Case Study

Effect of modified leg-raising exercise on the pain and pelvic angle of a patient with back pain and excessive lordosis

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Abstract. [Purpose] This study developed a modified active leg-raising exercise to decrease lumbar lordosis and assessed its effectiveness in a patient with low back pain and excessive lumbar lordosis. [Subject and Methods] The subject was a 56-year-old woman with excessive lordosis, who complained of continuous severe LBP pain at the L5 level for 1 year. The subject performed the modified active leg-raising exercise while flexing the neck. She performed the modified active leg-raising exercises for 2 weeks, performing three sets of 30 repetitions per day. [Results] The patient’s anterior pelvic tilt angle decreased from 20° and 23° to 16° and 17° on the right and left sides, respectively. In backward trunk extension, the VAS score of her back pain decreased to 4 (from the initial score 8). [Conclusion] This result suggests that the modified leg-raising combined with neck flexion helped to recovery the pelvic posture and back pain. The subject could also easily fix her pelvis and avoid moving her lower trunk while exercising.

Key words: Back pain, Leg-raising, Lumbar lordosis

INTRODUCTION

Generally, the excessive lumbar lordosis angle showed with pelvic anterior tilt. This reason, clinicians recommended the various posterior pelvic tilt exercises at lying or sitting or standing positions associated with LBP with excessive lordosis. Safe, effective exercise methods can prevent the structural damage caused by excessive exercise, and increase the stability of the vertebrae and prevent overload. The leg-raising exercise is used to strengthen the abdomen in healthy people, and in those with back and hip joint pathology, to improve health and prevent musculoskeletal disease. Whereas the rectus abdominis flexes the trunk while curling up, raising the legs stabilizes the trunk. Raising the legs stabilizes the pelvis and prevents the body from tilting forward due to downward traction of the hip flexors. The purpose of a stabilizing exercise is to restore the ability to control muscles and movement. There are various exercises for achieving this, including lumbar stability exercises, as well as exercises using a mat, ball, dumbbell, or balancing disc in a prone or supine position. This study developed a modified active leg-raising exercise to decrease lumbar lordosis and assessed its effectiveness in a patient with low back pain and excessive lumbar lordosis.

SUBJECT AND METHODS

The subject was a 56-year-old woman with excessive lordosis, who complained of continuous severe LBP pain at the L5 level for 1 year. The study purpose and methods were explained to the patient, who provided informed consent according to the principles of the Declaration of Helsinki before participating. An examination revealed that her pelvis was tilted anteriorly.
orly and the lumbar spine showed excessive lordosis. There was no shortening of the hip flexors. She had not received any specific treatment for this condition. When she performed backward extension in the standing position with the knees fully extended, she experienced pain and stiffness in the lower back. The visual analogue scale (VAS) score of this back pain was 8.

One examiner measured the pelvic inclination with a palpation meter (PALM; Performance Attainment Associates, St. Paul, MN, USA). The intra- and inter-test reliabilities of the PALM are 0.8 or higher 8). The patient removed her shoes and spread her feet during the measurements, which were made with the patient standing upright with the anterior aspect of the thighs against a stabilizing table. The sagittal plane rotation of the innominate was measured with the caliper tips of the PALM in contact with the ipsilateral anterior and posterior superior iliac spines. At the initial assessment, the anterior pelvic tilt angles were 20° and 23° on the right and left sides (normal range=11 ± 4°), respectively. The subject performed the modified active leg-raising exercise while flexing the neck. She was told to maintain contraction while breathing lightly, to contract slowly, and to not move the lower trunk while exercising. The exercises were conducted in a supine position, with the hip joint flexed to 60°. The patient lifted both legs, while completely unfolding the legs with the neck flexed at 60°. Then, she maintained the position for 10 seconds, before returning to the initial supine position. During neck flexion, the subject supported her pelvis posteriorly using both hands. She performed the modified active leg-raising exercises for 2 weeks, performing three sets of 30 repetitions per day.

RESULTS

The patient’s anterior pelvic tilt angle decreased from 20° and 23° to 16° and 17° on the right and left sides, respectively. In backward trunk extension, the VAS score of her back pain decreased to 4 (from the initial score 8).

DISCUSSION

Generally, hip flexor shortening is seen in patients with excessive lordosis of the lumbar spine.

However, our patient had excessive lordosis of the lumbar spine with no hip flexor shortening. Consequently, she needed a new approach for excessive lumbar lordosis. Active leg-raising requires that normal activation of the rectus abdominis generate posterior, and prevent anterior, pelvic tilt by contracting the hip flexor muscles1). Raising the legs while flexing the neck can effectively increase the strength of the abdominal muscles. In addition, raising the legs while flexing the neck increases the activity of the sternocleidomastoid and scalene muscles, and it can cause co-contraction to the abdominal muscles3, 5). Therefore, we thought that raising the legs while flexing the neck would increase abdominal muscle activation and abdominal cavity internal pressure. To stabilize the vertebrae, activation of the multifidus and transverse abdominal muscles should be increased, while minimizing the contraction all other muscles, such as the rectus abdominis and erector muscles of the spine5). Therefore, co-contraction of the abdominal muscles, and the increased abdominal cavity internal pressure caused by raising the legs while flexing the neck, would decrease the pelvic anterior tilt responsible for the lordosis. The patient felt more comfortable raising her legs while flexing the neck than when performing the standard leg-raising exercise. When the abdominal muscles weakened, the leg-raising could evoke anterior pelvic tilt. On the other hand, the modified leg-raising combined with neck flexion helped to activate the abdominal muscles. The patient could easily fix her pelvis and avoid moving her lower trunk while exercising. This result suggests that the modified leg-raising combined with neck flexion would be help to recovery the pelvic posture and back pain.

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