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a core concepts musculoskeletal group newsletter



Use of real-time ultrasound imaging in the rehabilitation of spinal muscles

Retraining of the core muscles in spinal rehabilitation is now widely accepted as beneficial in the management of low back pain. The inhibition and the loss of control of the Multifidus and Transversus Abdominus as a result of low back injury do not recover spontaneously (Hides et al, 1996; Hodges and Richardson, 1996) and require specific exercises in stimulating their recovery (O'Sullivan, 2000). The use of real time ultrasound imaging facilitates this process by accurately diagnosing poor motor pattern and accelerates motor learning through instant visual feedback (Hides et al 1998). This article discusses the rationale and benefits of the use of real time ultrasound imaging (RTUI).



Figure 1: Assessing Activation of Multifidus

Ultrasound imaging is widely used by medical professionals. In the field of musculoskeletal medicine one of the more common uses of ultrasound imaging is to determine the presence, location and the severity of muscle lesions, especially tendon tears. The reason why ultrasound techniques are so useful in evaluating rotator cuffs, achilles tendon and patella tendon is that dynamic evaluations can be performed. It is this fact that ultrasound can capture moving structures in real time that physiotherapists find RTUI attractive as we can assess specific muscle activation and control in functional movements. It can also be used as a feedback tool during muscle activation.

Ultrasound imaging serves two main purposes in rehabilitation. The first is to measure muscle size, assessing atrophy and hypertrophy, second and more recent application is to assess abdominal and pelvic floor muscles contraction under sub-maximal and functional loading. The benefits of the use of RTUI compared to conventional methods for the latter has been documented (Kernode, 2004).

Why the need for RTUI?

The primary stabilizing muscles that require retraining after an episode of low back pain are the Transversus Abdominus, Multifidus and Pelvic floor. These muscles function together to create a stable back hence reducing functional instability. It is through the rehabilitation of these specific muscles that recurrences in low back pain can be reduced.

Transversus Abdominus, Multifidus and pelvic floor muscles are deep muscles. As they are stabilizers, their muscle activation is not overt as seen with the Rectus Abdominus or the Obliques. This makes it difficult to assess the quality and quantity of the activation.

Currently, two indirect methods are used in evaluating Transversus Abdominus activation. The first uses a pressure biofeedback placed under the lumbar spine to detect a change in pressure. This change in pressure indicates movement in the lumbar spine which reflects the activation of the flexors, i.e. Rectus Abdominus, Internal and External Obliques, or lumbar spine extensors. Hence the assumption in this method of assessment is based on a lack of movement in the lumbar spine equating to Transversus Abdominus activation. Unfortunately, this assumption is flawed as co-contracting all the flexors and extensors will also prevent movement, locking down the spine.

The second method used, is through palpation of the tensioning of the deep fibres of the abdominal wall. Similarly, assessment of Multifidus activation,

segmental Multifidus is palpated as the patient attempts a slow, gentle and subtle contraction. However, considerable clinical skill is required to interpret different strategies adopted by low back pain patients who have difficulty activating the Multifidus and Transversus in this way. Therefore, RTUI is advantageous as it allows instant visualization of the contraction which is useful for both evaluation and facilitation of these muscles. It can also be used to observe unwanted activation of the superficial muscles.

Benefits of RTUI for the patient

- Allow patient to learn how an isolated contraction of the muscles really feels like when properly performed
- Allow patient to objectively monitor his progress
- Improve muscle proprioception so patient can feel when his tonic hold is lost with functional activity
- Motivate patient to exercise (Kermode 2004)

Benefits of RTUI for the physiotherapist

- Enhance the physiotherapist's ability to assess the true function of the stabilizing muscles more precisely than with manual palpation
- Allow the physiotherapist to assess more accurately the relative activity of Transversus Abdominus and the superficial muscle Internal Oblique
- Enhance the physiotherapist's ability to progress Transversus Abdominus and Multifidus contraction into different functional positions while ensuring independent activity between abdominal muscle groups is maintained
- Allow more precise exercise regimes to be implemented taking into account of muscle fatigue, specificity of muscle action and repetition (before tonic hold of Transversus Abdominus and Multifidus is lost)

As the benefits of RTUI become more

apparent to both therapists and patients, Core Concepts Physiotherapy Group has now invested in a real time ultrasound machine so as to continue to provide quality evidence based rehabilitation to our clients.

Real time ultrasound imaging has great potential in improving the quality and accuracy of treatment in physiotherapy. However, the skill of the therapist using the ultrasound machine is essential for the images on the screen to be interpreted accurately. RTUI is an extension of our manual physiotherapy skills and hence must be used as an adjunct to assess-

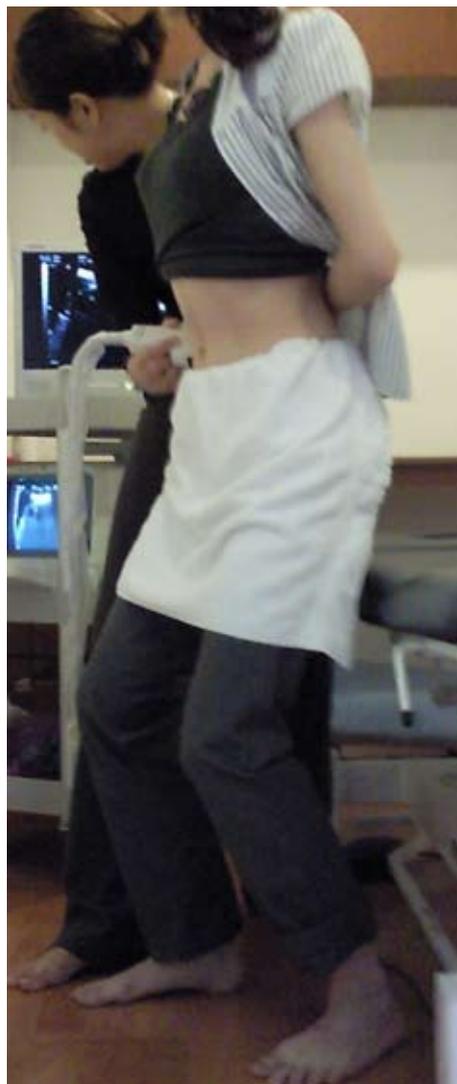


Figure 3: Assessing activation of Transversus Abdominus in a functional position - sit to stand



Figure 2: Assessing activation of Transversus Abdominus

ment and treatment and cannot replace good clinical reasoning and skill.

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