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HIP ANATOMY AND DESCRIPTION OF INFERIOR CONFORMATION OF THE FEMUR

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ABSTRACT. Anatomy represents a cornerstone in the field medical research. The human anatomy serves in the medical practice as a teaching science, it researching a unit, an entirety of forms which must be properly learned and understood in the sense and for the benefit of patient treatment, as well as for the benefit of the practical medicine.

Keywords: anatomy, hip, femur, bones

INTRODUCTION

Anatomy represents a cornerstone in the field medical research. The human anatomy serves in the medical practice as a teaching science, it researching a unit, an entirety of forms which must be properly learned and understood in the sense and for the benefit of patient treatment, as well as for the benefit of the practical medicine.

Historically, the anatomy has been described starting with the ancient Greeks: anatomy/ana = by and temnein = cutting. Anatomy's main study and investigation method is dissection. Several details of the human body have been described and discovered by dissection, details not known up to that respective moment.

The research and development degree and direction of the modern medical sciences and especially that of the practical medicine valorize today certain aspects of the anatomic underlayer where all the pathologic processes take place, requiring a differentiated knowledge of the various regions and organs.

This is the reason why the anatomic learning process must correspond to that respective reality. The anatomy learning process must include a great degree of general knowledge regarding the human body, with an in-depth study of the regions more frequently interested by the pathological processes and which are more often the subject of physician's intervention in the therapeutic medical practice. A detailed knowing of the descriptive and topographic anatomy notions is also important.

The history of knowledge regarding the construction of the human body is intermingled with the evolution of human anatomy's study methods, and especially that of dissection.

Before describing the musculoskeletal system, the anatomical position of the human body is an aspect which must be considered. The human's characteristic anatomical position is the vertical one, in orthostatism.

The anatomical position has the following image: orthostatism, lower limbs side by side, feet in a 90 degree angle, with heels side by side and opening towards the front, knees and hips in extension, upper limbs against the sides of the body, elbows in extension, forearms rotated towards the outside, palms and fingers pointing forward.

In what concerns the anatomical plans, there are three categories:

- frontal
- sagittal
- transversal.

As an entity, the "hip" is a part of the musculoskeletal system. The musculoskeletal system's main function is moving the body in space.

While studying the musculoskeletal system, there must be considered three main parts:

1. the osteology (derived from the Greek words osteon = bone and logos = science) is that part of the anatomy which studies bones.
2. the arthrology (derived from the Greek, arthron = joint and logos = science) is the part which studies the joints, the connections between the bones.
3. the myology (word derived from Greek, myos, mus = muscle and logos = science) is the part which studies the skeletal muscles.

The bones are rigid, hard organs, with various architecture and density, of white-yellowish color. All the bones in the body form the skeleton, and together with the joints, they represent the passive elements of the musculoskeletal system, which is geared by the muscles, which in their turn, are the active elements (Figure 1).

If we section various bones and examine them, we can assess the fact that the actual osseous substance is presented under two aspects:

- the compact substance
- the porous substance.

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The outer surface of the bones is lined by a membrane called periosteum, where many nerve endings can be found. The medullary canal is lined by a membrane called endosteum. The blood vessels, as well as the nerve fillets enter the bone by nutritive tunnels.

Anatomy of the hip region

The bones of the lower limb are divided into two groups:

1. lower limb ring, consisting in two hip bones
2. free limb:
   a. at the thigh: the femur and the patella
   b. at the shank: the tibia and the fibula
   c. at the foot: tarsal, metatarsal and phalange.

The femur

Is the longest bone in the body and single-handedly forms the skeleton of the thigh (Figure 2).

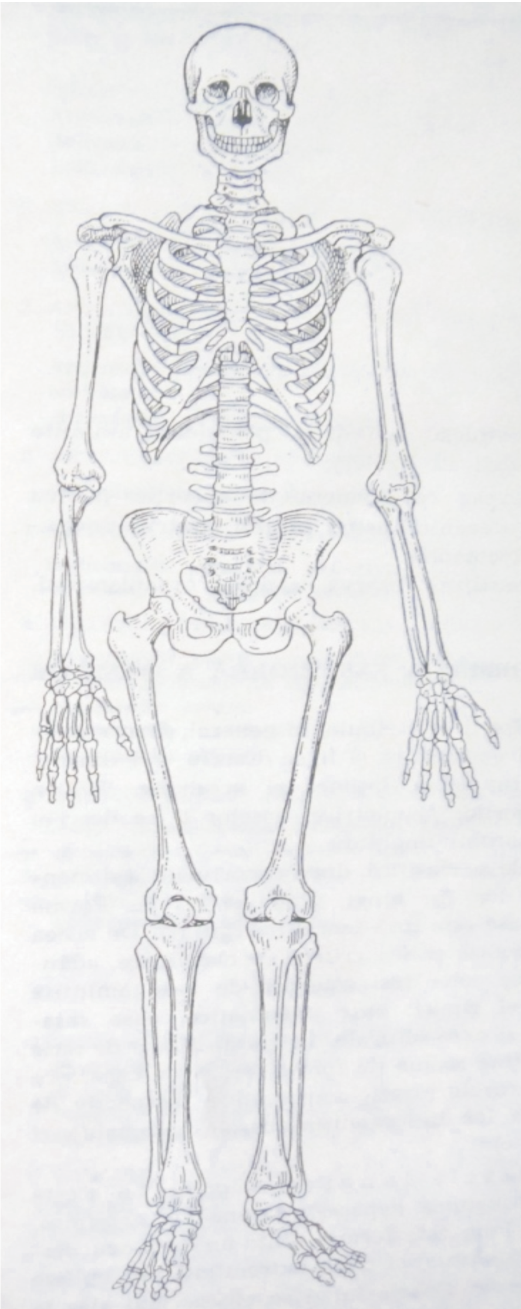

Fig. 1 The human skeleton, front view

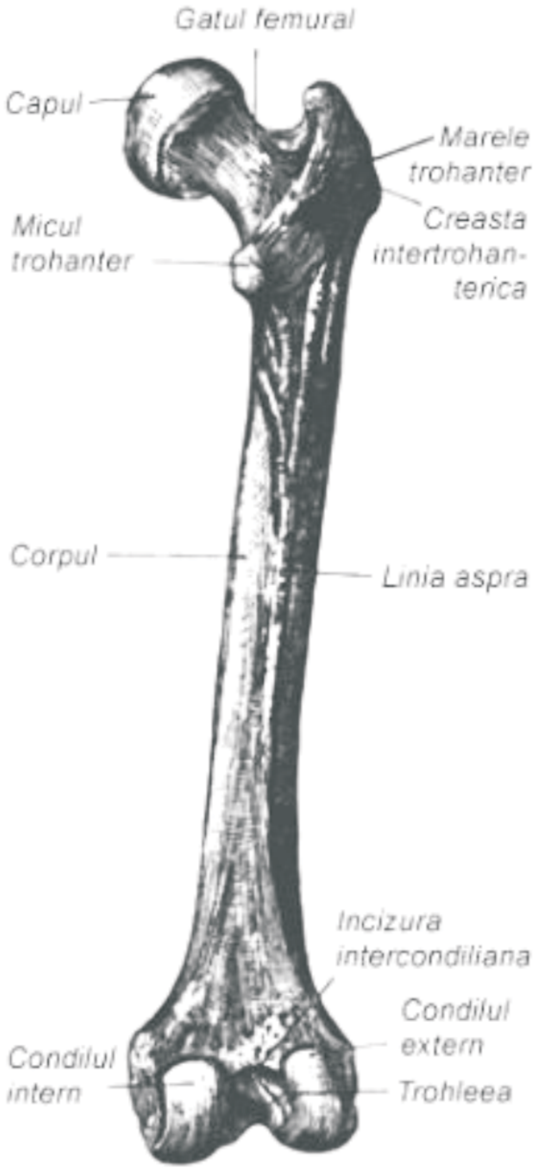

Fig. 2 Posterior view of the femur

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The inner conformation of a long bone clearly appears in a longitudinal section:

a. the body of the bone, consisting in a cylinder of compact osseous tissue, which is longitudinally pervaded by a central wide, central canal, called the medullary canal. The osseous tube is thicker in the diaphysis side. The medullary canal permeates in the epiphysis, but it progressively narrows due to some ogival lamellar systems. The medullary canal contains the bone marrow.

b.The extremities, the epiphyses of the long bone consist in a thin peripheral layer of compact osseous substance, covering a mass of porous substance. Its cavities communicate with the medullary canal thru a group of areole (Figure 3).

In time and as a result of body aging, the porous substance in the extremities is partially resorbed, and the medullary canal of the diaphysis is extended up to this level.

There is a strong connection between the arrangement of the osseous tissue and the functions performed by the bone. The diaphysis of long bones, by the presence of the medullary canal is lighter and stronger; therefore, overall, the long bones are more resistant and lighter.

To provide a comparison example, a hollow tube with very rigid walls is more resistant than a solid rod, made from the same quantity of material.

If we build two columns of equal length, one hollow and with a greater diameter and the other solid, but with a smaller diameter, from the same quantity of material, the first one shall be more resistant and more elastic than the second. Thus, the diaphysis of the long bones resists more easily to the forces acting upon it (traction and pressure).

In the case of the porous osseous substance, the facts are equally conclusive. This osseous substance can also be found where the osseous elements must have a greater volume: the epiphyses of the long bones by which they achieve large articular surfaces.

The osseous divisions, called spans, and the porous osseous substance lamellae are disposed in the plan of the pressure or traction forces which are exercised on the bone. They follow a direction equal to that of the forces that they suffer. Thus, they offer a maximum of resistance with a minimum of material.

The osseous trabeculae and lamellae belonging to the porous substance are materialized and identified with the isostatic lines by which the forces are transmitted inside the bones. Braus explained this mechanism using an eloquent example.

In the bones, the most important osseous lamellae are disposed in such a manner so that their surface is located on the plane of the forces and not perpendicularly on them, so that each would oppose a maximum resistance with a minimum material. The osseous spans in a bone can be continued with those of other neighboring bones, thus forming common systems. The osseous lamellae in the conformation of the bone shift, depending on the conditions of the bone and on the traction and pressure forces acting on it (Figure 4).

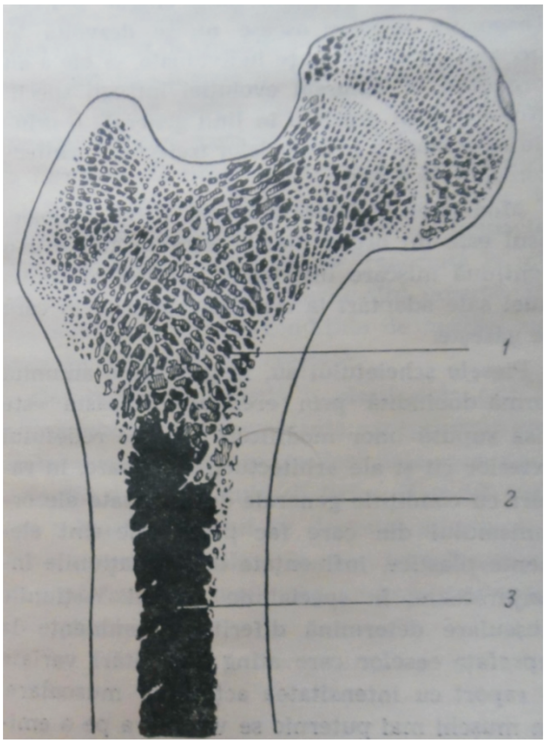

Fig. 3 Partial section thru a femoral epiphysis
1 - porous
2 diaphysary compact
3 medullary canal

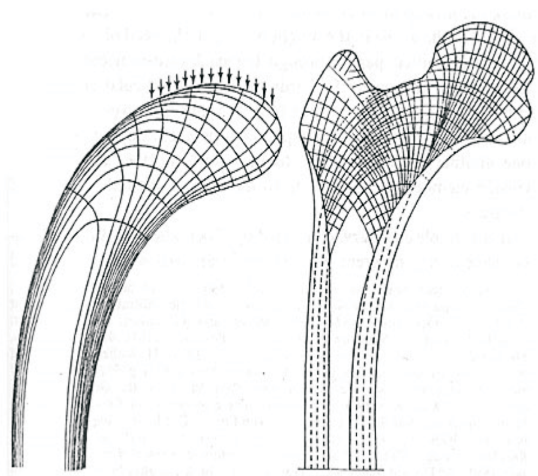

Fig. 4 Diagram of the trabeculae fascicles in the superior epiphysis of the femur

This is the proof of the adaptation of the living matter to biomechanical actions taking place in the body. From another point of view, the bone, regarded biologically, is a plastic organ in a continuous inner movement, result of its continuous adaptation to various conditions it withstands.

The bone also has an important property, which is represented by the capacity of healing its fractures by forming new osseous tissue, called *calus*.

The radiological aspect of bones, the image of their structure is modified in relationship with their working conditions, the increased functional strain producing a densification of the bone, and the reverse producing a rarefaction, with the gradual erasing of the internal architecture of the respective bones.

The periosteum is a fibrous membrane lining the entire outer surface of the bone, except the surfaces covered by articular cartilage and some muscular insertions. At the level of the joints, the periosteum is continued by an articular capsule and thus the entire skeleton is lined by a conjunctive fibrous sheath.

In the case of longer bones and especially in the case of the femur, the periosteum may be as thick as three millimeters. Its thickness also increases with age. The periosteum is very rich in vessels and nerves and is extremely important in the life of the bone.

Long bones are well vascularized by diaphysary nutrient arteries and by periosteal arteries. The arteries also have branches for the marrow and they also protrude in the Havers canals, and their ends reach the level of the epiphyses. Inside the bone, the vessels of the two systems become anastomotic (nutritive and periosteal), (Figure 5). The femur is obliquely located on the skeleton from overhand, and medial and laterally. The study of the femur includes its body and two epiphyses. Its body is lightly curved with a posterior concavity; it has three sides and three margins.

The superior epiphysis contains the femoral head, the anatomical neck and two tubercles the large and the small trochanter. The femoral head is articular and forms, together with the acetabular cavity by the ligament of the femoral head, a part of the hip joint.

Its anatomical neck is very strong and binds the femoral head to the rest of the bone. It is obliquely positioned from overhand, and medial and laterally, forming with the diaphysis de inclination angle measuring between 125 and 130 degrees. The increase of the angle determines abduction, thus coxa-valga, and the decrease determines adduction, thus coxa-vara.

In the physiopathology of the hip, its neck has a great importance, because it transmits the direction of the forces from the basin to the inferior free limb. With aging, more often than not, in this region may occur osseous fractures, generally severe and usually needing surgical intervention.

The large trochanter is a quadrilateral prong, continuing the femoral body upwards. The small trochanter is located on the posterior-inferior side of the neck. The inferior epiphysis consists in two articular hunches, called condyle (median and lateral).

Conclusions: The fact that anatomy must be well known by each physician, regardless their branch of profession, is a condition *sine qua non*, also representing a great help in treating various illnesses of the human body. The hip has a very important role in the musculoskeletal system. Generally, all the pathological disorders of the hip can be diagnosed by studying the X-rays. This permanently helps, by new X-ray investigation techniques, to discover a special pathology in various groups of disorders. The X-ray diagnosis is therefore a very important one in today's medicine.

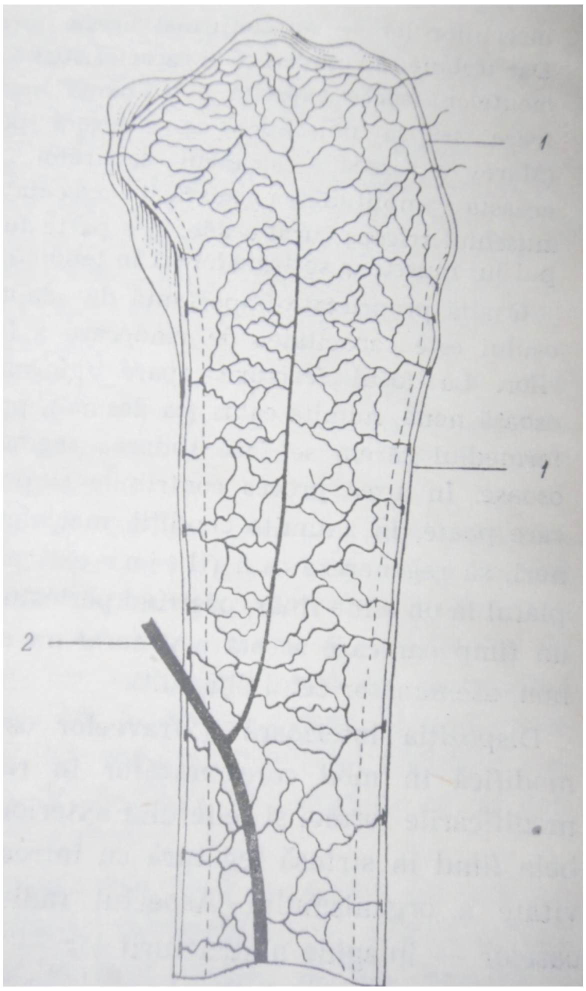

Fig. 5 Arteries of a long bone
1 - the periosteum crossed by
epiphysis and diaphysis arteries
2 - nutritive arteries of the bone, which fork in
the medullary canal and its branches are united
with the periosteal arteries at the surface of the bone

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