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

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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-Mureş, 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 sprospinous 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.

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 an 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 appearance of the articular cartilage. A complete 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- tendinitis, 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 functional aspects of the lesion.
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 Târgu-Mureș, in January 2012 - December 2012.

**METHODS**

This study included a sample of 209 patients examined by ultrasound in Nova Vita Medical Rehabilitation Centre from Târgu-Mureș, 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>
<thead>
<tr>
<th>The location of muscular lesion</th>
<th>Muscle injuries grade I (number of patients)</th>
<th>Muscle injuries grade II (number of patients)</th>
<th>Muscle injuries grade III (number of patients)</th>
<th>Total number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. biceps femoris</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>M. gastrocnemius (medial și lateral)</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>6</td>
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<td>1</td>
<td>0</td>
<td>1</td>
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<td>4</td>
<td>1</td>
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</tr>
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<td>M. semitendinosus</td>
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<td>3</td>
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<td>5</td>
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<tr>
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<td>1</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>M. rectus femoris</td>
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<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>M. pectineus</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total no. of patients</td>
<td>32</td>
<td>14</td>
<td>5</td>
<td>51</td>
</tr>
</tbody>
</table>

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

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. 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

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
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, traumatology and rehabilitation department).

**REFERENCES**