GEN-S01

Interventional Ultrasound Application in Musculoskeletal System

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Ultrasonography (US) of musculoskeletal system has become popular in recent years. This can be partly attributed to the advances in technology that have improved image resolution, allowing accurate delineation of anatomic structures and pathologic conditions. Additionally, trends toward medical cost reduction have made musculoskeletal US an attractive alternative to the other more expensive imaging methods, such as magnetic resonance (MR) imaging. A high frequency transducer is capable of producing high resolution images but is only able to penetrate the soft tissues for a short distance. Most superficial structures are imaged with 7 to 10 MHz transducers while deeper structures such as the hip and psoas muscle require 3.5-5 MHz transducer. US is also an effective modality to guide intervention in multiple regions of musculoskeletal system. The real-time capabilities of US allow rapid and multiplanar approaches to lesions, and color Doppler US enables detection of vascular regions, aiding in precise needle placement. To apply this technique on musculoskeletal interventional procedure including pain control, we should be familiar to the normal anatomy of muscle, tendon, peripheral nerve and enthesis.

The tendon is made of fascicles, with an interfascicular membrane separating the fascicles into bundles which calls epitenon. Tendon usually present as linear parallel echogenic lines in longitudinal section. The normal nerve trunk is surrounded by the epineurium, which present as echogenic bold lines, consisted of multiple fascicles which are consisted of multiple nerve fibers. Each neural fascicle which present as hypoechoic is surrounded by thin concentric layer of connective tissue forming the echogenic perineurium. The characteristics of reticular pattern (rounded hypoechoic areas surrounded by echogenic lines) make it easily to differentiate from surrounding hypoechoic muscles in the perpendicular sound beam. The nerve structure is very similar to the tendon. Therefore, it also has apparently anisotropy effect and resulted in poorly defined the nerve in non-perpendicular section.

This topic will demonstrate the application of US guided interventional procedure in MSK, including aspiration, biopsy, and drug injection in upper limb and lower limb and trunk.

GEN-S02

Application of US in Breast Intervention

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In this lecture. I will introduce 2nd look ultrasound for clinical problem solving, lesion identification for suspicious findings in mammography and MRI, ultrasound guided aspiration, biopsy, vacuum assisted biopsy, ultrasound guided pretreatment localization with marker clips, wires or patent blue dye injection. Using case presentation for each utility of ultrasound in breast intervention.

GEN-S03

Application of US in Ablation of Hepatic Tumors

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RFA is a recommended treatment option for early stage and very early HCC that falls within Milan criteria. The use of fusion imaging guidance can improve the technical feasibility of percutaneous RFA compared to traditional B-mode US guidance.

This process involves the registration of a reference CT/MRI image to the US equipment being used for the procedure. Anatomic landmarks are then selected on both the real-time US and the reference CT/MRI, followed by the marking of the targeted tumor on the reference image. The location of the tumor on the real-time working US can be visualized immediately in the corresponding location. Compared to B-mode US alone, real-time US-CT/MR fusion significantly improves the visibility of tumors as well as the operator's confidence in the procedure's feasibility. This fusion imaging technique can improve the feasibility of RFA for HCCs that are not visible on traditional US. In fact, 53.3% of HCCs that were previously invisible on conventional ultrasound were successfully ablated using fusion imaging guidance. Additionally, fusion imaging using US/EOB-MRI is more sensitive than conventional sonography or contrast-enhanced sonography for detecting HCCs, especially small or atypical ones. Finally, the absence of an ablative margin of at least 5 mm significantly correlated with local tumor progression. Gas bubbles are strong scatters and intraoperative feedback of ablation zone measurements. Changes in the backscattered energy (CBE) may assist in the estimation of ultrasound temperature. CBE method was developed for noninvasive thermometry due to the temperature dependence of CBE is explained by thermal effects on the scatterers' backscatter coefficients. RFA-induced gas bubbles may be used as natural contrast agents in CBE to tissue-air interfaces due to their large difference in acoustic impedance.

GEN-S04

Application of US in Ablation of Head & Neck Tumors

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Ultrasound of the head and neck has been developed for many years, but most of them stay in the routine imaging examination and tissue sampling. In the past 20 years, due to the development of appropriate thermal ablation machines, head and neck ablation therapy has sprung up like mushrooms. From the treatment of benign thyroid nodules to the metastatic tumors, hyperparathyroidism, low risk thyroid cancer, parotid gland benign tumors and other benign vascular tumor which provide patients with a safe and effective alternative treatment without scars for head and neck neoplasm.