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A CLINICAL REASONING-BASED REVIEW: KINESIO-TAPING FOR SHOULDER IMPINGEMENT SYNDROME- WHAT DOES EVIDENCE SUGGESTS?

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ABSTRACT

Background: Kinesio-taping is widely used in sports rehabilitation for prevention and treatment of sports-related injuries. The role of Kinesio-taping has recently received renewed interest in patients with shoulder problems like shoulder impingement or rotator cuff tendinopathy.

Objective: The objective of this review article to go through the recent literature on providing evidence for the efficacy of kinesio-taping in the management of shoulder impingement syndrome and its rationale. Method: We selected 24 recent articles on kinesio-taping in shoulder impingement syndrome through Medline, Cochrane, CINAHL and Science Citation Index for the review between the published years 2009 – 2019. The research articles (full texts only) on the use of kinesio-taping application and its mechanism in patients with shoulder impingement syndrome were selected.

Major Finding: Literature review revealed that the use of taping techniques is often neglected in designing a rehabilitation protocol for the shoulder impingement. Though application of kinesio-taping in patients with shoulder impingement has beneficial effects on shoulder pain, reduced range of motion and correcting shoulder muscle imbalances (improving the synergy between the force couples) and positional fault at shoulder complex. Various facilitation and inhibition kinesio-taping techniques were reported to be effective in treatment of shoulder impingement syndrome in short term and long term.

Conclusion: The investigations reviewed imply that appropriate selection and application of kinesio-taping with proper muscle facilitation and inhibition are vital and could provide excellent results along with routine physiotherapy protocol in patients with shoulder impingement syndrome.

KEYWORDS : Kinesio-taping, shoulder impingement, facilitation technique, inhibition technique.

Shoulder Impingement:

Shoulder impingement syndrome is a clinical syndrome in which soft tissues become painfully entrapped in subacromial space of gleno-humeral joint[1] causing pain, swelling and inflammation of tendons impinged leading to functional impairments at shoulder. Usually, patients with impingement syndrome complain pain on elevating the arm or when lying on the affected side. The impingement generally caused by mechanical/anatomical factors or imbalance between the force couples of shoulder and scapular muscles or poor body posture.[1] The judgement to treat surgically or conservatively is commonly made on the basis of clinical evaluation, duration and severity of pain, the degree of functional impairment, and the extent of structural damage. The goal of treatment is to restore pain-free and powerful movement of the shoulder joint.[1] Currently, many conservative physical therapy options available, however previous literature showed that combination of manual therapy and exercise therapy would be beneficial. The evidence of kinesio taping in shoulder impingement syndrome as an adjunct is limited. Therefore, this review article is intended to provide evidence to include Kinesio-taping in clinical practice guidelines to treat shoulder impingement syndrome with proper clinical reasoning.

Concept Of Kinesio-taping:

Kinesio-taping is a therapeutic technique and widely used as an adjunct to treatment of musculoskeletal disorders and in prevention of sports-related injuries. The concept of taping was developed by Japanese Chiropractor Dr. Kenzo Kase in the 1970's with the purpose to ease pain and improve the healing in soft tissues. The basic function of most of the kinesio-tape is to provide support or promote normal movement pattern (by facilitating or inhibiting muscle contractions) and allow pain free movements. According to Kase, et al. (2003), benefits of kinesio-taping are dependent on the type of tape, selection of appropriate technique for application, amount of stretch applied to the tapes during application etc. Kinesio-taping provides a positional stimulus through the skin, align facial tissues, make more space by lifting fascia and soft tissue above area of pain/inflammation, provide sensory stimulation (proprioception), support to assist or limit motion decreasing kinesio-phobia[2], and it can help in the removal of edema by directing exudates toward a lymph duct.[3]

In current review, we selected articles providing evidence for the effectiveness of Kinesio-taping in patients with shoulder impingement syndrome on pain, shoulder range of motion and movement control, increasing sub acromial space, correction of position of scapula, facilitating normal force couple activation and functional disability with more emphasis on clinical reasoning.

Role Of Kinesio-taping In Shoulder Impingement:

The role of kinesio-taping has recently received renewed interest in patient having shoulder problems like shoulder impingement or rotator cuff tendinopathy. Kinesio-taping found to be managing acute as well as chronic shoulder impingement syndrome. Previous literature reported that in shoulder impingement syndrome application of kinesio-taping improves blood/lymphatic circulation, reduce pain, realign joint, decrease muscle tension and increasing proprioceptive awareness which help to support and stabilize the articular structures and reduce soft tissue inflammation, increase joint motion and reduce pain which further help in reducing functional disability and improving activities of daily living. Kinesio-taping is believed to work by various physiological mechanisms which help in decreasing pain, decreasing muscle tension, improving range of motion and functional disability immediately after its application.

Next part of this review provides the recent evidences of the effectiveness of Kinesio Taping for achieving specific goal in patients with Shoulder impingement syndrome with appropriate clinical reasoning:

Decreasing Pain:

Mechanical correction technique of Kinesio Taping applied at

the most painful region around coracoid process with 50-75% stretch and downward pressure for inhibiting supraspinatus and deltoid muscle decreases pain immediately.[4,5] Sachin Onat et al. (2016) reported that kinesio-taping provide immediate relief of symptoms, improve comfort of patient, or stability of the shoulder joint as application of taping elevates the epidermis, increasing the pressure on mechanoreceptors below the dermis, thus decreasing the nociceptive stimuli.[5] In addition, it activates Pain modulation via the gate control theory as it stimulates neuromuscular pathways via increased afferent feedback through large-diameter Aβfibers.[6]

Promoting Increase Range Of Motion:

Studies found that Kinesio Taping decreases mechanical irritation of involved soft tissues /tendons by increasing sub acromial space allowing pain free gleno-humeral movements.[7,8] Also, Kinesio-Taping increases supraspinatus motor unit recruitment during activity which may improve proprioceptive stimulus to control movement and improve proper muscle activation leads to increase in range of motion.[8] Another study done by Simsek et al. (2013) showed that kinesio-tape applied with correction technique and extra stretching can stimulate skin receptors and increase proprioception which helps to change joint stability and movement biomechanics.[9]

Increases Acromio-Humeral Distance:

Kinesio-taping helps to increase sub acromial space by aligning gleno-humeral joint and scapula in near normal anatomical position. An ultra-sonographic study carried out by Sorin P et al. (2019) have demonstrated the significant increase in sub acromial distance immediate application of joint correction technique using kinesio-taping with 90-100% tension which has clinical relevance.[10] Harput G et al. (2017) suggested that kinesio-taping on medial border of scapula and from anterior aspect of humeral head to inferior border of scapula with 75% tension helps to repositioning the joint and increase acromio-humeral distance, which was measured by ultrasonography immediately after application of tape. Mechanical correction technique of Kinesio-taping corrects the alignment of humeral head in glenoid cavity changes the moment arm of the rotator muscles and improves length-tension relationship.[11] This would release rotator cuff tendons tend from impinging during overhead movement. Recent study done by de Oliveira FC et al. (2019) recommended that kinesio-taping contributed to restraining the humeral head superior translation during arm elevation with mechanical correction of gleno-humeral joint assessed immediately after application of tape by USG and furthermore, alteration in muscular activity due to increase acromio-humeral distance inhibits deltoid muscle action favouring a reduction of migration of humeral head in the subacromial space during arm elevation.[12]

Correct Position Of Scapula To Promote Proper Shoulder Alignment:

Shakeri H et al. (2013) reported abnormal pattern of scapular motion such as decrease scapular posterior tilt, increase internal rotation and decrease upward rotation of scapula in patients with shoulder impingement syndrome.[13] Further, studies have reported that combination of facilitation of lower trapezius and inhibition of upper trapezius can immediately decrease scapular positional error like excessive scapular tilt and upward and downward rotation.[14] Improved scapular sensorimotor control through the mechanical alignment correction effect from the kinesio-taping might have decreased scapular reposition errors.[14] It has been reported that kinesio-taping enhances sensory feedback from peripheral mechanical receptors and also improve joint proprioception. This study hypotheses that kinesio-taping related immediate improvement in scapular reposition sense was due to enhanced scapular kinematics, increased scapular posterior tilt and marginal improvement in scapular upward rotation during arm elevation in the scapular plane.[14]

Correcting Muscle Imbalance or Synergy between Force Couple with the help of various facilitation and inhibition technique of Kinesio- Taping:

In shoulder impingement syndrome, altered shoulder girdle muscular activation and imbalance (abnormal Force Couples) seen at glenohumeral and scapulothoracic joint. Many researchers described an increase in upper trapezius and deltoid activation with decrease in activation of lower trapezius, middle trapezius, serratus anterior and rotator cuff muscles.[15] It has been found that by proper facilitation and inhibition kinseio-taping technique can help is correcting muscle imbalance and activation pattern of glenohumeral and scapulothoracic joint in patient with shoulder impingement syndrome.[15]

1. Facilitation Techniques Of Kinesio-taping:

Facilitation techniques for muscle used for muscle activation by placing muscle in lengthened position typically taking origin and insertion apart. The starting anchor is applied from origin to insertion with 25-35% tension. Facilitation helps to restore the length- tension ration of muscle, restoring normal length and helps to normalise muscle activation pattern.[16] Facilitating muscle activation of middle/lower trapezius and rotator cuff will help by enhancing cortical motor-neuron output through increased cutaneous afferent input is a mechanism by which kinesio-taping is theorized to modify neuromuscular control of the shoulder and scapula.[17] Another study done by Hsu YH et al (2009) showed the facilitation techniques effect in lower trapezius and serratus anterior tested with electromyography (EMG) on scapular kinematics in shoulder impingement syndrome. It has been found that Taping tended to increase the muscle activation of the serratus anterior and lower trapezius in the entire range of scaption. This suggested that Kinesio taping assist in correcting the affected scapular and shoulder movements, thus helps patients to have their arm function on a more balanced and stabilized base.[18]

2. Inhibition techniques of kinesio-taping:

Inhibition techniques for muscle used for length application and decreasing muscle activation by placing muscle in lengthened position typically taking origin and insertion apart. The starting anchor is applied from insertion to origin with 15-25% tension. Inhibition helps to restore the length-tension ration of muscle, restoring normal length and helps to normalise muscle activation pattern.[16] Minimizing use of muscle that is inhibition technique could be illustrated by the lifting effect of the skin that formed by the application of the KT which prevents fatigue by increasing the circulation beneath the targeted area.[9] By inhibition technique kinesio-tape could stimulate the peripheral nerve and this stimulation reduces the motor neuron threshold and promotes both muscle spindle reflex contraction of the applied muscle and the excitation of the motor cortex. The study found that the application of the proper inhibition technique of the kinesio-tape has led to delaying the fatigue. The kinesio-taping is suggested to unloading the intrafusal muscle fibres, which sequentially reduces the Ia drive from the muscle spindle and, as a result, the drive to the motor-neuronal pool. Therefore, applying kinesio-taping to the muscles will make the muscle more relaxed.[19] Study done by Dhein W et al (2017) to see the effect of kinesio-taping in myoelectric activity in patients with shoulder impingement shown that when the strips of kinesio-tape were positioned exactly on the hyper activated muscles in the patients (upper trapezius and middle deltoid) which generates a inhibition generator factor, resulting from the sensory action of KT on the mechanoreceptors, as these provide an analgesic effect by inhibiting the nociceptors

according to the behaviour of pain theory and Inhibition of the upper trapezius and deltoid influence on the peak values of myoelectric activation during abduction which is an important result in the treatment of SIS, because with a inhibition technique it was possible to reduce the hyperactivity of the muscles most affected by the injury which is an important clinical factor in the impingement syndrome treatment since the upper trapezius and deltoid is one of the most overloaded muscles in patients.[20]

Alteration in deltoid and rotator cuff co-activation and rotator cuff imbalance has been described in patients with shoulder impingement syndrome. Muscle imbalance between deltoid and rotator cuff can cause compression of tendons within the subacromial space [14] which cause superior translation of humeral head; Kinesio-taping inhibition technique for supraspinatus and deltoid muscle can change stability of shoulder girdle, movement biomechanics and muscle activity which help to balance force couple between deltoid and rotator cuff muscles.[14,15]

Scapular rotation force couple imbalance leads to altered muscular activation pattern in shoulder impingement syndrome. Decreased activation of the lower trapezius or increased activation of the upper trapezius may lead to an alteration of scapular rotation position which in turn leads to an upward migration of the axis of rotation of the glenohumeral joint, thus causing impingement.[13] In study conducted by Embaby EA et al. (2016) thoracic and scapular taping with active postural correction assist in restoring abnormal scapular movement patterns. Studies found that taping can alter the activation level of the scapular muscles to control scapular motion. Scapular taping has been found to decrease the activity of the upper trapezius and to increase the activity of the lower trapezius and serratus anterior. It is believed that scapular taping allows better alignment of the scapula and helps to maintain subacromial space.[21]

Improvement In Functional Disability:

According to Shakeri H et al. (2013) kinesio-taping provides immediate sensorimotor feedback and correction of joint alignment during shoulder movement to improve normal gleno-humeral motion by decreasing micro trauma and mechanical irritation of the subacromial soft tissue structures, resulting in improvement in overall disability of the upper extremity.[22,23]

Promoting Muscles Strength:

The peak torque produced by muscles was found to be increased after kinesio-taping application with appropriate tension, which was measured with Pro dynamometer, but the difference did not quite reach statistical significance. Tension in tape provides a pulling force, which causes a change in stretch load, pressure, and shear force, triggering the mechanoreceptors in the sub dermal soft tissue and fascia. The central nervous system integrates the sensory input and modulates gamma-motor firing, which in turn leads to increased muscle tone.[24] Another reason is that strapping has a facilitating effect on cutaneous mechanoreceptors with subsequent reflex motor stimulation might be a possible mechanism that could explain why there was a mean difference in peak torque after kinesio-taping application. But kinesio-taping application possibly was not able to enhance muscle strength in healthy individuals directly but can increase the muscle fibre recruitment by reducing pain while performing muscle strengthening exercises. And tactile input (facilitating effect and inhibiting effect) generated by kinesio-taping might not be strong adequate to alter the instantaneous muscle force output and increase muscle strength.[24] So, taping facilitate pain free movement while performing muscle strengthening exercises.

CONCLUSION:

The current review implies that appropriate selection and application of kinesio-taping technique for muscle facilitation or inhibition or increasing sub acromial space or correct mal alignment of scapula are vital and could provide excellent results along with routine physiotherapy protocol in patients with shoulder impingement syndrome. Recent studies support the use of kinesio-taping as optional/alternative intervention in addition to physical therapy in improving pain, joint mobility, and functional disability especially from initial stage of treatment.

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The authors report no conflict of interest.

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