Crochet the Pain Away: A Case Study of Osteopathic Manipulation for Cervical Rib Induced Thoracic Outlet Syndrome

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Abstract

Background: Many people experience symptoms of thoracic outlet syndrome each year; one cause of these symptoms is the presence of cervical ribs. Cervical ribs have an estimated prevalence of 2% in the general population and 8.3% of those with thoracic outlet syndrome symptoms.[1] Current treatment for thoracic outlet syndrome includes physical therapy and surgical resection. Techniques have been described for the treatment of thoracic outlet syndrome with osteopathic manipulation, but no specific treatment for cervical ribs was noted on a literature review.

Case Presentation: 25-year-old healthy female presents with intermittent hand numbness and tingling along the C8 distribution that worsened with crocheting. She had also noted for many years the presence of a hard-supraclavicular mass on her left side. Palpation of this mass showed a bony protrusion that stopped 2 cm posterior to the clavicle on the left, but no mass noted on the right. Records review revealed an x-ray confirming cervical rib on the left.

Results: After the treatment of surrounding dysfunctions without improvement in symptoms, the cervical rib was identified, manually isolated, and treated with direct myofascial release with respiratory assistance. This treatment provided immediate resolution of her symptoms. She remained asymptomatic for 10 days after treatment. A repeat treatment at two weeks resulted in resolution of her symptoms as far out as three months.

Discussion: Cervical ribs are common in patients with thoracic outlet syndrome, and treatment for these patients typically includes physical therapy followed by surgical intervention for non-responders. We propose that OMT, with a focus on direct myofascial release, may be effective in alleviating symptoms for patients with cervical ribs. A limitation of this study is that it is a case report of one young active female. A larger study that includes various ages, activity levels, and both sexes would be more generalizable.

Conclusion: Direct myofascial release is an effective technique for treatment of cervical rib induced thoracic outlet syndrome when myofascial restrictions are present.

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Disclosures: none reported.

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Submitted for publication March 23, 2020; final revision received Dec. 30, 2020; manuscript accepted for publication April 17, 2021.

Background

Thoracic outlet syndrome (TOS) is a common cause of upper extremity symptoms and is derived from compression of neurovascular structures around the neck and shoulder. The incidence of TOS is 1%-2% in the general population, with a higher incidence in women as compared to men (3:1), with most people becoming symptomatic between 20 and 60 years of age.[2] A common cause of TOS is the presence of cervical ribs. It is estimated that cervical ribs occur in 2% of the general population, but are as common as 8.3% in those with TOS.[1] TOS is subdivided into three different categories based upon the symptoms the patient is experiencing, which is determined by the specific structure(s) being compressed.

The first type of TOS, which comprises 85%-90% of cases, is neurogenic.[3] In this subtype of TOS, the nerve roots are being compressed causing radicular pain, numbness, and/or tingling in the upper extremity. These symptoms are typically dermatomal in nature, although multiple dermatomes can be affected, and are most commonly exacerbated by acute position changes of the head, neck, or upper extremity. Since the symptoms are frequently positional

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in nature, the patient may not have constant symptoms, but rather may experience symptoms when performing specific activities or with particular positions and postures. This subtype most frequently occurs in young, otherwise healthy individuals, and can be caused by acute injury or from repeated heavy lifting or overhead activities.[3] Exam findings that would facilitate diagnosis are tenderness to palpation in the subcoracoid or supraclavicular spaces. Patients may be able to reproduce symptoms with specific positions, but the physician should inquire specifically about military posturing (i.e. standing at attention) and the 3-minute elevated arm stress test.[3] A notable finding in neurogenic TOS is that diagnostic testing such as an electromyogram (EMG), roentgenograph, and magnetic resonance imaging will often be normal, thus the diagnosis is reliant on exclusion of other disorders and clinical findings suggestive of TOS.[3]

The next type of TOS is venous, which comprises 10%-15% of cases.[3] Venous TOS implies that the venous return from the upper extremity is impaired by compression. Most frequently, this occurs as the subclavian vein passes over the first rib within the costoclavicular space. This repetitive compression causes microtrauma and can lead to complications such as fibrosis of the vein and even venous thrombosis. Thrombosis will often result in upper extremity pain, poor venous return yielding a cyanotic appearance of the extremity and swelling of the arm distal to the occlusion.[3]

The third major type of TOS is arterial which makes up an additional 2%-5% of cases.[3] Since arteries have a more rigid structure with a muscular layer, which provides durability, increased structural integrity, and elasticity to the walls, this type is nearly always associated with anomalous anatomic variants. One such anatomic variant that causes arterial TOS is cervical ribs. The most common location of compression is within the scalene triangle, and will frequently induce development of post-stenotic subclavian aneurysms.[3] Another possible area of compression, which most frequently occurs in weightlifting athletes, is at the level of the axillary artery as it passes deep to the pectoralis minor tendon overlying the humoral head.[3] This compression can damage the artery, allowing formation of a mural thrombus, which can embolize in the arteries distal to the thrombus, most notably affecting the digits, or even the entire hand, causing ischemia.[3]

Lack of treatment from TOS can lead to chronic pain, numbness, and tingling in the extremity as the compression of the vital structures continues. Many will begin to limit the use of the extremity due to pain and discomfort.[3] Untreated TOS can even lead to limb threatening complications, especially in the arterial variant, which can cause occlusion of distal arteries and arterioles[3].

Treatment for thoracic outlet syndrome generally starts with physical therapy, muscle relaxers, and activity modification. The goals of these conservative treatment options are to decrease muscle tension and to change or avoid activities which worsen the patient's symptoms and ultimately prevent progression of symptoms. For non-responders to the traditional treatment, surgical resection of the problematic tissues (i.e. first rib, scalene musculature, etc.) is the next step. Anticoagulation is indicated when a venous or mural thrombus is present and surgical intervention is required with patients who are experiencing acute ischemia.[3]

Osteopathic practitioners have been studying and treating TOS for many years, and somatic dysfunction has been implicated in cases of TOS in the past. Dysfunction of multiple tissues in the region of the thoracic outlet, to include cervical ribs, hypertonic anterior, and middle scalene muscles, clavicle, first rib, pectoralis minor, and even upper thoracic spine, have been described by practitioners in the past.[5] Osteopathic manipulative treatments have been outlined for TOS and include treatment of the following areas: cervical spine, upper thoracic spine and ribs, clavicles, scalene muscles, and even muscles of the shoulder and pectoral girdle.[4,5] In spite of dysfunction of cervical ribs being implicated for causing TOS, no consistent treatments were found during a review of the literature and various osteopathic texts regarding specific treatment methods for cervical rib dysfunction to improve the symptoms of TOS.

Report of Case

A healthy 25-year-old female presented with a 10-year history of intermittent left hand numbness and tingling. Her symptoms had originally started in high school with an increase in overhead activities when she started playing volleyball. The patient described symptoms to be isolated in the C8 distribution intermittently during this time. The patient more recently noted that symptoms worsened after crocheting regularly and were exacerbated with military posture (i.e shoulder depression with external rotation). A hard, palpable nodule was noted in the left supraclavicular space and terminates 2 cm from the posterior border of the clavicle. Radial pulses were symmetric bilaterally. Reflexes at the triceps, biceps brachii and brachioradialis were 2/4 bilaterally. Upon record review, the patient had radiologic evidence of a left-sided cervical rib attaching primarily to C7 with a minor attachment to T1 *(Figure 1)*. Direct pressure inferiorly on the rib reproduced patient's symptoms.

Osteopathic examination:

- C6 and C7 were extended, rotated and sidebent left
- T1-4 were neutral, sidebent right, rotated left

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- Exhalation somatic dysfunction of ribs 2-5 on the left
- Cervical rib depressed on left
- Thoracic inlet restriction on the left
- Hypertonic trapezius and paraspinal muscles bilaterally

Patient denies a history of prior osteopathic manipulation. The patient's surrounding dysfunctions were all treated. Her hypertonic musculature and cervical and thoracic spine were treated with facilitated positional release; her exhaled ribs were treated with muscle energy. Her thoracic inlet was then treated with direct myofascial release. This did not improve her symptoms of numbness and tingling in her left arm.

The remaining somatic dysfunction was her depressed cervical rib on the left. The patient was placed in the supine position and the cervical rib was manually isolated with a finger of provider's left hand along the superior shaft of the rib and the tip of that finger contacting the tip of the rib. Motion restriction was most notable with attempted elevation of the rib. The rib was treated with direct myofascial release with respiratory assistance. Superior pressure was provided by the operator's ipsilateral distal digit. The distal phalanx of the provider's digit was wrapped around the anterior tip of the cervical rib as seen in Figure 2.

Following treatment, symptoms had resolved, even with military posture. The patient remained asymptomatic for ten days after the initial treatment. She was seen two weeks after this initial treatment, and a repeat treatment of the cervical rib with the above listed method was performed. The patient then remained asymptomatic at rest greater than 3 months in the post-treatment observation period.

Discussion

Our 25-year-old female, with neurogenic TOS secondary to a cervical rib, had temporary resolution of her symptoms with treatment of her cervical rib dysfunction with direct myofascial release. Prior to treating the patient, a literature review was performed to determine if there were any defined techniques for treatment of dysfunctional cervical ribs, but no specific techniques were found. Within our search regarding cervical ribs, it was noted that no commonly found musculature typically attaches directly to cervical ribs. An accessory scalene muscle known as the scalene minimus can occasionally be found attaching to the cervical rib and could be the cause of dysfunction in some patients with cervical rib induced TOS.[6] With this muscular attachment comes the potential for significant dysfunction of the cervical rib and given the location of cervical ribs near the neurovasculature of the upper extremity, it is logical that this dysfunction can be the root cause of TOS is these patients.

Figure 1. *The patient had radiologic evidence of a left-sided cervical rib attaching primarily to C7 with a minor attachment to T1.*

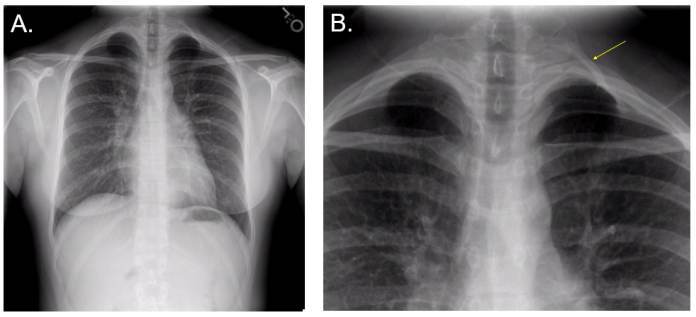
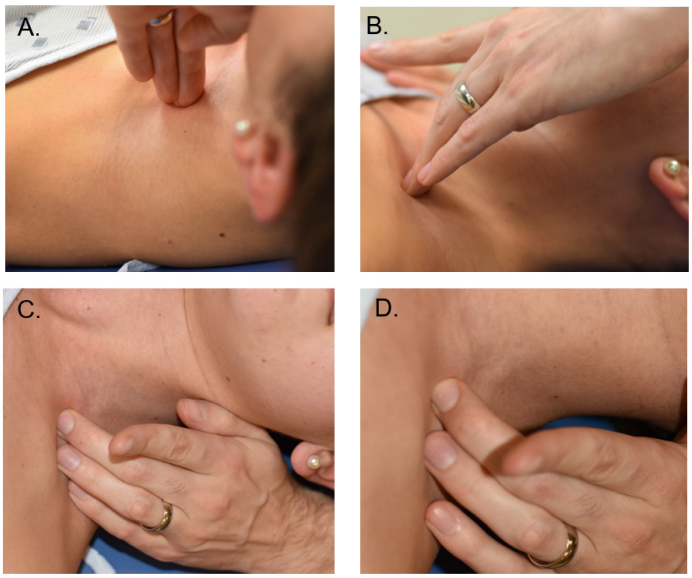


Figure 2. *Distal phalanx of the provider's digit was wrapped around the anterior tip of the cervical rib.*



The lack of regular muscular attachment to cervical ribs limits the efficacy of techniques which require muscular involvement for treatment such as muscle energy or facilitated positional release. High velocity, low amplitude thrusts treat primarily articular dysfunctions and though this may be the case with cervical rib dysfunction it would be relatively difficult to implement, particularly with exhalation somatic dysfunction or depressed cervical ribs.

This leaves us with fascia, which connects all areas of the body enclosing all body surfaces like a full body wet suit. Osteopathic practitioners have long embraced the theory of tensegrity which states that since all areas of fascia are connected, tension in one area of the body affects the rest of the body. Using tensegrity, it is reasonable to infer that fascia would connect to the cervical ribs and that this fascia would be affected by dysfunction of those ribs. We utilized this theory in our treatment of the cervical rib to perform a direct myofascial release, applying superior pressure to the distal aspect of the dysfunctional rib with excellent results.

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Another method of treatment that may be helpful is Strain-counterstrain if a tenderpoint was found during the assessment. Additionally, ligamentous articular strain should be considered if ligamentous restrictions of rib motion are present. If muscular attachments are present, as determined by ultrasound or magnetic resonance imaging (MRI), then other treatments such as muscle energy or facilitated positional release should be considered as well.

The primary limitation of this study is that it is focused on one young, otherwise healthy, active female and thus generalizability is limited. One could expect similar results to occur, to varying degrees, if there are myofascial restrictions causing the dysfunction and symptoms. Further study is clearly necessary, through a case series or at a larger center with an increased quantity of neurogenic TOS secondary to cervical ribs, to determine if this treatment method would be more generalizable to other populations. This should include patients of varying ages, of both sexes, and of varying body habitus to determine the overall efficacy of this treatment.

Conclusion

Direct MFR is an effective technique for treatment of cervical rib induced TOS when myofascial restrictions are present. Other methods of treatment may be effective but more study and trials would need to occur in order to determine if one can formulate a standardized osteopathic treatment regimen for cervical rib induced TOS.

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