

Case Study

Effects of individual strengthening exercises for the stabilization muscles on the nutation torque of the sacroiliac joint in a sedentary worker with nonspecific sacroiliac joint pain

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Abstract. [Purpose] We investigated the effects of individual strengthening exercises for the stabilization muscles on the nutation torque of the sacroiliac joint in a sedentary worker with nonspecific sacroiliac joint pain. [Subject] A 36-year-old female complained of pain in the sacroiliac joints. [Methods] The subject performed individual strengthening exercises for the stabilization muscles for nutation torque of the sacroiliac joint for 3 weeks. Pain-provocation tests and visual analog scale (VAS) scores were evaluated before and after the exercises. [Results] After performing the individual strengthening exercises for the erector spinae, rectus abdominis, and biceps femoris muscles for 3 weeks, the subject displayed no pain in the pain provocation tests, and the VAS score was 2/10. [Conclusion] The individual strengthening exercises for the stabilization muscles of the sacroiliac joint performed in the present study appear to be effective for sedentary workers with sacroiliac joint pain.

Key words: Nutation torque, Pain provocation tests, Sacroiliac joint stabilization

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INTRODUCTION

The sacroiliac joint is a diarthrodial joint with a fibrous capsule that contains synovial fluid, the sacral and iliac surfaces being covered with hyaline and fibrocartilage, which have a rough and coarse texture due to physiological adaptation to stress¹⁾. The sacroiliac joint, which is also a modified synarthrodial joint, displays an age-dependent increase in roughness and coarseness on the articular surface, which is also an adaptation to increased weight associated with physical maturity²⁾. Adaptive changes in muscle length, which become evident when an individual muscle does not perform a complete range of motion on a daily basis, may in turn trigger habitual forward-head and slumped-sitting postures in sedentary workers³⁾. Yoo and Kim⁴⁾ reported that a comfortable seat might induce greater pelvic posterior tilting, which could in turn decrease lumbar lordosis. Pelvic posterior tilting could produce a counternutation torque in the sacroiliac joint⁵⁾. The erector spinae, rectus abdominis, and biceps femoris could produce the nutation torque necessary for sacroiliac joint stability⁶⁾. Therefore, we investigated the effects of individual strengthening exercises for the stabiliza-

tion muscles on nutation torque of the sacroiliac joint in a sedentary worker with nonspecific sacroiliac joint pain.

SUBJECTS AND METHODS

A 36-year-old female complained of pain in the medial areas of the right gluteus and sacroiliac joints over a period of 1 year. Ethical approval was obtained from the Inje University Faculty of Health Science Human Ethics Committee. The patient provided written informed consent prior to participation in the study. The subject was a sedentary worker whose habitual sitting posture consisted of the slumped sitting and crossed leg postures. Pain occurred in the medial areas of the right gluteus and sacroiliac joints after standing for >1 hour or walking for >30 min. However, x-ray revealed no clinical signs or symptoms for sacroiliac joint pain. Stressing in pain provocation tests reproduced pain in both sacroiliac joints. In the pain provocation tests⁷⁾ for the right sacroiliac joint, the following tests yielded positive results: the Gaenslen test (the subject lies supine over the edge of a table, draws both legs up to the chest, and then lowers the affected leg into full hip extension; pain indicates a positive response), the Patrick test (the subject lies supine and places the foot of the affected side on the opposite knee to achieve flexion, abduction, and external rotation of the hip while the examiner fixes the opposite anterior superior iliac spine and applies pressure to the affected knee; pain indicates a positive response), and the resistive abduction (REAB) test (the subjects lies supine, performs a 30° abduction of the affected leg in full hip extension, and pushes the affected leg

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to the side while the examiner holds the ankle; pain indicates a positive response⁷⁾. The subject also experienced pain in the right sacroiliac joint in the Gaenslen, Patrick, and REAB tests. The patient described the pain based on a visual analog scale (VAS), with 0 representing no pain and 10 the worst imaginable pain. A VAS score of 5/10 was reported for the palpation state of the right gluteus medial areas in the prone position. The patient performed the individual strengthening exercises for the erector spinae, rectus abdominis, and biceps femoris for nutation torque of the sacroiliac joint. The strengthening exercise for the erector spinae was as follows: the subject stood with the feet shoulder-width apart with both hands holding 5-kg weights, flexed the trunk slowly (5 s) until it was parallel with the floor while maintaining the natural arch of the back with the shoulder blades pulled back, and then slowly returned (5 s) to the starting position. A crunch exercise was performed for the rectus abdominis in which the subject lay supine with the knees bent and feet flat on the floor, arms crossed, and hands placed on the chest. The exercise for the biceps femoris was a hamstring curl exercise using a resistance band in the prone position. Three sets of 30 repetitions for all exercises were performed daily for 3 weeks.

RESULTS

After performing the individual strengthening exercises for the erector spinae and rectus abdominis for 3 weeks, the subject displayed no pain in the Gaenslen, Patrick, or REAB tests for the right sacroiliac joint, and the VAS score was 2/10 during palpation of the right iliac crest posterior areas; the initial score was 5/10.

DISCUSSION

Nutation refers to the sacrum anterior tilt on the ilium or the iliac posterior tilt on the sacrum. In contrast, counternutation refers to the sacrum posterior tilt on the ilium or the iliac anterior tilt on the sacrum⁵⁾. The stability of the sacroiliac joint is increased by nutation torque. Three factors produce nutation torque: hip joint compression by the body weight because of gravity, passive tension of stretched ligaments, and active muscle force^{6, 8)}. Van Wingerden et al.⁶⁾ demonstrated that sacroiliac joint stiffness increased when individual muscles (erector spinae, biceps femoris, and gluteus maximus) were activated. The finding that the sacroiliac joint stiffness increased even with slight muscle activity supports the notion that the effectiveness of load transfer from the spine to the legs is improved when muscle forces actively compress the sacroiliac joint, preventing shear. Therefore,

in the present study, we prescribed individual strengthening exercises for the stabilization muscles for nutation torque of the sacroiliac joint. After exercising for 3 weeks, the subject displayed no pain during pain provocation tests for the sacroiliac joint, and the VAS score was reduced compared with the initial value. Pelvic stability is associated with prolonged periods of computer work and holding a static posture in sedentary workers, while a flexed spine results in the pelvis being continuously inclined backwards^{9, 10)}. A deficit in the form or force closure mechanism of the sacroiliac joint may be related to pain disorders of the lumbopelvic region¹¹⁾. Therefore, the individual strengthening exercises for the stabilization muscles of the sacroiliac joint described here may be effective for sedentary workers with sacroiliac joint pain.

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