# 6. THE MUSCULOSKELETAL SYSTEM

The human musculoskeletal system consists of bones and muscles that share primary function: movement of the body and its parts.

**Bones** are composed of osseous tissue containing minerals that make the tissue hard and rigid. Before birth, bones are soft and composed mostly of cartilage and as an infant grows, bones become harder to bear the body weight. This process is called **ossification**.
Bones as structures serve three functions, in that:

1. They provide the rigid framework for the body,
2. They serve as levers for the skeletal muscles,
3. They also provide protection for vulnerable viscera including the brain and the spinal cord, the heart and the lungs.

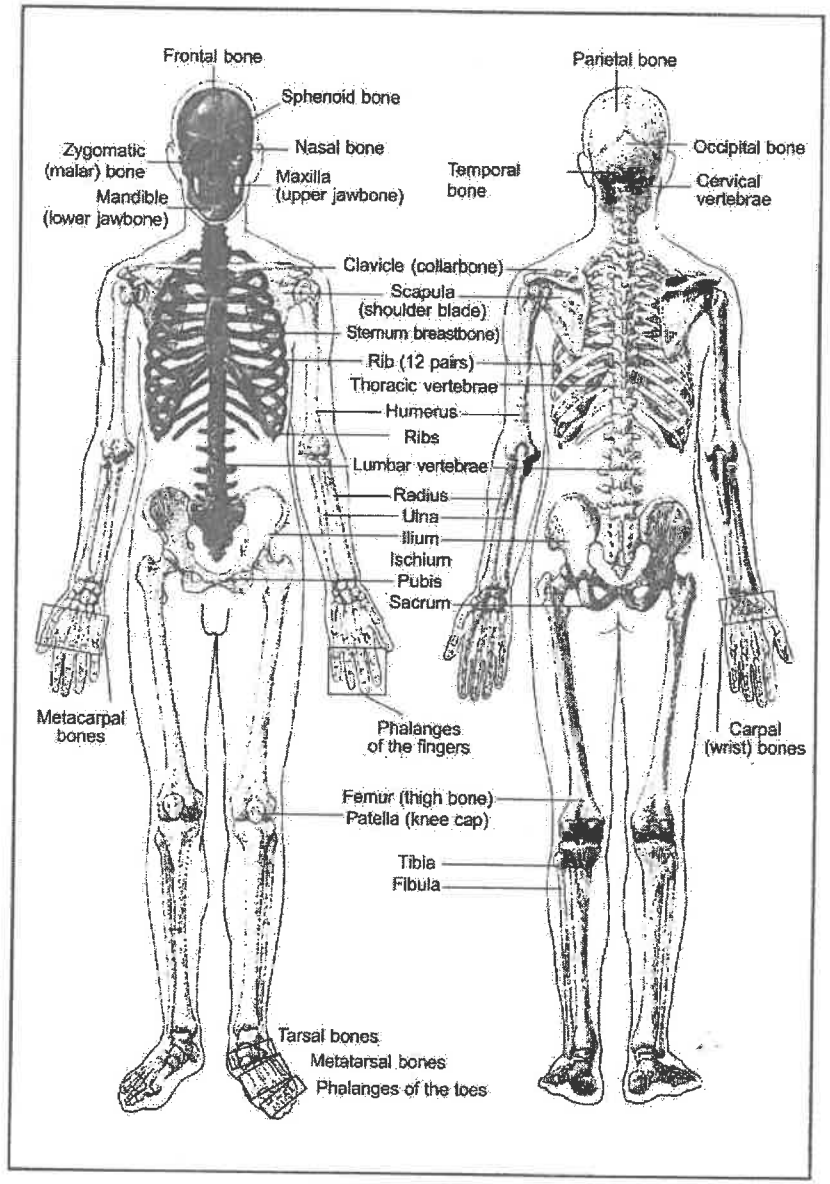
Bone as an organ serves two additional functions in that:

1. It contains haemopoietic tissue of the myeloid type for the production of erythrocytes, granular leucocytes and platelets,
2. It is the organ of storage for calcium, phosphorus, magnesium and sodium.

Bones are classified according to the shape: **long, short, irregular** and **flat**. Long bones are those in the body extremities: arms and legs, and they provide places for the attachment of large muscles. Short bones are found in the hands and feet. Irregular bones comprise the spinal column, wrist and ankle and flat bones (sternum and bones of the skull and pelvis) protect internal organs.
The supporting framework for all organs is called the **skeleton**. It consists of 206 bones and is divided into the axial skeleton (bones of the head and the trunk) and the appendicular skeleton (shoulder girdle, upper and lower extremities and pelvic girdle). In children, the covering periosteum is thick, loosely attached to the cortex and produces new bone readily; in adults it becomes progressively thinner and more adherent to the cortex and produces new one less readily. It explains why fractures heal more rapidly in young children than in adults.
A junction between two or more bones is called the **joint**. Functions of joints are to allow movement between bones. There are three types of joints: movable, partially movable and immovable. A typical human joint







consists of the muscle, fibrous capsule, synovial membrane, articular cartilage, meniscus, fat pad and sesamoid.
A bone, which is a highly specialized type of connective tissue, is capable of only a very limited number of reactions to a large number of abnormal conditions.
There are three basic ways in which a bone can react to abnormal condition:

1. Local death (when the area of the bone is without the blood supply),
2. An alteration of the bone deposition,
3. An alteration of the bone resorption (decreased or increased bone deposition of resorption as a reaction to the soft tissue inflammation is called the rheumatoid arthritis).

There are over **500 muscles** in the body: **skeletal, cardiac** and **smooth.**
Skeletal muscles have three functions:

1. Movement of bones (by contraction and relaxation of pairs of muscles; e.g. when one muscle contracts in response to a nerve impulse, the other must relax or stretch).
2. Maintenance of body posture,
3. Production of body heat.

Cardiac muscle contracts to pump blood and smooth muscle in the walls of hollow organs contracts to move substances through the organs.

## VOCABULARY

**adherent** [əd'hiərənt] přirostlý
**alteration** [ɔ:tə'reišn] přeměna, poškození
**appendicular** [æpen'dikjulə] přívěskový
**attachment** [ə'tæčmənt] připevnění
**axial** [æksiəl] osový
**bear** [beə] nést
**birth** [bɔ:θ] narození
**cardiac** [ka:diæk] srdeční
**cartilage** [ka:tilidž] chrupavka
**comprise** [kəm'praiz] zahrnovat, obsahovat
**deposition** [depə'zišn] ukládání, usedlina
**fat pad** [fæt pæd] tukový polštář
**fibrous capsule** [faibrəs kæpsju:l] vazivové pouzdro
**flat** [flæt] plochý





**haemopoietic tissue** [hi:məpoi'etik tisju:] krvetvorná tkáň
**heat** [hi:t] teplo
**junction** [džaŋkšn] spojení, křižovatka
**movable** [mu:vəbl] pohyblivý, stěhovavý
**myeloid** [maiəloid] myeloidní
**osseous** [osiəs] kostní
**partially** [pa:šəli] částečně
**periosteum** [peri'ostiəm] okostnice
**posture** [poščə] pozice
**readily** [redili] snadno, ochotně
**resorption** [ri'so:pšn] vstřebávání
**rheumatoid arthritis** [ru:mətoid a:'θraitis] zánět kloubů
**rigid** [ridžid] pevný, nehybný, strnulý
**sesamoid** [sesəmoid] sezamský (kůstka)
**skeletal** [skelitl] kosterní
**smooth** [smu:θ] hladký
**soft** [soft] měkký
**storage** [storidž] uchování
**vulnerable viscera** [valnərəbl visərə] zranitelné (měkké) vnitřnosti
**wrist** [rist] zápěstí

## QUESTIONS AND EXERCISES

Answer:

1. What does the musculoskeletal system consist of?
2. What are the functions of bones and muscles?
3. What is ossification?
4. How are the bones classified?
5. Describe long and short bones.
6. Describe irregular and flat bones.
7. What is the skeleton?
8. Why do fractures heal quickly in children?
9. What is the joint?
10. What are the types of joints?
11. Describe shortly the three types of muscles.
12. What is the function of each of them?

Translate:
kosti se skládají z kostní tkáně; obsahují minerály; kosti jsou před narozením měkké; poskytuje pevný rámec pro tělesné orgány; ochrana pro zranitelné vnitřnosti; mozek a mícha; obsahuje krvetvornou tkáň; produkce červených krvinek; jsou klasifikovány podle tvaru; kosti hlavy a trupu; pletenec ramenní; dolní a horní končetiny; zlomeniny se hojí u dětí rychleji; umožňuje pohyb mezi kostmi; svalstvo kosterní; srdeční a hladké; produkování tělesného tepla; jsou úplně bez krevní zásoby; zánět kloubů





## 7. ORTHOPAEDICS

The branch of medicine that mostly deals with the musculoskeletal system is known as orthopaedics.
The speciality of orthopaedics as a branch of medicine is relatively young. In 1741 Nicholas Andy, the Professor of Medicine in Paris published a book *Orthopaedics, or the Art of Preventing and Correcting Deformities in Children* and coined the term from the words "orthos" (straight or free from deformities) and "pais" (child). He expressed the view that most deformities in adults have their origin in childhood.
The present science includes all ages and consists of the prevention, investigation, diagnosis and treatment of **disorders and injuries of the musculoskeletal system** by medical, surgical and psychical means and, in addition, the study of musculoskeletal physiology, pathology and other related basic science.
**Musculoskeletal deformities** are manifested by an abnormal form or shape of the affected limb or trunk. A deformity may be congenital (present at the time of birth) or it may be acquired during post-natal life. It is necessary to consider the type and causes of the deformity in various musculoskeletal structures and think of their correction together with the possible prevention.
In the diagnosis of the musculoskeletal disorders and injuries, the doctor should conduct the investigation in the following order:

1. Taking history (e.g. symptoms),
2. Physical examination (e.g. signs),
3. Radiographic examination (X-ray signs),
4. Laboratory examination (of various body fluids as well as of a specimen; or biopsy of the diseased tissue).

**Congenital abnormalities** are defined as those defects in development of the body form or function that are present at the time of birth. They may be caused by a variety of factors including genetic defects, environmental influences and a combination of the two (infection – rubella). They may be **localised** (as in a single club-foot) or **generalised** (fragile bones). All localised congenital abnormalities of the skeleton are a sort of manifestation of one or more of the various types of disturbances in its normal growth and development. For example a bone may fail to form entirely (aplasia), or it may fail to grow to a normal size (hypoplasis), or its growth may be abnormal (dysplasia), or it may overgrow (hypertrophy or