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The role of ultrasound imaging in rehabilitation of the abdominal and lumbar paraspinal muscles

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Abstract

Physiotherapists working in the field of obstetrics and gynaecology will be familiar with ultrasound imaging (USI) of the pelvic floor muscles (PFMs) and bladder. Interaction between the PFMs, anterolateral abdominal and lumbar paraspinal muscles, and the diaphragm modulate intra-abdominal pressure and spinal stiffness, as well as movement ability, breathing and continence. Similarly, conditions affecting the lumbopelvic region, such as back pain, can impair the activity of all muscle groups, and therefore, it may be useful to consider all relevant muscles. Ultrasound imaging has been used extensively to study the abdominal and paraspinal muscles. The specific use of USI by physiotherapists has been termed rehabilitative USI (RUSI). When used for research purposes, the validity and reliability of an imaging technique are crucial. Systematic reviews have reported that ultrasound has an acceptable level of reliability for imaging various skeletal muscle groups, including the abdominal and paraspinal muscles. The validation of USI against magnetic resonance imaging and electromyography has also been demonstrated. Selective impairment of the lumbar multifidus and transversus abdominis muscles has been well described in the literature, as demonstrated by reduced resting muscle thickness and decreased change in thickness during contraction. Ultrasound imaging has shown that changes in the abdominal muscles during pregnancy include the rectus abdominis becoming thinner and wider, as well as widening of the inter-recti distance. These changes reverse postpartum, but the muscles have not returned to normal at 12 months. In terms of functional capacity and the risk of back pain, the implications of incomplete recovery postpartum require investigation, as do the appropriate rehabilitation exercises to promote recovery. The RUSI technique is also used as a biofeedback tool to aid rehabilitation, and there is evidence that motor control relearning is more effective when patients can see their muscles contracting on a screen than without visual feedback. Assessing or rehabilitating one muscle or group in isolation may not be effective. Therefore, RUSI of the abdominal and lumbar paraspinal muscles, as well as the PFMs, may be a useful adjunct to rehabilitation in pelvic obstetric and gynaecological physiotherapy.

Keywords: abdominal muscles, paraspinal muscles, physiotherapy, rehabilitation, ultrasound imaging.

Editor's note: For a review of ultrasound imaging, please see Whittaker & Stokes (2011), published in the *Journal of Orthopaedic and Sports Physical Therapy*. This publication is openly accessible online: <http://www.jospt.org/doi/pdf/10.2519/jospt.2011.3682>

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Reference

Whittaker J. L. & Stokes M. (2011) Ultrasound imaging and muscle function. *Journal of Orthopaedic and Sports Physical Therapy* 41 (8), 572–580.

Maria Stokes is Professor of Musculoskeletal Rehabilitation and Head of Active Living Technologies Research in the University of Southampton's Faculty of Health Sciences. She has a background in physiotherapy, and gained

a PhD in neuromuscular physiology from Nuffield Department of Orthopaedic Surgery, University of Oxford, Oxford, UK. Maria leads the Southampton arm of the Arthritis Research UK Centre for Sport, Exercise and Osteoarthritis. Her research focuses on active living and healthy ageing, and she studies participants across the spectrum from elite sports to frail older people. Her research themes include: (1) understanding the mechanisms of musculoskeletal function

to inform exercise programmes; (2) sustaining lifelong physical activity; and (3) developing and evaluating assessment tools, including rehabilitative USI of muscle, and measuring the mechanical properties of muscle using mechanomyography and Myoton technology. Maria's work with USI includes exploring various muscles to develop protocols for measuring their size and shape, and establishing the reliability and validity of this imaging technique.