THORACIC INTERVERTEBRAL JOINT MOBILIZATION FOR ANTERIOR CHEST PAIN – A CASE REPORT
Index

Abstract

Introduction

Case Description

Discussion

Conclusion

References

Appendices

Appendix 1: Clinical reasoning form

Appendix 2: Informed consent

Appendix 3: Short Form McGill Pain Questionnaire

Appendix 4: Numeric Pain Scales

Appendix 5: Exercise program

Appendix 6: Outcome measures
Abstract

Anterior chest wall pain is commonly caused by dysfunction of the thoracic intervertebral joints. A 45 year old female presented with anterior chest pain the day after lifting a piece of wood with a unilateral arm movement. The patient’s pain could be reproduced with active thoracic extension, breathing and central P-A pressure on T6. The treatment technique of a rotary posterior- anterior intervertebral mobilisation by Maitland was chosen, directed at T6. After four sessions the patient was pain-free and fully functional. The joint mobilisation was followed by an exercise program which was progressed to include a group neck and back class.

The literature often describes anterior chest wall pain along a dermatome and referral patterns due to T4 syndrome, but there is a lack of description of somatic referral patterns to the anterior chest wall. This case report describes the possible mechanism of injury that could have injured the thoracic motion segment, and the effect of rotary posterior- anterior intervertebral joint mobilisation on pain in a patient with anterior chest pain.

Keywords: Thoracic Spine, Joint Mobilisation, Chest Pain
Introduction

Young et al (2008) emphasised the unreliability of diagnosing referral pain patterns from thoracic costotransverse joints, as these referral patterns resemble the patterns from other soft tissue or spinal structures. Despite this, it is proposed that approximately 50% of all the patients attending emergency departments and outpatient cardiac clinics for chest pain have a non-cardiac origin for their symptoms (Mayou et al 1997). Referral from the costovertebral and costotransverse joints are often only considered after a costly visceral examination has been made. T4 syndrome with symptoms that include unilateral or bilateral glove-like paraesthesia, refers pain into the neck, scapular region and a dull, generalised headache. The pain is thought to come from the T4 intervertebral disc, thoracic zygapophyseal or costotransverse joints affecting the sympathetic trunk in the area. Erwin et al (2000) concluded in his study that the costovertebral complex could produce pseudo-angina and back pain. Maitland (2001) describes the dermatomal referral pattern when the nerve root is the source of the pain. Rabey (2008) suggested that in atypical chest pain the costovertebral and costotransverse joints are commonly overlooked as sources of pain.

Edmondston and Singer (1997) concluded that sound knowledge of the anatomy and biomechanics of regional variations in the thorax influences the examination and management of these conditions. The strong but elastic thorax consists of a sternum, 12 pairs of ribs, thoracic vertebra and costal cartilage, which resists anterior-posterior (A-P) forces on the thorax, thus protecting the viscera. During inspiration all rib angles and lengths increase and decrease with expiration causing gliding movements of the costoovertebral joints. Anterior chest wall pain is commonly
caused by dysfunctions from the neuromusculoskeletal system. These conditions may be aggravated by sneezing, upper torso body movements, coughing or just breathing (Schafer 1997). The stability and rotational mobility of the thoracic spine is increased by certain anatomical features, but sagittal movement is limited compared to the cervical and lumbar spine. Flexion and lateral translation is limited by the thoracic zygapophyseal joints (White 1969 cited in Edmondston and Singer 1997).

Two case studies on chest pain reported good results with joint mobilisation. The first patient presented with costochondral swelling and localized anterior tenderness, and reported relief by manual therapy directed at the zygapophyseal and posterior rib articulations (Rabey 2006). DeFranca et al (1995) reported good results after joint manipulation directed at the thoracic spine in patients with thoracic dysfunction and upper extremity symptoms. The purpose of this case report is to describe the effect of a rotary posterior- anterior (P-A) intervertebral mobilisation on a patient complaining of anterior chest pain.
Case Description

A 45 year old female shop owner consulted physiotherapy after she lifted a piece of wood with a unilateral arm movement five days prior to the consultation. A left anterior chest pain, located lateral to the sternocostal junction and inferior to the clavicle, presented the day after she picked up the wood. The pain was described as a moderately “stabbing” or “cramping” and mildly “tiring” or “exhausting” according to the Short Form McGill Pain Questionnaire, which was used to specify the subjective pain experience of a patient (Melzack 1975). The pain experience was indicated on the questionnaire as between “distressing” and “horrible”. The intensity of the pain according to the Numeric Pain Scale (NPS) was 7/10 at its worst.

The pain woke her up regardless of the side she slept on, but she did not experience any pain sleeping on her back. The pain was aggravated when breathing deeply, bending forward or blowing her nose, but subsided within a few seconds. According to the patient there was no change in the intensity of the pain during the day.

Figure 1. Body chart indicating the area of pain
She reported a history of recurring right neck pain for which physiotherapy treatment helped ten years ago, and severe headaches three years ago, which a chiropractor cured. No trauma was reported. Except for an allergy her general health was good.

The Short Form McGill Pain Questionnaire was completed at the first consultation, according to which the pain was rated as a mild pain. Before and after every manual therapy the patient rated her pain on a numerical pain scale 0 to 10 (Johnson 2005). The NPS has a good sensitivity and generates data that can be analysed statistically (Williamson et al 2005). Pain with breathing, the history, behaviour and the area of the pain indicated intervertebral or costovertebral joint involvement. A second hypothesis could be a pectoralis muscle injury, because the pain started a day after the injury, which is typical for a muscle strain rather than a joint dysfunction. The main hypothesis generated after the interview was left anterior chest pain referred from a thoracic intervertebral motion segment dysfunction, possibly a thoracic joint or nerve.

Observation revealed both a decreased cervical lordosis and thoracic kyphosis and kyphotic hump at C7/T1. An increased left paraspinal muscle bulk in the thoracic area was also noted. Active thoracic flexion, right lateral flexion and rotations were asymptomatic at end of range, with overpressure. Mid-thoracic left lateral flexion with overpressure produced a local pain and thoracic extension with overpressure hinged over T6/T7 reproduced the familiar left anterior chest pain (7/10). Arm movements did not reproduce the pain. During palpation of the rib cage, no raised temperature, swelling or sweating was noted. Palpation of the left upper costochondral joints was more tender than the right. Pectoralis major, Rhomboids and the middle Trapezius muscles on the left were tender and toned. Central P-A passive joint pressure
indicated that T4 (grade II+), T5 (grade II+), T6 (grade II) and T7 (grade II), and left unilateral P-A pressure on T6/T7 (grade II) were tender. The patient reported some relief with re-assessment after the physical examination. Pain during breathing on the NPS rated between 6 and 7/10. Thoracic extension indicated less pain (6/10) anterior with overpressure at T6/T7. After the physical examination it was concluded that the anterior chest pain came from a dysfunction of the T6/T7 intervertebral motion segment.

The short-term management plan was to achieve full pain-free mobility of the thoracic intervertebral joints. The treatment of choice was a rotary posterior- anterior (P-A) intervertebral mobilisation technique by Maitland directed at the thoracic spine to mobilise the costotransverse, costovertebral and intervertebral joints (Maitland 2001). The single joint ranges of movement are small, but a considerable movement can be achieved between the joints, giving an immediate improvement in movement and comfort. The long-term management plan was re-education of movement of the thoracic muscles i.e. rhomboids, mid and lower trapezius through specific stabilizing exercises in a specific exercise program that suited her lifestyle. The focus was on stability, control and quality of movement as to increase thoracic stability and mobility. Education and promotion of correct working positions and posture during all activities of daily living were also included.
Treatment one (Day one)

In a prone lying position with a pillow under the patient's chest a T6 Rotary P-A intervertebral mobilization clockwise and anti-clockwise three times 30 seconds grade III was performed. T4, 5 and 7 rotary P-A intervertebral mobilizations clockwise and anti-clockwise one time 30 seconds grade III were also performed. The T6/7 intervertebral motion segments were mobilised with a rotary P-A intervertebral mobilisation of T6, to affect T5/T6 and T6/T7 as explained by Maitland (2001).

Figure 2. Rotary P-A intervertebral mobilization anti-clockwise (Consent obtained from patient).

After thoracic mobilisation the patient rated pain during breathing 6/10 on the NPS. Thoracic extension indicated decreased anterior chest pain (5/10) with overpressure of T6/T7 motion segment. A central P-A T6 was still tender with a grade II palpation (See appendix 6 for outcome measures). Gentle myofacial release and massage
techniques were applied after the manual therapy techniques. Heat and pain medication was advised for treatment soreness.

Treatment two (Day Three)

The patient reported a decrease in symptoms and no anterior chest pain when she slept on her sides, or when she moved during the night. She also reported that her pain moved from the left anterior chest to the left lateral chest with breathing and picking up objects. Pain during breathing rated as 4/10 on the NPS. Evaluation of active movements reproduced the anterior chest pain (1/10) during thoracic extension with slight overpressure of the T6/T7 motion segment. Central P-A pressures T6(II+), T7(III-), T4(III+) and T5(III+) showed improvement from the previous session. The same thoracic mobilisation techniques were performed at treatment two as a result of the improvement in pain after the first treatment. Pain during breathing after thoracic mobilization was 3/10 on the NPS. Thoracic extension at end of range with overpressure of T6/T7 produced no anterior chest pain (0/10), but slight pain over the area (2/10). Central P-A of T6 was tender with a grade II+ palpation (See appendix 6 for outcome measures). Gentle myofacial release and massage was performed after the manual therapy techniques.

Treatment three (Day 11)

At the third session she reported that she had pain over the weekend, but she was now almost pain free. She felt slight pain on the posterior chest next to T6/T7 when breathing and picking up objects. Pain during breathing was 1/10 on the NPS. Re-assessment of thoracic extension revealed slight pain (2/10) on T6/T7 with overpressure. Palpation of T6(III), T7(III), T4(IV) and T5(IV) with a central P-A
showed again improvement from the previous session. The treatment of choice was again a T6 Rotary P-A intervertebral mobilization clockwise and anti-clockwise three times 30 seconds grade III. T7 Rotary P-A intervertebral mobilization clockwise and anti-clockwise once for 30 seconds grade III was also performed. After thoracic mobilization pain with breathing was between 0 and 1/10 on NPS. Thoracic extension T6/T7 was sensitive (1/10) with overpressure. Central P-A on T6 was still tender with a grade III palpation (See appendix 6 for outcome measures). Myofacial release and massage techniques were done. See appendix 5 for home exercises given.

Treatment four (Day 18)

With the fourth session a week later, the patient reported that she was pain free when breathing, blowing her nose and picking up objects. Pain with breathing was 0/10 on the NPS. Thoracic extension was almost pain free (1/10) with overpressure T6/T7 and a central P-A (grade IV) on T6 was tender. T6 Rotary P-A intervertebral mobilization, clockwise and anti-clockwise three times 30 seconds grade III was performed due to the slight pain with overpressure during thoracic extension. T7 Rotary P-A intervertebral mobilization clockwise and anti-clockwise one time 30 seconds grade III was also performed. After manual therapy thoracic extension was pain free at end of range with overpressure. Central P-A (grade IV) produced no pain (See appendix 6 for outcome measures). Myofacial release and massage therapy was done. During the treatment focus was placed on posture correction and rehabilitation incorporated with breathing. See appendix 5 for exercises done as the initial rehabilitation during the session, and given as home program. The patient started attending back and neck rehabilitation classes, twice a week, three weeks
after her last treatment session. The class focussed on local and global stability and global mobility incorporated with breathing. She was compliant with the classes and was pain free when the case report was recorded two months after the first treatment session.
Discussion

Postural or asymmetrical spinal movement response to arm elevation on mid thoracic side flexion indicated changes in movement patterns or thoracic segment dysfunction (Edmondston and Singer 1997). The mechanism of injury in this case indicated a possible dysfunction at the thoracic joint motion segment, as the thoracic spine might have been influenced by movements, active or resisted, of the lumbar and cervical spines and the extremities (Austin and Benesky 2000). This showed that the unilateral arm movement when picking up a weight could have injured the thoracic motion segment, influencing movement patterns and thus the mobility of the joint.

Referral patterns from somatic structures in the thoracic region are complex. Young et al (2008) emphasised the unreliability of diagnosing referral pain patterns from thoracic costotransverse joints, as these referral patterns resemble the patterns from other soft tissue or spinal structures. They conducted a study where the costovertebral joints of asymptomatic subjects were injected to locate the referral patterns of these joints. An ipsilateral localised pain described as a dull, deep and pressure sensation was referred more superior and inferior to the joints. Erwin et al (2000) examined the costovertebral complex and found that the costovertebral joints can produce pseudo-angina and back pain that may be relieved by spinal manipulation. The study showed similarities in pain production of the costovertebral joint compared to other joints of the spinal column.

The pain that referred to the patient’s anterior chest was suspected to be from a thoracic joint complex dysfunction, indicating a possible movement pattern limitation. The choice of treatment was based on the intervention used by Rabey (2006). He
reported on two case reports where anterior chest pain, presenting with costochondral swelling and localized anterior tenderness, was relieved by manual therapy directed at the zygapophyseal and posterior rib articulations. Conroy and Schneiders (2005) reported that central passive mobilisation on a symptomatic T4 vertebra reduced pain and improved spinal mobility. In this case the anterior chest pain was relieved by a rotary P-A intervertebral mobilisation directed at T6 to affect T5/T6 and T6/T7.

The relief of pain by joint mobilisation is debated in the literature. Maitland (2001) states that even though the single costotransverse, costovertebral and intervertebral joint ranges of movement are small, considerable movement can be achieved with passive joint mobilisation, resulting in an immediate improvement in movement and comfort. Skyba et al (2009) hypothesised that a non-opoid form of analgesia was caused by joint mobilisation. Spinal noradrenergic and serotonergic receptors were activated, which utilised the descending inhibitory pathways, relieving the pain. Spinal manual techniques decreased the superficial neck flexor muscle activity by a sympathoexitatory effect in a study conducted by Sterling et al (2002). The activation of the deep neck flexor muscles was facilitated more effectively with less superficial neck flexor activity.

Liebler et al (2001) reported an increase in lower Trapezius strength after asymptomatic vertebrae T6 – T12 were mobilized with a Grade IV central P-A pressure. The theory behind this was that the mechanoreceptor-associated inhibition of the lower trapezius muscles was decreased when the extensibility of the joint tissue increased. Thus incorporating therapeutic exercises with mobilisation can
improve the treatment plan. In this case study intervertebral joint mobilisation was followed by therapeutic exercises to decrease the load on the joints.

Pain in the anterior chest wall often comes from neuromusculoskeletal dysfunctions and diseases, but it is not uncommon for it to mimic pathologic heart or lungs processes. The initial priority is to differentiate among functional, traumatic and visceral origin. In neuromusculoskeletal conditions the patient can often place their finger on the area, and it may be aggravated by upper torso body movements, sneezing, coughing and breathing (Schafer 1997). A neurogenic referred pain can be excluded by a neurological examination. The rate of recovery may be delayed if there is autonomic nervous system involvement. When mobilisation of the thoracic spine, ribs and related neural tissue does not relieve the pain, referral to a specialist should take place (Maitland 2001).
Conclusion

This case report demonstrated the effect of passive joint mobilisation directed at the thoracic spine in a patient presenting with anterior chest wall pain. More research on the somatic referral patterns of the thoracic vertebral complex, will facilitate diagnosis of the source of such pain. This case report adds to the literature as it describes the positive effect of rotary P-A intervertebral mobilisation of the thoracic spine on anterior chest pain.
References


DeFranca GG, Levine LJ 1995 The T4 syndrome. *Journal of Manipulative and Physiological Therapeutics* 18:34-7


Rabey MI 2006 Chostochondritis: Are the symptoms and signs due to neurogenic inflammation. Two cases that responded to manual therapy directed towards posterior spinal structures. *Manual Therapy* 13: 82-86

Schafer RC 1997 Priority Appraisal Following Anterior Thorax Trauma
http://www.chiro.org/rc_schafer/Monograph_20.shtml
[Online] Retrieved on 11 August 2010

Skyba DA, Radhakrishnan R, Rohlwing JJ, Wright A, K.A. Sluka AA 2003 Joint manipulation reduces hyperalgesia by activation of monoamine receptors but not opioid or GABA receptors in the spinal cord. *Pain* 106: 159-168


