

**MUSCLES - PHYSIOLOGICAL CONSIDERATIONS
AND PATHOPATHOLOGY**

Olaru Mariana Luminița^{1*}, Matei Ioana-Cristiana²

¹ University of Craiova, Faculty of Horticulture, Biology and Engineering Department, A. I. Cuza Street,
No. 13, 200585, Craiova

² University of Craiova, Student, Faculty of Horticulture, Biology, A. I. Cuza
Street, No. 13, 200585, Craiova

* Correspondence author. E-mail: luminitaolaru@yahoo.com

Keywords: *muscular sistem, muscles, bones, hip joint, surgical interventions*

ABSTRACT

This paper emphasizes the emphasis of information on the indispensable importance of the muscular system among vertebrates. Thus, these aspects will be exemplified by the study of the relationship between the muscular system and the bone system, carried out by presenting several intraoperative and postoperative images, of a bone trauma.

INTRODUCTION

The science that deals with the study of muscles is called myology. Chemically, muscles are mostly water and dry matter. Dry matter is represented by proteins, carbohydrates, inorganic salts (calcium, chlorides, iron, magnesium, phosphorus, potassium and sodium), enzymes, fat globules, nitrogenous compounds (creatine, uric acid), non-nitrogenous compounds (lactic acid, glycogen).

Their number depends on a number of factors, so not all people have the same number of muscles. Some muscles can appear on one side of the body but not on the other (psoas minor), other muscles are completely absent in other people (palmaris longus). Different texts classify certain muscles as parts of a larger muscle, on the other hand, other texts classify the same type of muscle as a separate one such as in the case of flexor hallucis brevis and flexor digitorum brevis. Most consider their number to be 680 in all, and about 240 have separate names (Behnke 2012).

Skeletal muscle is one of three types of muscle in the human body (the other two are cardiac and smooth). They are the engines that enable the human body to move and perform physical tasks (Langford 2015).

Skeletal muscles in vertebrates are a variety of striated muscles under the control of the nervous system (Smith 2018).

The purpose of skeletal muscle is to generate force between two bones of the skeleton, allowing the animal to move. It is therefore under voluntary control, and its action is rapid and powerful (Kawai 2018).

In orthopedics and physiotherapy, the importance and knowledge of muscles and muscle groups, as well as their vasculature and innervation, is as great as that of the skeleton, because for surgical interventions and postoperative

recovery, knowledge of these aspects is essential to avoid damage and avoid complications both during and after surgery.

Kinesiology of the Musculoskeletal System and Fundamentals of Rehabilitation serves as a guide to kinesiology, focusing on the anatomical and biomechanical interactions within the musculoskeletal system (Neumann 2010).

It can be defined as the study of the principles of anatomy (active and passive structures), physiology and mechanics in relation to human movement. Structural kinesiology is the study of muscles, bones, and joints as they are involved in the science of movement. To a much lesser extent, certain physiological and mechanistic principles are addressed to improve the understanding of these structures (Floyd 2015).

To study kinesiology, or the science of muscle movement, requires a thorough knowledge of the hundreds of muscles and bones, as well as an understanding of the physical laws that act on the body (Dail et al. 2011).

MATERIAL AND METHODS

The paper will explain the importance of the muscular system in the optimal functioning of the bone system by presenting a case of surgical intervention for a right pertrochanteric fracture performed in the orthopedic department of the Emergency County Hospital in Târgoviște.

Thus, the 73-year-old patient C.E., who suffered a trauma following a domestic accident, ended up with a right pertrochanteric fracture. In order to cure the patient, an intervention was initiated to mount a prosthesis based on a DHS system, to fix the trochanteric fragments.

According to doctors, this is one of the most effective systems in these types of fractures, offering high resistance to the affected joint. Statistics say that these types of fractures are very common among women over the age of 60, as a result of domestic accidents resulting from knocks or falls.

In the following images, some brief stages of the surgical intervention and of the postoperative recovery carried out in the physiotherapy department are presented.

RESULTS AND DISCUSSIONS

In image 1, it can be seen the incision, made to start the intervention and how the surgeon uses spacers to easily manipulate the intergumentary layers, in order to expose the muscles. Being a deep section it can be seen how the vessels that irrigate the skin have been affected and produce a controlled hemorrhage.



Figure 1. Image of the incision

After stopping the bleeding and partially cleaning the blood, the fascia latta covering the tensor muscle of the fascia latta can be easily seen, which will have to be set aside to be able to perform the next steps of the operation.

As can be seen in image 2, the muscle fascia has a pearlescent color and is superficial to the epimysium, which is a covering over the bundles that make up the muscle.



Figure 2. Removal of the superficial muscle bundles

It can also be seen how the surgeon uses forceps to separate the superficial muscle bundles to expose the deep muscles and finally to reach the proximal epiphysis of the femur for placement of the DHS prosthesis assembly.

After mounting the prosthesis at the level of the coxofemoral joint, the incision must be closed and sutured so that the wound can begin to heal. After the muscular structures have been properly repositioned, the suture of the wound can be started, first thing being the superficial fascia that was sectioned and then the 3 integumentary layers, as can be seen in images 3, 4.



Figure 3. Wound closure



Figure 4. Bandaging the patient

At the end of the intervention, the patient is bandaged and sent to the physical therapy department where, from the day after the operation, recovery can begin with the help of motor exercises.

On the second day, the patient is examined before starting recovery exercises, in order to identify possible postoperative complications. After the examination, the physical therapy session can begin.

The first step, as can be seen in image 5, is flexion of the lower limb, a basic and simple movement to avoid reopening the wound. Flexion is performed while the patient is lying supine on the bed and is assisted and guided by the physical therapist throughout the session.

Flexion represents the approach of the anterior femur to the anterior pelvis in the sagittal plane, acting on the iliopsoas, pectineus, rectus femoris and sartorius muscles.



Figure 5. Flexion movement of the right lower limb

In picture 6, the leg remains raised for a few seconds to keep the muscles in tension, then let it relax back to the initial position.

The next movement is the abduction of the limb in image 7, which represents a lateral movement of the femur with respect to the median axis in the frontal plane. This movement works on the gluteus medius, gluteus minimus, external rotator and tensor fascia lata muscles.

After performing the abduction, the patient, also in the supine position and with the leg in a lateral position, performs an adduction movement as can be seen in image 8, which acts on the 4 muscles: adductor brevis, adductor magnus,

adductor longus and gracilis, in frontal plane through the proximity of the femur to the median axis.
All these movements will be repeated regularly, during several weeks until the patient is completely cured.



Figure 6. Flexion of the right lower limb



Figure 7. Abduction of the right lower limb



Figure 8. Adduction of the right lower limb

CONCLUSIONS

As it emerges from personal research on the impact that the muscular system has in orthopedics and physical therapy, the importance of a healthy and toned skeletal muscular system can be seen in the prevention of fractures. It is also very easy to assume that the influence of age is a very important factor, thus elderly people are prone to much more serious and frequent fractures in contrast to a younger person who is implicitly more active, resulting in greater muscle tone. Muscle tone also has an important role in the prevention of fractures, due to the denser and stronger structure of the muscle fibers that, subject to a shock, can mitigate the impact and implicitly avoid a fracture. At the same time, a more active muscle leads to an increase in blood pressure, which improves the supply of nutrients and oxygen reaching the bones, thus resulting in the stimulation of osteosynthesis, increasing bone strength.

REFERENCES

- Behnke R.S. 2012. Kinetic Anatomy. Indiana State: Editura Human Kinetics. Pp.12
- Dail N.W., Agnew T.A., Floyd R.T. 2011. Kinesiology for Manual Therapies. New York: Edit. MC Graw Hill. Pp. 2
- Floyd R.T. 2015. Manual of structural kinesiology. New York: Editura McGraw-Hill Education pp.1
- Kawai M. 2018. Biomechanics, Muscle Fibers, and How to Interface Experimental Apparatus to a Computer. Cham: Editura Springer. Pp.34
- Langford K. 2015. Anatomy 101 From Muscle And Bones To Organs And Systems, Your Guide To How The Human Body Works. Massachusetts: Editura Adamsmedia. Pp. 79
- Neumann D.A. 2010. Kinesiology of the musculoskeletal system: Foundations for Rehabilitation. St. Louis: Editura Mosby Elsevier pp. 3
- Smith D.A. 2018. The Sliding-Filament Theory of Muscle Contraction. Cham: Editura Springer. Pp. 9.