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Imagine this scenario: An unconscious patient has been brought to the emergency room. Although the patient cannot tell the ER physician what is wrong or “where it hurts,” the doctor can assess some of the injuries by observing surface anatomy, including:

- Locating pulse points to determine the patient’s heart rate and pulse strength
- Palpating the bones under the skin to determine if a fracture has occurred
- Passively moving the limbs to observe potential damage to muscles and tendons
- Examining skeletal and muscular landmarks to discover whether joints are dislocated

Examination of surface anatomy must often substitute for interviewing the patient, and when the health-care professional is a keen observer, it may be very accurate in assessing illness or injury.

**13.1 A Regional Approach to Surface Anatomy**

**Learning Objectives:**

1. Explain the importance of surface anatomy in learning about internal structures.
2. Discuss how surface anatomy studies help us diagnose and treat disease.

*Surface anatomy* is a branch of gross anatomy that examines shapes and markings on the surface of the body as they relate to deeper structures. An understanding of surface anatomy is essential for locating and identifying anatomic structures prior to studying internal gross anatomy. Health-care personnel use surface anatomy to help diagnose medical conditions and to treat patients, as when taking a pulse, inserting a needle or tube, or performing physical therapy. You have already begun your study of surface anatomy; each time we have asked you to palpate a part of your body and feel for a structure, you have examined your own surface anatomy.

Health-care professionals rely on four techniques when examining surface anatomy. Using **visual inspection**, they directly observe the structure and markings of surface features. Through **palpation** (pal-pā’šūn) (feeling with firm pressure or perceiving by the sense of touch), they precisely locate and identify anatomic features under the skin. Using **percussion** (per-kūshūn), they tap firmly on specific body sites to detect resonating vibrations. And via **auscultation** (aws-kūl-tā’shūn), they listen to sounds emitted from organs.

In our discussion of surface anatomy in this chapter, the illustrations include some structures that we have discussed previously and other features yet to be discussed. We strongly suggest that you return to this chapter often as you explore and examine other body systems in subsequent chapters. In addition, before you begin, refer back to chapter 1 and review the discussion of body region names and abdominopelvic regions and quadrants.

**Figure 13.1**

*Head and Neck.* The major regions of the head and neck are shown in (a) lateral view, while specific features are shown in (b) anterior view.
13.2a Cranium

The **cranium** (also called the **cranial region** or **braincase**) is covered by the scalp, which is composed of skin and subcutaneous tissue. The cranium can be subdivided into three regions, each having prominent surface anatomy features.

The **frontal region** of the cranium is the forehead. Covering this region is the **frontal belly** of the **occipitofrontalis** muscle. The frontal region terminates at the **superciliary arches**. You can feel these bony elevations immediately inferior to your eyebrows.

Laterally, the scalp covers the sides of the skull in each **temporal region** and terminates just superior to the ear. The **temporalis** muscle is attached at the temporal region, and is easily palpable when the jaw is repeatedly clenched. Running over the temporalis muscle is the **superficial temporal artery**. You can feel the pulse of this artery just posterior to the orbits and anterior to the auricle of your ear.

The posterior part of the cranium is the **occipital** (ok-sip’-i-tal) region. In the center of that region is the **external occipital protuberance**, a rounded or pointed projection (see figures 7.5, 7.8). In chapter 7, you learned that males tend to have a more prominent, pointed external occipital protuberance than females. Palpate your own external occipital protuberance. Is it small and rounded, or somewhat larger and pointed? [APR]

**WHAT DO YOU THINK?**

1. Can you name some other facial muscles not already mentioned in this chapter that can be palpated easily under the skin?

13.2b Face

The **face** is divided into five regions: auricular, orbital, nasal, oral, and mental.

The **auricular** (aw-rik’-u-lar; auris = ear) region is composed of the visible surface structures of the ear as well as the ear’s internal organs, which function in hearing and maintaining equilibrium. The **auricle** (aw’-ri-kle), or **pinna**, is the fleshy part of the external ear. Within the auricle is a tubular opening called the **external acoustic meatus**. The **mastoid process** is posterior and inferior to the auricle. Palpate your mastoid process; it should feel like a bony bump immediately posteroinferior to the ear.

The **orbital** (or **ocular**) region includes the eyes and associated structures. Most orbital region surface features protect the eye. **Eyebrows** protect against sunlight and potential mechanical damage to the eyes; **eyelids** (palpebrae; pal’pē-brē) close reflexively to protect against objects moving near the eye; and eyelashes prevent airborne particles from contacting the eyeball. The **superior palpebral fissure**, or upper eyelid crease, is palpated easily on most individuals, although Asians do not have a superior palpebral fissure.

The **nasal region** contains the nose. The firm, narrow part of the nose that projects anteriorly between the eyes is the **bridge**; it is formed by the union of the nasal bones. Anteroinferior to the bridge is the fleshy part of the nose, called the **dorsum nasi** (nāzē; nāsās = nose). Farther anteroinferiorly is the tip of the nose, called the **apex**. The **nostrils**, or **external nares** (nā-rēz; sing., **naris**, nā’-ris), are the paired openings into the nose. The **ala nasi** (wing of the nose) forms the flared posteroalteral margin of each nostril. [APR]

The **oral region** is inferior to the nasal region; it includes the **buccal** (cheek) region, the fleshy upper and lower **lips** (labia), and the structures of the **oral cavity** (mouth) that can be observed when the mouth is open. Look in the mirror and observe the vertical depression between your nose and upper lip; this is called the **philtrum** (phil’trum; phil’tron = a love charm).

The **buccal** (bu’kal) region refers to the cheek. Within this region is the **buccinator muscle**. Palpate the superolateral region of your cheek and locate your **zygomatic bone** and the **zygomatic arch**. The **oral cavity** (also called the **oral cleft** or **oral fissure**) includes the **mouth** that can be observed. Identify at least two surface features of the orbital region that protect the eye.

1. Identify at least two surface features of the orbital region that protect the eye.
2. Identify the narrow, bony, superior part of the nasal region between the eyes.

13.3 Neck Region

**Learning Objectives:**

1. Outline the palpable structures in the regions of the neck.
2. Name the triangles of the neck, and identify the structures they contain.

The **neck**, also called the **cervical region** or **cervix** (ser’-viks), is a complex region that connects the head to the trunk. The spinal cord, nerves, trachea, esophagus, and major vessels traverse this highly flexible area. In addition, the neck contains the larynx (voice box) and several important glands. For purposes of discussion, the neck can be subdivided into anterior, posterior, and lateral regions.
The anterior region of the neck has several palpable landmarks, including the larynx, trachea, and sternal notch. The larynx (lar’ingks; voice box), found in the middle of the anterior neck, is composed of multiple cartilages. Its largest cartilage is the thyroid cartilage, which you can palpate as the big bulge on the anterior side of your neck. In males, the larynx has a noticeably pointed laryngeal prominence (commonly known as the “Adam’s apple”) that may be visualized more easily than in females. Inferior to the larynx are the cricoid cartilage and trachea (air tube). The neck terminates at the suprasternal notch of the manubrium and the left and right clavicles. Palpate your anterior neck region: Moving inferiorly along the neck, you first feel the prominent thyroid cartilage, then the trachea with its hard, cartilaginous rings, and eventually the suprasternal notch and the clavicles.

The posterior neck region is also referred to as the nuchal region (see figure 13.1b). This region houses the spinal cord, cervical vertebrae, and associated structures. You can easily palpate the spinal process of the vertebra prominens (C7), especially during neck flexion. Palpate your nuchal region; the bump you feel at the inferior boundary of this region is the vertebra prominens. As you move your fingers superiorly along the midline of the neck, you can palpate the ligamentum nuchae, a thick ligament that extends from C7 to the nuchal lines of the skull.

The left and right lateral portions of the neck contain the sternocleidomastoid muscles, which become prominent when a person turns his or her head to one side. Each sternocleidomastoid muscle partitions each side of the neck into two clinically important triangles, an anterior triangle and a posterior triangle (figure 13.2). Each of these triangles houses important structures that extend through the neck, and these triangles are further subdivided into smaller triangles.

The anterior triangle lies anterior to the sternocleidomastoid muscle and inferior to the mandible. It is subdivided into four smaller triangles: the submental, submandibular, carotid, and muscular triangles.

The submental triangle, the most superiorly placed of the four triangles, is posteroinferior to the chin in the midline of the neck and partially bounded by the anterior belly of the digastric muscle. It contains some cervical lymph nodes and tiny veins. When you are ill, these lymph nodes (as well as some glands) may enlarge and become tender. A physician palpates these to determine if you have an infection that has been detected by immune cells within these nodes.

The submandibular triangle is inferior to the mandible and posterolateral to the submental triangle. It is bounded by the mandible and the bellies of the digastric muscle. If you palpate this triangle, you can feel the submandibular gland, which is the bulge inferior to the mandible.

The carotid (kär′ōt-id) triangle is bounded by the sternocleidomastoid, omohyoid, and posterior digastric muscles. Palpate this triangle until you feel the strong pulsation of an artery; that is the common carotid artery. This triangle also contains the internal jugular vein and some cervical lymph nodes, which may be easily palpated here as well.

The muscular triangle is the most inferior of the four triangles. It contains the sternohyoid and sternothyroid muscles, as well as the lateral edges of the larynx and the thyroid gland. Try to palpate the thyroid gland here. Also in this triangle are cervical lymph nodes. (Cervical lymph nodes are present throughout the neck, as we have indicated.)

The posterior triangle is in the lateral region of the neck, posterior to the sternocleidomastoid muscle, superior to the clavicle inferiorly, and anterior to the trapezius muscle. This triangle is subdivided into two smaller triangles: the occipital and supraclavicular triangles.

The occipital triangle is the larger and more posteriorly placed of the two triangles. It is bounded by the omohyoid, trapezius, and sternocleidomastoid muscles. This important triangle contains the external jugular vein (which may be visible internal to the skin), the accessory nerve, the brachial plexus (a mass of nerves that innervates the upper limbs), and some lymph nodes.

The supraclavicular (soo-prä-kla-vik’ū-lār) triangle also goes by the names omoclavicular and subclavian. It is bounded
13.4a Thorax

The thorax is the superior portion of the trunk sandwiched between the neck superiorly and the abdomen inferiorly. It consists of the chest and the “upper back.” On the anterior surface of the chest are the two dominating surface features of the thorax—the clavicles and the sternum—as well as several other important surface anatomy landmarks (figure 13.3).

The paired clavicles and the suprasternal notch represent the border between the thorax and the neck. Feel the clavicles on the superior anterior surface where they extend between the base of the neck on the right and left sides laterally to the shoulders. The left and right costal margins of the rib cage form the inferior boundary of the thorax. The infrasternal angle (subcostal angle) is where the costal margins join to form an inverted V at the xiphoid process. On a thin person, many of the ribs can be seen. Most of the ribs (with the exception of the first ribs) can be palpated.

The sternum is palpated readily as the midline bony structure in the thorax. Its three components (the manubrium, the body, and the xiphoid process) may also be palpated. The sternal angle can be felt as an elevation between the manubrium and the body. The sternal angle is clinically important because it is at the level of the costal cartilage of the second rib, where it is often used as a landmark for counting the ribs.
Figure 13.3
Anterior Trunk Region. Anterior views show selected surface anatomy landmarks in (a) a male and (b) a female.
Each breast is located lateral to the sternum. The breast has a projection, the nipple, surrounded by a circular, colored region called the areola.

13.4b Abdominopelvic Region

The abdominopelvic region is the portion of the trunk that lies inferior to the rib cage. Surface anatomy features in this region may be difficult to palpate in some obese people. Some of the features in this region are shown in figure 13.3, and the abdominopelvic regions and quadrants are shown in figure 1.11.

On the anterior surface of the abdomen, the umbilicus (navel) is the prominent depression (if you have an “innie”) or projection (if you have an “outie”) in the midline of the abdominal wall. Also in the midline of the abdominal anterior surface is the linea alba, a tendinous structure that extends inferiorly from the xiphoid process to the pubic symphysis. If you observe the anteroinferior surface of the abdomen, you can readily palpate the pubic bones in the pubic region, underneath the pubic hair.

Additionally, the abdominopelvic region houses several other readily observed structures. The left and right rectus abdominis muscles and their tendinous intersections are observable in individuals with well-developed abdominal musculature and low body fat. These muscles and intersections are referred to as “six-pack abs.” The superior aspect of the ilium (iliac crest) terminates anteriorly at the anterior superior iliac spine. Attached to the anterior superior iliac spine is the inguinal ligament, which forms the inferior boundary of the abdominal wall. The inguinal ligament terminates on a small anterior, rounded projection on the pubis called the pubic tubercle. Superior to the medial portion of the inguinal ligament is the superficial inguinal ring. This “ring” is actually a superficial opening in the inferior anterior abdominal wall via the inguinal canal, and represents a weak spot in the wall. Although this ring may not be readily seen, a physician can palpate the ring and the inguinal canal to detect an inguinal hernia.

13.4c Back

The surface anatomy features of the back appear in figure 13.4.

At the superior midline surface of the back near the interface between the neck and back, the vertebra prominens is readily palpated, as discussed previously. Moving inferiorly from the vertebra prominens in the midline, some vertebral spinous processes can be observed. The entire series of vertebral spinous is visible when the vertebral column is flexed. When the back is extended, some of the inferior vertebral spines are obscured; instead, a vertically oriented indentation called the median furrow is all that can be seen along the inferior midline of the back.

Several prominent features of the posterior scapula are observed and easily palpated in some individuals, including the...
WHAT DID YOU LEARN?

5. What is the sternal angle, and what is its clinical significance?

6. The most superior levels of the iliac crests are at the same level as what bony structure? Why is this clinically important?

7. List the muscles that border the triangle of auscultation. What is the clinical significance of this triangle?
13.5 Shoulder and Upper Limb Region

Learning Objectives:

1. Identify the surface features of the shoulder and upper limb.
2. Outline the clinically relevant features of the axilla, the cubital fossa, and the wrist.

The anatomy of the shoulder and upper limb region is clinically important because of frequent trauma to these body regions. Additionally, vessels of the upper limb are often used as pressure sites and as sites for drawing blood, providing nutrients and fluids, and administering medicine.

13.5a Shoulder

The scapula, clavicle, and proximal part of the humerus collectively form the shoulder, and portions of each of these bones are important surface landmarks in this region (see figures 13.3 and 13.4). Anteriorly, the clavicle and acromion of the scapula may be observed and palpated. The acromion helps form the rounded, superior projection on your shoulder. The rounded curve of the shoulder is formed by the thick deltoid muscle, which is a frequent site for intramuscular injections.

13.5b Axilla

The axilla (ak’sil-ā’), commonly called the armpit, is clinically important because of the nerves, axillary blood vessels, and lymph nodes located there. The pectoralis major forms the fleshy anterior axillary fold, which acts as the anterior border of the axilla. The latissimus dorsi and teres major muscles form the fleshy posterior axillary fold, which is the posterior border of the axilla (figure 13.5). Palpate your own axilla to locate the posterior and anterior axillary folds.

The axillary (ak’sil-ār-ē) lymph nodes are also in this region and may be palpated easily. These lymph nodes may become tender and swollen due to an infection, or they may become hard if breast cancer cells spread to them. Also palpable in this region is the pulse of the axillary artery.

13.5c Arm

Several structures are clearly visible in the arm, also called the brachium (brā’kē-ūm), which extends from the shoulder to the elbow on the upper limb. On the anterior side of the arm, the cephalic vein is evident in muscular individuals as it traverses along the anterolateral border of the entire upper limb. This vein terminates in a small surface depression, bordered by the deltoid and pectoralis major muscles, called the clavpectoral triangle (or deltopectoral triangle) (figure 13.6). The basilic vein is sometimes evident along the medial side of the upper limb. The brachial artery becomes subcutaneous along the medial side of the brachium, and its pulse may be detected there. This region is clinically important in measuring blood pressure.
The biceps brachii muscle becomes prominent when the elbow is flexed (figure 13.7). Located on the anterior surface of the elbow region, the cubital fossa is a depression within which the median cubital vein connects the basilic and cephalic veins (see figure 13.6). The cubital fossa is a common site for venipuncture (removal of blood from a vein).

The bulk of the posterior surface of the brachium is formed by the triceps brachii muscle. Three bony prominences are readily identified in the distal region of the brachium near the elbow (figure 13.8; see also figure 13.7). The lateral epicondyle of the humerus is a rounded lateral projection at the distal end of the humerus. The olecranon (ō-lekˈrā-non) of the ulna is palpated easily along the posterior aspect of the elbow. The medial epicondyle of the humerus is more prominent and may be easily palpated. The ulnar nerve traverses posterior and inferior to the medial epicondyle. When we hit our “funny bone,” we actually are hitting or pinching the ulnar nerve as it travels posterior to the medial epicondyle.

13.5d Forearm

The radius, the ulna, and the muscles that control hand movements form the forearm, or antebrachium (an-te-brəˈkē-əm) (figure 13.8). Palpate your own forearm. Note that the proximal part of the forearm is bulkier, due to the fleshy bellies of the forearm muscles. The head of the radius may be palpated just distal to the lateral epicondyle of the humerus, especially when you pronate and supinate your forearm. As you palpate distally, the forearm becomes thinner because you are palpating the tendons of these muscles. The styloid process of the radius is readily palpable as the lateral bump along the wrist, while the head and styloid process of the ulna collectively form the medial prominence of the wrist.

The pulse of the radial artery may be detected between the distal tendons of the flexor carpi radialis and the brachioradialis (figure 13.9). The pulse of the ulnar artery is a bit more difficult to find. You can locate it by feeling for the medial bump in your hand that is the pisiform bone and then placing your fingers immediately lateral to the pisiform bone.

The tendons of the extensor pollicis brevis, abductor pollicis longus, and extensor pollicis longus muscles mark the boundary of the triangular anatomic snuffbox. You can palpate the pulse of the radial artery here as well. In addition, you can palpate the scaphoid bone in this region. (See also the chapter 12 Clinical View, “Anatomic Snuffbox,” on page 371.)

13.5e Hand

The most obvious surface anatomy features of the hand involve flexion creases, fingerprints, and fingernails (figure 13.9). Anteriorly, flexion creases are seen for the metacarpophalangeal (MP), proximal interphalangeal (PIP), and distal interphalangeal (DIP) joints. Palpate the thenar (thēˈnər) eminence (emˈtə-nəs), the thickened, muscular region of the hand that forms the base of the thumb. The hypothenar eminence is the medial region of the palm immediately proximal to the little finger.

The tendons that extend to each of the fingers from the extensor digitorum muscle are readily observed on the posterior side of the hand when the digital joints are extended. Also on the posterior side of the hand, the MP joints (“knuckles”) are formed by the distal ends of metacarpal bones II–V. Palpate each phalanx (fāˈlāngks) and all the interphalangeal joints.
**Figure 13.8**
Forearm and Hand. (a) Anterior and (b) posterior views show the right forearm in a male.

**Figure 13.9**
Wrist and Hand. (a) Palmar and (b) dorsal views of the right hand illustrate many surface anatomy features.
### What Did You Learn?

1. What muscles form the anterior and posterior axillary folds?
2. Discuss the location of the cubital fossa, and describe what is found in this depression.
3. Where is the pulse of the brachial artery taken?

### 13.6 Lower Limb Region

#### Learning Objectives:
1. Distinguish the surface features of the lower limb.
2. Discuss the clinical importance of the femoral triangle.
3. Compare and contrast the arches of the foot.

The massive bones and strong muscles of the lower limbs are weight bearing and important with respect to locomotion, our ability to move from place to place.

#### 13.6a Gluteal Region

The buttock could have been included in our discussion of the posterior region of the pelvis, but instead we discuss it here as the **gluteal** (gloo-tē-āl; gloutos = buttock) region. Several surface anatomy features are in this region (see figure 13.4).

The inferior border of the **gluteus maximus** muscle forms the **gluteal fold**. The **natal cleft** extends vertically to separate the buttocks into two prominences. In the inferior portion of each buttock, an **ischial** (is-kē-āl) **tuberosity** can be palpated; these tuberosities support body weight while seated. The gluteus maximus muscle and some fat form most of the inferolateral “fleshy” part of the buttock. The **gluteus medius** muscle may be palpated only in the superolateral portion of each buttock. The **sciatic nerve** isn’t easily palpable, but knowledge of its location in the buttock region is essential for health-care providers who must give gluteal intramuscular injections. The sciatic nerve originates in the inferior medial quadrant of the buttock and travels inferi- orly to the lower limb.

#### What Do You Think?

2. What muscle functions would be impaired if you accidentally pierced or injured the sciatic nerve?

### 13.6b Thigh

Many muscular and bony features are readily identified in the thigh, which extends between the hip and the knee on each lower limb (figure 13.10). An extremely important element of thigh surface anatomy is a region called the **femoral triangle**. The femoral triangle is a depression inferior to the inguinal ligament and on the anteromedial surface in the superior portion of the thigh. It is bounded superiorly by the inguinal ligament, laterally by the sartorius muscle, and medially by the adductor longus muscle. The femoral artery, vein, and nerve travel through this region, making it an important arterial pressure point for controlling lower limb hemorrhage. Now focus your attention on the distal part of your anterior thigh, and try to palpate three parts of the **quadriceps femoris** as they approach the knee.

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**Clinical View**

#### Gluteal Intramuscular Injections

The gluteal region is a preferred site for intramuscular (IM) injections because the gluteal muscles are quite thick and contain many blood vessels. However, health-care personnel must be careful not to accidentally inject the sciatic nerve or the superior and inferior gluteal vessels and nerves that supply the gluteal muscles. The sciatic nerve and the gluteal nerves and vessels are located primarily in the medial and inferior lateral part of the buttock. Therefore, the iliac crest is an important surface landmark for determining the safest place for a gluteal IM injection. Usually the injection is administered in the **superior lateral quadrant** of the buttock, about 5 to 7 centimeters inferior to the iliac crest. By placing the injection in the superior lateral quadrant, the health-care worker can be reasonably certain of not accidentally piercing an important nerve or blood vessel.

Proper placement of a gluteal intramuscular injection.
Still on the anterior side of the thigh, four obvious skeletal features can be observed and palpated: (1) The greater trochanter is palpated on the superior lateral surface of the thigh; (2) the patella is located easily within the patellar tendon; and (3) the lateral and (4) medial epicondyles of both the femur and tibia are identified and palpated at each knee. On the lateral side of the thigh, the tendinous iliobial tract may be palpated.

The posterior side of the thigh has the tendinous attachments of the hamstring muscles. By flexing your knee, you can readily palpate these tendons along the posterior aspect of the knee joint. Also in this part of the thigh, observe the depression on the posterior part of the knee joint, called the popliteal (pop-lit’e-āl, pop-li-tē’āl) fossa (pl., fossae, foss’ē). This is often the site of vascular problems in the elderly due to reduced muscle tone and inactivity that lead to incompetent valves in the veins, poor circulation, and blood clots.

### 13.6c Leg

Several skeletal features are observable as part of the surface anatomy of the leg, which extends from the knee to the foot. From an anterior perspective, palpate the tibial tuberosity immediately inferior to the knee joint. Then, moving inferiorly, feel the anterior border of the tibia (called the “shin”), which is subcutaneous and palpable along its length. At the distal end of the leg, observe and palpate the medial malleolus and lateral malleolus along the sides of the ankle.

On the posterior side of the leg, palpate the strong calcaneal tendon (Achilles tendon) along the posteroinferior leg. Then try to palpate the pulse of the posterior tibial artery, posteroinferior to the medial malleolus of the tibia.

Next, observe the leg first from a lateral perspective and then from a medial perspective. The superior part of the lateral leg is the head of the fibula. Palpate this bony projection. Then look distally and observe the lateral malleolus that you palpated when observing the leg in anterior view. The small saphenous vein is easily seen along the lateral malleolus, traveling superiorly along the posterior part of the leg. Switch over to a medial view and observe the medial malleolus you palpated earlier. Another superficial vein of the leg is the great saphenous vein, seen subcutaneously on the medial side of the leg.
Figure 13.11
Leg. (a) Anterior, (b) posterior, and (c) lateral views of the right leg show the prominent surface landmarks.
13.6d Foot

In most individuals, numerous surface features of the foot can be clearly observed (figure 13.12; see figure 13.11a). On the superior side of the foot, also called the dorsum, palpate the tendons for the tibialis anterior, extensor digitorum longus, and extensor hallucis longus. Each of these tendons is clearly observed, especially when the foot is dorsiflexed. Move back toward the ankle, and palpate the navicular bone along the dorsum. You may feel the pulse of the dorsalis pedis artery either over the navicular (the medial dorsal side of the foot) or along the dorsal interspace between the first and second metatarsals. Physicians check the pulse of this artery for circulation problems such as peripheral vascular disease or compartment syndrome in the anterior leg (see Clinical View: In Depth, chapter 12, page 391).

Both sides of the foot have distinct surface anatomy structures. Along the lateral surface, palpate the base of metatarsal V. The tendon for the fibularis brevis attaches here. Then observe the lateral longitudinal arch, the curvature along the lateral side of the foot. The phalanges, metatarsophalangeal (MP) joints, PIP and DIP joints, and toenails are obvious surface landmarks readily observed when viewing either the lateral side or the dorsum of the foot. The medial surface of the foot clearly illustrates the high, arched medial longitudinal arch. At the distal end of the medial longitudinal arch, the head of metatarsal I appears as a rounded prominence.

Clinical Term

femoral hernia Herniation of the intestines through the medial part of the femoral triangle.

Chapter Summary

| 13.1 A Regional Approach to Surface Anatomy 398 | ■ Visual inspection, palpation, percussion, and auscultation are the primary tools used when examining surface anatomy. |
| 13.2 Head Region 398 | ■ The head is composed of the cranial and facial regions.  
13.2a Cranium 399 | ■ The cranium is composed of frontal, temporal, and occipital regions.  
13.2b Face 399 | ■ The facial region is composed of auricular, orbital, nasal, oral, and mental regions. |

(continued on next page)
Chapter Summary (continued)

13.3 Neck Region 399
- The sternocleidomastoid muscle subdivides each lateral region of the neck into anterior and posterior triangles.

13.4 Trunk Region 401
- The trunk is divided into the thorax, abdominopelvic region, and back.
  13.4a Thorax 401
  - Palpable structures of the thorax include the sternum, sternal angle, and ribs.
  13.4b Abdominopelvic Region 403
  - The important surface anatomy features of the abdominopelvic region include the linea alba, umbilicus, and the inguinal ligaments.
  13.4c Back 404
  - The triangle of auscultation is an area where breathing sounds may be heard clearly with a stethoscope.

13.5 Shoulder and Upper Limb Region 405
- The surface anatomy of the shoulder and upper limb is used for drawing blood, providing nutrients and fluids, and administering medicine.
  13.5a Shoulder 405
  - The scapula, clavicle, and humerus are palpable contributors to the structure of the shoulder.
  13.5b Axilla 405
  - The axilla, or armpit, is important clinically because of the blood vessels, nerves, and lymph nodes located there.
  13.5c Arm 405
  - The pulse of the brachial artery may be felt along the medial surface of the arm.
  13.5d Forearm 406
  - The styloid process of the radius and head and styloid process of the ulna are readily palpable landmarks of the forearm.
  13.5e Hand 406
  - The thenar and hypothenar eminences are easily palpated on the anterior surface of the hand.

13.6 Lower Limb Region 408
- The massive bones and strong muscles of the lower limbs are weight-bearers and serve in locomotion.
  13.6a Gluteal Region 408
  - The gluteal muscles form the prominences of the buttocks.
  13.6b Thigh 408
  - The femoral triangle and popliteal fossa are clinically important surface landmarks.
  13.6c Leg 409
  - The pulse of the posterior tibial artery is palpated posteroinferiorly from the medial malleolus.
  13.6d Foot 411
  - The pulse of the dorsalis pedis artery may be palpated on the medial dorsal side of the foot above the navicular bone, or along the dorsal interspace between the first and second metatarsals.

Challenge Yourself

Matching
Match each numbered item with the most closely related lettered item.

1. latissimus dorsi _______ 6. scapula a. common place for an intramuscular injection
2. cubital fossa _______ 7. deltid b. costal cartilage of second ribs attach here
3. neck _______ 8. L4 spinous process c. venipuncture performed here
4. auricle _______ 9. sternal angle d. its spine may be palpated on the back
5. umbilicus _______ 10. philtrum e. lumbar puncture performed near here
   f. contains the carotid triangle
   g. forms part of posterior axillary fold
   h. vertical depression inferior to nose and superior to lips
   i. fleshy part of external ear
   j. structure on the abdomen
Multiple Choice
Select the best answer from the four choices provided.

1. Which of these can be palpated in the nuchal region of the neck?
   a. hyoid bone
   b. larynx
   c. cervical vertebrae
   d. trachea

2. Which muscle forms the anterior axillary fold?
   a. latissimus dorsi
   b. pectoralis major
   c. biceps brachii
   d. teres major

3. Which nerve is pinched when you “hit your funny bone”?
   a. ulnar nerve
   b. brachial nerve
   c. cephalic nerve
   d. radial nerve

4. Which of the following surface features may not be observed easily on obese people?
   a. philtrum
   b. auricle
   c. iliac crests
   d. natal cleft

5. An arterial pulse in the neck is best detected at the
   a. carotid triangle.
   b. submandibular triangle.
   c. submental triangle.
   d. supraclavicular triangle.

6. The costal margin is the inferior edge of the
   a. sternum.
   b. clavicle.
   c. rib cage.
   d. linea alba.

7. Eyebrows are located on the
   a. ala nasi.
   b. external occipital protuberance.
   c. superciliary arches.
   d. superior palpebral fissure.

8. Which artery can be palpated between the tendons of the flexor carpi radialis and the brachioradialis?
   a. popliteal
   b. radial
   c. brachial
   d. femoral

9. The great and small saphenous veins are located in
   a. forearm.
   b. foot.
   c. leg.
   d. neck.

10. The triangle of auscultation is formed by all of the following muscles except the
    a. trapezius.
    b. rhomboid minor.
    c. latissimus dorsi.
    d. rhomboid major.

Content Review
1. Identify the five regions of the face, and specify a surface feature of each region.
2. What is the vertebra prominens, and where is it located?
3. Identify the two major triangles of the neck, and describe the structural subdivisions of each triangle. Also, identify an important structure in each triangle.
4. Where is the superficial inguinal ring, and where can it be palpated? What is the ring’s clinical significance?
5. Why must a physician know surface anatomy of the back to perform a lumbar puncture? What key surface anatomy features are used to do this procedure correctly?
6. What prominent features may be palpated at or near the elbow?
7. Identify and describe the tendons that can be observed or palpated along the anterior surface of the wrist.
8. Discuss and describe the surface features that form the boundaries of a buttock.
9. Describe the location of the popliteal fossa, and discuss the clinical importance of this region.
10. Describe the anatomic locations where the following could be observed: (a) the posterior tibial arteries, (b) the greater trochanter, (c) the medial malleolus and lateral malleolus, and (d) the tendinous attachments of the hamstring muscles.

Developing Critical Reasoning
1. Marcie went to the doctor and received an intramuscular injection in her right gluteal region. Afterward, Marcie had partial paralysis and lack of sensation in her right leg. What may have happened to Marcie during this injection?
2. Javier was hit hard in the lateral thoracic region. His doctor told him he had fractured his right sixth rib. How was the doctor able to determine which rib was fractured? What surface anatomy feature did he use to count the ribs?
3. When Louisa was sick with the flu, the doctor palpated her neck. What specific neck structures was the doctor palpating, and how do these structures relate to Louisa’s infection?
Answers To “What Do You Think?”

1. Most of the muscles of facial expression may be palpated under the skin, including the orbicularis oculi, orbicularis oris, zygomaticus major, and platysma. In addition, you can palpate the masseter muscle, a muscle of mastication.

2. The sciatic nerve supplies the hamstrings, all leg muscles, and all muscles of the foot, so none of these muscles would work properly if the sciatic nerve were injured.

www.mhhe.com/mckinley3  Enhance your study with practice tests and activities to assess your understanding. Your instructor may also recommend the interactive eBook, individualized learning tools, and more.