

Original Article

# Effects of humeral head compression taping on the isokinetic strength of the shoulder external rotator muscle in patients with rotator cuff tendinitis

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**Abstract.** [Purpose] The purpose of this study was to examine the effects of humeral head compression taping (HHCT) on the strength of the shoulder external rotator muscle in patients with rotator cuff tendinitis. [Subjects and Methods] Twenty patients with rotator cuff tendinitis were recruited. The shoulder external rotator strength was measured using a Biodex isokinetic dynamometer system. A paired t-test was performed to evaluate within-group differences in the strength of the shoulder external rotator muscle. [Results] Significantly higher shoulder external rotator peak torque and peak torque per body weight were found in the HHCT condition than in the no-taping condition. [Conclusion] HHCT may effectively increase the shoulder external rotator muscle strength in patients with rotator cuff tendinitis.

**Key words:** Shoulder external rotator, Taping, Rotator cuff tendinitis

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## INTRODUCTION

Injury of the rotator cuff muscle is a common cause of shoulder dysfunction. Although the relationship between rotator cuff tendinitis and muscle weakness remains unclear<sup>1)</sup>, previous research has shown that rotator cuff tendinitis leads to shoulder muscle weakness<sup>2)</sup>. To treat these injuries, many clinicians and researchers have emphasized internal and external rotator muscle strengthening exercises because of their critical role in providing dynamic stability and producing rotation torque at the shoulder joint<sup>3, 4)</sup>. The external rotator of the shoulder is an important muscle for the stability and mobility of the glenohumeral joint, and most shoulder injuries are related to the integrity of the external rotator that surrounds the glenohumeral joint<sup>5)</sup>.

Clinically, shoulder external rotator-strengthening exercises have been used to restore shoulder function in patients with rotator cuff tendinitis. To enhance the strength and endurance of the shoulder external rotator muscle, shoulder external rotation exercises using various methods are often performed by patients with shoulder disorders<sup>6)</sup>. The application of postural tape has been recommended as a safe and cost-effective approach to treating and correcting abnormal posture and movement<sup>7)</sup>. Magarey and Jones described the use of humeral head compression taping (HHCT) to enhance the stabilizing activity of the rotator cuff muscle<sup>8)</sup>. Although the effects of HHCT were not proven, HHCT has

been applied to decrease pain and increase the range of motion in patients with rotator cuff tendinitis. Furthermore, most studies have overlooked the influences of HHCT on the strength of the shoulder external rotator muscle in patients with rotator cuff tendinitis. Previous findings indicate that clinicians should consider conservative management for correction of the humeral head position, including postural taping, to improve the strength of the shoulder external rotator muscle in patients with rotator cuff tendinitis.

Therefore, the purpose of this study was to investigate the effects of HHCT on shoulder external rotator muscle strength in patients with rotator cuff tendinitis.

## SUBJECTS AND METHODS

This study included 20 patients with rotator cuff tendinitis (subscapularis tendinitis combined with supraspinatus tendinitis, n = 11; subscapularis tendinitis, n = 8; and supraspinatus tendinitis, n = 1) who underwent physiotherapy treatment at a local hospital in Gimhae, South Korea. Patients showing a positive sign in an ultrasonographic evaluation of rotator cuff tendinitis and drop arm test were included, while patients with a history of shoulder surgery, inflammation, glenohumeral joint arthritis, or trauma of the shoulder were excluded. Prior to participation, all patients read and signed an informed consent form approved by the Inje University Ethics Committee for Human Investigations.

Nonelastic tape (Endura Sports Tape; Endura-Tape Pty. Ltd., Sydney, Australia) was applied to simulate compression of the humeral head into the glenoid and facilitate contraction. The tape was applied with gentle weight-bearing through the elbow with the arm in slight scapular-plane abduction and neutral rotation. The tape was spiraled from the midpoint of the anterior arm in line with the deltoid inser-

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tion with one band over the anterior deltoid and acromion and finished along the spine of the scapula; another piece of tape was placed in a similar fashion over the posterior deltoid and acromion, finishing along the clavicle. An initial half-circle around the arm at the level of the deltoid insertion was frequently used as an anchor, and the tape was placed in this location with no tension. However, tension was applied when placing the tape over the anterior and posterior deltoid to draw the humeral head upward into the glenoid. A final anchor was occasionally needed over the top of the shoulder girdle to fix the proximal ends of the tape.

Shoulder external rotator strength was evaluated using a Biodex System 4 isokinetic dynamometer (Biodex Corp., Shirley, NY, USA). For the testing procedure, attachments were set up, and participants were evaluated in a seated position with the elbow at 90° of flexion and shoulder at 30° of flexion with abduction in the scapular plane. The olecranon of the humerus was aligned with the rotational axis of the dynamometer. Straps were used for fixation of the chest and pelvis. The patients performed concentric isokinetic contractions at 60°/s with five repetitions, and the peak torque and peak torque per body weight were measured. An isokinetic evaluation was performed before applying HHCT, and a reevaluation was performed 5 min after the application of HHCT. The HHCT and no-taping conditions were compared using a paired t-test, and p values of <0.05 were considered to indicate statistical significance. The mean and standard deviation were calculated for each parameter.

## RESULTS

The peak torque of the external rotator muscle and external rotator peak torque per body weight were significantly higher in the HHCT condition than in the no-taping condition at an angular velocity of 60°/s ( $p < 0.05$ ) (Table 1).

## DISCUSSION

This study investigated the effect of HHCT on shoulder external rotator strength using a Biodex isokinetic dynamometer in patients with rotator cuff tendinitis. The shoulder external rotator peak torque and peak torque per body weight were significantly higher at 60°/s. These findings indicate that application of HHCT increases shoulder external rotator strength.

In this study, the shoulder external rotator peak torque and peak torque per body weight increased significantly at 60°/s. It is possible that the shoulder external rotator strength increased secondary to pain relief. Pain decreases agonist activity<sup>9</sup>, and pain relief has been shown to increase muscle strength in patients with shoulder impingement syndrome<sup>10</sup>. Previous studies have demonstrated that postural taping relieves pain<sup>11, 12</sup>. Thus, HHCT may help to increase the shoulder external rotator muscle strength in patients with rotator cuff tendinitis. The increased shoulder external rotator strength may have been closely related to an increase in shoulder stability. Rotator cuff tears and glenohumeral joint instability are related<sup>8</sup>, and recurrent anterior shoulder instability is related to external rotator strength because the humeral head cannot be maintained within the

**Table 1.** Strength of shoulder external rotator at an angular velocity of 60°/s

Variable	Mean ± SD (Nm)	
	No taping	HHCT
Peak torque	13.3 ± 7.6	18.5 ± 11.0*
Peak torque per body weight	21.8 ± 11.5	31.1 ± 17.6*

HHCT, humeral head compression taping. \* $p < 0.05$

glenoid fossa during shoulder movement<sup>13</sup>). In this study, the HHCT may have compressed the humeral head into the glenoid fossa, and the mechanical correction technique may have prevented anterior gliding of the humeral head. These techniques can maintain the humeral head in the glenoid fossa and control the instability of the humeral head during rotation.

This study had several limitations. First, we did not investigate the change in pain before and after the application of humeral head compression taping. Future studies should investigate this change in pain. Second, our study investigated the immediate effects of humeral head compression taping on shoulder external rotator strength. Future studies are required to investigate the long-term effects.

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