

APPLICATIONS OF ULTRASOUND EXAMINATIONS IN THE DIAGNOSIS AND MONITORING OF PATIENTS WITH TRAUMATIC MUSCULOSKELETAL INJURIES

IULIU MOLDOVAN¹, TUDOR SORIN POP², KLARA BRÂNZANIUC³, ALEXANDRA MIHAELA DOBRA⁴, SIMONA MUREȘAN⁵

¹“Dr. Eugen Nicoară” Town Hospital Reghin, ^{2,3,5}University of Medicine and Pharmacy Tîrgu-Mureș, ⁴County Clinical Emergency Hospital Tîrgu-Mureș

Keywords:
musculoskeletal
ultrasound, muscle
injuries, ankle,
shoulder, knee

Abstract: The need for a higher diagnostic accuracy over time imposed several imaging techniques. Increased accessibility and lack of radiation are some of the advantages that helped ultrasound examination to extend its applications in the field of musculo-articular pathology. This study aimed to establish musculoskeletal pathology encountered in a group of patients with sports injuries, which addressed to Nova Vita Rehabilitation Center from Tîrgu-Mureș, in January 2012 - December 2012. In our study group, that consists of 189 subjects, most exposed joints injuries in order of frequency were: knee, shoulder and ankle. The most frequent knee pathology was the collateral ligament sprain, in the shoulder were recorded the largest number of lesions in spraspinosus tendon, while ankle was characterized by an increased number of disturbances in the anterior talo-fibular ligament. The study of muscle injuries by location and degree of damage revealed most frequent lesions in the lower limb. Though ultrasound allows an accurate description of post-traumatic injuries and their staging according to the time factor, it requires a multidisciplinary approach to each case (sonographer – orthopedic - rehabilitation doctor), knowledge sharing and tracking protocols for each lesion and treatment, in order to achieve therapeutic success.

Cuvinte cheie:
ecografie musculo-
scheletală, leziuni
musculare, gleznă,
umăr, genunchi

Rezumat: Necesitatea elaborării unui diagnostic cu acuratețe ridicată a impus de-a lungul timpului mai multe tehnici imagistice. Accesibilitatea crescută și lipsa iradierii reprezintă câteva dintre avantajele prin care ecografia și-a extins aplicațiile în domeniul patologiei musculo-articulare. Studiul de față și-a propus stabilirea patologiei musculo-scheletale întâlnite la un lot de pacienți cu traumatisme sportive, care s-au adresat Centrului Medical de Recuperare Nova Vita Tg. Mureș, în intervalul ianuarie 2012 - decembrie 2012. În lotul alcătuit din 189 de subiecți, articulațiile cele mai expuse traumelor au fost în ordinea frecvențelor: genunchiul, umărul și glezna. Din patologia genunchiului se remarcă frecvența mai crescută a leziunilor de tip entorsă prin lezare de ligamente colaterale, la nivelul umărului s-au înregistrat cele mai numeroase leziuni la nivelul tendonului mușchiului supraspinos, în timp ce glezna a fost caracterizată de un număr crescut de afectări ale ligamentului talo-fibular anterior. Studiul leziunilor musculare funcție de localizare și grad de afectare fibrilară a relevat afectarea predilectă a membrului inferior. Deși ecografia permite o descriere exactă a leziunilor și stadializarea lor funcție de factorul timp, se impune totuși o abordare multidisciplinară a fiecărui caz (ecografist-ortoped-medec de recuperare), cunoașterea în comun a protocoalelor de urmărire și tratament pentru fiecare leziune, pentru a obține succes terapeutic.

INTRODUCTION

Musculo-skeletal injuries represent a common pathology for both athletes and the general population. A correct and complex diagnosis, as early is possible, represents the basic element for obtaining a rapid treatment and a complete functional recovery.

Besides conventional imaging examinations practiced until now (radiography, computed tomography, magnetic resonance), encumbered by various disadvantages (high cost, radiation), it is necessary today as a diagnostic alternative, the musculo-skeletal echographic examination. Using ultrasound to obtain images, echography is characterized by the absence of irradiation, being applicable to all categories of patients. Examination is accessible, anytime repeatable and the only technique that allows a dynamic examination of the lesion

Musculo-skeletal ultrasound examination, practiced with modern devices, allows obtaining very detailed images, able to present information about anatomical structures such as skin, subcutaneous tissue, muscles and tendons, vessels and nerves, bone surfaces, components of joint (cartilage, meniscus, capsule, ligaments). Regardless of the injured area (shoulder, elbow, knee, ankle etc.) with ultrasound we can identify the presence of collections (intra-articular, bursitis, hematomas etc.), the degree of muscle injuries, ligament involved in trauma (inflammation- tendonitis, fibrillar lesions) or describe the appearance of the articular cartilage. A complete musculo-skeletal ultrasound report is a very useful tool for various medical specialties such as orthopedics, rehabilitation medicine, general surgery, as it is able to provide information about: injuries, its spatial location, all morphological, structural and

¹Corresponding author: Tudor Sorin Pop, Str. Ghe. Marinescu, Nr. 38, Tîrgu-Mureș, România, E-mail: sorintpop@yahoo.com, Tel: +0744 527023
Article received on 27.05.2013 and accepted for publication on 01.08.2013
ACTA MEDICA TRANSILVANICA September 2013;2(3):309-311

CLINICAL ASPECTS

dimensional characteristics and the rapport to adjacent anatomical structures.

PURPOSE

This study aimed to establish musculoskeletal pathology encountered in a group of patients with sports injuries, which addressed to Nova Vita Rehabilitation Centre from Tîrgu-Mureş, in January 2012 - December 2012.

METHODS

This study included a sample of 209 patients examined by ultrasound in Nova Vita Medical Rehabilitation Centre from Tîrgu-Mureş, in the period January 2012 - December 2012. Are part of this group only subjects who presented musculoskeletal trauma (acute or chronic) and which were subsequently monitored by The Department of Rehabilitation in our Medical Centre. After an initial complete clinical exam, patients were advised to perform an ultrasound examination of the affected anatomical region (joint, muscle mass). This was done with an multifunctional ultrasound -GE LOGIQ 7, using high-frequency linear probe of 9-15 MHz. Imaging assessment protocol provided serial examinations for muscular lesions (on days 1, 3, 7 from presentation), while the peri-articular injuries (ligament pathology, bursitis) were examined at diagnosis, followed by reassessment correlated with the transition to a higher stage in the recovery program. New alarm symptoms (pain, redness, swelling) was the criterion for a further reevaluation of the subject.

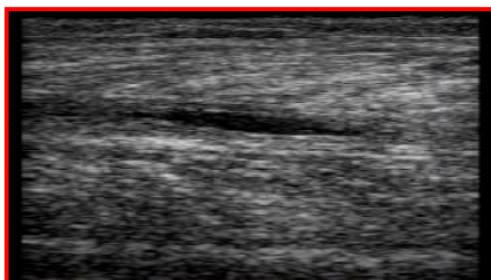
RESULTS

From all 209 patients included in the study, 51 subjects presented muscle injuries (grade I- fibrillar lesions, grade II - hematoma surprised in various stages of organization and grade III - with complete muscle discontinuity). Various locations and the classification of muscular pathology according to the degree, are described in table no. 1.

Table no. 1. Classification of muscle injuries, I, II and III degree according to their location

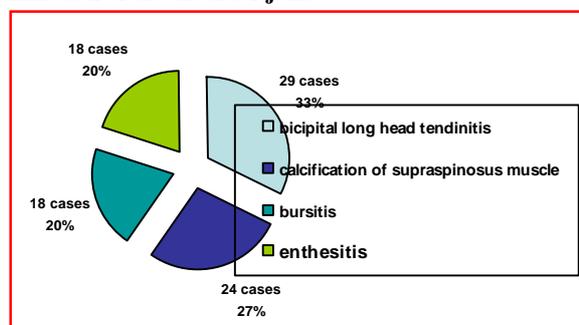
The location of muscular lesion	Muscle injuries grade I (number of patients)	Muscle injuries grade II (number of patients)	Muscle injuries grade III (number of patients)	Total number of patients
M. biceps femoris	7	2	1	10
M. gastrocnemius (medial și lateral)	3	2	1	6
M. tibialis anterior	0	1	0	1
M. adductor longus	9	4	1	14
M. semitendinosus	2	3	0	5
M. soleus	7	1	1	9
M. rectus femoris	2	1	0	3
M. pectineus	2	0	1	3
Total no. of patients	32	14	5	51

Figure no. 1. Ultrasound image – lesion of biceps femoris muscle



Shoulder joint proved to be a frequent location for sports injuries. Along with muscle injuries, ultrasound described the existence of various pathologies: calcifying tendinopathy of supraspinatus muscle, enthesitis, bursitis, tendinitis of bicipital long head (figure no. 2).

Figure no. 2. Types of injuries described by ultrasound examination of the shoulder joint



The knee is a frequently joint exposed to trauma, but also easy to be explored with the ultrasound technique. Examination of collateral ligaments allowed us a correct classification of degrees of sprain and the view of the patellar tendon identified the existence of fibrillar lesions or tendinitis. (figures no. 3,4).

Figure no. 3. Types of lesions described by the ultrasound examination at the level of the knee joint

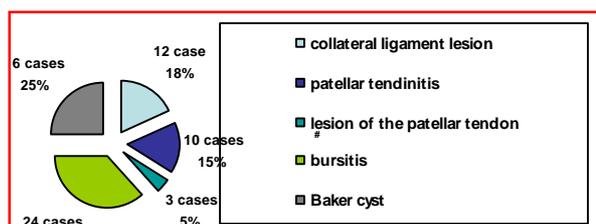
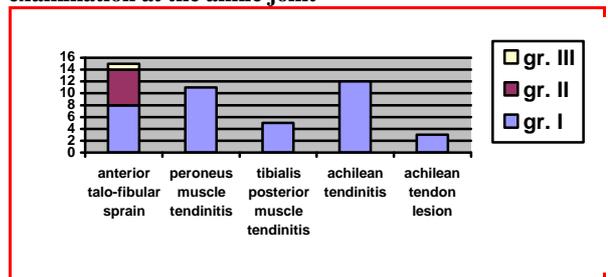


Figure no. 4. Ultrasound image - lateral meniscus



Ankle injuries were also the subject of our study. The echography allowed us to visualize ligaments, the achilean tendon and various adjacent muscles (figures no. 5, 6).

Figure no. 5. Types of injuries described by ultrasound examination at the ankle joint



CLINICAL ASPECTS

Figure no. 6. Ultrasound image – anterior talofibular ligament sprain



DISCUSSIONS

The need for a higher diagnostic accuracy over time imposed several imaging techniques. Increased accessibility and lack of radiation are some of the advantages that made ultrasound to extend its applications in the field of musculo-articular pathology. All new high frequency transducers allow currently examinations of peri-articular structures and superficial muscle.(1,2) This study aimed to establish musculoskeletal pathology encountered in a group of patients with sports injuries, which addressed to a Medical Centre of Rehabilitation with increased addressability. According to literature studies, joints exposed most to trauma in, order of frequency, are: knee, shoulder and ankle.(3) From the knee pathology, an increased frequency presented collateral ligament sprain (18%), followed by injuries or inflammation of the patellar tendon. Bursitis or Baker cyst, although frequently described in the reports, were only semiological elements associated at basic lesions. Ultrasound examination of the shoulder revealed extensive pathology in the supraspinatus tendon. The majority of fibrillar lesions (acute or chronic) were associated with pre-existing calcification in the tendon. Overuse during the sports-specific training (volleyball, handball, gymnastics), with secondary local ischemia may be a valid explanation for this situation.(4)

Ultrasound used to assess ankle sprains, allowed us an accurate examination of talofibular ligament damages. Associated with this type of trauma patients often had peroneal tendonitis muscle. The achilean tendon also proved to be a facile area to be scanned by ultrasound, capable to revealed any diffuse inflammatory process (tendonitis) or fibrillar lesions.(5) We have to remark that all achilean tendon lesions from the study group presented the third degree and they required specific surgical treatment

We paid attention separately in isolated muscle pathology, classification of lesions being performed both depending of the muscle location and its extent. According with the literature, the most common injuries were found in the biceps femoris muscle and adductor longus muscle.(6) The majority of lesions were grade I (62%), but 10% of patients had grade III injuries, all with favourite locations in the lower limbs. Evaluation of injuries using a protocol (day 1,3,7), followed by the examination of muscle damaged area at the end of therapy, allowed to the patients to return safely to sports activity ,without record any early relapse in the studied group.(7)

CONCLUSIONS

1. Musculo-skeletal ultrasound examination is accessible, anytime repeatable and able to offer a dynamic examination of the lesion.
2. The most approachable joints in terms of exploration by ultrasound, often involved in traumatic pathology are: shoulder, knee, ankle.

3. Ultrasound examination allows precise classification and staging of all muscle injuries, also according with the factor time.
4. A multidisciplinary approach to each case (sonographer – orthopedic - rehabilitation doctor), knowledge sharing and tracking protocols for each lesion and treatment is the key for obtaining a therapeutic success.
5. The complexity of ultrasound images, the variety of injuries and their location, requires from the doctor an extensive experience and make the musculoskeletal ultrasound one technique applicable only in medical centres with high addressability (medical centres with departments of orthopaedics, traumathology and rehabilitation department).

REFERENCES

1. Fodor D. Ecografie clinica musculo-scheletală, Editura Medicală, București; 2009.
2. Bianchi S, Martinoli C. Ultrasound of the Musculoskeletal System, Springer Berlin Heidelberg, NY, ISBN. 2007;987-3-540-4227-9.
3. Armfield DR, Hyun-Min Kim D, Towers JD, Bradley, JP., Robertson DD. Sports-Related Muscle Injury in the Lower Extremity , Clin Sports Med, 2006;25:803-842.
4. Iannotti JP, Ciccone J, Buss DD, Visotsky JL, Mascha E, Cotman K, Rawool NM. Accuracy of office-based ultrasonography of the shoulder for the diagnosis of rotator cuff tears, J Bone Joint Surg Am. 2005 Jun;87(6):1305-11.
5. Arts IM, Pillen S, Schelhaas HJ, Overeem S, Zwarts MJ. Normal values for quantitative muscle ultrasonography in adults, Muscle Nerve. 2010;41:32-41.
6. Koh ES, McNally EG. Ultrasound of skeletal muscle injury, Semin Musculoskelet Radiol. 2007 Jun;11(2):162-73.
7. Pillen S. Skeletal muscle ultrasound, European Journal Translational Myology. 2010;1(4):145-155.