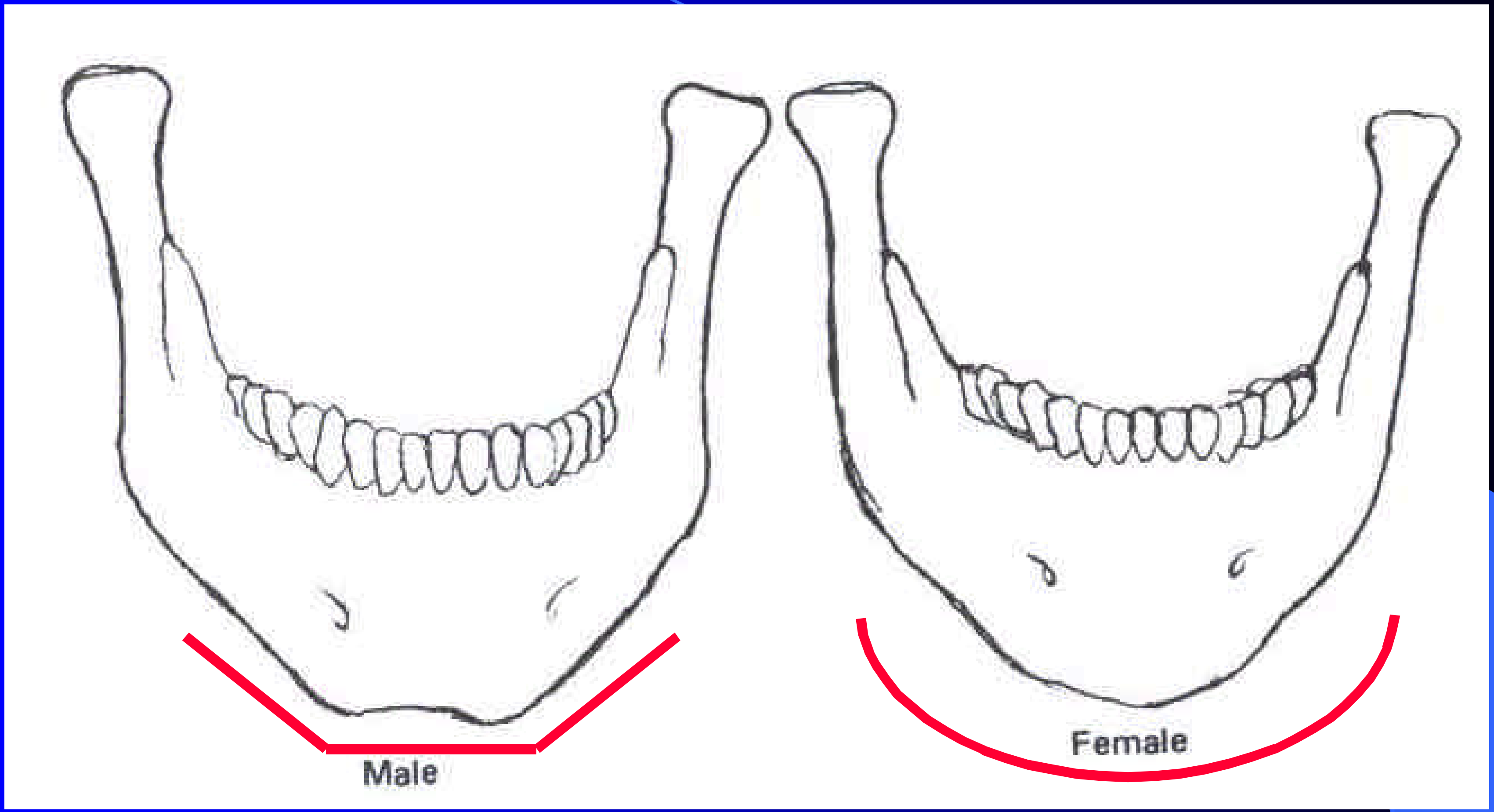
Modified from Bass

From Bass

Sex Estimation – Skull - Mandible

5. Chin more square in males; rounded with midline point in females
6. Teeth: larger in males, particularly canines
7. Gonial angle: > 125 degrees in females, <124 degrees in males
8. Gonial eversion: slight in females, marked in males
9. Ascending ramus: <28mm in females, >33 mm in males

Sex Estimation – Skull - Mandible



Chin more square in males, rounded in females; teeth larger in males

Modified from Bass

Sex Estimation – Skull - Vault

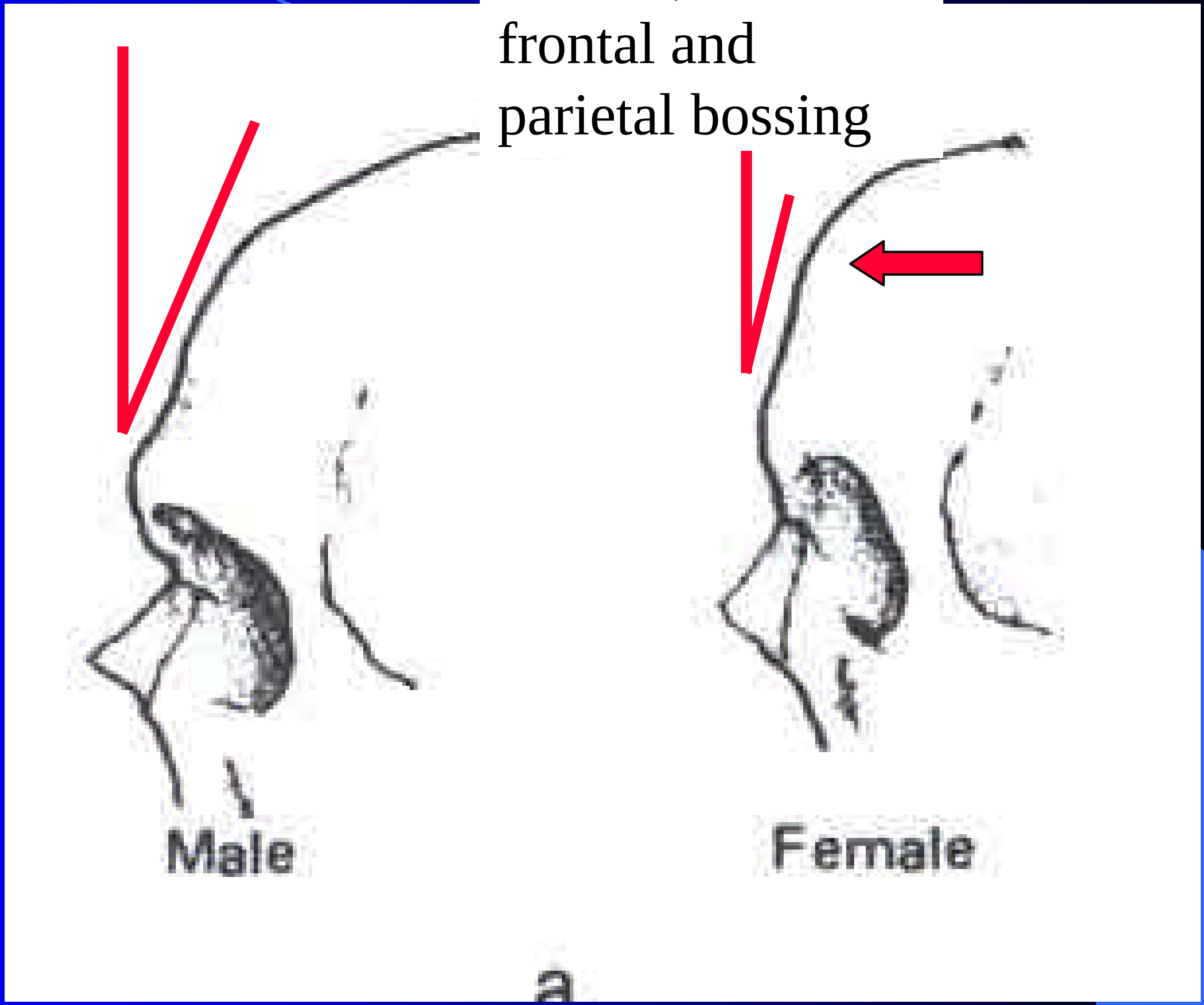
10. Female skull smaller, smooth, more gracile; retains frontal and parietal bossing into adulthood; male skull larger
11. Muscle ridges: larger in males; e.g. temporal lines; especially occipital – nuchal crests
12. Posterior end of zygomatic arch extends as supramastoid crest farther in males

(Bass) (cont.)

Sex Estimation – Skull - Vault

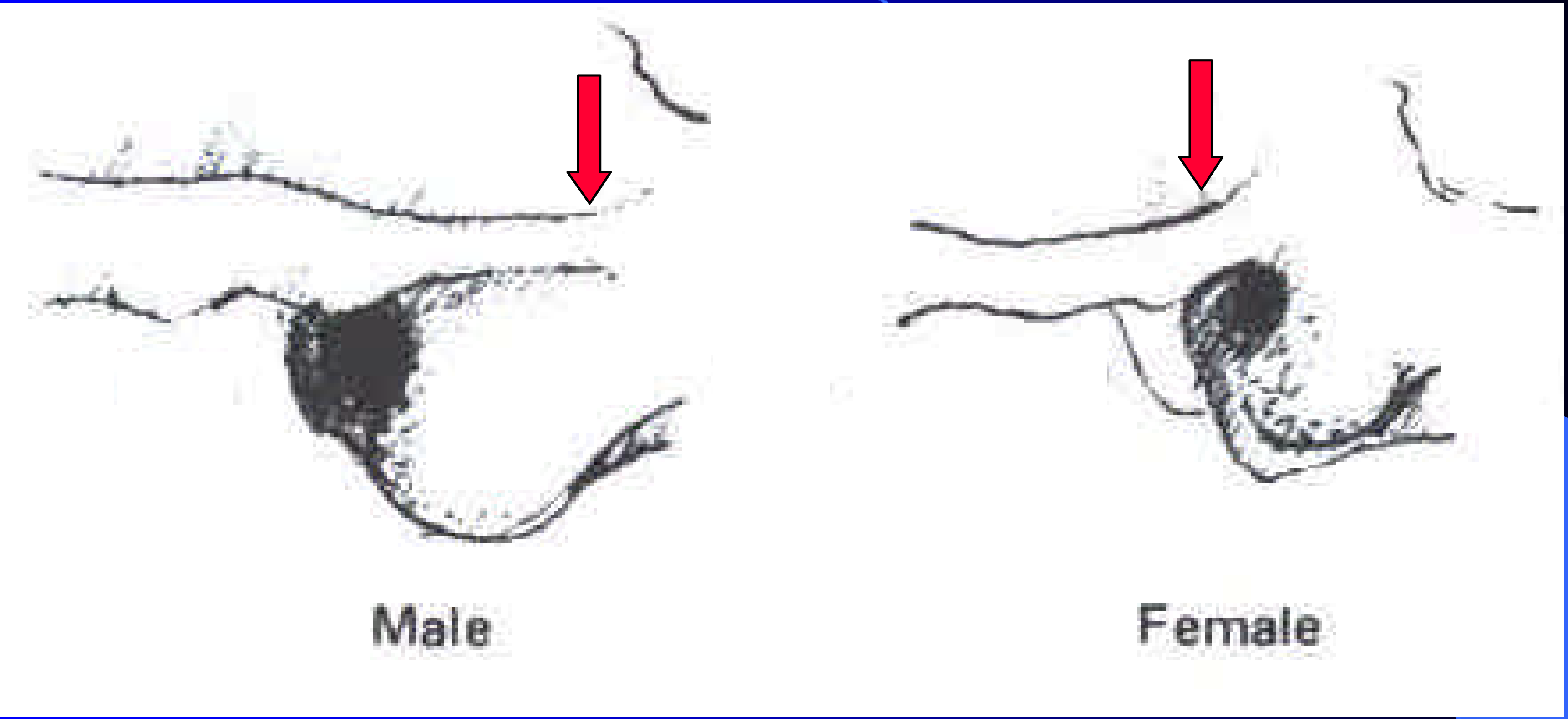
Male skull is larger, has a more sloping forehead

Female skull is smaller; retains frontal and parietal bossing



From Bass

Sex Estimation – Skull - Vault



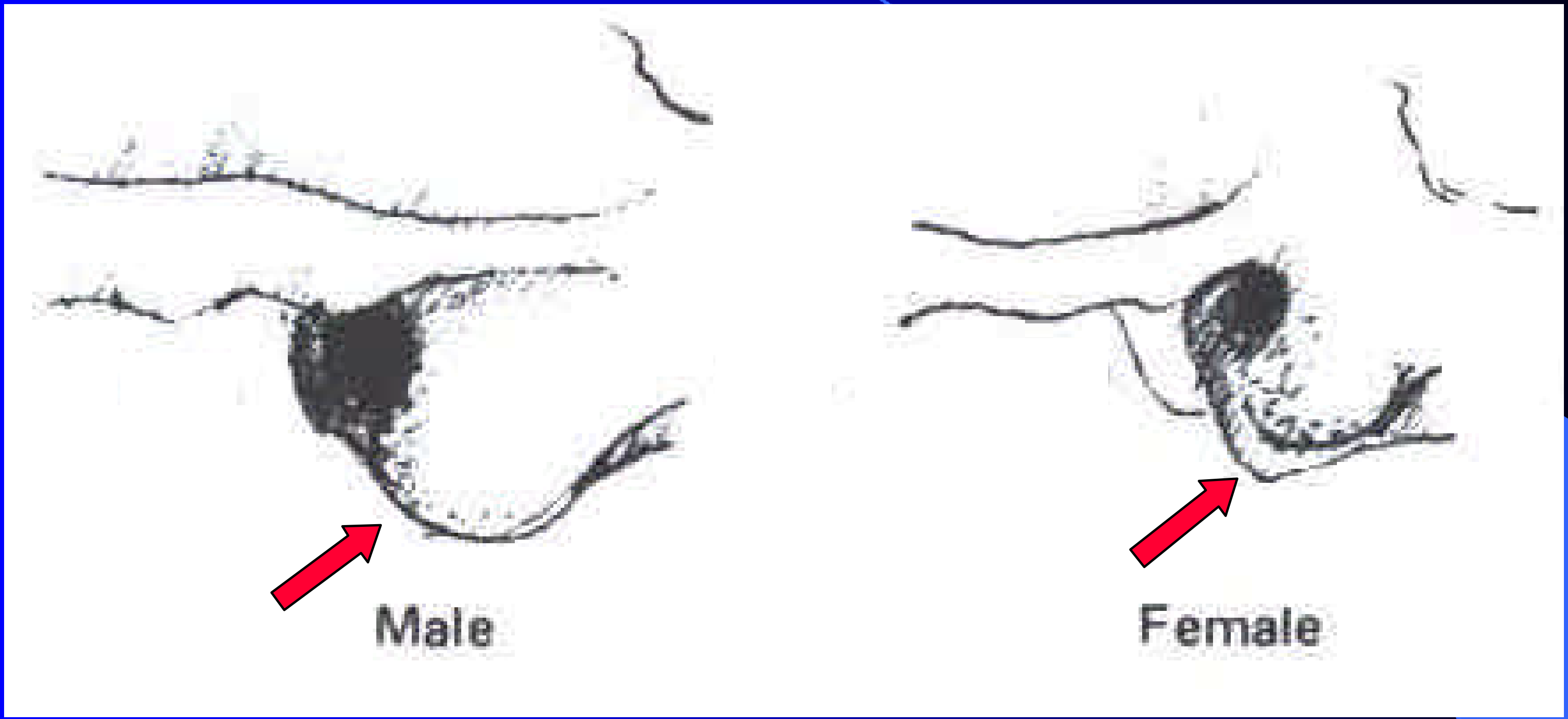
Posterior end of zygomatic arch extends as supramastoid crest farther in males

Modified from Bass

Sex Estimation – Skull - Vault

13. Mastoid process: larger, more blunt in males, and smaller, more pointed in females
14. Frontal sinuses: larger in males
15. Inion (external occipital protuberance, EOP): may be more prominent in males
16. Zygomatic arch: wider in males, narrower in females

Sex Estimation –
Skull - Vault

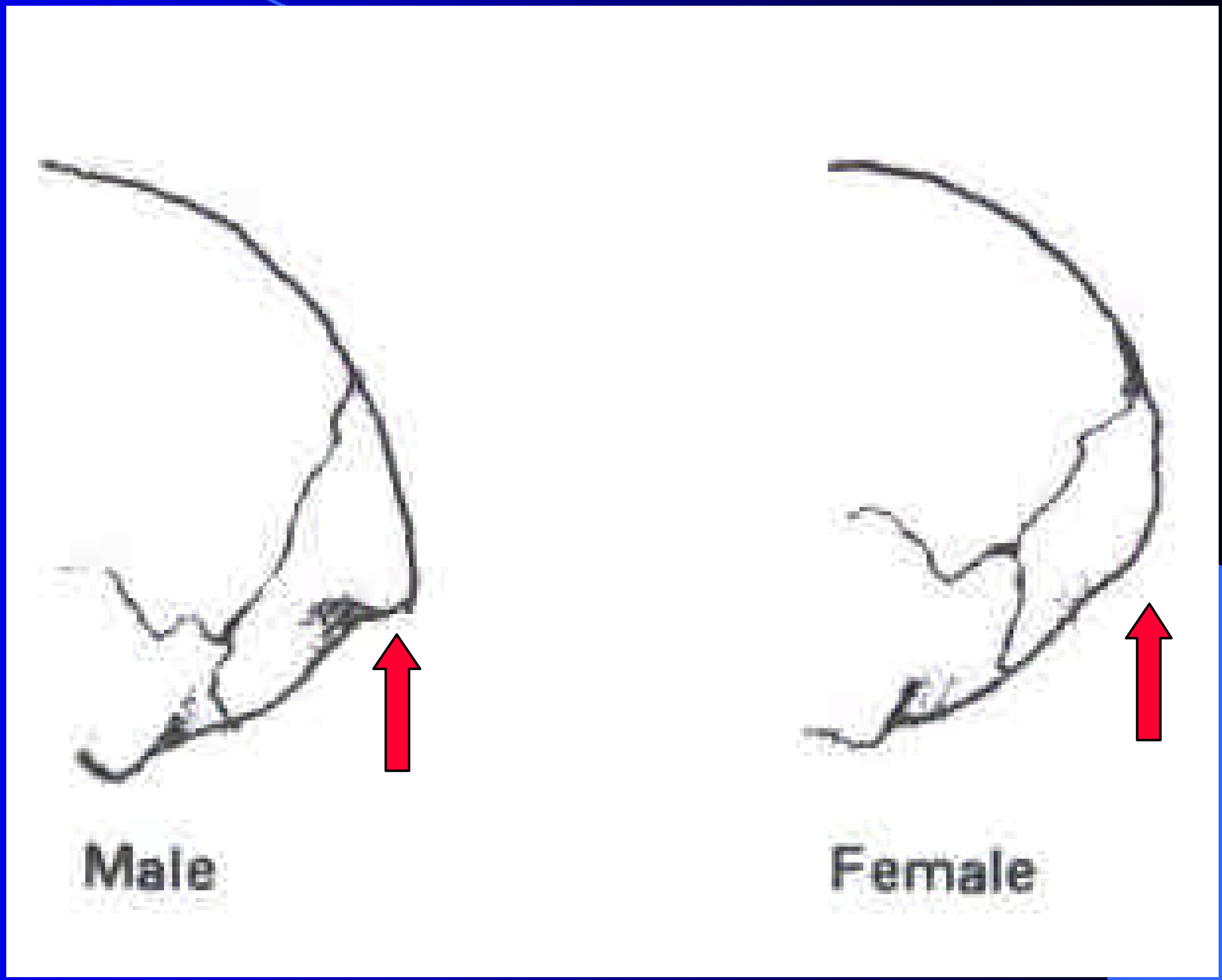


Mastoid process is larger and more blunt in males, smaller in females

Modified from Bass

Sex Estimation – Skull - Vault

Inion may be more prominent in males, sometimes to point of appearing hook-shaped



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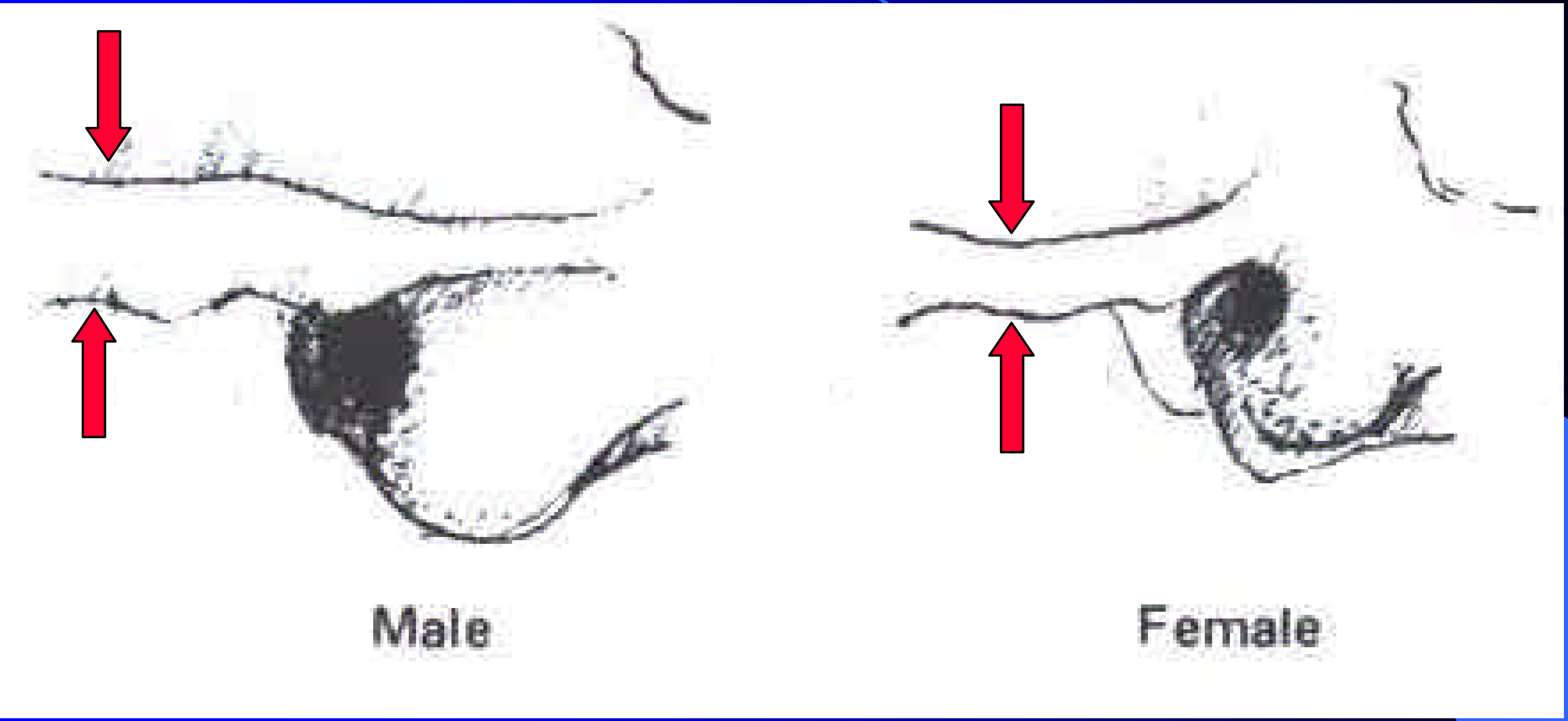
Sex Estimation – Skull - Vault



Zygomatic arch wider in males, narrower in females

Modified from Bass

Sex Estimation – Skull - Base

- Holland (1986) has attempted to establish sex of fragmented crania by certain measurements of skull base

Sex Estimation – Postcranial - Pelvis

Sex Estimation - Pelvis

- Very good area for skeletal sex estimation
- High accuracy
- See Bass, table 3-23, for markers that can be used for sexing pelvis
- See Bass, table 3-25, for accuracy levels for each individual pelvic trait

Sex Estimation - Pelvis

- Phenice characteristics:

1. Ventral arc
2. Subpubic concavity
3. Medial aspect of ischiopubic ramus

These 3 characteristics can distinguish male from female 95% of the time (Phenice, 1969)

Osteology – Sex Estimation

Phenice characteristics:

1. Ventral
2. Subpubic concavity
3. Medial aspect of ischiopubic ramus

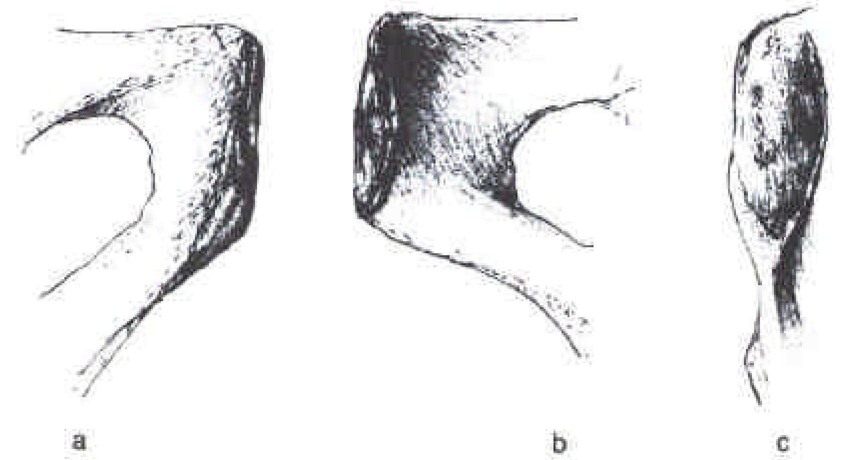
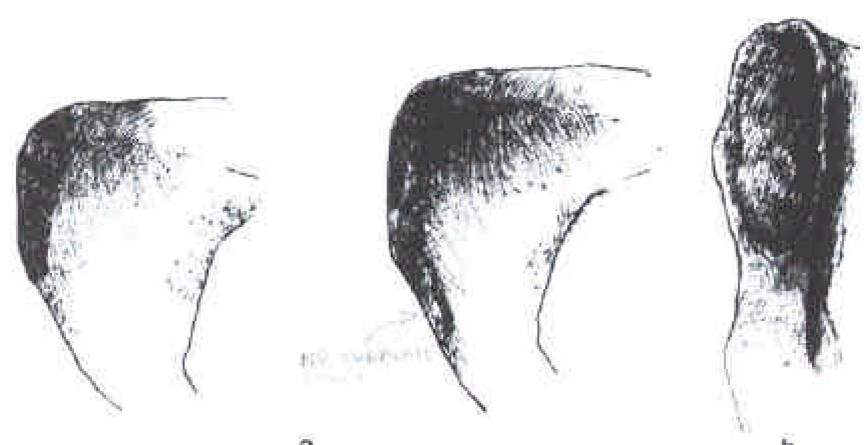


Figure 3–82. Female pelvis: a, ventral arc; b, subpubic concavity (dorsal surface); narrow medial aspect of the ischiopubic ramus.

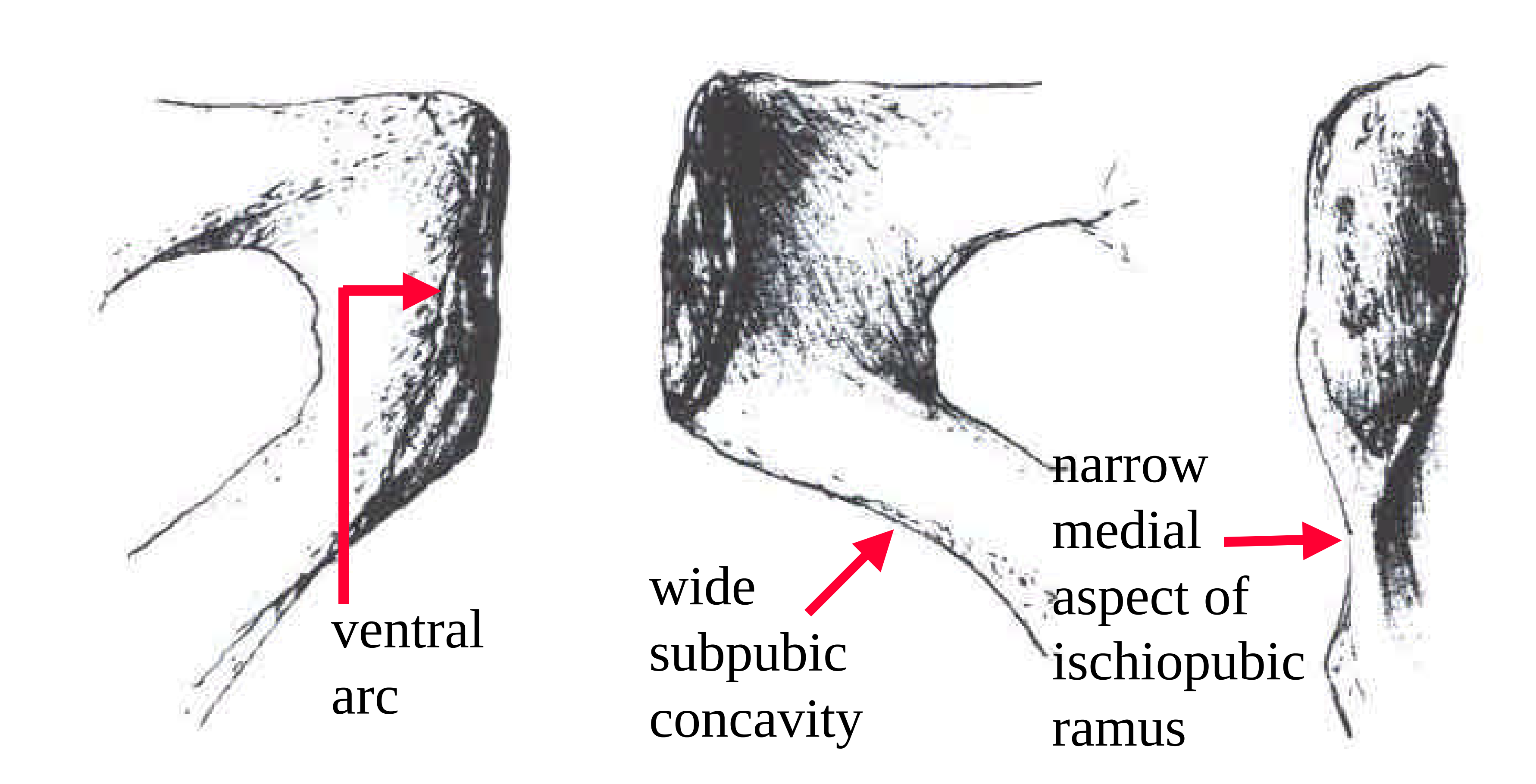


From Bass

Sex Estimation – Pelvis – Ventral Arc

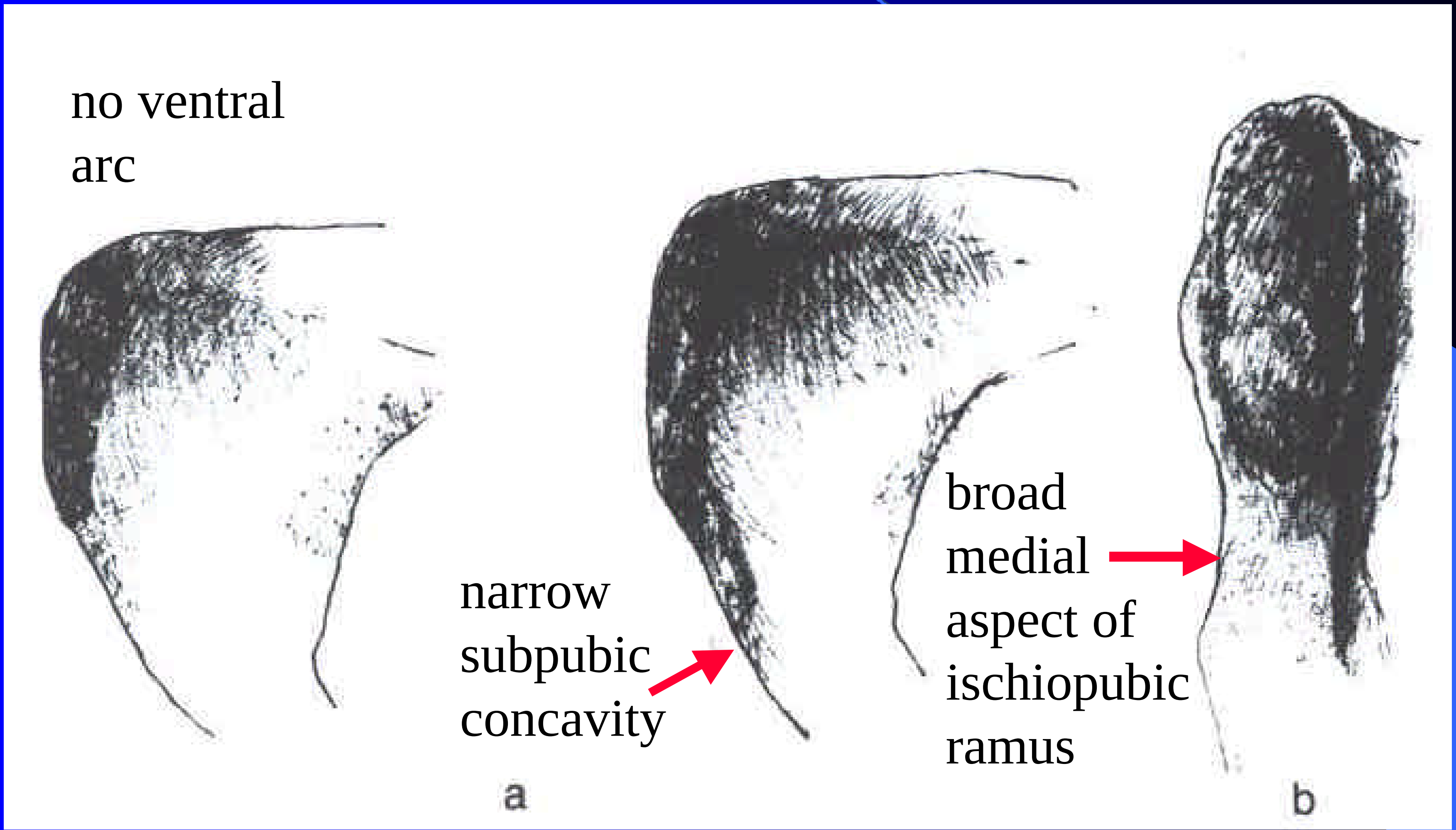
- Ventral arc: slightly elevated ridge of bone on anterior (ventral) surface of female pubis, extending inferolaterally
- Presence or absence of ventral arc is most determinative of the 3 Phenice characteristics

Osteology – Sex Estimation – Female Pelvis



Modified from Bass

Osteology – Sex Estimation – Male Pelvis



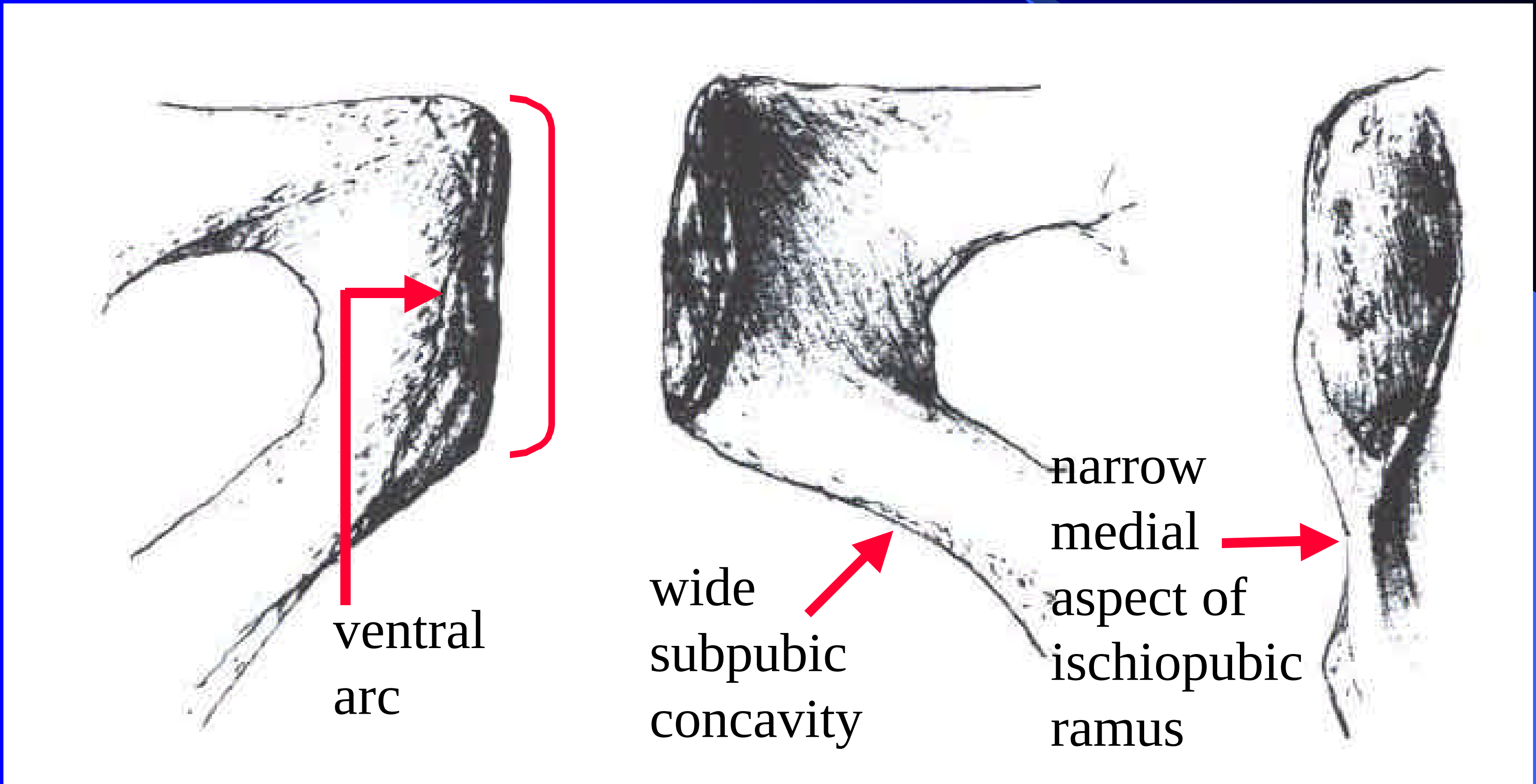
Modified from Bass

Sex Estimation – Pelvis – Subpubic Concavity

- Subpubic concavity: as a result of females having a longer pubic part of the innominate bone, the subpubic angle and hence the subpubic concavity has to be larger in females

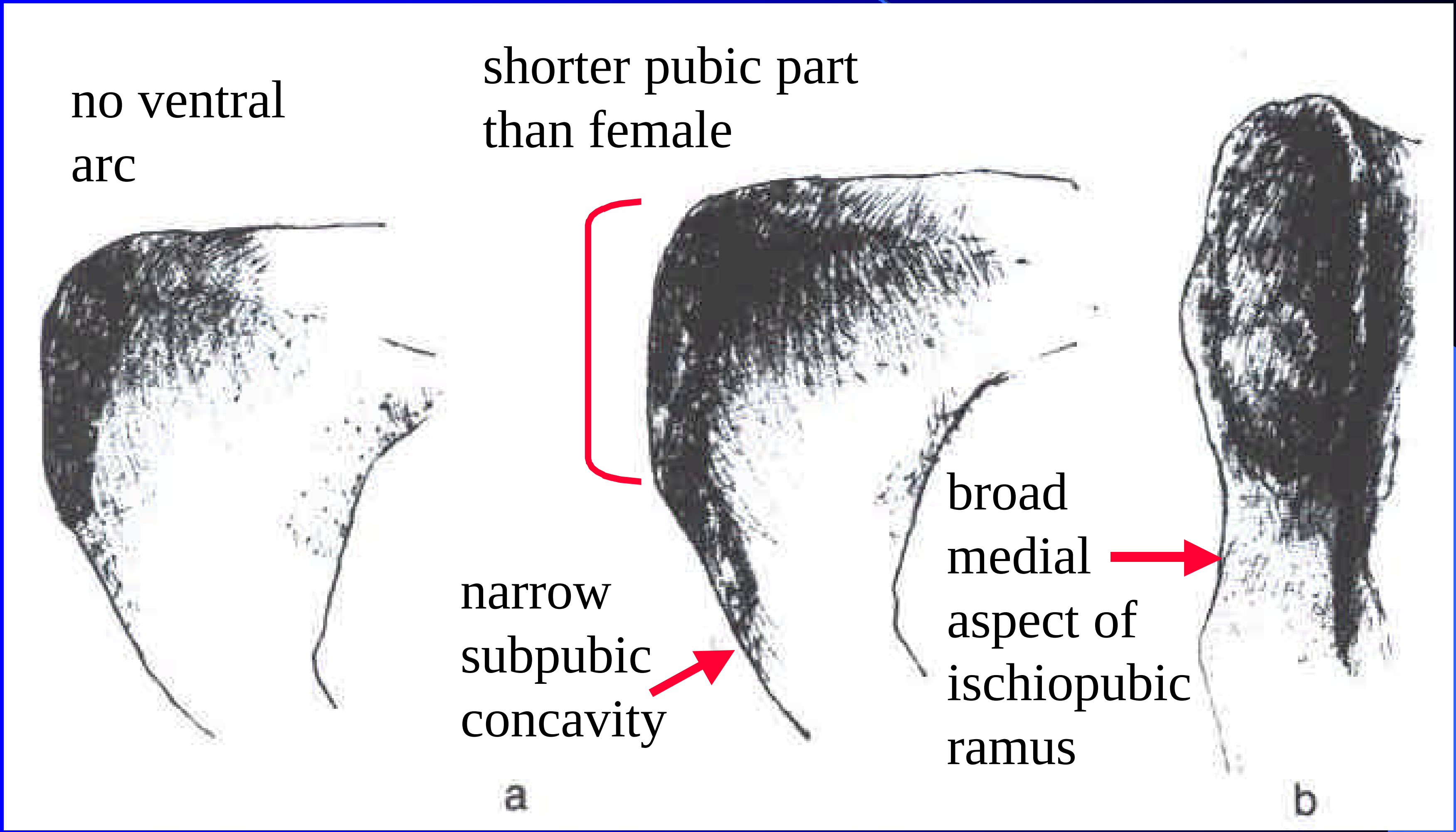
Osteology – Sex Estimation – Female Pelvis

Longer pubic part of innominate causes subpubic angle and hence subpubic concavity to be larger



Modified from Bass

Osteology – Sex Estimation – Male Pelvis



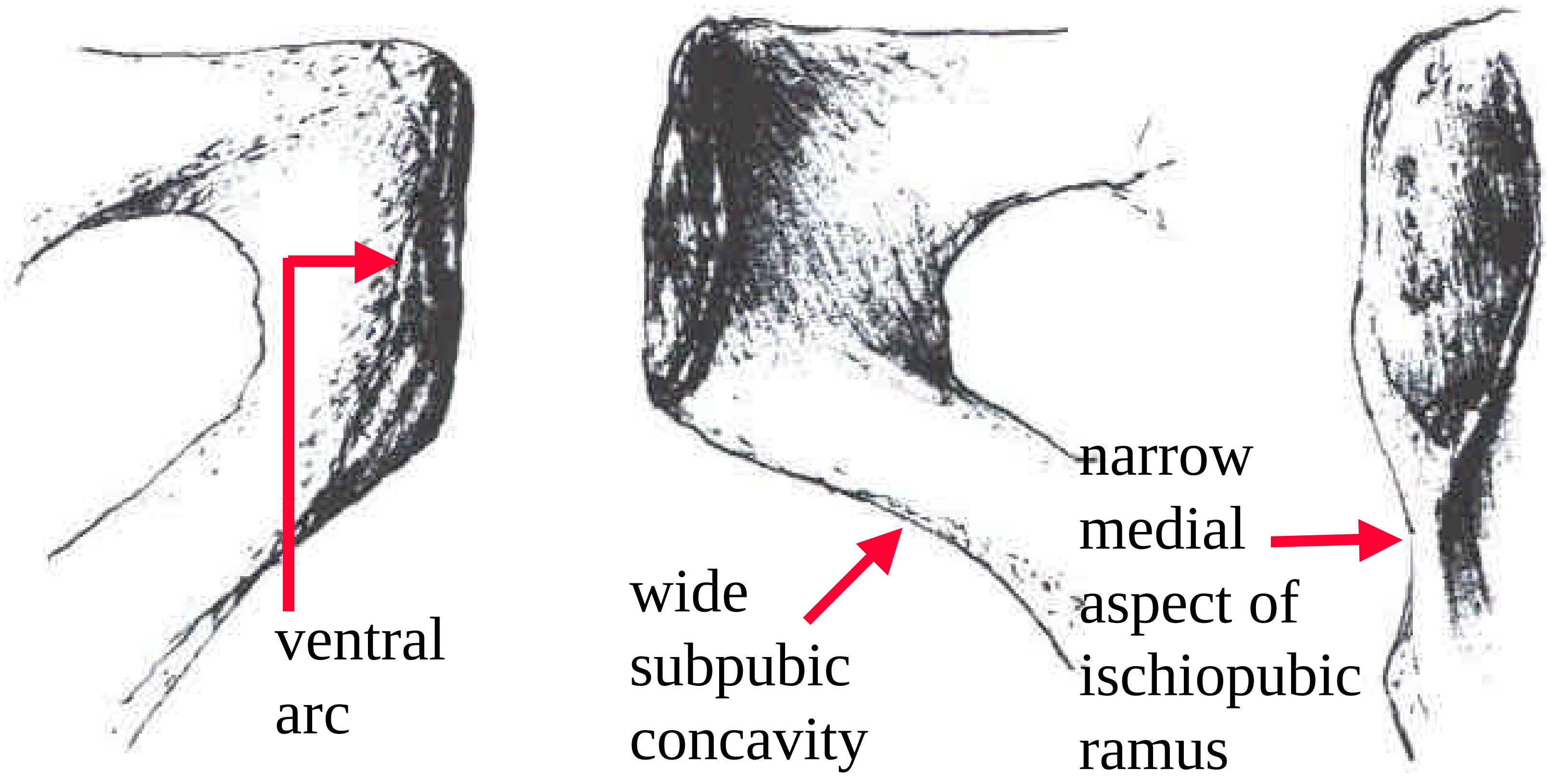
Modified from Bass

Sex Estimation – Pelvis – Medial Ischiopubic Ramus

- Medial aspect of ischiopubic ramus in females is a ridge, sometimes a narrow surface, inferior to symphyseal face

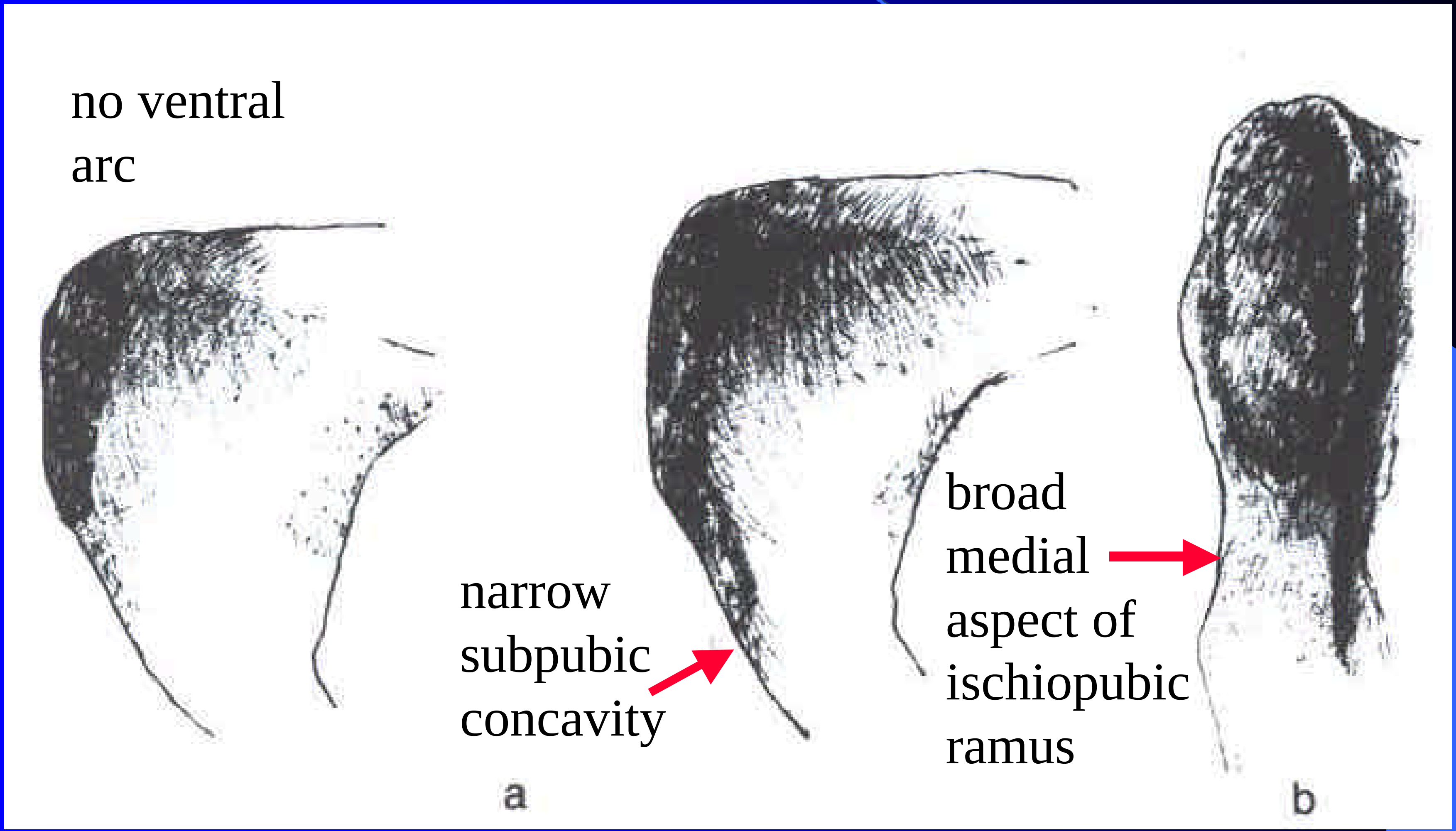
Osteology – Sex Estimation – Female Pelvis

From Bass



Osteology – Sex Estimation – Male Pelvis

From Bass



Sex Estimation - Postcranial

Sex Estimation - Sacrum

- Sacrum: straighter in females, more curved in males (may relate to parturition)
- Sacral body to ala ratio: 1:1:1 in females, centrum >1/3 in males

Sex Estimation – Sternum

- Variable usefulness in sex estimation
- In males, body of sternum is > 2X length of manubrium; in females, < 2X
- < 125 mm = female
- > 155 mm = male (these figures are from Rathbun; also compare Bass, pp. 117-118)

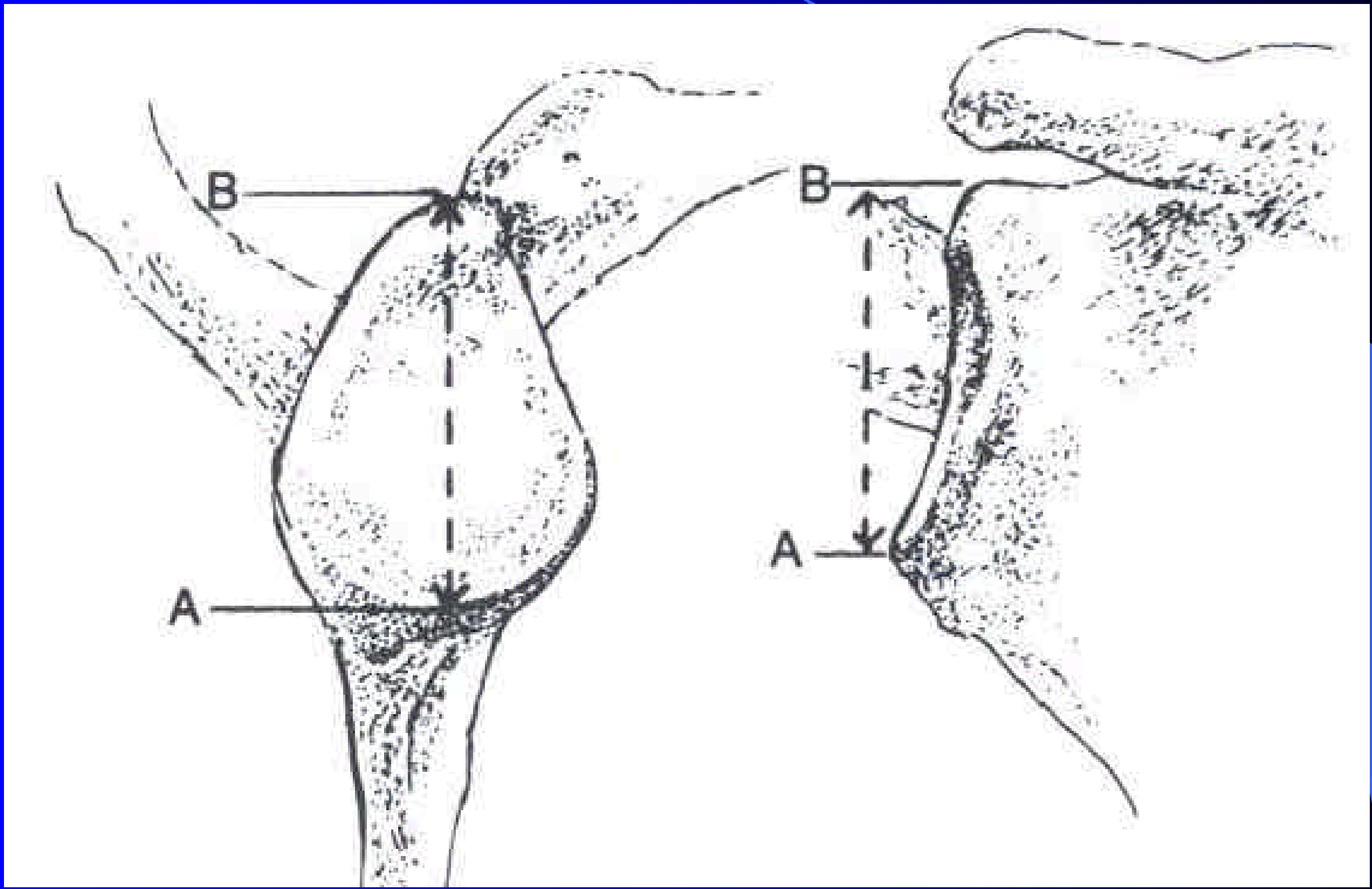
Sex Estimation - Scapula

- Scapular body (maximum length between superior and inferior angles): < 140 mm = female, > 170 mm = male
- Glenoid fossa: < 35 mm = female,

  > 36 mm = male

Sex Estimation - Scapula

Landmarks for measuring scapular glenoid cavity length for sex estimation



From Bass

Sex Estimation – Humerus

- Humeral head: < 43 = female,
  > 47 mm = male (Rathbun; also see Bass page 26 – slightly different measurements)

Sex Estimation - Radius

- Radius head diameter: < 21 = female,
  > 24 = male

Sex Estimation - Femur

- Femoral head diameter: < 43 mm = female, > 47 mm = male (Rathbun; slightly different figures in Bass, p. 26, p. 231)
- Femoral midshaft circumference: < 81 mm = female, > 81 mm = male

Sex Estimation - Metacarpals

- Several different measurements (Bass, pp. 188-189) used
- Lazenby, 1994 (UNBC) – 19th century church cemetery at St. Thomas Anglican Church in Belleville, Ontario: > 90% success rate for males using 2nd metacarpal

Sex Estimation - References

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