Dynamic Musculoskeletal Sonography

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***Abstract**:Sonography is increasingly being used for diagnosing a large number of musculoskeletal disorders. Its multiple advantages include low cost, accessibility, portability and non-invasiveness. But perhaps, it the unique capabilities of real time imaging and dynamic evaluation which give it a distinct edge over other diagnostic modalities. This dynamic capability is particularly useful in musculoskeletal imaging as some disorders of muscle, tendons, joints and nerves are better –or sometimes- only seen dynamically when the affected extremity is in motion. Further, the ability for the patient to provide an immediate feedback to the examiner can increase the specificity of any finding in correlation to a stated complaint. In this article the authors illustrate some of the musculoskeletal disorders which can be diagnosed on dynamic sonography.*

INTRODUCTION

Sonography is a useful technique for imaging a large variety of musculoskeletal disorders. Its advantages of low cost, availability, non-invasiveness and multiplanar capabilities are well known. In addition, recent advancements such as high resolution probes, power doppler sonography, extended field of view imaging and compound imaging have further expanded its clinical applications. One of the most important diagnostic advantages over other techniques is its real-time capability, allowing for dynamic evaluation. This real-time imaging nature of sonography is of particular interest as some disorders of muscles, tendons, nerves and joints are best or only demonstrated dynamically, that is, during motion of extremity, muscle contraction, passive movement of part or probe compression. With the increasing popularity of musculoskeletal imaging, a increasing number of applications of dynamic ultrasound are being discovered. In this article we illustrate a wide variety of musculoskeletal disorders that can be diagnosed with dynamic sonography.

DYNAMIC SONOGRAPHY OF TENDON DISORDERS SHOULDER IMPINGEMENT SYNDROME (SIS)

This syndrome is the result of chronic irritation of the supraspinatus tendon against the undersurface of the anterior one third of the acromion, the coracoacromial ligament, and the acromioclavicular joint. It is often difficult to diagnose because the clinical presentation may be confusing and clinical tests lack specificity.

MRI is a reliable technique for the evaluation of the rotator cuff tendons, but it provides only a static evaluation of the shoulder joint. In some conditions like impingement, patient has symptoms during performing a particular movement and may be asymptomatic at rest. Dynamic sonography is an ideal diagnostic tool as it can provide direct visualization of the relationships between the anterior one third of the acromion, subacromial bursa, supraspinatus tendon, and greater tuberosity of the humeral head during active shoulder motion [1]. In addition, sonography has proved useful in the diagnosis of rotator cuff tears, rotator cuff tendinosis, calcific tendinosis, and subacromial bursitis which are known to be associated with impingement.

Technique: The patient is sitting on a stool. A high resolution linear probe is put in a coronal plane over the acromion. Arm is abducted passively and the smooth movement of the rotator cuff tendon passing beneath the acromion and coraco-acromial ligament in the subacromial space is observed in real time (Fig 1). Repeat the arm movement in forward flexion. The signs of impingement are:

- Bunching or cogwheel hesitation of rotator cuff during the movement of the arm with reproduction of the shoulder pain (Fig 2).
- Gradual distention of subacromio-subdeltoid (SASD) bursa.

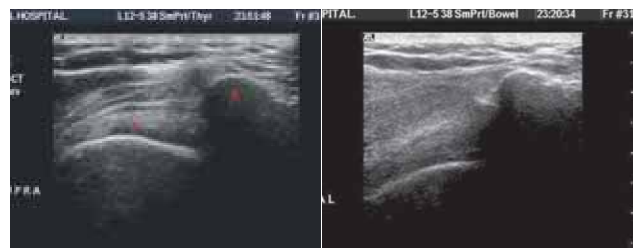

***Fig 1** Normal dynamic overhead abduction: Coronal sonogram at the start (a) and end (b) of dynamic maneuver showing complete passage of tendon (T) under the acromian (A).*

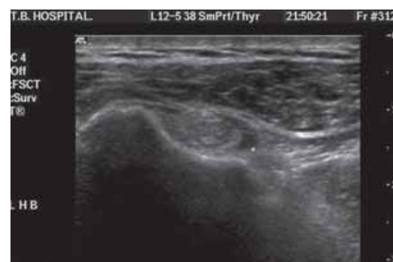

***Fig 2** Moderate shoulder impingement: Coronal sonogram showing bunching of tendon and subdeltoid-subacromian bursa under the aromian*

The patient is not allowed to rotate the gleno-humeral joint internally or externally while abducting or forward flexing as this "trick" maneuver may avoid impingement.

This dynamic evaluation may be used to **classify the severity of shoulder impingement syndrome**[2]. In **mild impingement**, there are no objective sonographic findings of impingement during shoulder motion; however, correlation exists between passage of the tendon under the acromion and painful symptoms. With **moderate impingement**, there is accumulation of subacromial–subdeltoid bursal synovium or fluid lateral to the acromion. The supraspinatus tendon may catch on the acromion (ratchet motion). With **severe impingement**, there is superior migration of the humeral head and the tendon bunches up or bulges laterully because the greater tuberosity cannot glide under the acromial acoustic shadow.

ADHESIVE CAPSULITIS OF SHOULDER (AC)

AC is a clinical condition of progressive pain and decreased passive and active range of motion of the glenohumeral joint. There are no universally accepted clinical criteria for the diagnosis of adhesive capsulitis, it essentially

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