

Thirteenth Lecture

13. Musculoskeletal system

Summary of previous lectures

In the previous lectures we talked about the basic elements of the medical word: word root, combining form, suffix, and prefix. The meaning of a word is determined by how these elements are combined. Detailed information about suffixes is mentioned. Suffix linking and suffix types are explained in detail and many examples related to the surgical, diagnostic, pathological, grammatical and plural suffixes are also provided. Detailed information about prefixes is also mentioned. Prefix linking and prefix types are explained in detail and many examples related to different types of prefixes are provided.

The basic structural and functional organization of the body from the cellular level to the organism level is also presented. Additionally, terms used to describe planes of the body, body cavities, quadrants and regions of the abdominal cavity, and divisions of the spinal column are presented. These terms are considered as an essential part of medical terminology and are used in all body systems. We moved on to talk about the body systems in detail.

Starting with the digestive system, also called the gastrointestinal (GI) system, it is mentioned that it consists of a digestive tube called the GI tract or alimentary canal, and several accessory organs whose primary function is to break down food, prepare it for absorption, and eliminate waste. The GI tract, extending from the mouth to the anus, varies in size and structure in several distinct regions. Many terms related to the digestive system are also introduced.

Next, we talked about the respiratory system and how it is responsible for the exchange of oxygen (O₂) and carbon dioxide (CO₂). Oxygen is carried to all cells of the body in exchange for CO₂, a waste product. The cardiovascular system helps in this vital function by providing blood vessels for carrying these gases. Failure or deficiency in either system has the same effect on the body: disturbance of

homeostasis and O₂ starvation in tissues that may cause death. The respiration process and some medical word elements related to the respiratory system are also introduced.

Later on we talked about the cardiovascular (CV) system and how it is composed of the heart and blood vessels. The pumping action of the heart propels blood containing oxygen, nutrients, and other vital products from the heart to body cells through a vast network of blood vessels called arteries. Blood vessels include arteries, veins and capillaries. The key terms related to the anatomy and physiology of the cardiovascular system are also introduced. Specifically, the focus has been on the terms related to the heart.

13.1. Anatomy and Physiology²³⁹

The musculoskeletal system includes muscles, bones, joints, and related structures, such as the tendons²⁴⁰ and connective tissue that function in support and movement of body parts and organs.

13.1.1. Muscles

Muscle tissue is composed of contractile cells or fibres that provide movement of an organ or body part. Muscles contribute to posture²⁴¹, produce body heat, and act as a protective covering for internal organs. Muscles make up the bulk of the body. They have the ability to be excited by a stimulus, contract, relax, and return to their original size and shape. Whether muscles are attached to bones or to internal organs and blood vessels, their primary responsibility is movement. (See [Table 13-1](#)). Apparent motion provided by muscles include walking and talking. Less apparent motions include the passage and elimination of food through the digestive system, propulsion of blood through the arteries, and contraction of the bladder to eliminate urine. (See [Figure 13-1](#)).

²³⁹ Medical Terminology Systems - A Body Systems Approach: Musculoskeletal System - Anatomy and Physiology p. 266

²⁴⁰ Tendon: /'tendən/ a strong band of tissue in the body that joins a muscle to a bone

²⁴¹ Posture: /'pɒstʃə(r)/ the position in which you hold your body when standing or sitting

Table 13-1: body movements and the resulting muscle action. With the exception of rotation, these movements are in pairs of opposing functions

| Motion Action | Motion Action |
|------------------------------|------------------------------------|
| Adduction /ə'dʌkʃən/ | Moves closer to the midline |
| Abduction /æb'dʌkʃən/ | Moves away from the midline |
| Flexion /flekʃən/ | Decreases the angle of a joint |
| Extension /ɪkstenʃən/ | Increases the angle of a joint |
| Rotation /rəʊ'teɪʃən/ | Moves a bone around its own axis |
| Pronation /prɒs'neɪʃən/ | Turns the palm down |
| Supination /,sʊpə'neɪʃən/ | Turns the palm up |
| Inversion /ɪnvɜːʃən/ | Moves the sole of the foot inward |
| Eversion /ɪ'vɜːʒən, -ʃən/ | Moves the sole of the foot outward |
| Dorsiflexion /,dɔːsə'flekʃən | Elevates the foot |
| Plantar flexion /'plæntə(r)/ | Lowers the foot (points the toes) |

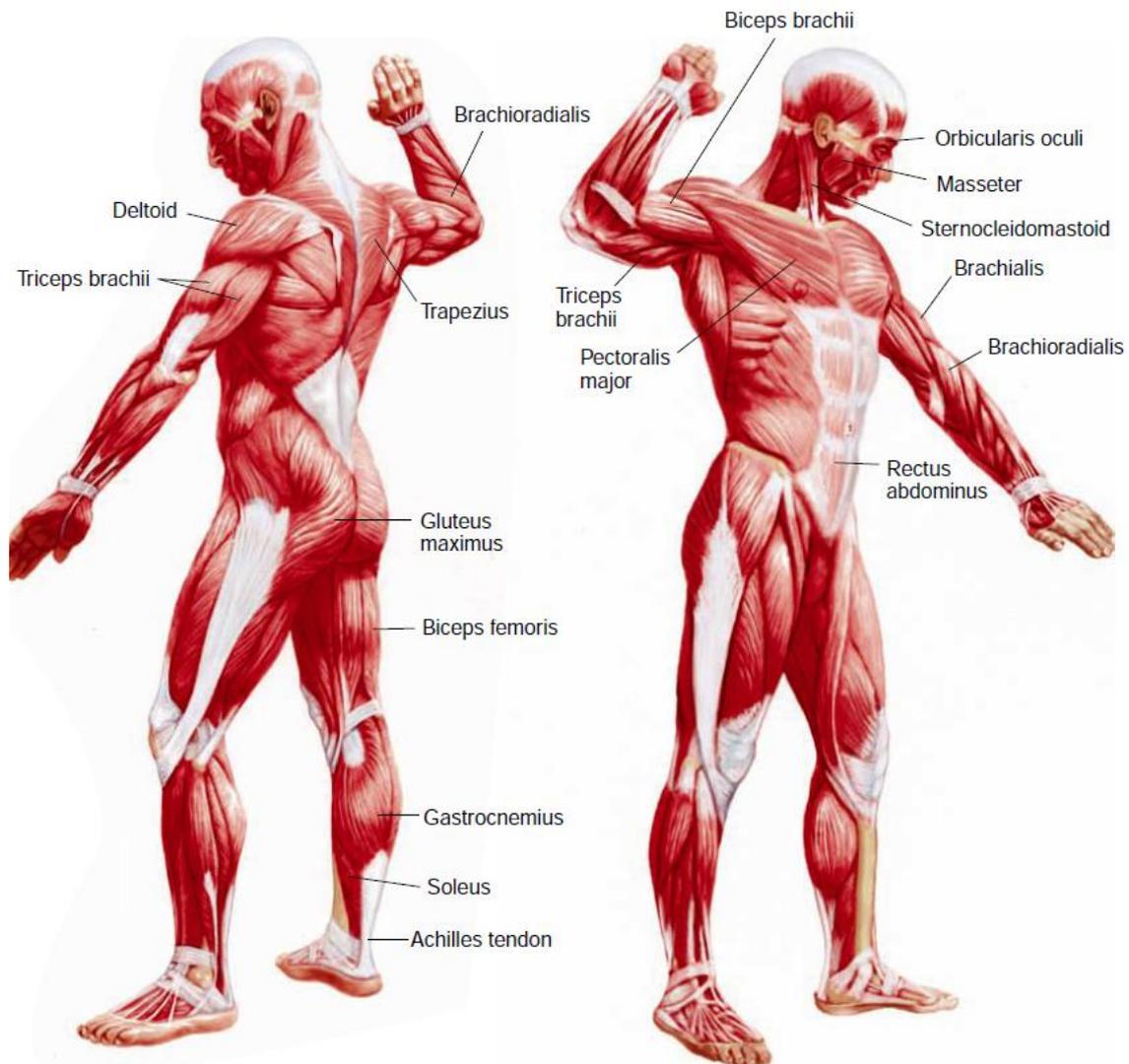


Figure 13-1: Selected muscles of the body

There are three types of muscle tissue in the body:

- Skeletal muscles, also called voluntary or striated²⁴² muscles, are muscles whose action is under voluntary control. Some examples of voluntary muscles are muscles that move the eyeballs, tongue, and bones.
- Cardiac muscle is found only in the heart. It is unique for its branched interconnections, and makes up most of the wall of the heart. Cardiac muscle shares similarities with both skeletal and smooth muscles. Like skeletal muscle, it is striated, but it produces rhythmic involuntary contractions like smooth muscle.
- Smooth muscles, also called involuntary or visceral muscles, are muscles whose actions are involuntary. They are found principally in the visceral organs, walls of arteries and respiratory passages, and urinary and reproductive ducts. The contraction of smooth muscle is controlled by the autonomic (involuntary) nervous system. (See *Figure 13-2*).

13.1.1.1. Attachments

Muscles attach to bones by fleshy or fibrous attachments. In fleshy attachments, muscle fibres arise directly from bone. Although these fibres distribute force over wide areas, they are weaker than a fibrous attachment. In fibrous attachments, the connective tissue converges at the end of the muscle to become continuous and indistinguishable from the periosteum²⁴³. When the fibrous attachment spans a large area of a particular bone, the attachment is called an aponeurosis²⁴⁴. Such attachments are found in the lumbar²⁴⁵ region of the back. In some instances, this connective tissue penetrates the bone itself. When connective tissue fibres form a cord or strap, it is referred to as a tendon. This arrangement localizes a great deal of force in a small area of bone. Ligaments are flexible bands of fibrous tissue that are highly adapted for resisting strains and are one of the principal mechanical factors that hold bones close together in a synovial²⁴⁶ joint. An example of this is the cruciate²⁴⁷ ligaments of the knee that help to prevent anterior-posterior

²⁴² Striated: /'straɪɪtɪd/ marked with striae (pl. of stria: /'straɪə/ a slight or narrow stripe or streak, especially one of a number in parallel arrangement)

²⁴³ Periosteum: /,perɪ'ɒstɪəm/ (pl. -tea /-tɪə/) a thick fibrous two-layered membrane covering the surface of bones

²⁴⁴ Aponeurosis: /,æpənɪʊə'rəʊsɪs/ (pl. -ses /-sɪz/) a white fibrous sheet of tissue by which certain muscles are attached to bones

²⁴⁵ Lumbar: /'lʌmbə(r)/ relating to the lower part of the back

²⁴⁶ Synovial: /saɪ'nəʊviəl/ (of a joint) having a membrane containing liquid between the bones, which allows the joint to move freely

²⁴⁷ Cruciate: /'kru:ʃɪt; -,eɪt/ shaped or arranged like a cross

displacement of the articular²⁴⁸ surfaces and to secure articulating bones when we stand.

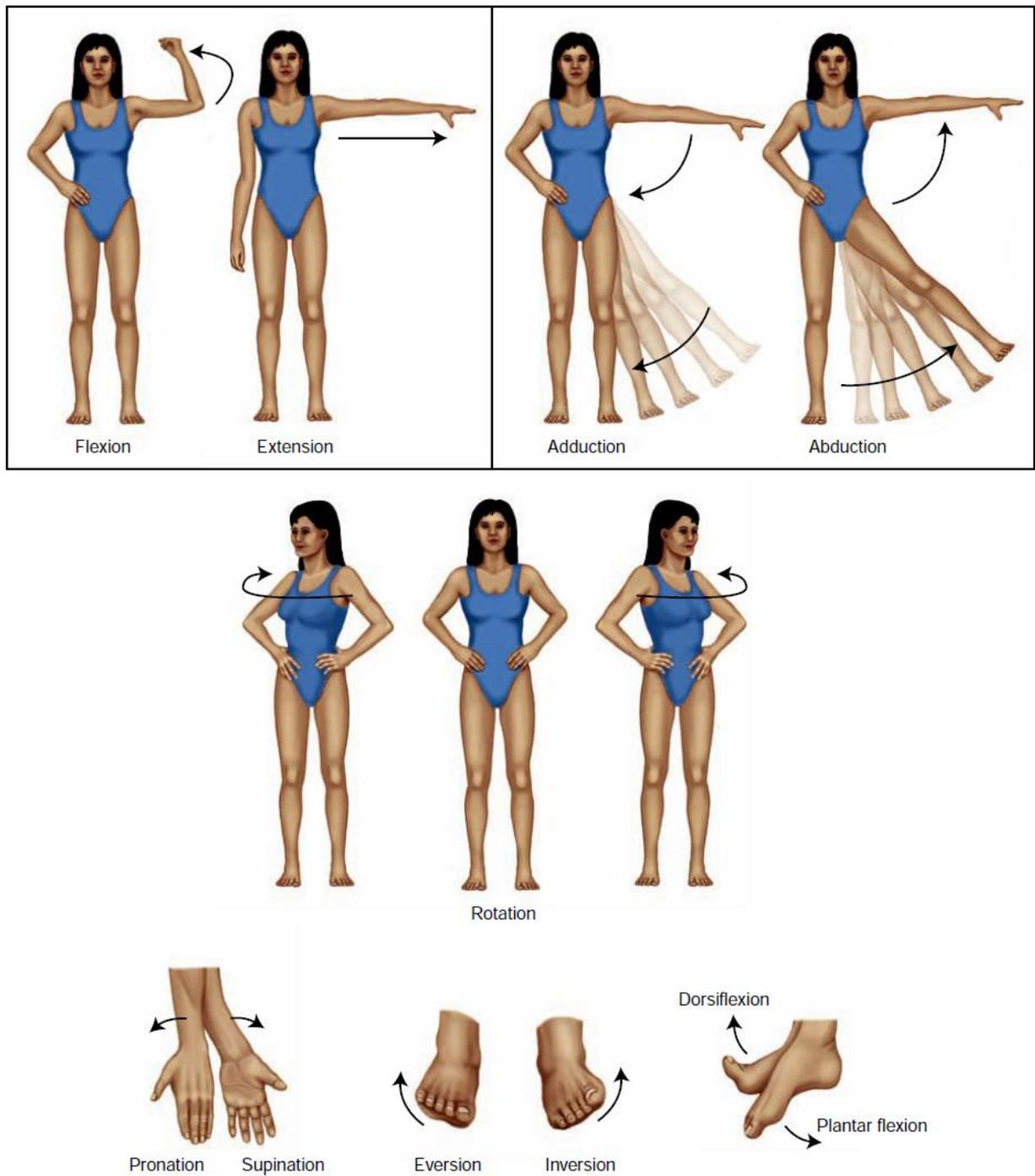


Figure 13-2: Body movements produced by muscle action

²⁴⁸ Articular: /ɑ:ˈtɪkjələ/ of or relating to joints or to the structural components in a joint

13.1.2. Anatomy and Physiology Key Terms

This section introduces important terms along with their definitions and pronunciations. Word analyses are also provided.

| Term | Pronunciation ²⁴⁹ | Arabic ²⁵⁰ | Meaning |
|---|------------------------------|------------------------------------|--|
| appendage | ə'pendɪdʒ | لَاِجْقَة | Any body part attached to a main structure Examples of appendages include the arms and legs. |
| articulation | ɑ: ,tɪkjʊ'leɪʃn | مَفْصِل | Place of union between two or more bones; also called joint |
| cancellous | 'kænsələs | إِسْفَنْجِي | Spongy or porous structure, as found at the ends of long bones |
| cruciate ligaments cruci: cross -ate: having the form of; possessing | 'kru:ʃɪ,eɪt 'lɪgəmənts | الْأَرْبَطَةُ الْمُنْصَالِيَّةُ | Ligaments that cross each other forming an X within the notch between the femoral condyles ²⁵¹ Along with other structures, the cruciate ligaments help secure and stabilize the knee. |
| hematopoiesis hemat/o: blood -poiesis: formation, production | hɪ ,mætəʊpɔɪ'ɪsɪs | تَكْوُن الدَّم | Production and development of blood cells, normally in the bone marrow |

²⁴⁹ Oxford Advanced Learner's Dictionary, 8th ed. or: <http://dictionary.reference.com/>

²⁵⁰ <http://www.emro.who.int/Unified-Medical-Dictionary.html>

²⁵¹ Condyle: /'kɒndɪl/ the rounded projection on the articulating end of a bone, such as the ball portion of a ball-and-socket joint