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PILOT STUDY

Effects of scapular taping in young adults with shoulder pain and scapular dyskinesis

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Summary *Objective:* To assess the immediate effects of scapular taping on pain, isometric force, and the level of activation of several scapular girdle muscles in individuals with shoulder pain and scapular dyskinesis.
Materials and methods: Ten individuals with shoulder pain during arm elevation and scapular dyskinesis were included and evaluated by using a visual analogue scale (VAS), pressure algometry, dynamometry, and surface electromyography. All assessments were performed before and immediately after the application of scapular taping.
Results: Scapular taping did not change the electromyographic activity of the upper trapezius muscle ($p = 0.041$, IC95%: −0.8256 to 10.8752). The positive effects of taping application were related to pain reduction ($p = 0.025$) and improvement in pressure algometry in the middle deltoid muscle ($p = 0.020$, IC95%: −1.8910 to −0.0490). Maximal isometric force did not change after the application of taping (flexo-abduction $p = 0.4136$, external rotation $p = 0.4261$). Significant correlations were noted between the VAS and pressure pain threshold (PPT) for the upper trapezius muscle ($r = -0.6643$, $p = 0.0361$) as well as for the PPT measures of the middle deltoid and infraspinatus muscles before ($r = 0.9491$, $p = 0.0001$) and after ($r = 0.9006$, $p = 0.0004$) the application of taping.
Conclusion: Scapular taping was not effective for inducing changes in the electromyographic activity of the upper trapezius, lower trapezius, and serratus anterior muscles, nor in altering the isometric force of shoulder flexo-abduction and external rotation. However, taping was effective at improving the pressure algometry values of the middle deltoid. Significant correlations between the pressure algometry of the middle deltoid and infraspinatus muscles, both before and after the application of scapular taping, were noted.

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Introduction

Shoulder pain is a common source of dysfunction among workers and athletes. Greving et al. (2012) reported an incidence of 29.3 per 1000 individuals/year, with pain being more common in women aged 45–64 years. Nevertheless, in subjects between 18 and 44 years, the incidence was still 22.2%. In an inquiry study, shoulder pain in people aged 18–24 years reached an incidence of 23% (Parsons et al., 2007). In a sample of 613 overhead athletes, Mohseni-Bandpei et al. (2012) found a prevalence of shoulder pain of 31.9% in rowing sports and of 12.3% in swimmers, while Walker et al. (2012) showed that 23% of young swimmers ($n = 74$, aged 11–27) suffer from persistent shoulder pain for two weeks.

From a therapeutic perspective, physiotherapy represents one of the primary options for shoulder pain treatment. In order to implement effective interventions for these injuries, the accurate assessment and interpretation of signs and symptoms are important, including pain, range of motion, scapular dyskinesis, and maximal isometric force. The use of several assessment methods by previous researchers has established a scientific framework that justifies the application of specific interventions, previously implemented in an empiric fashion.

Previous reports have related scapular dyskinesis with various shoulder pathologies, including subacromial impingement syndrome (SIS), internal impingement, and labrum injuries (SLAP) (Ludewig and Cook, 2000; Burkhart et al., 2003a, 2003b; Ludewig and Reynolds, 2009; Chester et al., 2010; Kibler and Sciascia, 2010, 2012). Despite the original hypothesis proposed by Burkhart et al. (2003b) that each type of dyskinesis is correlated with a specific shoulder injury, such relations are currently recognized as only theoretical. In a narrative study, Ludewig and Reynolds (2009) reported evidence of scapular kinematic alterations associated with a spectrum of shoulder injuries and that such injuries are associated nonspecifically with decreased serratus anterior and increased upper trapezius activation. Therefore, any intervention that targets this imbalance may produce a clinical benefit in patients with shoulder pain.

The functional taping of the scapula was first described by McConnell for the treatment of SIS (Selkowitz et al., 2007; Smith et al., 2009) and other pathologies, probably associated with the altered balance of shoulder girdle muscles, in order to treat such imbalance. After this, other authors (Morrisey, 2000; Kneeshaw, 2002; Schmitt and Snyder-Mackler, 1999; Host, 1995) published case reports and narrative studies of the clinical effectiveness and mechanisms of action of scapular taping in individuals with SIS. Later, studies that assessed the activation of trapezius muscles using surface electromyography (sEMG) were published, finding conflicting results. Cools et al. (2002), for example, found no changes in the trapezius and serratus anterior muscles in 20 healthy individuals. However, Selkowitz et al. (2007) and Smith et al. (2009) reported a decrease in upper trapezius muscle activation in subjects with SIS, with the opposite results regarding lower trapezius muscle activation. Even considering the limited amount of evidence on how scapular taping affects muscle activation, a decrease in upper trapezius muscle electromyography activity seems to be the most consistent finding among these studies. However, neither the neurophysiological nor the biomechanical mechanisms that could explain the clinical effects and changes in the muscle activation levels of scapular taping have been completely elucidated.

Another two clinical measurements commonly studied in relation to musculoskeletal pain are the pressure pain threshold (PPT) and maximal isometric force. Pressure algometry represents a reliable method for assessing tissue mechanosensitivity (Nussbaum and Downes, 1998). Because scapular taping places the scapula in a more retracted position, and given that Morrisey (2000) postulated that such an intervention could unload irritable neural tissue, scapular taping could influence the threshold of mechanical pain. In addition, some indirect evidence exists about a relation between scapular retraction and the isometric force of shoulder muscles. Kibler et al. (2006) and Tate et al. (2008) both reported that placing the scapula in a retracted position by using the scapular retraction test resulted in increased isometric shoulder elevation strength. This effect can be attributed to the manual stabilization of the scapula, resulting in a more stable kinetic chain. Thus, scapular taping may increase the maximal isometric force production of shoulder muscles. To our best knowledge, no study has thus far assessed the effects of scapular taping upon these variables before and after its application.

Consequently, our purpose is to assess the immediate effects of scapular taping on the pain, maximal isometric force, and electromyographic activity of several shoulder girdle muscles in individuals with shoulder pain and scapular dyskinesis. The main hypothesis is that in individuals with shoulder pain and associated scapular dyskinesis, scapular taping decreases upper trapezius electromyographic activity without changes in the lower trapezius. The second hypothesis is that the decreased electromyographic activity of the upper trapezius correlates with an increase in the maximal isometric force of shoulder muscles, decrease in shoulder pain, and increase in pressure algometry.

Materials and methods

Sample

Ten subjects were included (six women) with shoulder pain during arm elevation and scapular dyskinesis. All subjects were between 18 and 35 years of age (mean age 26.3) and had previously consulted an orthopedic physician for shoulder pain and impaired function. The right arm was the dominant one in all subjects and was also the affected side in seven of the 10 individuals. They all participated in overhead and overuse activities including basketball, volleyball, hockey, and gymnastics. The mean evolution time of pain was 6.8 months (2–12 months). None of the patients was an elite athlete, had reported traumatic or surgical history around the shoulder or the cervical spine, or referred to neurological diseases. Furthermore, none

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