

The Clinical Utility of Ultrasound Histogram Analysis in Tissue Characterization of Structures in and Around the Shoulder Joint

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ABSTRACT

The aim of the present study is to explore the usefulness of histogram values in ultrasound tissue characterization of structure in and around shoulder joint. Since the physical examination was unable to differentiate rotator cuff tendinosis from tear, impingement from partial or full thickness tear, shoulder ultrasound was performed with histogram values. 149 patients with shoulder pain were screened by ultrasound and histogram analysis. The study was done at Sri Ramachandra Medical College and Research Institute, Sri Ramachandra University, Porur, Chennai, Tamil Nadu, India. Only the patients with shoulder pain and clinically suspected shoulder pathology were included in the study. Patients with obvious fracture or dislocation of shoulder were excluded. Clinical signs were demonstrated in 92 men (59%), 57 women (41%) in the age group of 11-68 years with the mean age of 35.74 + 11.18 years. The duration of shoulder pain was less than 24 months. The following histogram values were obtained: total area 3500-3700; adjacent retracted tendon 1100-1250; adjacent muscle, 600-900; subdeltoid haematoma, 900-1100; glenohumeral joint, 300-350; calcified tendonitis, 61-140; subdeltoid bursal fluid, 20-30 and bicipital groove fluid 10-20. Calcific tendonitis histogram graph is biphasic. All other areas the graph is monophasic. Histogram values and the histogram graph were significant. Quantitative ultrasound histogram analysis in tissue characterization of structures in and around the shoulder joint are of great help in guiding the clinician towards patient management, partial tear of rotator cuff muscles and tendons and to characterize fluid in bursa around shoulder joint.

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Compared to other cross-sectional modalities like CT scan and MRI, high resolution ultrasound has several advantages such as ready accessibility, portability, quick scan time, better patient tolerability and the ability to perform dynamic evaluation of high resolution ultrasound that use no radiation and is non invasive (Bryant *et al.*, 2002) The dynamic, real-time nature of sonography requires personal interaction with the patient, often resulting in a more directed examination specific for each individual (Chaubal, 2007).

Ultrasonographic evaluation of the rotator cuff was first described in 1979 and subsequently was used to detect shoulder joint effusions (Brandt *et al.*, 1989). The use of ultrasonography as an imaging modality has become widely spread because of its ability to visualize major joints and surroundings structures with no deleterious effects. The main limitation for ultrasound is its inherent inability to visualize air-containing or bony structures. This limitation does not apply for structure such

as muscles, tendon, bursae, soft tissues and blood vessels (Walach *et al.*, 1986).

Diseases of the rotator cuff muscles are taken seriously because of their vital importance. Visual criteria for diagnosing partial tear of the rotator cuff muscle are in general confusing and highly subjective. Visual examination of these images does not produce conclusive diagnosis. Therefore, physicians may resort to invasive methods such as arthroscopy. Although this technique is considered to be the golden test for diagnosis in terms of accuracy, it has the disadvantage of being invasive (Bryant *et al.*, 2002). To solve these problems in diagnosis, ultrasound tissue characterization done by gray level brightness mode histogram values. Good results have been reported for the thyroid, breast and liver and fetal lung maturity (Prakash *et al.*, 2002).

Therefore, in the present study tissue characterization in and around shoulder joint was carried out using ultrasound histogram analysis and the significance was statistically

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