The Relation Between the Transversus Abdominis Muscles, Sacroiliac Joint Mechanics, and Low Back Pain

Carolyn A. Richardson, PhD*; Chris J. Snijders, PhD†; Julie A. Hides, PhD‡; Léonie Damen, MSc†§; Martijn S. Pas, MSc†; Joop Storm, BSc†

From the *Department of Physiotherapy, University of Queensland, Australia, the †Department of Biomedical Physics and Technology, Erasmus University Rotterdam, the Netherlands, the ‡Department of Physiotherapy, Mater Misericordiae Hospital, Brisbane, Australia, and the §Institute of Rehabilitation, University Hospital Rotterdam, the Netherlands.

SPINE 2002;27:399-405

Study Design. Two abdominal muscle patterns were tested in the same group of individuals, and their effects were compared in relation to sacroiliac joint laxity. One pattern was contraction of the transversus abdominis, independently of the other abdominals; the other was a bracing action that used all the lateral abdominal muscles.

Objectives. To demonstrate the biomechanical effect of the exercise for the transversus abdominis known to be effective in low back pain.

Summary of Background Data. Drawing in the abdominal wall is a specific exercise for the transversus abdominis muscle (in cocontraction with the multifidus), which is used in the treatment of back pain. Clinical effectiveness has been demonstrated to be a reduction of 3-year recurrence from 75% to 35%. To the authors’ best knowledge, there is not yet in vivo proof of the biomechanical effect of this specific exercise. This study of a biomechanical model on the mechanics of the sacroiliac joint, however, predicted a significant effect of transversus abdominis muscle force.

Methods. Thirteen healthy individuals who could perform the test patterns were included. Sacroiliac joint laxity values were recorded with study participants in the prone position during the two abdominal muscle patterns. The values were recorded by means of Doppler imaging of vibrations. Simultaneous electromyographic recordings and ultrasound imaging were used to verify the two muscle patterns.

Results. The range of sacroiliac joint laxity values observed in this study was comparable with levels found in earlier studies of healthy individuals. These values decreased significantly in all individuals during both muscle patterns (P < 0.001). The independent transversus abdominis contraction decreased sacroiliac joint laxity (or rather increased sacroiliac joint stiffness) to a significantly greater degree than the general abdominal exercise pattern (P < 0.0260).

Conclusions. Contraction of the transversus abdominis significantly decreases the laxity of the sacroiliac joint. This decrease in laxity is larger than that caused by a bracing action using all the lateral abdominal muscles. These findings are in line with the authors’ biomechanical model predictions and support the use of independent transversus abdominis contractions for the treatment of low back pain.