Case Report

Axillary nerve palsy consequent to a guided manual stretch of the upper extremities: a case report

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Reflexive breathing therapy and complementary manual therapy aim to improve breathing by mobilizing the chest, reducing the muscle tone of the breath supporting muscles, and improving secretion and chest wall compliance. We describe an uncommon case of axillary nerve (AN) palsy in association with a treatment session of reflexive breathing therapy combined with manual therapy. After a therapist's guided intensive movement of crossed arms in front of the body, upward, as high as possible, a sudden ache in the left shoulder that radiated to the lateral upper arm occurred along with loss of elevation and abduction of the shoulder. An electrophysiological examination demonstrated a diminished and delayed compound muscle action potential that indicated AN injury. Following conservative treatment, the nerve dysfunction resolved completely. Stretching of the nerve may have resulted in tearing some nerve fibers and is discussed as a possible pathophysiological mechanism.

Keywords: Axillary nerve, Stretch injury, Manual therapy, Deltoid muscle, Nerve injury

Introduction

Manual therapy and chiropractic management are widely used forms of complementary or alternative medicine.¹ In order to relieve breathing problems and to improve breathing capacity, a number of different and complementary interventions are known, such as hydrotherapy, with or without warm packing, ribcage massage, manual stretching, vibration, autogenic drainage, and other manual therapeutic procedures.² Reflexive breathing therapy and its modifications are quite common in Germany. This method is attributed to Dr Ludwig Schmitt and Lieselotte Brüne.³ The intentions of all of these techniques include improvement of ventilation, modification of breathing rhythm, reduction of misbreathing, and overcoming breath-constraining resistances in order to economize the act of breathing. Further objectives were to mobilize the chest, to reduce the muscle tone of the breath supporting muscles, and to improve secretion clearance, bronchial hygiene, and chest wall compliance. Often, classic reflexive breathing therapy is combined with additional manual techniques, such as guided movements, in order to mobilize the chest and the ribs.^{2,3}

However, little is known about the side effects and unwanted adverse reactions of these techniques in

isolated or combined applications of daily clinical practice. The purpose of this case report is to present a rare case of axillary neuropathy resulting from combined reflexive breathing and manual interventions.

Case Report

A 73 year old woman presented with a reduction in strength of shoulder abduction associated with slight pain. She was known through former neurological consultations for restless legs and small fiber polyneuropathy syndrome, which were diagnosed when she was 72 years old. In the thorough work-up that was completed according to the national guidelines at that time, no cause could be identified. Since her symptoms were described as tolerable, no specific medication was implemented. This clinical problem had not changed over the time elapsed since diagnosis. Otherwise, the patient was healthy.

The patient suffered prolonged bronchitis 4 weeks before the current neurological consultation and was treated with mucolytic agents. In addition, she received manual medicine in the form of modified reflexive breathing therapy. The patient's therapy had begun with the application of hot compresses to intensify breathing, improve the blood supply, and support muscle relaxation. These were followed by manual techniques that were derived from classical massage and included effleurage, kneading, trigger

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Figure 1 (A) Patient demonstrating difficulty with abduction of the left shoulder (B) Compound motor action potential (CMAP) of right and left deltoid with supramaximal stimulation at Erb's point (C) Schematic drawing of the axillary nerve (AN) and the radial nerve (RN). In forced abduction and internal rotation, a stretch injury may occur and result in a neurapraxic, or greater, nerve injury.

point releases and manual tapotement. These interventions were performed on the patient in various positions (prone, lateral, supine, and sitting) and lasted for about 45 minutes. The patient reported that despite the foregoing relaxing techniques, she was very anxious and tense. At the end of the treatment session, with the patient seated, a guided intensive movement of the patient's crossed arms upward in front of the body as high as possible was performed. The therapist supported the patient's upper extremity elevation from behind with his hands. In the most extreme position, the patient felt a sudden ache in the left shoulder that radiated to the lateral upper arm.

The next day, the patient could not elevate and abduct her left arm due to shoulder pain (Fig. 1A). A few days later, after the pain regressed, she began physiotherapeutic exercises with active and passive ranges of motion of the shoulder. She did not engage a professional physiotherapist but rather carried out a self-designed regimen. She attempted to perform repeated elevations of the outstretched arm several times a day in order to strengthen the deltoid muscle. Even though she noticed that her symptoms continued to improve, she consulted neurological care for diagnostic purposes. At this time, the neurological examination revealed an isolated paresis of the deltoid muscle, rated 3/5. No sensory dysfunction could be objectified and the muscle tendon reflexes were bilaterally reduced (1+). The patient's remaining neurological status was unremarkable.

Physical examination showed passive shoulder mobility normal for her age and the signs and symptoms of her bronchitis completely resolved. Given her presentation, supramaximal stimulation of the AN was performed.⁴ The electrical stimulation was executed at the Erb's point and the compound motor action potential (CMAP) was recorded with non-invasive surface electrodes over the deltoid muscle. The stimulation of the right AN (healthy

side) evoked a biphasic response of the deltoid muscle with a 3.6 ms latency and 10 mV amplitude. On the left (affected) side, the response was delayed (11.9 ms), with a diminished amplitude (2 mV) indicating dysfunction of the AN (Fig. 1B). Electromyography was not performed, as her clinical condition was improving and the method is invasive. Conservative therapy, with active and passive motion and strengthening of the deltoid muscle, was continued and 12 weeks later the symptoms resolved completely.

Discussion

In our patient, we diagnosed AN dysfunction with an acute onset after the active-assistive part of a manual stretching technique. It is hypothesized that, in the extreme position with maximal abduction and internal rotation of the arm, a stretch injury of the AN occurred. The AN is relatively short and derives from the posterior cord of the brachial plexus. Passing through the quadrilateral space, it curves around the posterior humerus, supplying the deltoid muscle and the overlying skin of the shoulder. As in our patient, muscle strength was partially preserved and sensation was not impaired; the lesion was incomplete and could be localized between the teres minor and the deltoid muscle. In particular, at this location, the overlying muscle tethers the nerve, making it susceptible to stretch injury.⁵ This is the hypothesized mechanism in our patient. It is assumed that the manual overpressure applied with stretching led to excessive abduction and internal rotation of the humerus, thus increasing the distance between the quadrilateral space and the nerve's entry into the deltoid muscle (Fig. 1C). Abduction of the shoulder in this manner has been shown to increase tension on the AN intraoperatively.⁶ The patient's acute pain is suggestive of a tear of some fibers, or vessels, of the nerve leading to neurapraxia. It is noteworthy that extreme traction can lead not only to a tear of some AN fibers, but also

to a complete rupture of the nerve and the accompanying circumflex artery.⁷ Even the nerve fibers for the teres minor muscle can be affected as a result of this type of traction injury.⁸

Other traumatic mechanisms of blunt trauma to the AN involve penetrating injuries, subluxation or fracture.⁹ In sports-associated AN injuries, skiing and football are the most frequent foregoing activities reported in the literature.⁵ In one case report, AN damage associated with the sport of squash was presented.¹⁰ Axillary neuropathy in young volleyball players, as a result of excessive abduction and external rotation with flexion or extension of the arm, has been discussed as a potential mechanism by which the quadrilateral space is confined where the AN exits alongside the scapula. This might potentially compress the nerve. In addition, this compartment might also be narrowed by hypertrophy of the muscles in the region, especially in athletes.^{11,12} Rarely, axillary neuropathy may also occur via compression resulting from sustained lateral decubitus positioning.¹³

In the literature, an axillary neuropathy following a manual medicine technique had not been reported hitherto. In this patient, we discussed the pathophysiological mechanism of the therapist's guided intensive abduction and internal rotation of the upper arm, which led to a possible stretch injury of the AN, which appeared to resolve in 12 weeks. We speculated that the patient's anxious state, along with strong muscle tension, may have been the predisposing factors. Even the age of the patient may have contributed, as in the elderly, fear and anxiety related to manipulative therapy are more common.¹⁴ The possibility of a preexisting narrow quadrilateral space¹² favoring the nerve lesion cannot be excluded, as imaging was not performed to evaluate the quadrilateral space before and after the insult.

A limitation of our observation is that the facts were reconstructed according to the patient's report. The therapist himself was not available for comment. Notwithstanding, manual therapy should always be performed as carefully as possible, and, as a rule, with lower forces in the elderly, in order to minimize the net force applied in the manual intervention.¹⁴

The intent of the case is not to preclude therapists from doing manual procedures like the one described herein, but rather to sensitize one to the possibility of such an occurrence and to encourage caution when applying similar techniques. Furthermore, patients' reports of pain should not be disregarded but rather be taken seriously, so as to help preclude similar nerve injuries.

Conflict of Interest

The author declares that there is no conflict of interest.

References

- 1 Harris PE, Cooper KL, Relton C, Thomas KJ. Prevalence of complementary and alternative medicine (CAM) use by a general population: a systematic review and update. *Int J Clin Pract.* 2012;66:924–39.
- 2 Heint S. Physiotherapie bei Atemwegserkrankungen (Teil II). *Physiotherapie.* 2008;6:24–6.
- 3 Brüne L. Reflektorische Atemtherapie. 3r ed. Stuttgart: Thieme-Verlag; 1994.
- 4 Freedman M, Helber G, Pothast J, Shahwan TG, Simon J, Sher L. Electrodiagnostic evaluation of compressive nerve injuries of the upper extremities. *Orthop Clin North Am.* 2012;43:409–16.
- 5 Lee S, Saetia K, Saha S, Kline DG, Kim DH. Axillary nerve injury associated with sports. *Neurosurg Focus.* 2011;31:E10.
- 6 Witthaut J, Steffens KJ, Koob E. Intermittent axillary nerve palsy caused by a humeral exostosis. *J Hand Surg Br.* 1994;19:422–3.
- 7 Patel J, Turner M, Birch R, McCrory P. Rupture of the axillary (circumflex) nerve and artery in a champion jockey. *Br J Sports Med.* 2001;35:361–3.
- 8 Wilson L, Sundaram M, Piraino DW, Ilaslan H, Recht MP. Isolated teres minor atrophy: manifestation of quadrilateral space syndrome or traction injury to the axillary nerve? *Orthopedics.* 2006;29:447–50.
- 9 Berry H, Bril V. Axillary nerve palsy following blunt trauma to the shoulder region: a clinical and electrophysiological review. *J Neurol Neurosurg Psychiatr.* 1982;45:1027–32.
- 10 Oberle J, Kuchelmeister K, Schachenmayr W, Richter HP. Axillarisparese nach Squash-Spielen. *Nervenarzt.* 1999;70:750–3.
- 11 Paladini D, Dellantonio R, Cinti A, Angeleri F. Axillary neuropathy in volleyball players: report of two cases and literature review. *J Neurol Neurosurg Psychiatr.* 1996;60:345–7.
- 12 Lester B, Jeong GK, Weiland AJ, Wickiewicz TL. Quadrilateral space syndrome: diagnosis, pathology, and treatment. *Am J Orthop.* 1999;28:718–22.
- 13 Adair WA, Schwartz G. Acquired isolated axillary neuropathy: an unusual complication of quadriplegia. *Arch Phys Med Rehabil.* 1985;66:713–6.
- 14 Dougherty PE, Hawk C, Weiner DK, Gleberzon B, Andrew K, Killinger L. The role of chiropractic in older adults. *Chiropr Man Therap.* 2012;20:3.