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Concord Sport & Spine Physiotherapy

## Real-time Ultrasound

Real-time ultrasound has been used in physiotherapy over the past two decades. Its popularity stems from the fact that it is a safe imaging technique, and one that is able to be used to visualize tissues at the time of treatment. Diagnostic ultrasound uses high-frequency sound waves, which travel through soft-tissues of the body, and bounce back to a receiver. The image is immediately relayed to a screen, which shows the tissue layers under the ultrasound probe.

In physiotherapy, this form of ultrasound is used mostly to assist with 'core' muscle training. Most of these muscles are deep and difficult to feel or see from the outside. When teaching the patient to activate these core muscles, ultrasound gives immediate feedback to the therapist and patient. This helps the patient to know whether the exercises are being done correctly.

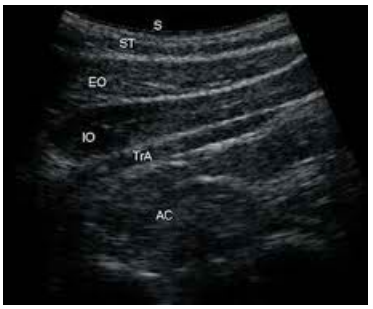
The therapist generally looks for two things during ultrasound muscle training:

(a) Effective muscle contraction. This is determined by observing the degree to which the muscle increases in thickness, or decreases in length. It is also possible to determine if other muscles are overworking to compensate for the weak target muscle.

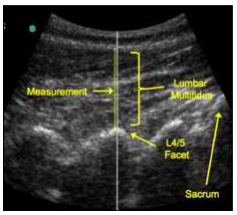
(b) Endurance capacity. One of the important functions of healthy core muscles is that they can be activated at a low level, and for prolonged periods of time. The therapist will usually test endurance by measuring the ability of the muscle to sustain the contraction (often for 10 seconds), and to do this repeatedly (normally 10 or more times).

Some of the important core muscles which are commonly trained with real-time ultrasound include:

1. **Transversus abdominis (TA)**. This is the deepest of the abdominal muscles, and the most important one for spinal stability. Unlike the other abdominal muscles, its fibres run transversely across the abdomen, creating a 'corset' effect when they contract. They are impossible to feel under the other muscles (and a variable layer of fat). Ultrasound images this muscle very clearly.



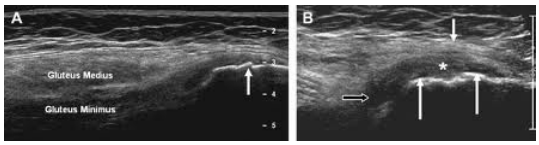

2. **Lumbar multifidus**. These are the deepest *extensor* muscles, and are situated just off-centre and deep in our lower back and sacroiliac regions. They are vitally important to stability between the different spinal levels. Multifidus quickly becomes weak when there is low back pain or injury. They also




stop working properly when we sit slumped for too long. Assistance is often needed to get them working correctly again. Contracting multifidus can be felt with the fingers, but it is also easy to cheat and use other low back muscles without getting an effective multifidus contraction. Ultrasound helps to determine how effective the attempted contraction is.

3. **The pelvic floor**. 
The anterior pelvic floor muscles form the bottom layer of our lumbopelvic core. Research has shown that pelvic floor activation assists TA contraction, and vise versa. Dysfunction in these muscles is common in people with back problems, and in at least 50% of patients with gynecological or urological problems. Ultrasound can help with training of these muscles, by visualizing the bladder during a contraction. The shape of the bladder during the exercise tells the therapist whether the muscles are working correctly.
4. **Hip stabilizing muscles**. These include:
   (a) The deep hip rotators: These are the 
‘rotator cuff of the hip’. They are important for helping us to be stable when our weight is on one leg. They also assist with balancing forces within the hip to ensure the joint is not under stress. Retraining the deep hip rotators is important for people with biomechanical lumbopelvic and hip problems, as well as diseases of the hip. Some of the common complaints related to poor hip control include running related back and hip pain, ‘*trochanteric bursitis’*, anterior knee pain, shin splints, stress fractures, and ‘heel spurs’.

   (b) Gluteus medius & minimus. These muscles on the outside of the hip work with the deep hip rotators to keep us stable when our weight is on one side. They frequently become weak, and this contributes to the same conditions listed above. Most notably, weak ‘gluts’ are often associated with the ‘Trendelenburg gait’, where weight shifts excessively to one side when walking. This problem is extremely common.




   (c) Deep hip flexors. These muscles assist in hip stability, and in combination with the above muscles ensure that support is provided on all sides of the hip. Ultrasound can also be used to confirm a diagnosis of *anterior snapping hip*, which is common and often problematic in dancers. 

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Concord Sport & Spine Physiotherapy
202 Concord Road
Concord West, NSW 2138
Sydney, Australia.
**Ph (02) 97361092**