

Ultrasound imaging: An asset in sports medicine.

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Abstract

Ultrasound imaging is used by physiotherapist in various purposes such as research, diagnosis and for other clinical purposes. It increases the scope for physical therapy field. Ultrasound imaging is more reliable than other diagnostic tool hence, is more preferred by practitioners. In last 20 years, the use of ultrasound imaging has been drastically increased with the technical advances in the diagnosis and management of sports injuries. The real-time efficiency in ultrasound imaging shows unique evaluation in dynamic states that helps in identifying pathology which is demonstrated when patient performs certain movements. It is rapidly developing area of sports medicine that has proved its importance in all aspects.

Keywords: Ultrasound, Sport medicine, Diagnosis and sport injury.

Introduction

Ultrasonography is a portable device which is useful to diagnose sport injury at the spot. It is a medical technique that uses high frequency sound waves to capture live images from the inside of your body [1,2]. US is helpful in providing a degree of physiological assessment. Ultrasonography assesses the acute and chronic tendon conditions such as tendon synovitis, tendinopathy and tears and helps to diagnose cause of pain and swelling. It is the most frequently utilized technique in sports medicine.

The advancement of technology is so effective that it improves the sensitivity of the diagnostic tool. Due to this improvement in the musculoskeletal field, ultrasonography help to measure bone density, help to detect the pinched nerves; abnormal growth and even tumors. Soft tissues such as ligaments, tendons, muscles, capsule etc. can be observed easily by the help of ultrasound imaging. In spite of being successful diagnostic tool for foetus so no graph, it is a fortune in sports medicine as well and hence it is used as a first line approach.

Ultrasound imaging manifest many advantages such as:

- Less expensive
- Less ionizing radiation exposure, as it uses sound waves
- Gives real time feedback to both patient and therapist

- Faster diagnosis
- Immediate treatment planning
- Portable technology

In sports injury, the most affected region is lower limb, which includes acute and chronic conditions. The severity of acute and /or chronic muscle injuries can be graded with ultrasonography, therefore, it is an aid for sports medicine specialists to visualize structure & also the function [1,2].

E.g. If patient says his/her arm or leg hurts while doing movements in a certain way, therapist and patient both can actually watch what's happening with the soft tissues while in motion. In this article, the efficacy of ultrasound imaging in sports medicine will be reviewed. The ultrasonography in sports medicine will be briefly discussed.

Purpose of writing the article

The purpose of writing this review article is to make people aware about the use of ultrasonography in musculoskeletal injuries and its diagnostic and clinical interventions.

Application of ultrasound imaging or scanning to the muscle injury in the field of sports medicine

10-55% of muscle injury is common in sports medicine. US provide compatible resolution to visualize the normal and injured structures. As it is available on the field, it is very easy

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to assess the severity and extent of injury. Muscle Injuries is classified into 3 degrees:

1° = muscle injury is subtle and loss of muscle function is insignificant

2° = Partial muscle tear.

3° = full thickness rupture of the muscle & loss of function can be significant [3].

This grading of muscle injuries is important in determining the treatment planning rehabilitation. Repetitive sonographer helps in better understanding the process of healing. Ideal time to perform sonographer is 2-48 hour after injury [3] as at that time hematoma gets more hypo echoic. It helps in examining the post-injury complications. As ultrasound imaging provides information about healing of muscle injuries, it helps the physicians to determine the appropriate timing for returning back in sports hence, it is very helpful in elite athletes. Hernia and recurrent seromas are easily visible in dynamic examination with active muscle contraction. Due to muscle injury contusion occurs which can be seen as a focal loss of normal muscle fibrillar architecture under the ultrasound imaging [4].

Application of ultrasound imaging or scanning to the tendon injury in the field of sports medicine

Ultrasound imaging plays a crucial role in evaluation of tendon injury. By using ultrasound imaging, we can depict the detailed intratendinous pathology and the fluid around the tendon or in the tendon sheath. With the colour Doppler techniques, the hyper vascularity suggests active inflammation of the lesion which is an aid for the physician to advice the patient to help. To deal with such tendinopathy ultrasound- guided injection of sclerosant or platelet rich plasma may be used. For tendon lesion, the standard examination is dynamic views as it provides information of its interaction with surrounding tissues. E.g., active or passive abduction of the shoulder may reveal impingement of an abnormal rotator cuff or bursa by the coracoacromial arch. Ultrasound guidance injections are recommended practically for sports injuries. Tendon injuries are divided up into acute and overuse injuries.

- **Acute injuries:** occurs suddenly from a specific force.
- **Overuse injuries:** cause by repetitive micro trauma over a period of time [4].

Under the ultrasound imaging, overuse injuries are seen as an increased vascularity, hypo echoic oedematous tissue, synovitis and the possible small tears.

Application of ultrasound imaging or scanning to the ligament injuries in the field of sports medicines

In sports injuries, 25% ankle sprain is common. The image of injury under ultrasound imaging appears usually as a hypo echoic due to anisotropy effect. To examine the superficial ligaments, ultrasound imaging gives good visualization. With the help of ultrasound scanning or imaging, we can easily assess the ligament integrity and joint stability. By the help of high frequency transducer, tiny ligaments of the hand and

the wrist can be characterized. To know the pathologies of the repetitive tear of the ligaments such as ulnar collateral ligament, static and dynamic imaging or scanning can be demonstrated and it also demonstrates the stability of the joint. Swelling or rupture of the ligament (seen in game keeper's thumb or skier's thumb) readily detected with ultrasonography. While performing static ultrasonography its sensitivity is only 66% but it can be improved to 89% when performed dynamically [5,6].

For example, dynamic ultrasonography of tibio fibular joint in ankle sprain shows instability of this joint. During an acute anterior cruciate ligament, hematoma is found around its insertion ultrasonography shows the indirect evidence for an acute rupture of anterior cruciate ligament.

Application of ultrasound imaging or scanning to the bursa injuries in the field of sports medicines

As the normal bursa contains small amount of liquid, in ultrasound imaging it appears as an anechoic layer. If ultrasonography shows the surrounding hypervascularity then it indicates an acute inflammatory status. The common bursa injuries are subacromial – subdeltoid bursitis at the shoulder, olecranon bursitis at the elbow, etc. Ultrasound - guided injection (for example, intrabursal steroid injection) is recommended.

Application of ultrasound imaging or scanning to the bony structures in the field of sports medicines

Under the ultrasound imaging, bony surfaces are clearly demonstrated. Multiplanar ultrasound imaging provides more detailed evaluation in minimally displaced fractures [7].

Application of ultrasound imaging or scanning to the subcutaneous tissue in the field of sports medicines

The lesion which occurs in subcutaneous tissues is “More – Lavalles lesion. It is a fluid – filling gaps in the cutis with possible internal fat droplets. And it can be readily seen in ultrasound imaging Fat necrosis or fat degeneration which turns into hard lump can be easily assessed under ultrasound scanning and it also provides information for a treatment plan.

Diagnostic ultrasound imaging

It consists of examination of the effects of injury, lesion or disease on joint surfaces and solid visceral organs [8,9] Health – care professionals can use ultrasound scanning as a point – of – care application.

Interventional ultrasound imaging

It involves using gray – scale brightness – mode (b – mode) ultrasound for safely guidance of ‘dry’ and ‘wet’ needling. Ultrasound - guided injection and needling shows to be more efficacious. Ultrasound – guided dry needling for acupuncture, trigger point release, percutaneous electrolysis. Variety of invasive intervention includes injection or aspiration [10-12].

Research ultrasound imaging

Ultrasonography is used as a clinical and applied research that helps to inform physical therapist practices. For example,

ultrasound has been used to improve our better understanding of the pathology of pain, swelling and to determine the specific treatment planning and it also provides in enhancing motor learning. Ultrasound – based imaging interventions helps in insertion of intramuscular electromyography electrodes into muscles that are small and deep.

Conclusion

Ultrasound imaging is an effective technique in the field of sports medicines as it can be used in both monitoring and diagnosing the lower and upper limbs sporting injuries. It can be used as a real – time contact with the patient Ultrasonography is also used in targeted injections and it is a portable technique, due to this advancement we can perform ultrasound scanning at the sporting venue, thus it helps in speedy diagnosing and treatment planning. In sports injuries, ultrasound imaging is the first – line and handy tool for intervention of sports injuries. As the dynamic examination is most important to analyse function, ultrasound scanning helps in managing rehabilitation and hence control healing Due to this advancement, physician should start using ultrasound imaging especially those physicians who are treating athletes. It can be used as tailor–made management. Doppler techniques provide high–resolution imaging of muscles, tendons, ligaments, bursa and all the structures in sport injuries which is very helpful for the therapist/physicians as ultrasound uses sound waves, so it allows for prolonged and repeated exposure as needed. As the patient can also see the image at the same time; it increases the patient satisfaction. So concluding, practicing the ultrasound imaging in sports injury is an asset for practitioners on - field as well as off – field.

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