RI-S01

Ultrasound Guided Intervention for MSK Pain

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Chronic pain from musculoskeletal origin is one of the most common reasons for patients seeking for medical care. Ultrasound guided intervention might provide more targeted treatment while decrease systemic side effects.

In this short talk, we will briefly introduce essential techniques of ultrasound guided intervention for common musculoskeletal origin chronic pain including low back pain originated from sacroiliac joint and facet joint, shoulder, knee and hip pain intervention.

Compared to conventional steroid injection, regenerative injection therapy (RIT) gained more and more attention in recent years, especially in degenerative process. Some basic concept of RIT will also be covered in this talk.

RI-S02

Application of Musculoskeletal Ultrasound in Myositis: An Update

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1. Idiopathic inflammatory myopathies (IIMs) include dermatomyositis, polymyositis, overlap myositis, myositis of the antisynthetase syndrome, necrotizing autoimmune myositis, inclusion body myositis, and drug-induced myositis, etc.
2. Ultrasound is emerging as a promising tool for the assessment of muscle pathology, as described below.
3. General ultrasound scanning characteristics
   a. Greyscale and Doppler parameters for the ultrasound assessment of myositis, including architecture, echogenicity, thickness, and vascularity.
   b. Stages of myositis.
   c. Fascial thickness.
   d. Elasticity.
   e. Validity and reliability.
4. Dynamic methods
   a. Fasciculation: twitches of small parts of the muscle with a defined duration.
   b. Elasticity: strain elastography and shear-wave elastography.
5. Limitations
   a. Lack of protocol standardization for the variables.
   b. Criterion validity, reliability, discrimination and feasibility of quantitative methods

References:

1. Paramalingam S, Morgan K, Becce F, Diederichsen LP, Ikeda K, Mandl P, et al. Conventional ultrasound and elastography as imaging outcome tools in autoimmune myositis: A systematic review by the OMERACT ultrasound group. Semin Arthritis Rheum 2021; 51: 661-676.
2. Di Matteo A, Smerilli G, Cipolletta E, Salaffi F, De Angelis R, Di Carlo M, et al. Imaging of Joint and Soft Tissue Involvement in Systemic Lupus Erythematosus. Curr Rheumatol Rep 2021; 23: 73.

RI-S04

Advance in Doppler Imaging for Rheumatoid Arthritis

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Doppler ultrasound detects the change of frequency between the emitted and the reflecting waves on a moving objective, like red blood cells or contrast, in order to calculate the blood flow velocity and direction. As vasodilatation and angiogenesis are major characteristics of inflamed soft tissues,

Doppler ultrasound is suitable for assessment of such hyperemic conditions. Two types of Doppler are available: power Doppler and Color Doppler. The former is more sensitive to detect small flows without information of directions, and is more widely used in assessing soft tissue inflammation. Power Doppler scoring with OMERACT criteria for evaluation of rheumatoid arthritis and peripheral spondyloarthropathy disease activity is promising, and actually, help physicians to make a better therapeutic decision. Recently, two advances in Doppler ultrasound have been developed: Superb microvascular imaging (SMI) and ultrafast Doppler. SMI uses a specific clutter filtering algorithm to remove tissue signals without diminishing the signal of slow blood flows. Ultrafast Doppler uses high-frame rate plane waves to detect the motion of red blood cells and singular value decomposition clutter filtering to remove tissue signals. Both SMI and ultrafast Doppler are able to detect more small and slow blood flows than conventional Doppler. The diagnostic performance of SMI, ultrafast Doppler and conventional Doppler will be discussed.

RI-S04

Update in Psoriatic Arthritis Ultrasound

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Psoriatic arthritis (PsA) is a chronic inflammatory disease with heterogenous domain, involving synovium, enthesis of peripheral and axial skeleton, skin, and tendon. Clinical assessment by ultrasound provides a convenient, low-cost, and sensitive option for making treatment decision. Recent research on enthesopathy, regarded as the major etiology of PsA, has improved better understanding on the disease pathogenesis and progression. Ultrasound-detected enthesitis is associated with progression to PsA in psoriasis patients. Moreover, several clinical scoring tools were developed and validated in different domains of PsA group, such as 5 targets Power Doppler for Psoriatic disease (5TDP) for synovitis, DACTylitis glObal Sonographic score in PsA (DACTOS) for dactylitis. Previous enthesitis score may potentially overestimate disease activity in fibromyalgia patients, and a preliminary enthesitis score developed by GRAPPA may help for differentiation. Ultrasound is a powerful tool for assessing early signs of PsA with a comprehensive evaluation of involved structures. This speech aims to introduce the sonographic structures of PsA in different parts and provide new information of recent advances in clinical practice.

RI-P01

Bone Enhancement Algorithm for Ultrasound Image of Rheumatoid Arthritis: A New Technique for Assessment of Bone Erosion

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Background: Bone erosion is a major feature of rheumatoid arthritis (RA) which could be assessed by ultrasonography. However, the bone contour may not be well visualized in medium and large joints due to attenuation of ultrasound wave relate to the depth of bone. The purpose of this study is to develop a bone enhancement (BE) algorithm for better visualization of erosion, and to clarify if this technique would distort the erosion.

Methods: The BE algorithm included horizontal grey level compensation, bone segmentation, binary image, and image fusion. Fourteen ultrasound images (9 wrists, 4 elbows, 1 MCP joint) were collected from 7 RA patients. The

original images were converted to BE images using BE algorithm in Matlab environment. Bone erosion size was measured on both original and BE images by an experienced rheumatologist.

Results: Twenty bone erosions were identified on both original and BE images. The erosion size was 2.11±1.04 mm (range 0.55-4.09) on original images, and 2.09±1.03 mm (range 0.55-3.85) in BE images (p=0.96). For each erosion lesion, the error in erosion size was calculated with the erosion size on original image as gold standard. The median of errors was -0.75% (range -10.03% to +9.97%, interquartile range -5.95% to +3.99%) for BE images.

Conclusion: BE image provided a clear visualization of bone contour and help to identify erosions. It had acceptable errors in erosion size measurement and did not distort the erosions.