Effect of the dual-wall pushup plus exercise in patients with scapular dyskinesis with a winged or tipped scapula

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Abstract. [Purpose] This study was performed to evaluate the clinical effect of the dual-wall pushup plus exercise in patients with scapular dyskinesis with a winged or tipped scapula. [Subject] A 32-year-old man with scapular dyskinesis participated in this study. [Methods] The subject performed the dual-wall pushup plus for 2 months, 4 days a week, for an average of 2 hours each day. The scapular dyskinesis test, linear distance of the acromion, acromion angle, and inferior scapular distance were evaluated before and after the exercise program. [Results] After 2 months of dual-wall pushup plus exercises, the scapular dyskinesis test was negative, the linear distance of the acromion decreased, the acromion angle increased, and the inferior scapular distance decreased compared with the initial measurements. [Conclusion] The dual-wall pushup plus exercise is an effective intervention in patients with scapular dyskinesis with a winged or tipped scapula.

Key words: Push-up, Scapular dyskinesis, Scapular position

INTRODUCTION

Abnormal scapular orientations such as winging are caused by lesions of the long thoracic, accessory, and dorsal scapular nerves, which innervate the serratus anterior, trapezius, and rhomboid muscles, respectively1, 2). Injuries causing scapular winging are rare and may require surgical management in some cases1, 2). Abnormal kinematics of the scapula include winging, tipping, and excessive elevation. McClure et al.3) developed the scapular dyskinesis test to evaluate abnormal scapular kinematics in the posterior view while the subject performs a dynamic loaded task. Performing a pushup activates the scapulothoracic musculature, including the serratus anterior, upper and lower trapezius, and pectoralis muscles4). As a closed kinetic exercise, a pushup can be beneficial for dynamic stabilization and stimulating proprioception in the shoulder complex5). However, performing a pushup against gravity may be unsuitable in the initial stages of a rehabilitation program. Researchers have suggested the wall pushup plus as an alternative exercise that requires relatively low effort to complete the movement6). We developed a new exercise, the dual-wall pushup plus, for patients with scapular dyskinesis with a winged or tipped scapula and investigated its clinical effects.

SUBJECT AND METHODS

A 32-year-old man with scapular dyskinesis participated in this study. The study purpose and methods were explained to the subject, who provided informed consent according to the principles of the Declaration of Helsinki before participating. Three physical therapists evaluated the participant for the presence or absence of scapular dyskinesis. The participant was asked to elevate his arms overhead within 3 seconds in a thumbs-up position and lower them within 3 seconds. A 3-lb weighted cuff was attached to the subject’s forearm, and the subject performed four repetitions (two for flexion and two for abduction) that were recorded by a video camera. The three physical therapists determined the presence of scapular dyskinesis by consensus3). The subject then assumed a supine position with his knees bent and arms relaxed at his sides, and the linear distance from the treatment table to the posterior aspect of the acromion was measured. A palpation meter (PALM; Performance Attainment Associates, St. Paul, MN, USA) was used to measure the acromion angle between the acromion and the C7 spinous process and the inferior scapular distance from the inferior angle to the spinal process. The subject then performed the dual-wall pushup plus exercise for 2 months, 4 days a week, for an average of 2 hours each day with his hands shoulder-width apart. The dual-wall pushup plus involved a front wall pushup at 90° of shoulder flexion with the scapulae protracted to push the thorax posteriorly against the back wall for 5 seconds (Fig. 1).
RESULTS

Initially, the subject was determined to have scapular dyskinesis. The linear distance from the table to the posterior aspect of the acromion was 4 cm, the acromion angle was 1 degree, and the inferior scapular distance was 10 cm. After performing the dual-wall pushup plus exercise for 2 months, there was no sign of scapular dyskinesis, the linear distance from the table to the posterior aspect of the acromion had decreased to 2 cm, the acromion angle had increased to 5 degrees, and the inferior scapular distance had decreased to 6 cm.

DISCUSSION

A change in scapular position and motion influences the lengths of the muscles attached to the scapula, ultimately leading to shoulder pathology. Although scapular dyskinesis can occur in pain-free individuals, the scapular kinematics of dyskinesis are similar to those of subjects with impingement syndrome. Therefore, scapular dyskinesis might be a risk factor for shoulder disorders. Shortness of the levator scapular and pectoralis minor muscle activity result in scapular elevation and inferior angle tipping. Ludewig et al. reported that middle and lower trapezius weakness caused a forward shoulder posture with scapular anterior tilt. The serratus anterior originates from the lateral aspects of the upper eight ribs and inserts on the anterome-dial border and inferior angle of the scapula, positioning the scapula close against the thorax and stabilizing the scapula, which prevents the medial border and inferior angle from projecting posteriorly. Weakness of the serratus anterior can contribute to altered scapular kinematics, such as winging and tipping.

In the dual-wall pushup plus, the front wall pushup is performed at 90° of shoulder flexion and the scapulae are protracted to push the thorax posteriorly against the back wall. The resistance of the front wall pushup likely activates the serratus anterior and middle and lower trapezius muscles, while the resistance of the thorax pushing posteriorly against the back wall stretches the levator scapula and pectoralis minor by limiting scapular movement. The dual-wall pushup plus exercise also produces a compression force that corrects the abnormal scapular position. Athletes and patients with shoulder injuries should perform appropriate, effective exercises to strengthen the shoulder muscles to prevent shoulder impairment and improve performance.

This study suggests that the dual-wall pushup plus exercise is an effective intervention for patients with scapular dyskinesis with a winged or tipped scapula.

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