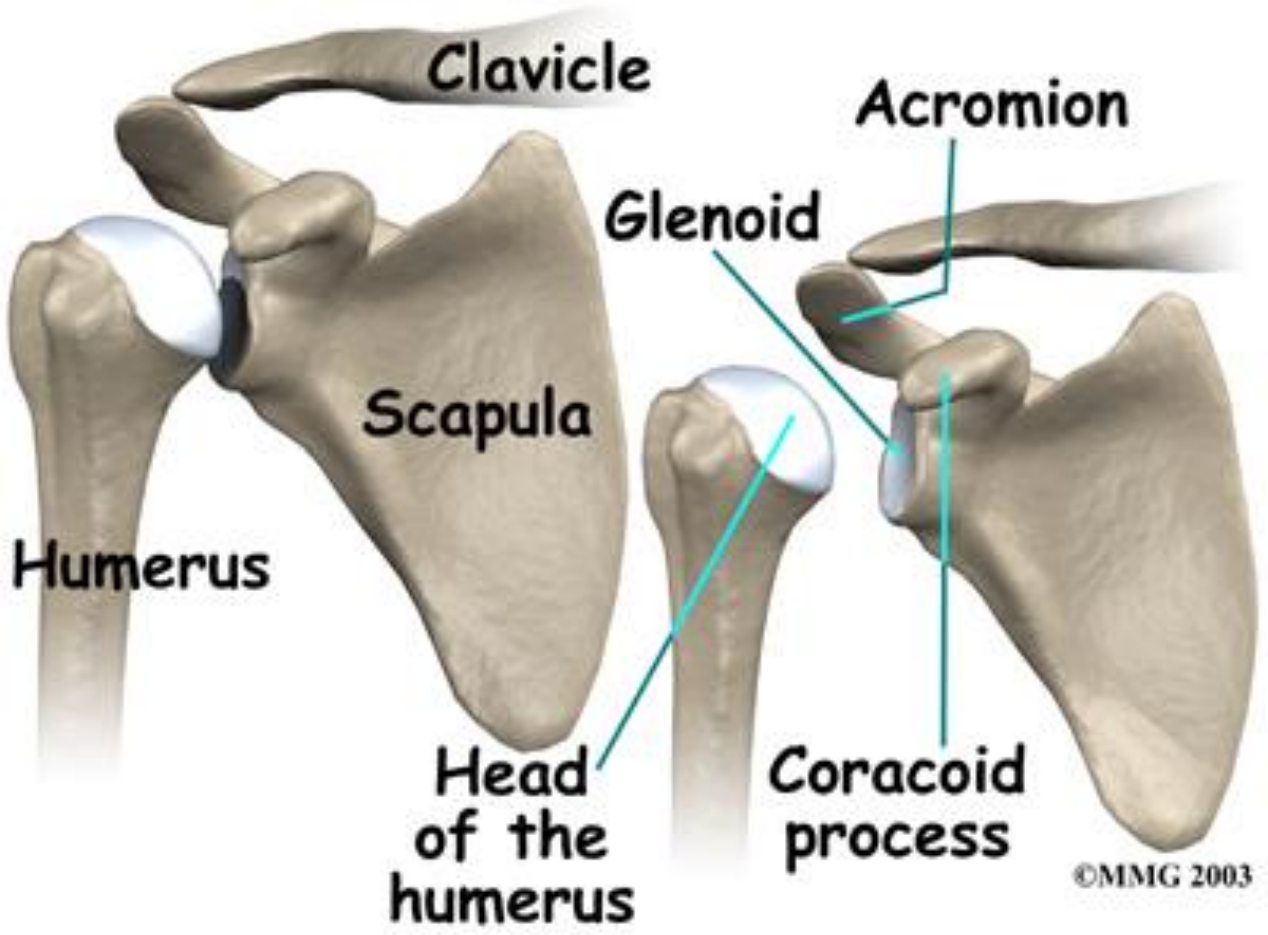
Scapular Taping for Subacromial Impingement in Overhead Athletes

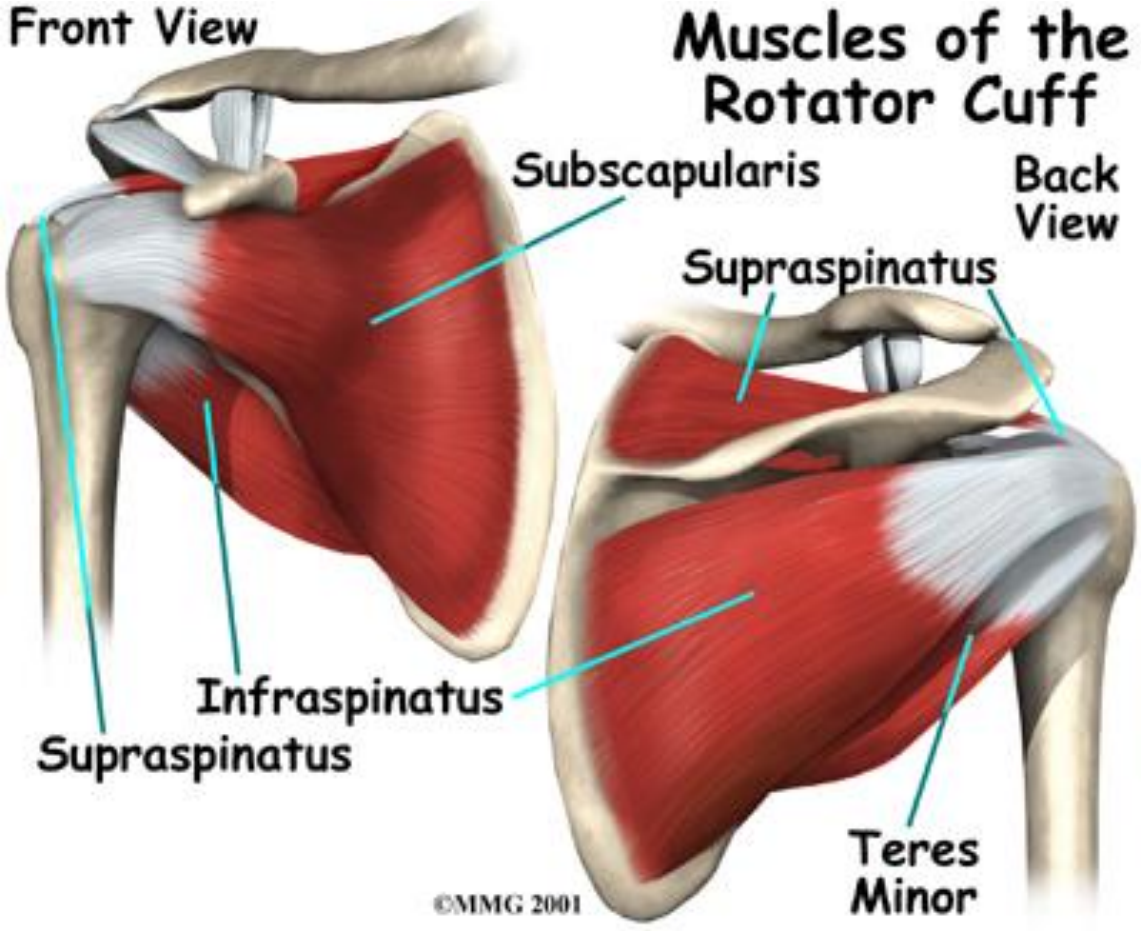
-Capstone Project

Matthew Medlin

Shoulder Anatomy - Osteology

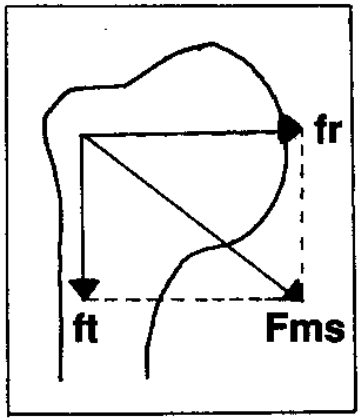


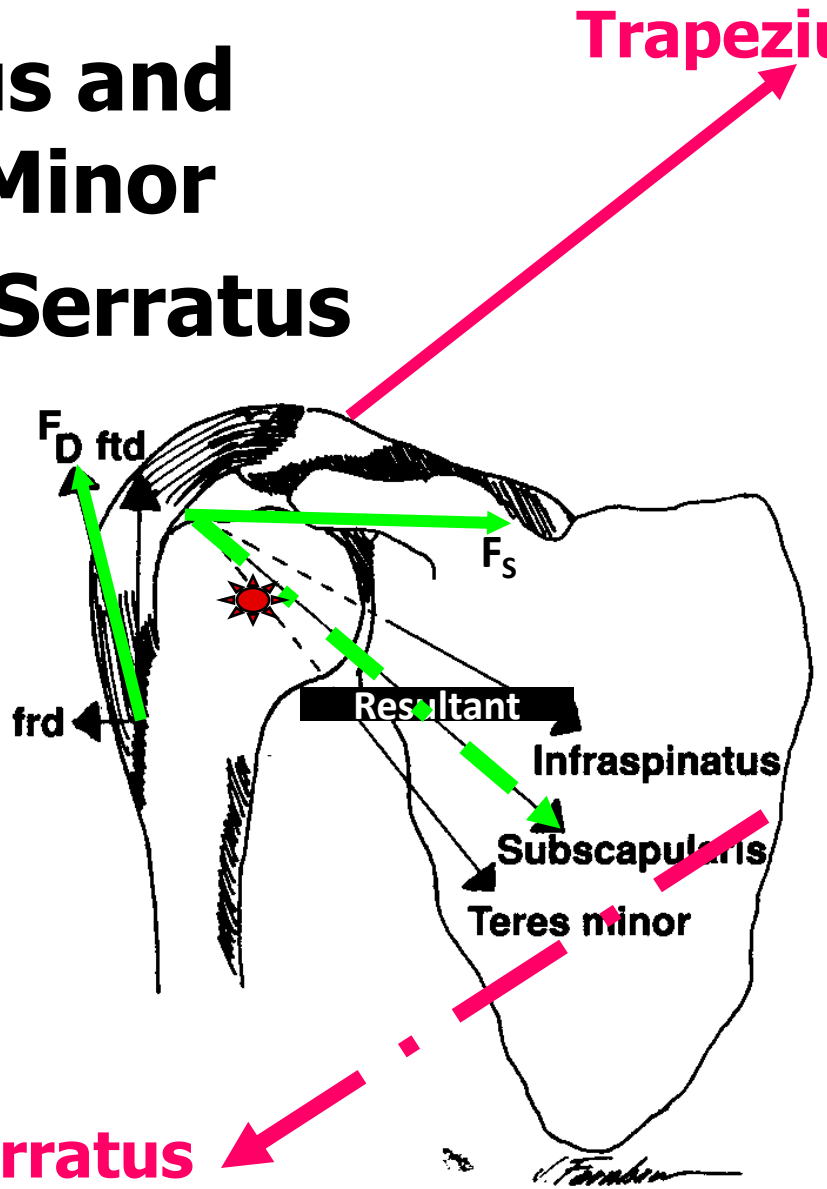
Shoulder Anatomy – Rotator Cuff Musculature



Force Couples

- **Deltoid/Supraspinatus and Infraspinatus/Teres Minor**
- **Upper Trapezius and Serratus Anterior**



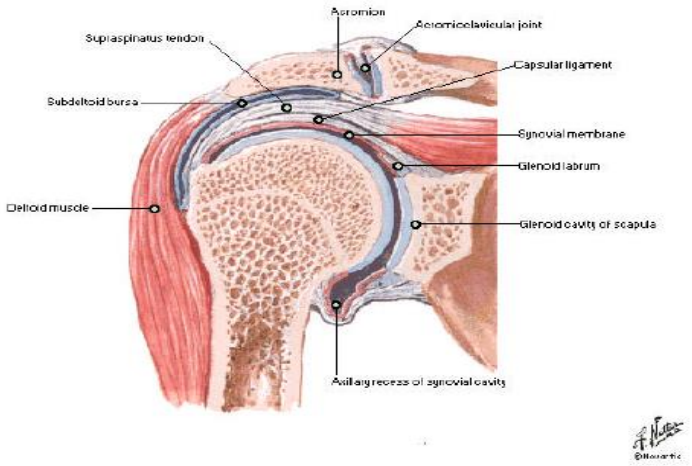


Subacromial Impingement

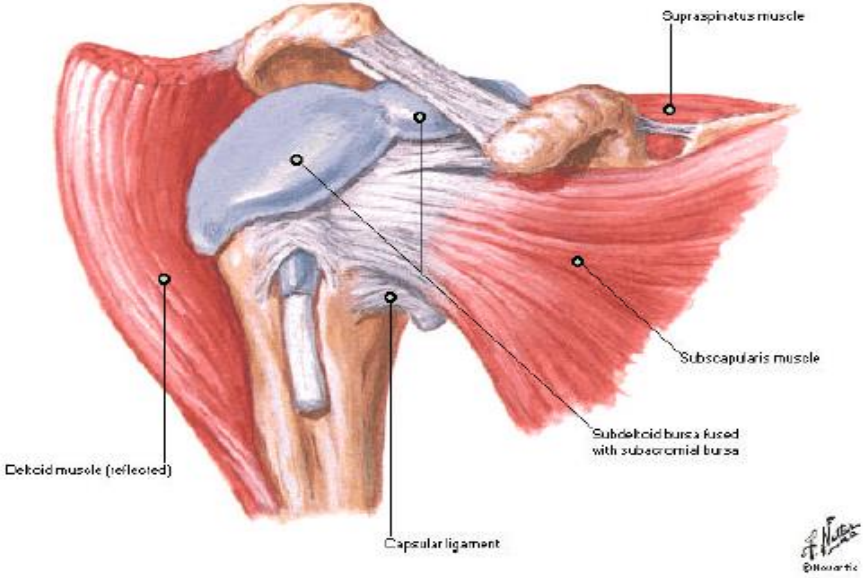
- Most common form of shoulder pathology in overhead athletes AND nonathletic populations[5,7]
  - Reportedly as high as 42% in some populations[16]
- Characterized by compression of structures that reside within the subacromial space
  - Supraspinatus tendon*
  - Biceps tendon long head
  - Subacromial bursa

Subacromial Component

- **Superior Capsule**



- **Subacromial/Subdeltoid Bursa**



Subacromial Impingement

- Weak lower/middle Trapezius fibers
- Weak Serratus Anterior
- Tight upper Trapezius fibers
- Tight anterior structures – Pectorals, etc.

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- Scapular Elevation
- Decrease in scapular posterior tilt, external rotation and upward rotation

Impingement History

- Mechanism – typically from repetitive activities that require the GHJ to be above 90 degrees with gradual onset
- Etiology: Compression of soft tissue structures between the acromion/coracoacromial arch and greater tuberosity

Signs/Symptoms

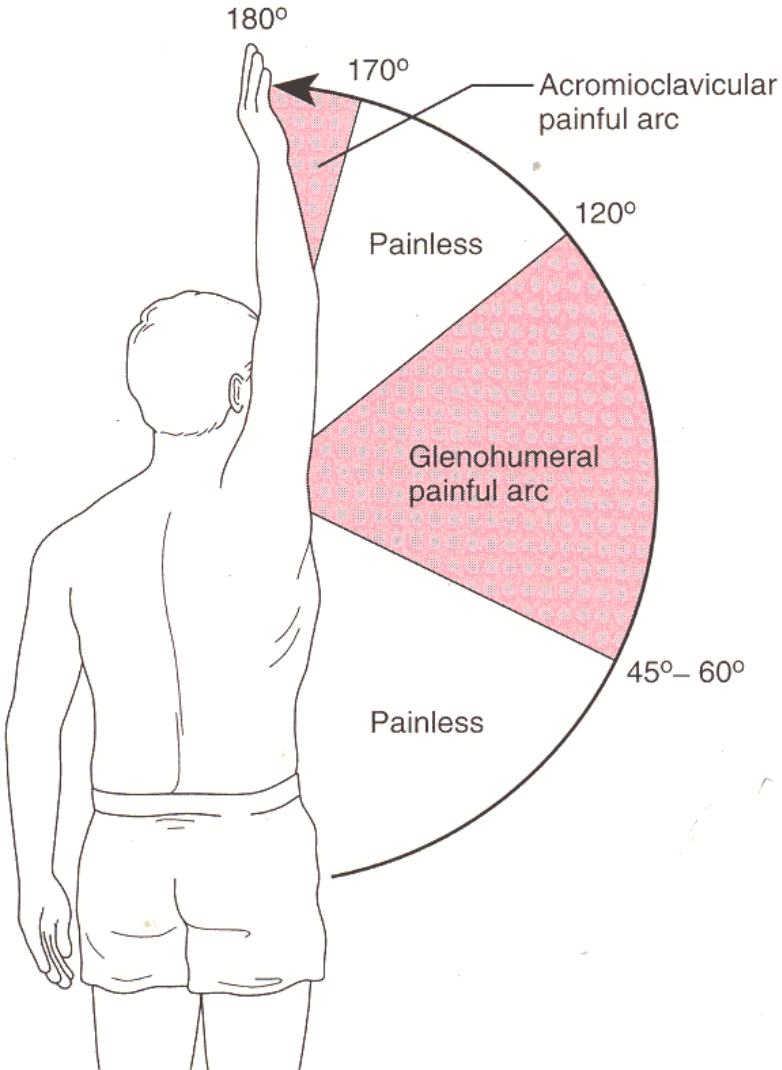
- Discomfort located lateral brachial C5,6 region
- Pain or restriction of motion
- Pain limiting activity with ache afterwards
- Athletes specifically – Pain with throwing/serving/overhead motion
- With progression: loss of strength/motion, pain at night

Examination

- Likely forward head/rounded shoulders posture
- Disrupted SH rhythm/motion/positioning
  - 2:1 Humerus:Scapula normal
- Painful Arc (Abd) at 60-120 degrees
- + Neer Impingement Sign
- +Hawkins-Kennedy

Painful Arcs/Impingement Zone

- **Subacromial**



Examination

- Bicipital tendon
  - + Yergason's
  - + Speed's
  - Point tenderness bicipital groove

Examination

- Supraspinatus
  - + Empty Can
  - + Drop Arm
  - Point tenderness insertion

- Internal Rotation Resistance Strength Test[28]

Rehabilitation Options

- Rest, analgesics, anti-inflammatory medications
- Manual Therapy
- Local steroids injections
- Exercise
- Scapular taping
- Surgery

Injection

- Subacromial Corticosteroid injection shown to improve[22]:
  - ROM
  - Function
  - Pain
- BUT….
  - "…are associated with tendon rupture, subcutaneous fat atrophy, and articular cartilage changes"
  - And…subacromial corticosteroid injection improvements were not sustained[23]

NSAIDs

- Efficacy for SIS injection use NOT supported over use of NSAIDs[22,23,24]
- "Although all SIS patients showed immediate improvement, only those who received NSAID injections continued to show improvement at 4 weeks"
- "Because NSAID injections are not associated with tissue atrophy or damage to cartilage, they may be a viable alternative in the treatment of SIS"[23]

Exercise

- Exercises should focus on selective activation of weaker muscles with minimal activation of overactive muscles and enhancement of all scapular stabilizers
  - Avoiding upper trapezius activation
  - Promoting activity in External rotators, lower/middle trapezius, shoulder extensors
- Stretching of tight anterior/posterior structures
  - Pectorals, upper trapezius, scalenes, posterior/anterior capsule
- ROM exercises to improve all planes

Exercise

- Jobe Exercises and rotator cuff conditioning/return to sport exercises
  - http://orthoinfo.aaos.org/PDFs/Rehab_Shoulder_5.pdf.
  - Can sometimes irritate injuries

- Exercise shown to demonstrate improvements in pain and function
  - BUT…is not tolerated always nor effective for every patient[25]
  - Even with conscious effort some movement patterns cannot be corrected[25,29]

Exercise

- Improved recruitment of weaker muscles[19,20,21]:
  - Side-lying forward flexion
  - Side-lying external rotation
  - Prone horizontal abduction with external rotation
  - Prone extension in neutral

*But no significant effect on activation patterns demonstrated

Scapular Taping

- Hypothesized mechanisms for improvement[8,9]
  - Enhanced joint stability
  - Improved strength
  - Improved proprioception
  - Enhanced muscle activation patterns
  - Pain reduction
  - Scapular re-positioning

Question: Does inclusion of scapular taping enhance effectiveness of rehabilitation for subacromial impingement in overhead athletes?

Literature Review

- Taping Alone

VS.

- Taping Included In Comprehensive Regimens

Taping Conditions Alone

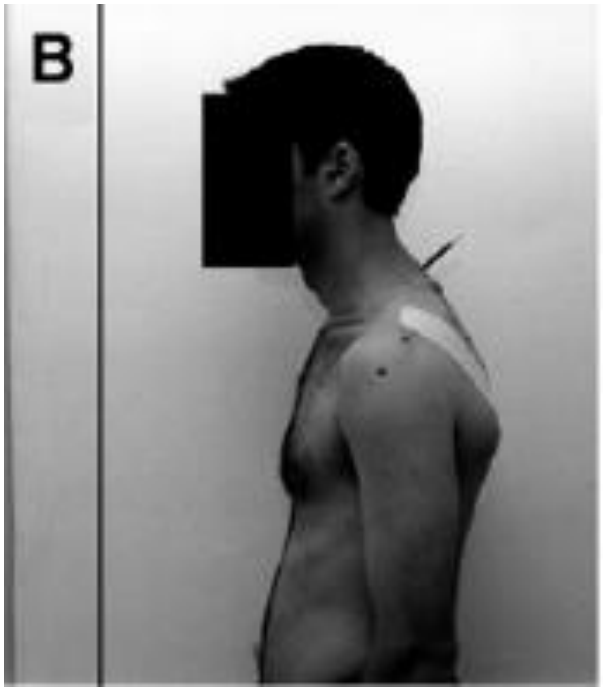
- Basis: taping does not impact shoulder kinematics in healthy populations (Cools et al. 2002)
- Enhanced muscle activation pattern; specifically, increased activation lower trapezius and decreased activation upper trapezius (Selkowitz et al. 2007; Williams et al. 2012; Hsu et al. 2009, Smith 2006, Morrissey 1999)

Taping Alone

- Scapulohumeral kinematics and pain free ROM improved (McConnell et al. 2011; Thelen 2008, Lewis, 2005)
  - Only immediately, long-term results insufficient
- Function as determined by SPADI not significantly impacted (Thelen, 2008)
- Proprioception
  - Inconclusive
  - Likely more related to sense error (Williams, 2012)

Taping

- Scapular Positioning/Posture improved (Lewis et al. 2005)



Comprehensive

- Pain improved as measured by SPADI and NPRS (Kumar et al. 2012; Host, 1995)
- Pain free ROM improved flexion/abduction (Host, 1995; Kaya, 2011; Williams, 2012)
- Strength improved flex, abd, ER, ext, IR (Kumar, 2012; Schmitt, 1999) and Supraspinatus/all major planes (Host, 1995)
  - Only inferred in Williams, 2012

Comprehensive

- Muscle activation patterns improved (Tucker, 2010; Williams, 2012)
- Function improved
  - SPADI (Kumar, 2012)
  - Ability to perform ADLs (Tucker, 2010; Host, 1995)
  - Work (Schmitt, 1999)

Kumar et al., 2012

- Taping + Conventional Treatment compared to Conventional Treatment alone
  - Conventional = ROM, strengthening, joint mobilization, stretching, education, cold modalities

- Taping + Conventional group showed significant improvement in SPADI pain and disability measures and isometric muscle strength compared to conventional only group

Conclusion

- Study methodological limitations are evident with high variation in application methods as well as inconsistent outcomes
- Most authors agree that taping is most likely to be beneficial if included in a comprehensive approach[4,5,8,11,12,14]
- From this literature review taping appears to be most effective in the very short term for altering scapular alignment and production of EMG pattern alterations[9,11]

Bottom Line

- Highly variable and inconsistent results that appear to be at best short lived, despite demonstrating the POTENTIAL for improvement in many areas

- Taping is a potential tool to be considered but is likely to be best effective in individuals where a comprehensive and individualized regimen is implemented

Types of Tapes

- Kinesio Tape
  - Hsu, 2009
  - Thelen, 2008

- Leukotape/McConnell
  - Selkowitz, 2007
  - Host, 1995
  - Cools, 2002
  - Kumar, 2012

McConnell Taping Technique

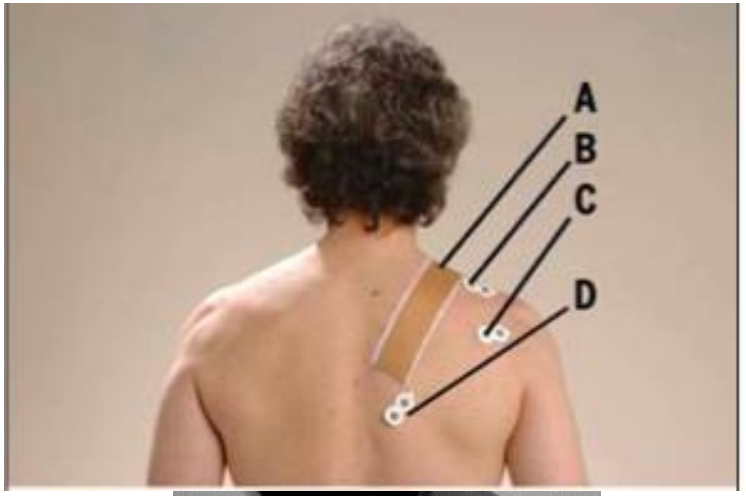
McConnell Taping is a bracing or strapping technique using a super-rigid, cotton mesh highly adhesive tape (EnduraTape ®, LuekoTape®). Most commonly used for pattelafemoral syndrome, shoulder subluxation, lumbar, foot, and hip impingement. Left on for no more than 18 hours due to causing adverse skin reactions. Typically left on for a shorter period of time due to its constricting and suffocating feel. Affects bio mechanics of patient. Primarily used for neuromuscular re-education of the affected condition. Widely accepted by the medical community.

Kinesio Taping Technique

Kinesio Taping is a therapeutic taping technique, not only offering your patient or athlete the support they are looking for, but rehabilitating the affected area as well. This technique uses a highly specific designed tape that works with the body allowing full range of motion (ROM). This technique will not adversley affect the bio mechanics of the patient. This latex free product makes it hypoallergenic and safe to use from the pediatric to geriatric populations. No compression to the skin makes it "light to the feel" allowing comfortable wear over a 3 to 5 day period. The water resistant fabric wisks away moisture and gives the patient the ability to bathe as normal. Kinesio Taping works with the lymphatic system to increase circulation of blood and lymph in order to rehabilitate and relieve pain. Used for virtually all clinical conditions.

Location

- Upper Trapezius
  - Selkowitz, 2007
  - Cools, 2002
- Lower Trapezius
  - Hsu, 2009



Location

- Supraspinatus/Upper Trapezius/Deltoid
  - Thelen, 2008
- Center of spine pulled back for retracted position
  - Host, 1995
  - Kumar, 2012

FIGURE 2. Therapeutic Kinesio Tape application.

Application Methods

- McConnell
  - Assessment of structure orientation, determining which components need to be corrected, taping the structure into alignment and specifically retraining appropriate muscles[31]
  - Selkowitz; Cools, 2002; Smith, 2009
- Kase
  - The tape is applied over the affected area with the muscles in a stretched position and is applied from origin to insertion
  - Designed to support activation or prevent over-contraction[30]
  - Hsu, 2009; Thelen, 2008

Outcome Measures

- Principle criterion in evaluating shoulder in athlete is return to same level of sport[32]
  - Does not account for those players who have to change position, style, intensity or duration[32]
- Disabilities of the Arm, Shoulder and Hand (DASH)
  - Reliable and valid[32]
  - But not shoulder specific
- Shoulder Pain and Disability Index (SPADI)
  - Mod-good reliability
  - Good internal consistency
  - Responsive
  - Good construct validity[35]

Impingement Specific

- Western Ontario Rotator Cuff Index
  - Self report questionnaire
  - 5 domains
    - Pain/physical symptoms
    - Sports/recreation
    - Work
    - Lifestyle
    - Emotions
  - High internal consistency, mod-good validity, high reliability, good responsiveness[34]

Outcome Athletic Function

- ASES Standardized Shoulder Assessment
  - Patient-completed subjective portion added
  - Reliable, valid and responsive in athletes[33]
- Kerlan-Jobe Orthopaedic Clinic (KJOC) Score
  - Valid, reliable, and responsive or adult overhead athletes[32]
  - “may provide more clinically relevant information when used compared to existing traditional shoulder and elbow scoring instruments”[32]

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