**Answers: Chapter 23**

**Matching**

1. g 3. h 5. e 7. f
2. d 4. a 6. c 8. b

**Image Labeling**

1. inverted calcaneus
2. bones of forefoot in extreme varus position
3. plantarflexed ankle joint
4. deformed talus
5. ligaments, tendons

**Multiple Choice**

1. d 6. a 11. b 16. b
2. c 7. b 12. c 17. c
3. a 8. d 13. b 18. d
4. b 9. c 14. c 19. d
5. a 10. d 15. a 20. a

**Fill-in-the-Blank**

1a. lower
1b. upper
2a. 10
2b. 12
3. tibial
4. skeletal dysplasia
5. craniosynostosis
6. dysostosis
7. camptomelic dysplasia
8. collagen
9. absence
10. club hand
11a. vertebral
11b. anorectal
11c. cardiac
11d. tracheoesophageal
11e. renal
11f. limb
12. oligohydramnios
13a. synechiae
13b. endometrium
14. vascular
15. fatal
16. bowing
17. asphyxiating thoracic
18. two
19. humeral
20. II

**Short Answer**

1. The fetal femur grows approximately 3 mm per week from 14 to 27 weeks and slows to approximately 1 mm per week in the third trimester. The accuracy of this measurement decreases with gestational age from ±1 week in the second trimester to ±3.5 weeks at term. Fetal femur length varies according to maternal height and weight.

2. The femur, tibia, fibula, humerus, radius, ulna, and foot can be accurately measured.

3. Pregnancy dating, bone length, documentation of existence or absence, condition (mineralization, straight versus angled), position, comparison with each other, and distal extremity (radius to ulna and hand;ibia to fibula and foot) can be gathered.

4. Cranial shape should be evaluated. Craniosynostosis, a disorder where premature fusion of one or more of the cranial sutures fuses due to early cranial pelvic descent or from genetic and chromosomal syndromes, causes irregularly shaped skulls. Deformities include a cloverleaf cranial shape, hypoplasia of the midface, micrognathia, abnormally shaped ears, and frontal bossing. Note that these defects are frequently related to anomalies of the long bones, hands and digits; facial, thoracic, and cardiac defects; and abnormal amniotic fluid volumes.

5. Classification and identification of skeletal dysplasia can be challenging. Some anomalies are undetectable at certain fetal ages, or are not severe enough to visualize or be occluded by position and lack of amniotic fluid. Many of the skeletal dysplasias are lethal. Diligence, skill, and a thorough family history will help with identification of abnormalities. Classification of findings may be difficult. For instance, the differential diagnoses for achondroplasia are thanatophoric dysplasia, achondrogenesis, and osteogenesis imperfecta. It is not always possible to provide a definitive diagnosis based on sonographic evaluation. A thorough examination and family history will offer the finest information for the reading radiologist and/or obstetrician to determine both a diagnosis and a prognosis.

**Image Evaluation/Pathology**

1. This long bone may be difficult to identify based on a single image, as the femur and humerus can appear similar. A femur is displayed. To increase the visualization of the bony structures, a decrease in dynamic range helps highlight the shades of white of the early ossified femur. Mid shaft bowing is evident relating to a fracture.
2. The 3-D multiplanar image demonstrates a fetal profile. This fetus displays characteristic frontal bossing related to craniosynostosis.

3. The longitudinal image of the fetal thigh shows a bowed femur in image A. Image B is a post delivery radiograph of the fetus. Bilateral short bowed femurs are noted, with bowed tibias and fibulas. This defect was diagnosed as OI Type III. (OI Type I and III present with femoral bowing.)

4. Both images display a markedly clear example of hypomineralization. The transverse spine is poorly depicted as are the metacarpals and phalanges of the hand image. Hypophosphatasia is the diagnosis. There are two types of congenital hypophosphatasia; type I can be detected prenatally whereas type II is not detected until later in life. A fetus with type I will appear with an overall reduction in ossification and short, bent bones. The skull may be easily compressed and spurs may be visualized along the midshaft of long bones and at the knees and elbows. Prognosis for congenital hypophosphatasia is lethal for type I.

5. This is a newborn with postaxial fifth finger duplication of the right hand (polydactyly). The common method of correction is surgery in early stages of life.

CASE STUDY

1. The single parasagittal image suggests short rib-polydactyly syndrome. The profile shows short ribs and a hypoplastic thorax. The condition is rare and without gender preference. Micromelic dwarfism, short ribs positioned horizontally, polydactyly, and a narrow thorax are known characteristics. Other anatomical defects that are frequently noted are syndactyly; cardiac, gastrointestinal, genital, and urogenital malformations; cleft lip and/or cleft palate; hydrops; and polyhydramnios. The prognosis for all three types is lethal as affected fetuses die within a few hours after birth due to pulmonary hypoplasia.

2. The bilateral infant radiographs display increased space between the third and fourth digits known as “trident” configuration. The prognosis is good for achondroplasia infants. Usually, normal intelligence and life expectancy is seen. Orthopedic medical issues are usually the greatest concern.