

“The effect of cervical spine mobilization on shoulder dysfunction”

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## **Introduction:**

In the modern lifestyle, which is more passive and based on computer technologies in the offices, we face an increase in shoulders dysfunctions cases, to be number three most common cases in the emergency rooms in some countries like the United States of America.

Generally, shoulders dysfunctions are difficult cases to treat and need to study and assess all the causes to understand it better and get better results. One of the structures that should be assessed is the cervical spine. There is a close relationship between the cervical spine and shoulders as the nervous innervation for the shoulders cross and passes from the cervical spine; many muscles contribute to both of them.

As osteopathy follows the holistic approach school, which deals with the body as one unit, I decided to investigate the interaction between them.

## **Synopsis:**

Is there a relationship between cervical spine mobilization and correcting shoulders dysfunctions? And if there is, is it a significant relationship that helps change the perspective of shoulders dysfunctions treatment?

## **Method:**

To answer these questions, I will review the anatomical structure for each of them and discuss the physiological interaction. Then I will review different researches and papers that discussed this point.

## **Anatomy:**

The cervical spine is a highly specialized portion of the vertebral column, the first two vertebra C1 and C2 is unique and they got special names Atlas and Axis, they are smaller and more movable compared to the lower which is larger to handle weight bearing, the first vertebra attached to the skull, and then the other five cervical vertebra were the C7 is attached at the end to the thoracic spine. They have small thickness of discs compared to other spinal vertebra, although they have to carry a relatively high weight of the head (average 10 to 13 pounds) and keep the flexibility for the widest possible movement. This is in a way similar to the shoulder joint by compromising movement to stability. Both joints had a delicate equilibrium, and the unique relation between them make it more challenging to keep this coordination. From each vertebra of the cervical spine, there are two intervertebral foramina which the nerve roots emerge to supply shoulder muscles. Any cervical spine diseases will have an effect on the shoulder joint. Cervical vertebrae provide points of attachment for muscles that include erector spinae, interspinales, intertransversarii, levator scapulae, multifidus, obliquus capitis, rectus capitis, rhomboid minor, rotatores, semispinalis, splenius capitis, and trapezius.

Nerves of the upper limbs arise from the brachial plexus, which compound from the nerves descending from C5 – T1. The Dorsal Scapular nerve, which comes from the C5, innervates the

levator scapula, Rhomboid major, and Rhomboid minor muscles. The Long thoracic nerve comes from the root of C5 to C7 innervate the Serratus anterior muscle. The Suprascapular nerve comes from C5 – C6 innervate the Supraspinatus and Infraspinatus muscles that compound with the rotator cuff. The Subclavian nerve comes from C5 – C6 innervate the Subclavius muscle. Lower scapular nerve C5 – C6 innervate the Teres major, and upper and lower Scapular nerve innervates the Subscapularis muscle. Axillary nerve C5 – C6 innervate the Teres minor muscle. The Deltoid muscle gets innervated from the C5 – C6 via the axillary nerve.

As we can see, most of the shoulder muscles are innervated from the C5 – C6 passing through the brachial plexus; this is why most of the studies focused on this vertebral level when studying the effect of cervical spine mobilization to the shoulder dysfunction.

We can see from the complexity in the neural innervation for the shoulders, which passed from the cervical spine, bring us to a question, if there is asymptomatic compression in the nerves root, is there any consequences in the shoulders muscles and therefore the balance and coordination between this muscles to perform movement?

This point has been tested practically with the Chiropractic's D. D. Palmer, the explorer of Chiropractic science. He believes that all the bodily function controlled by the flow of nerve vibration from the brain through the spinal cord passing from opening in the vertebral column to innervate tissues makes him believe that any interruption in these signals can lead to malfunction in the brain innervated tissues. There are also many muscles that originate or insert in the neck and shoulders, which have combined functions in both joints.

Trapezius muscle descending and transverse part originate from the external occipital protuberance and ligaments attached to the spinous process of C1 to T3 spinous process and inserts in clavicle and acromion.

Levator scapula originates from the transfer process of C1 to C4 and inserts in the medial border of the scapula.

The Rhomboid minor muscle originates from the spinous process of C6 – T1 and insert in the root of the spine of the scapula.

These muscles are the dominant mover in a pattern movement and accessory mover in other movement patterns, for example, the levator scapula muscle action is to elevate the scapula and rotate it downward, but if the scapula is fixed, then it can participate in lateral flexion of the cervical spine and stabilize the vertebral column while rotation. A malfunction in the scapular fixation may lead to malfunction in the cervical spine lateral flexion, which causes other neck muscles to be overworking and abnormal cervical posture.

Neurokinetic technique therapy arguing in their theory and practice about the detection of compensation patterns between muscles. For example, they promote that inhibited scalene muscle can be a reason for overworking levator scapula or deltoid muscles, making a connection between cervical spine malfunction and shoulder malfunction.

Cervical spine manipulation has played an important role in the development of Chinese medicine over the last decade in china, at the same time cervical spine manipulation has been accepted and favored by clinicians, chiropracticors and physical therapists around the world. Neck pain is the most common symptoms of cervical radiculopathy, having impact on cervical

range of motion and function. There was moderate level evidence to support the immediate effectiveness of cervical spine manipulation in treating people with cervical radiculopathy. The safety of cervical manipulation cannot be taken as an exact conclusion so far **Liguo Zhu**, (2010)

The shoulder joint has a wide range of movement, and it can reach high degrees of movement in different axes of movement. This high movement ability meets lower joint stability compared to other body joints with less range of motions. Thus require a high and unique equilibrium and coordination between the joint muscles to maximize the stability and produce smooth movement in the joint. Any inhibition in the joint muscle can lead to dysfunction in the shoulder (as a theory). A few researches targeted this point, but we still need more studies about this relationship as these researches had different results.

A case report published in the JOSPT described a manual therapy management strategy for patients with shoulder pain and disability. It addressed impairments of the cervical spine that can contribute to the patients' symptoms. In patients diagnosed with cervicobrachial pain syndrome, a positive outcome associated with manual therapy intervention. After a physical examination, it has been found that all range of motions has improved comparing to the initial assessment.

Another study performed and published by **Lynda McClatchie a** (2009), claimed that it's the first study to examine the effects of cervical lateral glide mobilization in the cervical spine to the shoulder pain, they found that it had an immediate decrease in the intensity of shoulder pain beyond the placebo effect. Eight subjects (38.1%) showed a decrease in the intensity of shoulder pain by 1.3cm following the cervical lateral glide mobilization, compared to one subject (4.8%) following placebo intervention. They said that the 1.3cm difference in the VAS score following the cervical lateral glide mobilization is statically significant and indicate clinically relevant changes. The study subjects were non-symptomatic in their cervical spine. This was a large study that examined this kind of intervention beyond the placebo effects and had significant results. It can be a cornerstone study for other upcoming studies.

**Chad Cook a** (2009) wrote the addition of cervical unilateral posterior-anterior mobilization in the treatment of patients with shoulder impingements syndrome. They reported no significant change or benefits from the cervical unilateral posterior-anterior mobilization in the treatment of SIS when evaluating the out-coming pain, disability and PASS, which is in contrast to **McClatchie et al.** (2009), who reported immediate improvement in the range of motion and improvement in the reported pain after a single treatment to the neck.

They found that not only the results were different, but also the methodology. Their study was captured within 56.1 days, while McClatchie study was in a single visit results. In addition, they found that manual therapy to the thoracic spine had a significant change in the shoulders dysfunction, as they explained that people with shoulder impingement syndrome had limited thoracic mobility and more significant thoracic kyphosis compared to peoples with healthy shoulders.

**Wei-Ting Wu** (2011) had a study using the ultra sound to discussed that there is no association between the rotator cuff tear and cervical spine foramina stenosis in the level of C5 and C6. they reported that the only factor may contribute to rotator cuff tear is ageing. This is in contrast to the study done by **Hattrup et al** (2010), which is performed the same study in a comprehensive way. The work roposed that biomechanical connection linking them may be mediated by the irritation or dysfunction of the suprascapular nerve or axillary nerve.

In (2015) **Zhange et al** conducted a study using medical care records, where he found that patients diagnosed with rotator cuff pathology were more likely to have cervical and lumbar spine problems.

**Kou Mimori** (2012) wrote a study discussing the relationship between the painful shoulder and the cervical spine with the narrow canal in patients without obvious radiculopathy, they had several subjects with the narrow canal (due to disc involvement) and compared the shoulder pain, the study found that it may be one factor the narrow canal to cause shoulders pain, but it is not the only factor as there were some results of subjects had shoulder pain without narrowing cervical spinal canal.

From my perspective, this may be due to other tissue damage inside the shoulder joint or for other reasons, but the researcher did not extend his research to find out.

There is another study discovering the relationship between the mobilization of the cervical spine and treatment of pain and dysfunction in the lateral epicondyle was conducted by **Bill Vicenzino**. This study proposed a significant benefit when use cervical spine mobilization in the protocol of treating lateral epicondyle problem comparing to placebo intervention, and manipulative therapy can rapidly elicit hypoalgesic effect.

In (2015) **Karthikeyan Guru** studied the effects of gleno-humeral mobilization and cervical spine mobilization in patients with shoulder impingement syndrome. The study concluded that Mulligan mobilization with the movement of cervical lateral glide combined with conventional physical and Maitland mobilization proved to be better in the improvement of shoulder pain and range of motion compared to the standard protocols.

**Paul E. Mintken** in (2010) studied Some Factors Predict Successful Short-Term Outcomes in Individuals with Shoulder Pain Receiving Cervicothoracic Manipulation, the work show a result of 80 individuals included in the data analysis, 49 of them had a successful outcome. But if 3 of the 5 variable were present, then the chance of achieving a successful result will improve from 61% to 89%.

Also **Boyles et al** (2009) concluded that investigations indicated that there is a potential benefits of spinal manual therapy for patients with shoulders pain with acute and short term follow up, while **Craig A. Wassinger** (2015) had a study demonstrated that there are significant acute pain reduction following cervical spinal manipulation for patients with shoulder dysfunctions, by using cervical, cervicothoracic and thoracic manipulation for patients with acute shoulder pain. He recommend the clinical practitioners to add manipulation in the treatment protocols, and go beyond that to indicate that its not a contraindicated process of treatment comparing to the positive results practitioners can get.

## **Case study:**

**Polkinghorn** (1999) had a successful treatment of two cases of adhesive capsulitis using mechanical forces, where he included cervical manipulation to the shoulder and thoracic spine manipulation. However, he used high velocity low amplitude thrusts which was tolerated by the patient. The author believe that with a good practical manual skills, there can be a significant change in the patient outcome results.

**Conclusion:**

Based on these positive studies, the theoretical principles of the Chiropractic sciences and Neurokinetic therapy techniques, I believe that we may need to reconsider a review in the treatments protocols of the shoulders dysfunction, and may extend more to study the relations of other parts in the body so to improve the results of treatment. I think this relationship needs more studying and research.

I believe that we should not surrender to common knowledge and data. We need to continuously investigate and search as many expected relations did not have enough studies, like the relation of shoulder critical angle presence to the shoulder impingement syndrome.

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