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Original Articles

Informed Consent Regarding Risk of Stroke from Cervical Spine Manipulation: A Narrative Review

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ABSTRACT

Objective: Although the incidence of stroke following cervical spine manipulation (CSM) is low, the potential outcomes are serious. The objective of this study was to perform a narrative review to assess whether informed consent to the risk of stroke from CSM is recommended by chiropractic researchers and practice guidelines.

Methods: An electronic literature search was conducted in February 2025 using PubMed, Google Scholar, and the Index to Chiropractic Literature, covering 1989 to March 2025. Search terms included chiropractic, cervical spine manipulation, stroke, informed consent, and risk. English language peer reviewed studies by chiropractic physicians, along with practice guidelines written in whole or in part by chiropractic physicians, were considered.

Results: There was unanimous support for informed consent to the risk of stroke from CSM in the results. We identified two practice guidelines, two case control studies, three narrative reviews, and one case series authored by chiropractic physicians that recommend such informed consent. We did not find any peer reviewed studies that argued against such informed consent.

Conclusions: Informed consent to the risk of stroke from CSM is recommended by practice guidelines and chiropractic researchers. This lends weight to the view that such informed consent is the standard of care for the chiropractic profession.

INTRODUCTION

Plausible thromboembolic and thrombotic mechanisms of causation of immediate stroke from cervical spine manipulation (CSM) have been reported in the literature.[1,2,3] These causal mechanisms are supported by researchers from chiropractic, neurology, and physical therapy. Sudden neck movement from CSM could dislodge a loosely adherent thrombus from an existing cervical artery dissection (CAD). CAD refers to both vertebral artery dissection (VAD) and internal carotid artery dissection. The dislodged thrombus could embolize and occlude an artery that supplies the brain, resulting in thromboembolic ischemic stroke. Alternatively, an already large cervical artery thrombus could be suddenly repositioned by CSM in such a way that it blocks the cervical artery, resulting in thrombotic ischemic stroke from vascular occlusion. Multiple case reports of immediate stroke following CSM are consistent with these causal mechanisms.[4,5,6]

These mechanisms of causation of stroke require that CAD be present prior to CSM, not caused by CSM. Multiple biomechanical studies performed on healthy cadaveric vertebral arteries support that CSM is unlikely to cause CAD.[7,8] Multiple epidemiological studies support that in cases of stroke following CSM, CAD was present prior to the CSM.[9,10,11,12] A literature review found that biomechanical evidence is insufficient to establish the claim that CSM causes VAD and recommended that practitioners should strongly consider VAD as a presenting symptom. A systematic review and meta-analysis concluded that there is no convincing evidence that CSM can cause CAD.[13] There are no randomized controlled trials on this topic because they would be either unethical and/or infeasible due to the rarity and life-threatening nature of CAD and stroke.[14]

The incidence of CAD has been estimated at 8.93 per 100,000 people per year.[15] In the USA with a population of 330 million, this equates to 29,469 cases per year. The most common symptoms of CAD are neck pain and/or headache. It is plausible that neck pain and/or headache from undiagnosed CAD may be causing hundreds or thousands of these people to seek chiropractic care.

While some chiropractors argue CSM's stroke risk is overstated,[16] others advocate caution due to severe potential outcomes.[1] Given that CSM performed in the presence of CAD can potentially lead to serious outcomes like paralysis or even death due to stroke, it is crucial to examine the chiropractic literature to see how informed consent regarding this risk is addressed.

OBJECTIVE

The objective of this narrative review[17] was to assess whether informed consent for the risk of stroke from CSM is recommended by chiropractic researchers and practice guidelines by reviewing pertinent literature.

METHODS

An electronic search was performed of PubMed, Google Scholar, and the Index to Chiropractic Literature from 1989 to March 2025. 1989 was the year in which plausible mechanisms by which CSM could cause stroke first appeared in the literature.[1,18]

The following search terms were utilized: chiropractic, cervical spine manipulation, stroke, informed consent, risk. Two authors independently screened titles and abstracts, including English-language peer-reviewed studies or practice guidelines authored wholly or partly by chiropractic physicians, with discrepancies resolved by consensus. For this review, "practice guideline" refers to a formal document developed by a professional organization, association, or expert consensus group, intended to provide evidence-based recommendations to standardize clinical practice.

The standard of care in any healthcare profession is traditionally defined by professionals within that field. Therefore, this review exclusively included papers authored in whole or in part by chiropractic physicians. This approach aligns with medicolegal standards, which typically permit only members of a respective profession to provide opinions on what constitutes the standard of care for that profession.

RESULTS

There was unanimous support for informed consent to the risk of stroke from CSM in the results. Our literature search yielded two practice guidelines, two case control studies, three narrative reviews, and one case series recommending such informed consent. (**Table 1**) We did not find any peer reviewed studies that argued against such informed consent.

The 2020 Rushton et al. document is a multi-disciplinary publication of the physical therapy, chiropractic, and osteopathic professions.[19] It was co-authored by chiropractic physician Dr. Sidney Rubinstein. The 2014 Biller et al. study was co-authored by chiropractic physician Dr. Preston Long. Therefore, both studies met our search criteria.

Table 1: Results of Literature Search

Year	Study	Author(s)	Design	Publisher	Type of Informed Consent
1991	Standards of practice relative to complications of & contraindications to spinal manipulative therapy[20]	Gatterman	Narrative Review	Journal of the Canadian Chiropractic Association	Verbal and written informed consent

2002	Unpredictability of cerebrovascular ischemia associated with cervical spine manipulation therapy[21]	Haldeman et al.	Case Series	Spine	Informed consent (verbal and/or written not specified)
2007	Association of Chiropractic Colleges Informed Consent Guideline[22]	Association of Chiropractic Colleges	Practice Guideline	Association of Chiropractic Colleges	Informed consent (verbal and/or written not specified)
2008	Should the chiropractic profession embrace the doctrine of informed consent?[23]	Lehman et al.	Narrative Review	Journal of Chiropractic Medicine	Verbal and written informed consent
2008	Risk of vertebrobasilar stroke & chiropractic care[9]	Cassidy et al.	Case Control	Spine	Patient preference in treatment
2014	Cervical Arterial Dissections & Association With Cervical Manipulative Therapy[24]	Biller et al.	Narrative Review	Stroke	Informed consent (verbal and/or written not specified)
2015	Chiropractic care & the risk of vertebrobasilar stroke[10]	Kosloff et al.	Case Control	Chiropractic & Manual Therapies	Respect individual patient values
2020	International IFOMPT Cervical Framework[19]	Rushton et al.	Practice Guideline	International Federation of Orthopaedic Manipulative Physical Therapists	Verbal or written informed consent

Notable Exclusion

A 2010 Declaratory Ruling Memorandum of Decision by the State of Connecticut Board of Chiropractic Examiners concluded that chiropractors are not required to address stroke as a part of securing informed consent by patients to CSM.[25] This regulatory decision was not peer reviewed or a practice guideline, therefore it was excluded.

DISCUSSION

Gatterman (1991)

Gatterman recommended verbal and written informed consent to the risk of stroke and serious neurological damage as a result of CSM.[20] She proposed the use of an informed consent document developed by the Centre for the Study of Spinal Health at Canadian Memorial Chiropractic College.

Haldeman et al. (2002)

Haldeman et al. conducted a retrospective review of 64 unpublished medicolegal cases of stroke following CSM.[21] The study found no consistent patient characteristics or risk factors - such as age, gender, migraines, or hypertension - that could predict these events. Most incidents occurred rapidly (63% immediately, 94% within 48 hours), predominantly linked to vertebrobasilar artery dissection, with outcomes ranging from full recovery (18%) to significant residuals like coordination loss (50%) or death (3%).

The authors concluded that these strokes are "unpredictable" and "inherent" to CSM, labeling them idiosyncratic complications. They explicitly recommended that physicians inform patients of this risk, suggesting a discussion that weighs it against alternatives like NSAIDs or surgery. This stance supports verbal or written informed consent, emphasizing patient autonomy in light of an unpreventable yet serious potential outcome.

The Association of Chiropractic Colleges (2007)

The Association of Chiropractic Colleges (ACC) recommended[22] that in deciding what information the doctor should convey to a patient concerning risks involved in a particular procedure or care, the doctor must take into consideration both:

1. The potential severity of the injury or adverse consequences that may result.
2. The likelihood that injury or consequence will occur.

The ACC recognized that no physician must disclose every single conceivable risk of a proposed procedure, regardless of how remote that risk of injury might be. However, if a certain risk is a mere possibility which ordinarily need not be disclosed, yet if its occurrence carries serious consequences, such as stroke, paralysis, or death, it should be regarded as a material risk requiring disclosure. Although this recommendation is no longer visible on the ACC website, it has not been rescinded by the ACC.

Lehman et al. (2008)

Lehman et al. recommended informed consent to the risks of chiropractic treatment, such as the risk of stroke from CSM.[23] The authors reference a Connecticut malpractice case where the patient stated that if she knew there was a possibility of a stroke with CSM, she would not have consented to the treatment.[26] The authors recommended:

1. A written statement of informed consent to the risk of stroke from CSM signed by the patient.
2. The written statement of informed consent to the risk of stroke from CSM also signed by the doctor.
3. A doctor/patient discussion of informed consent to the risk of stroke from CSM documented in the patient's chart. Patients may sign forms that they may not have read and understood completely, hence the necessity for the physician/patient discussion.

Cassidy et al. (2008)

Cassidy et al. concluded that the association between chiropractic care and vertebrobasilar (VBA) stroke was likely due to pre-existing VAD prior to CSM, with the neck pain and/or headache from VAD causing the patient to seek chiropractic care.[9] They also observed that CSM could result in a thromboembolic event in a patient with existing VAD. Like Haldeman et al.,[21] the authors opined that there was no acceptable screening procedure to identify neck pain patients at risk of VBA stroke.

Given this potentially life-threatening clinical setting, the authors recommended that the treatment of patients with neck pain and/or headache should be driven by patient preference. This emphasis on patient preference implies a need for informed decision-making, supporting the relevance of discussing potential risks like stroke with patients. This is consistent with the authors' admission that they had not ruled out CSM as a potential cause of some VBA strokes.

Biller et al. (2014)

Biller et al. concluded that patients with neck pain from VAD may present to chiropractors for treatment and it is plausible that CSM could exacerbate the VAD and increase the risk of stroke.[24] Therefore, patients with neck pain and without neurological symptoms after trauma should be informed about the potential risks of receiving CSM, and chiropractors should carefully consider the possibility of CAD as a presenting symptom prior to performing CSM.

Kosloff et al. (2015)

Kosloff et al. examined the link between chiropractic care and VBA stroke. They found an association between chiropractic DC visits and VBA stroke but did not consider it significant. The authors concluded that the significant association found in other case control studies[9,27,28] was likely from patient decisions to seek care for neck pain and headache due to pre-existing VAD.

The authors recommended that clinical practice be guided by evidence of cervical manipulation's effectiveness, plausible treatment options (such as non-thrust manual techniques), and individual patient values. This focus on integrating evidence and options with patient values implies a need for shared decision-making, highlighting the importance of discussing potential risks like stroke with patients. This resonates with the authors noting

that their study does not exclude CSM as a possible cause or contributory factor in VBA stroke.

The IFOMPT Cervical Framework (2020)

The International Framework for Examination of the Cervical Region for potential of vascular pathologies of the neck prior to Orthopaedic Manual Therapy Intervention, also known as the International IFOMPT Cervical Framework, was published by the International Federation of Orthopaedic Manipulative Physical Therapists (IFOMPT).[19] In this multi-disciplinary document, the authors recommended that informed consent to the risks of CSM be obtained explicitly either verbally or in writing and that it be recorded in a standardized manner.

Proposed statement of informed consent

Our search did not find any statement of informed consent to the risk of stroke from CSM which reflects the research in this area. We offer an example informed consent statement reflecting available evidence, intended as a discussion starter rather than a definitive recommendation:

"I understand and am informed that there is a risk of stroke from neck manipulation performed in the presence of an arterial dissection. An arterial dissection is a tear in the inner lining of an artery which heals with a blood clot.[29,30] There is no convincing evidence that neck manipulation can cause dissection in healthy arteries.[13] However, an existing dissection may be aggravated by neck manipulation.[1] If a loosely adherent blood clot is dislodged by neck manipulation, it could travel to the brain and cause a stroke.[31] If a large blood clot is suddenly repositioned, it could block blood flow to the brain and cause a stroke.[18] I understand the physician will perform a thorough history and examination to determine if I may have a dissection. If a dissection is suspected, I will be referred to medical emergency for further evaluation."[32]

Suggestions for future research

Our proposed statement of informed consent has not undergone pilot testing for patient understanding. Future research in this area is essential before utilizing this or a similar proposed statement.

Multiple chiropractic-authored sources recommend informed consent for the risk of stroke associated with CSM, however this view is not uniform across the profession. Some researchers have stated that chiropractic care is not a risk factor for vertebrobasilar stroke.[16] This variability prompts questions: What factors contribute to the ongoing debate and lack of consensus on this practice? Are there educational, cultural, or historical influences or biases shaping chiropractors' approaches to risk disclosure? Exploring these differences lies beyond the scope of this review, but their presence highlights the value of future research to better understand and address the profession's diverse perspectives.

Our search did not yield any systematic literature reviews. Presumably, no systematic reviews on this topic appear to have been published. It is our hope that this initial narrative review will spur other researchers to perform more comprehensive reviews.

LIMITATIONS

This is a narrative review, rather than a systematic review. Article screening and data extraction was done by only two authors so it is possible that relevant articles may have been missed, or that there may have been errors in extraction.

CONCLUSION

We conclude that informed consent for the risk of stroke from CSM is recommended by chiropractic researchers and practice guidelines, with no peer-reviewed studies opposing this stance. The literature supports providing patients with information about this rare but serious risk, reflecting the chiropractic profession's standard of care equipping individuals to make informed choices about their treatment. These findings, drawn from authoritative sources within the field, highlight the importance of clear risk communication to support patient decision-making, lending weight to its role as a professional norm.

REFERENCES

1. Brown SP. Plausible Mechanisms of Causation of Immediate Stroke by Cervical Spine Manipulation: A Narrative Review. *Cureus*. 2024;16(3):e56565. doi:10.7759/cureus.56565

2. Haneline MT, Lewkovich G. Identification of internal carotid artery dissection in chiropractic practice. *J Can Chiropr Assoc*. 2004;48(3):206-210.

3. Paulus JK, Thaler DE. Does case misclassification threaten the validity of studies investigating the relationship between neck manipulation and vertebral artery dissection stroke? Yes. *Chiropr Man Ther*. 2016;24:42. doi:10.1186/s12998-016-0123-x

4. Terrett AGJ. *Current Concepts in Vertebrobasilar Complications Following Spinal Manipulation*. 2nd ed. NCMIC; 2001.

5. Kennell KA, Daghfal MM, Patel SG, DeSanto JR, Waterman GS, Bertino RE. Cervical artery dissection related to chiropractic manipulation: One institution's experience. *J Fam Pract*. 2017;66(9):556-562.

6. Turner RC, Lucke-Wold BP, Boo S, Rosen CL, Sedney CL. The potential dangers of neck manipulation & risk for dissection and devastating stroke: An illustrative case & review of the literature. *Biomed Res Rev*. 2018;2(1). doi:10.15761/BRR.1000110

7. Symons B, Herzog W. Cervical artery dissection: a biomechanical perspective. *J Can Chiropr Assoc*. 2013;57(4):276-278.

8. Gorrell LM, Sawatsky A, Edwards WB, Herzog W. Vertebral arteries do not experience tensile force during manual cervical spine manipulation applied to human cadavers. *J Man Manip Ther*. 2023;31(4):261-269. doi:10.1080/10669817.2022.2148048

9. Cassidy JD, Boyle E, Côté P, et al. Risk of vertebrobasilar stroke and chiropractic care: results of a population-based case-control and case-crossover study. *Spine*. 2008;33(4 Suppl):S176-183. doi:10.1097/BRS.0b013e3181644600

10. Kosloff TM, Elton D, Tao J, Bannister WM. Chiropractic care and the risk of vertebrobasilar stroke: results of a case-control study in U.S. commercial and Medicare Advantage populations. *Chiropr Man Ther*. 2015;23:19. doi:10.1186/s12998-015-0063-x

11. Whedon JM, Song Y, Mackenzie TA, Phillips RB, Lukovits TG, Lurie JD. Risk of stroke after chiropractic spinal manipulation in medicare B beneficiaries aged 66 to 99 years with neck pain. *J Manipulative Physiol Ther*. 2015;38(2):93-101. doi:10.1016/j.jmpt.2014.12.001

12. Cassidy JD, Boyle E, Côté P, Hogg-Johnson S, Bondy SJ, Haldeman S. Risk of Carotid Stroke after Chiropractic Care: A Population-Based Case-Crossover Study. *J Stroke Cerebrovasc Dis Off J Natl Stroke Assoc*. 2017;26(4):842-850. doi:10.1016/j.jstrokecerebrovasdis.2016.10.031

13. Church EW, Sieg EP, Zalatimo O, Hussain NS, Glantz M, Harbaugh RE. Systematic Review and Meta-analysis of Chiropractic Care and Cervical Artery Dissection: No Evidence for Causation. *Cureus*. 2016;8(2):e498. doi:10.7759/cureus.498

14. Ahuja AS. Should RCT's be used as the gold standard for evidence based medicine? *Integr Med Res*. 2019;8(1):31-32. doi:10.1016/j.imr.2019.01.001

15. Griffin KJ, Harmsen WS, Mandrekar J, Brown RD, Keser Z. Epidemiology of Spontaneous Cervical Artery Dissection: Population-Based Study. *Stroke*. 2024;55(3):670-677. doi:10.1161/STROKEAHA.123.043647

16. Perle SM. Chiropractic, Stroke Risk and Informed Consent. *Dyn Chiropr*. Published online May 2010. Accessed February 27, 2025. https://dynamicchiropractic.com/article/54678-chiropractic-stroke-risk-and-informed-consent

17. Green BN, Johnson CD, Adams A. Writing narrative literature reviews for peer-reviewed journals: secrets of the trade. *J Chiropr Med*. 2006;5(3):101-117. doi:10.1016/S0899-3467(07)60142-6

18. Mas JL, Henin D, Bousser MG, Chain F, Hauw JJ. Dissecting aneurysm of the vertebral artery and cervical manipulation: a case report with autopsy. *Neurology*. 1989;39(4):512-515. doi:10.1212/wnl.39.4.512

19. Rushton A, Carlesso LC, Flynn T, et al. International Framework for Examination of the Cervical Region for potential of vascular pathologies of the neck prior to Orthopaedic Manual Therapy (OMT) Intervention: International IFOMPT Cervical Framework ©(2020). Published online 2020. https://www.jospt.org/doi/10.2519/jospt.2022.11147

20. Meridel I. Gatterman. Standards of practice relative to complications of and contraindications to spinal manipulative therapy. *J Can Chiropr Assoc*. 1991;35(4):232-236.

21. Haldeman S, Kohlbeck FJ, McGregor M. Unpredictability of cerebrovascular ischemia associated with cervical spine manipulation therapy: a review of sixty-four cases after cervical spine manipulation. *Spine*. 2002;27(1):49-55. doi:10.1097/00007632-200201010-00012

22. Association of Chiropractic Colleges. Association of Chiropractic Colleges Informed Consent Guideline. Published online January 10, 2007. https://www.chirocolleges.org

23. Lehman JJ, Conwell TD, Sherman PR. Should the chiropractic profession embrace the doctrine of informed consent? *J Chiropr Med*. 2008;7(3):107-114. doi:10.1016/j.jcm.2008.04.002

24. Biller J, Sacco RL, Albuquerque FC, et al. Cervical arterial dissections and association with cervical manipulative therapy: a statement for healthcare professionals from the american heart association/american stroke association. *Stroke*. 2014;45(10):3155-3174. doi:10.1161/STR.0000000000000016

25. Connecticut Board of Chiropractic Examiners. *Declaratory Ruling Memorandum of Decision*.; 2010.

26. Slosberg S. At Age 57 This Woman is Still Defiant. Chiropractic Stroke Awareness Group, LLC. August 2006. Accessed August 21, 2024. https://chiropracticstroke.com/linda.defiant.php

27. Smith WS, Johnston SC, Skalabrin EJ, et al. Spinal manipulative therapy is an independent risk factor for vertebral artery dissection. *Neurology*. 2003;60(9):1424-1428. doi:10.1212/01.wnl.0000063305.61050.e6

28. Engelter ST, Grond-Ginsbach C, Metso TM, et al. Cervical artery dissection: trauma and other potential mechanical trigger events. *Neurology*. 2013;80(21):1950-1957. doi:10.1212/WNL.0b013e318293e2eb

29. Britt TB, Agarwal S. Vertebral Artery Dissection. In: *StatPearls*. StatPearls Publishing; 2022. Accessed January 15, 2023. http://www.ncbi.nlm.nih.gov/books/NBK441827/

30. Goodfriend SD, Tadi P, Koury R. Carotid Artery Dissection. In: *StatPearls*. StatPearls Publishing; 2022. Accessed October 9, 2022. http://www.ncbi.nlm.nih.gov/books/NBK430835/

31. Norris JW, Beletsky V, Nadareishvili ZG. Sudden neck movement and cervical artery dissection. The Canadian Stroke Consortium. *CMAJ Can Med Assoc J J Assoc Medicale Can*. 2000;163(1):38-40.

32. Chaibi A, Russell MB. A risk-benefit assessment strategy to exclude cervical artery dissection in spinal manual-therapy: a comprehensive review. *Ann Med*. 2019;51(2):118-127. doi:10.1080/07853890.2019.1590627

Late Whiplash Syndrome - Response to Conservative Chiropractic Management: A Case Report

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ABSTRACT

Objective: This case report describes a patient presenting with Late Whiplash Syndrome and symptoms of chronic neck pain, dizziness, nausea, and vertigo, and her response to a conservative chiropractic intervention.

Clinical Features: A 62-year old female presented with a chief complaint of neck pain. The history of present illness indicated the onset of the neck pain was approximately 10 years prior to this visit. She described upper cervical spine pain on the left as a deep and dull ache with stiffness throughout the neck. High velocity low amplitude cervical manipulations had produced adverse reactions over the past five years. Past medical history revealed several motor vehicle accidents over the past 35 years. A fall as a young child preceded tinnitus that persists today. Since 2001, she has experienced daily vertigo, dizziness, and nausea.

Intervention and Outcome: Following evaluation, conservative chiropractic care was provided with the goal of reducing symptoms and improving cervical range of motion. Trigger point release was performed to ameliorate active trigger points in the upper trapezii and the left levator scapulae muscle. Gentle, cervical long axis distraction was performed to reduce cervical pain, muscle hypertonicity, and joint dysfunction. Treatment reduced the neck pain, while the vertigo, dizziness, and nausea were eliminated. Six weeks following the treatment, the patient still denied neck pain, vertigo, dizziness, or nausea.

Conclusion: This case of a posttraumatic cervical sprain (whiplash injury) with resultant chronic pain syndrome as well as dizziness, nausea, and vertigo responded favorably to gentle conservative chiropractic care

INTRODUCTION

Crow first identified Whiplash Injury in 1928[1] and the Quebec Task Force coined the term Whiplash Associated Disorder (WAD*)* in 1995[2], whiplashed patients commonly seek chiropractic treatments for relief of neck pain and headaches.[3] Whiplash associated disorders are comprised of a range of symptoms. Of those related to the spine, neck complaints and headaches are the most significant.[4] Patients seeking care following whiplash injuries are prone to become chronic pain patients. Although patients may present for care during the acute stage of whiplash injury, 50% of them continue to experience pain for years.[5]

The whiplash-type of injury, as described by Dr. Ruth Jackson, is responsible for the greatest percentage of cervical nerve root irritations. This type of injury is caused by a sudden forceful movement of the neck in any direction with a sudden recoil in the opposite direction. Such injuries cause typical sprains of varying degrees with subluxation of the articular processes and stretching, tearing or avulsion of, and varying amounts of hemorrhage into the ligamentous and capsular structures. Automobile accidents are responsible for the greatest number of such injuries.[6] According to Poorbaugh et al, the term "whiplash" represents the multiple factors associated with the event, injury, and clinical syndrome that are the end-result of a sudden acceleration-deceleration trauma to the head and neck. Whiplashed patients may develop Late Whiplash Syndrome[7] and experience not only neck pain and headaches, but also nausea, dizziness, and vertigo.[8]

CASE PRESENTATION

A 62-year old female presented with a chief complaint of neck pain seeking an evaluation of her cervical spine.

Subjective Findings:

The patient reported neck pain with stiffness of approximately 10 years duration. She was involved in several car accidents in her 20s, but never sought evaluation for whiplash. While she reported intermittent neck pain and headaches for most of her adult life, she did note that the headaches diminished greatly after menopause.

She also reported positional vertigo brought on by head rotation or by lying supine. The frequency of vertigo had been increasing over the past four years from occasional (once or twice a month) to occurring daily. She described the vertigo as the room spinning for several seconds followed by a lingering queasiness.

She described upper cervical spine pain as a left sided deep and dull ache with stiffness throughout the neck. She pointed to the C2 area on the left side of the cervical spine. She denied any problems with loss of balance, weakness, or numbness in the upper or lower extremities.

Past History (Relevant):

The patient had been treated by four different chiropractors over the past 40 years. She responded well to chiropractic care until five years ago. Since that time high velocity low amplitude (HVLA) cervical manipulations began to produce adverse reactions, described as shooting, electrical shocks down both arms. Hence, she was opposed to cervical manipulation (HVLA).

Past medical history revealed several motor vehicle accidents since 1990. As a young child she fell and hit her head on a hard container. Following the fall she experienced tinnitus that persists today. Since 2001, she has experienced daily vertigo, dizziness, and nausea. She reported no history of treatment for any significant medical conditions, as well as no use of medication.

Objective Findings:

The patient stood 65 inches in height and weighed 135 pounds. She was alert, cooperative, polite, and an excellent historian. Her vital signs were reasonable with measurements of blood pressure at 122/78, pulse rate of 80 per minute, oral temperature of 98.4 degrees F, and a respiration rate of 12 per minute.

Posture and gait evaluation revealed ambulation without any apparent limping or loss of balance. Forward head posture was measured at 2 inches with some rounding of the shoulders. No signs of scoliosis or pelvic obliquity were observed.

Static palpation elicited pain at C2 on the left, at C5-6 over the ligamentum nuchae, and bilaterally with hypertonicity in the paravertebral muscles. Posterior joint dysfunction was revealed at C2-3 and C5-6 with pain and reduced range of motion. Taut bands with painful nodules were revealed in the upper trapezii bilaterally and in the left levator scapulae muscle. There was localized and referred pain to the head with palpation of the left levator scapulae muscle, which reproduced the deep and dull neck pain.

Active cervical range of motion demonstrated some reduction in all six cardinal ranges. Right lateral flexion, right rotation, and extension were reduced more than other movements with reproduction of neck pain, dizziness, and vertigo.

Gentle cervical compression was performed with the patient seated and the cervical spine in a neutral position. The gentle compression produced pain in the upper cervical spine on the left at the level of C2. Cervical distraction produced relief of the upper cervical spine pain. Grip strength was strong bilaterally. Sensation of light touch on the face and hands was intact bilaterally. Hoffman's sign was absent for pathological reflex. Gaze stability testing reproduced the symptoms of nausea, dizziness, and vertigo. H-testing of the oculomotor nerves produced nystagmus.

Assessment:

1. Late Whiplash Syndrome (Post-traumatic chronic pain syndrome).
2. Suspected sensorimotor dysfunction as a result of the cervical sprains and cervical joint dysfunction.
3. Myofascial pain syndrome.
4. Suspected degenerative posterior and anterior joint disease of the cervical spine.

Plan:

The patient received soft tissue treatment with pressure release to deactivate trigger points in the upper trapezii bilaterally and in the left levator scapulae. Gentle cervical long axis distraction was applied 3 times, each with a 30 second hold, to reduce pain and cervical joint dysfunction.

Outcome:

The patient responded very favorably with reduced neck pain and immediate relief of the dizziness, nausea, and vertigo. She was advised to follow up in 6 weeks, or sooner if the symptoms returned. The patient returned for follow up 6 weeks later and stated that she no longer experienced neck pain, nausea, dizziness, or vertigo. She commented that she still experienced occasional neck stiffness.

DISCUSSION

Whiplash injury is "an acceleration-deceleration mechanism of energy transferred to the neck," usually resulting from rear-end or side-impact motor vehicle collision.[2] Approximately 50% of whiplash injuries with only mild cervical strains do not require chiropractic intervention and heal without medical care within 2-3 weeks.[9] Historically, the whiplash injury requiring chiropractic interventions has involved acute strain and sprain of the cervical spine caused by a rear-end motor vehicle incident with resultant neck pain and headaches.

Whiplash associated disorders are the most common non-hospitalized injury resulting from a motor vehicle crash.[5] Ritchie et al concluded that a patient-centered care approach is needed to try and identify patient understanding of pain and recovery, as well as expectations of recovery, symptoms, and therapy.[5] In another study, Ritchie et al found that recovery following a whiplash injury is varied: approximately 50% of individuals fully recover, 25% develop persistent moderate/severe pain and disability, and 25% experience milder levels of disability.[10]

Late Whiplash Syndrome has been described by Poorbaugh et al as a disorder that is characterized by a constellation of clinical profiles including neck pain and stiffness, persistent headache, dizziness, upper limb paresthesia, and psychological emotional sequelae that persist more than 6 months after a whiplash injury. In this same study it is stated that cervicogenic vertigo has been recognized in the clinical and scientific domain as a pathological condition that may result because of whiplash.[7]

CONCLUSION

Patients suffering with posttraumatic chronic cervical pain with vertigo may be experiencing Late Whiplash Syndrome. Based upon the response of this patient with chronic neck pain, nausea, dizziness, and vertigo, it is reasonable to consider that chiropractic interventions may be indicated for the treatment of Late Whiplash Syndrome. The chiropractic profession should strive to offer patient-centered treatment, and modify chiropractic services in order to meet individual patient needs.

LIMITATIONS

This report describes a single patient's clinical presentation, diagnostic evaluation, and management of Late Whiplash Syndrome. Generalization of the content of this report to any other individual with a similar clinical presentation is to be avoided.

CONSENT

Written informed consent was obtained from the patient for publication of this case report. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

COMPETING INTERESTS

The author declares no competing interests.

REFERENCES

1. Barnsley L, Lord S, Bogduk N. Whiplash injury. *Pain*. 1994;58:283–307.

2. Spitzer WO, Skovron ML, Salmi LR, et al. Scientific monograph of the Quebec Task Force on Whiplash-Associated Disorders: redefining "whiplash" and its management. *Spine*. 1995;20:1S–73S.

3. Frigard LT. The Whiplash Injury 847.0. Richmond Hall Inc. January 1, 1970.

4. van Suijlekom H, Mekhail N, Patel N, Van Zundert J, van Kleef M, Patijn J. 7. Whiplash-associated disorders. *Pain Pract*. 2010 Mar-Apr;10(2):131-6. doi: 10.1111/j.1533-2500.2009.00356.x. PMID: 20415730.

5. Ritchie C, Ehrlich C, Sterling M. Living with ongoing whiplash associated disorders: a qualitative study of individual perceptions and experiences. *BMC Musculoskelet Disord*. 2017;18(1):531. Published 2017 Dec 15. doi:10.1186/s12891-017-1882-9

6. Jackson R. The classic: the cervical syndrome. 1949. *Clin Orthop Relat Res*. 2010;468(7):1739-1745. doi:10.1007/s11999-010-1278-8

7. Poorbaugh K, Brismée JM, Phelps V, Sizer PS Jr. Late whiplash syndrome: a clinical science approach to evidence-based diagnosis and management. *Pain Pract*. 2008;8(1):65-89. doi:10.1111/j.1533-2500.2007.00168.x

8. Endo K, Ichimaru K, Komagata M, Yamamoto K. Cervical vertigo and dizziness after whiplash injury. *Eur Spine J*. 2006 Jun;15(6):886-90. doi: 10.1007/s00586-005-0970-y. Epub 2006 Jan 24. PMID: 16432749; PMCID: PMC3489433.

9. Ferrari R, Schrader H. The late whiplash syndrome: a biopsychosocial approach. *J Neurol Neurosurg Psychiatry*. 2001;70(6):722-726. doi:10.1136/jnnp.70.6.722

10. Ritchie C, Hendrikz J, Kenardy J, Sterling M. Derivation of a clinical prediction rule to identify both chronic moderate/severe disability and full recovery following whiplash injury. *Pain*. 2013 Oct;154(10):2198-2206.

Adhesive Capsulitis Management: A Case Study

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ABSTRACT

Objective: To report the case of a 53-year-old male post-Comprehensive Arthroscopic Management (CAM) surgery for adhesive capsulitis and describe the rehabilitation process, including all phases of rehabilitation.

Clinical Features: A 53-year-old male presented to the clinic with visible bruising on the left medial humerus. MRI before the CAM procedure revealed severe degeneration and evidence of a previous labral repair. Positive examination findings included significantly reduced range of motion (ROM) in all planes and pain with specific movements.

Intervention and Outcome: The initial treatment, post-surgical clearance, involved passive range of motion (ROM) exercises, pendulum swings, chiropractic adjustments, and manual therapy. Subsequent sessions incorporated active ROM exercises, core stability training, and neuromuscular exercises. ROM improved progressively, enabling the patient to lift his arm unassisted. Pain decreased significantly, and functional activities improved.

Conclusion: This case demonstrates the successful post-surgical rehabilitation of adhesive capsulitis using a multimodal approach, including chiropractic adjustments, targeted exercises, and manual therapy.

Key Indexing Terms: Adhesive Capsulitis; Chiropractic Adjustment; Rehabilitation; Core Stability; Shoulder Exercises; Reactive Neuromuscular Training

INTRODUCTION

Adhesive capsulitis, commonly known as "frozen shoulder," is a condition characterized by stiffness, pain, and restricted ROM in the shoulder joint. This condition often results from injury, surgery, or prolonged immobilization leading to inflammation and capsular tightening.[1] Patients with adhesive capsulitis typically experience insidious onset shoulder stiffness, moderate to severe pain that worsens at night, and near-complete loss of passive and active external rotation of the shoulder.

Adhesive capsulitis follows a three-stage process which starts with the freezing stage. The freezing stage is a reactive process from either a trauma or a lack of movement in the joint itself that tends to elicit pain and discomfort.[2] The second stage of the process is the frozen stage which is typically less painful. However, the range of motion for the shoulder decreases and the thickening of connective tissue begins to develop during this stage. The last stage is the thawing stage in which the patient has a gradual increase of ROM in the shoulder joint.

If conservative non-surgical treatments are not providing relief for someone with adhesive capsulitis such as NSAIDs, chiropractic, physical therapy, ultrasound and passive modalities, there are various surgical options that are available. NSAIDs can be helpful in reducing pain and improving mobility in the early short-term stages for adhesive capsulitis due to their nature of decreasing inflammation and pain. However, NSAIDs are not a long-term solution for the underlying cause of adhesive capsulitis. Ultrasound therapy for adhesive capsulitis treatment may help to reduce associated pain by decreasing inflammation. The high-frequency sound waves produced by the ultrasound device can penetrate the skin and tissues, producing a deep heat effect that can relax the muscles, improve blood flow, and reduce pain.[3] The goal for chiropractic care for adhesive capsulitis is to focus on relieving pain, improving range of motion, and enhancing the overall function of the glenohumeral joint/scapular movement through manual therapies, adjustments to the shoulder girdle, and soft tissue work.[4]

Surgical options for shoulder conditions include arthrographic distension, total shoulder replacement (anatomical or reverse), and partial shoulder replacement. Arthrographic distension involves injecting fluid - such as saline, corticosteroids, or a combination - into the shoulder joint to treat adhesive capsulitis (frozen shoulder). This helps expand the joint capsule and break up adhesions, thereby improving mobility and reducing pain and stiffness.[5] Anatomical total shoulder replacement involves replacing both the ball and socket of the shoulder with implants that replicate the joint's natural anatomy. This procedure is commonly performed for patients with osteoarthritis, rheumatoid arthritis, or severe fractures. In contrast, reverse total shoulder replacement also replaces the ball and socket but switches their positions: the ball is attached to the scapula, and the socket is attached to the upper humerus. This technique is often used when the rotator cuff is irreparably damaged and unable to support shoulder function. Partial shoulder replacement involves replacing only the head (ball) of the humerus. It is typically indicated for patients with damage or arthritis isolated to the ball portion of the shoulder, often resulting from a fracture.[6]

Comprehensive Arthroscopic Management (CAM) surgery is often employed in severe cases to release capsular adhesions and restore mobility, providing a joint-preserving option for patients with advanced conditions. CAM is an arthroscopic procedure where a surgeon uses a small camera and surgical instruments to access the shoulder joint to release the tight, scarred capsule tissue causing the restricted movement.[7] This report highlights the rehabilitation strategies employed in the case of a 53-year-old male post-CAM surgery.

CASE PRESENTATION

History

A 53-year-old male sought care at a chiropractic office for significant reductions in ROM, weakness and pain following CAM surgery for adhesive capsulitis of his left shoulder. He had begun physical rehabilitation as ordered by his surgeon the previous week with a local establishment. The patient also wanted to add chiropractic care to his care management plan due to positive outcomes with previous care experiences. Pre-surgical MRI findings demonstrated severe degeneration and previous surgical labral repair which was reported by the patient to have been performed ten years previously. Post-surgical initial examination revealed obvious visual bruising on the left medial humerus and decreased ROM in all planes and pain exacerbated by specific movements. The patient was actively being co-managed with physical therapy exercises twice per week through a rehabilitation facility concurrently with chiropractic care which included spinal and scapulothoracic manipulation, instrument assisted soft tissue mobilization, proprioceptive neuromuscular facilitation (PNF) and pin and stretch techniques.[8]

Diagnosis

The patient was diagnosed with adhesive capsulitis based on clinical findings and imaging results, consistent with established diagnostic criteria.[9]

Clinical findings included decreased ROM in all planes of motion, both active and passive. Initial exam findings discovered left shoulder flexion 110 degrees, extension 40 degrees, abduction 110 degrees, external rotation 30 degrees, and internal rotation 30 degrees. Orthopedic exam findings of the left shoulder revealed positive Neers (Impingement), Hawkins (Impingement), Lift Off (Subscapularis), Adduction/Internal Rotation (Infraspinatus), and Jobe Tests (Supraspinatus), with Belly Press (Subscapularis) and Drop Test (Rotator Cuff Tear) demonstrating negative results.

Management and Treatment Plan

The treatment strategy for adhesive capsulitis involves addressing capsular tightness and inflammation to improve ROM and reduce pain.[2] Arthroscopy is an excellent additional tool for addressing the shoulder with adhesive capsulitis and has become well-accepted in treating this process,[9] while CAM surgery specifically has been validated as an effective joint-preserving surgical option for addressing adhesive capsulitis and advanced osteoarthritis.[7] Therefore, CAM surgery was utilized to release capsular adhesions and restore shoulder function, aligning with evidence supporting its efficacy in advanced cases.[7]

Post-surgical intervention consisted of physical therapy exercises, tailored to the patient's condition, which were pivotal in improving ROM and reducing pain, consistent with established approaches.[10,11] Chiropractic adjustments utilized focused techniques to address joint restrictions involving the medial scapulothoracic region and cervicothoracic junction. Manual therapy was employed to target the rotator cuff, triceps, deltoid, and bicep musculature. Additionally, passive modalities such as laser therapy, shockwave therapy, and TENS (transcutaneous electrical nerve stimulation) were applied to the treatment areas. Neuromuscular training consisted of band-assisted arm extensions for reactive neuromuscular control.[8] To lengthen the constricted rotator cuff and surrounding musculature, stretching exercises were performed in office and recommended as part of his home exercise program (HEP). Gradual progression to active exercises with active ROM and strengthening exercises were later added to his HEP.

Phase 1: Pain Relief & Mobility (Weeks 1-4)

Pendulum Stretch: Stand and lean forward with one arm hanging down. Hold onto a stable surface with the other hand (like a chair). Swing the affected arm in small circles, gradually increasing the size of the circles. Perform for 30 seconds to 1 minute. Repeat 2-3 times per day.

Finger Walk: Stand facing a wall with your fingers at waist height. Slowly walk your fingers up the wall as high as possible, then lower them back down. Do this for 10-15 repetitions. Repeat 2-3 times per day.

Towel Stretch: Hold a towel with both hands behind your back, one hand over your shoulder and the other at your lower back. Use your unaffected arm to pull the towel upwards, gently stretching the involved shoulder. Hold for 20-30 seconds and repeat 5-10 times. Perform 2-3 times a day.

Chiropractic Adjustments (Weeks 2-4)

Spinal Adjustments: Focusing on the thoracic (upper back) spine. Misalignments in these areas can cause muscle tension, poor posture, and nerve compression that can exacerbate shoulder pain. Adjustments to these areas may improve overall posture, reduce muscle tension, and enhance nerve function.[4]

Shoulder Girdle Adjustments: Adjustments to the posterior scapulothoracic region focusing on scapular retraction. The goal is to target the affected shoulder blade to improve movement, which can help alleviate pain and stiffness.[4,12]

Phase 2: Gradual Mobility & Restoring Range of Motion (Weeks 4-8)

Cross-Body Stretch: Bring the affected arm across your chest. Use the unaffected arm to gently pull the affected arm closer to your chest. Hold for 20-30 seconds and repeat 5 times. Perform 2-3 times a day.

Active Assisted Shoulder Flexion: Sit with your back against a chair and use your unaffected arm to help lift the affected arm overhead. Hold the position for 5-10 seconds, then lower it slowly. Repeat 10-15 times. Perform 2-3 times a day.

Shoulder Extension Stretch: Stand or sit tall and hold a long object like a bar/stick behind you with both hands. Use your unaffected arm to gently push the affected arm backward. Hold for 20-30 seconds, repeat 5 times. Perform 2-3 times a day.[13]

Chiropractic Adjustments & Trigger Point Treatment (Weeks 4-6)

Spinal and Shoulder Joint Mobilization*:* Grade 3 and 4 mobilizations were used to improve joint mobility in the scapulothoracic region, acromioclavicular joint, and glenohumeral joint. Gentle, controlled grade 3 and 4 mobilizations can help increase flexibility without overstretching.[4,12]

Soft Tissue Therapy*:* Techniques like myofascial release and trigger point therapy can be used to reduce tightness in the muscles around the shoulder, upper back, and neck. This can help reduce pain and improve blood flow to the affected area.[7]

Phase 3: Strengthening & Stabilization (Weeks 8-12 and Beyond)

Isometric Shoulder Exercises: Stand with your back straight and your arm at your side. Press your hand against a wall or object without moving your shoulder. Hold for 5-10 seconds and repeat 10 times. Perform 2-3 times a day.[13]

External Rotation: Stand with your elbow bent at 90 degrees. Hold a resistance band in both hands. Keep your elbow at your side and rotate your forearm outward, away from your body. Perform 10-15 repetitions. Repeat 2-3 times per day.[13]

Shoulder Press: Hold light weights (1-3 pounds) in both hands. Press the weights overhead and lower back down slowly. Perform 10-15 repetitions. Repeat 2-3 times a day.

Wall Push-Ups: Stand a few feet away from a wall and place your hands on it at shoulder height. Slowly lower your body toward the wall, then push back up. Perform 10-15 repetitions. Repeat 2-3 times a day.

Chiropractic Adjustments & Postural Shoulder Strengthening (Weeks 6-12)

Spinal Adjustments: Focusing on the cervicothoracic region to alleviate stiffness/pain in the brachial plexus region. Adjustments in this area may help alleviate any compensatory patterns in the neck and upper back that might be causing additional strain on the shoulder.[4,14]

Strength exercises: The last phase is to strengthen the rotator cuff and scapular stabilizers. These muscles are key for shoulder stability and proper movement. Resistance band exercises to improve external rotation and scapular retraction. Shoulder presses and rows to strengthen the deltoid, rotator cuff, and upper back muscles.

Intervention and Outcome

During the first session, the focus was on gently mobilizing the patient's shoulder with passive range of motion exercises and pendulum swings. Manual therapy was also applied to relieve tightness in the surrounding muscles. This approach led to noticeable pain relief and an improvement in mobility.

As treatment progressed, the patient transitioned to active range of motion exercises, including wall slides and overhead reaches, to promote greater muscle engagement. Core stability work, such as planks and side-lying rotations, were introduced to improve overall function and support shoulder movement. To enhance stability and control, neuromuscular training with resistance bands was added. Soft tissue techniques, including instrument-assisted soft tissue mobilization, proprioceptive neuromuscular facilitation, and targeted stretching, were applied to the latissimus dorsi, pectoralis minor, subscapularis, teres minor, and deltoid to further increase mobility and reduce muscular restrictions.

Over time, the patient showed significant improvements in shoulder mobility. Flexion increased from 110 to 132 degrees, extension improved from 40 to 53 degrees, and abduction rose from 110 to 135 degrees. External rotation expanded from 30 to 65 degrees, while internal rotation improved from 30 to 63 degrees. Pain levels dropped by more than 75%, going from 4/10 to 0-1/10 on the visual analog scale. With these gains, the patient was able to carry out daily activities with minimal discomfort, only experiencing mild pain in certain positions.

DISCUSSION

This case highlights the importance of a structured, individualized rehabilitation program following CAM surgery for adhesive capsulitis. Combining chiropractic adjustments, manual therapy, and targeted exercises proved effective in reducing patient pain, improving shoulder ranges of motion in all planes and enhancing functional abilities while returning the patient to better than pre-surgical function for all shoulder-related activities. **Figure 1** demonstrates the severity of pain and ROM in respect to time in the stages of adhesive capsulitis. The "freezing" stage shows that pain is severe, with significant limitations in motion. Durations of the severity can last from 6 weeks to 4 months. The "frozen" stage is characterized by severe loss of range of motion. This is also associated with a decrease in pain, resulting in a scenario where ROM is decreased for 4 to 12 months. Lastly, the "thawing" stage shows pain is minimal, but stiffness can linger. Full mobility returns gradually in 6 months to 2 years and can be accelerated with physical therapy, NSAIDs and other conservative treatments.[15] Overall, the faces on the graph show time (x-axis) and severity (y-axis) with three emotional states. The emotional states are angry/sad face (freezing phase - high pain, low mobility). Neutral face (frozen phase - reduced pain but still restricted movement). Happy face (thawing phase - recovery and increased mobility).

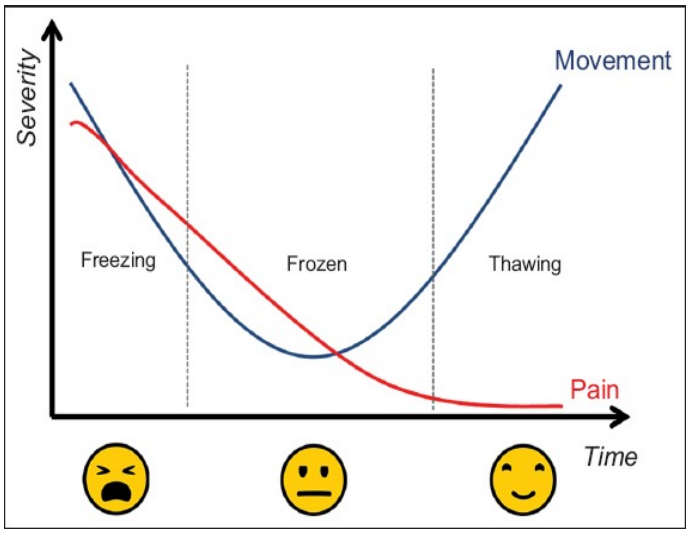

Figure 1[15]

The primary goals were to focus on stretching and joint mobilization, normalized scapular kinematics,[2] periscapular strengthening with isometrics or against gravity, and to implement a home exercise program for shoulder stretching 2-3 times daily. Physical therapy exercises were provided in combination with home stretches.[10] The patient's at home stretches/exercises included shoulder ROM exercises in all planes of motion using both concentric and eccentric emphasis. These planes of motion include forward flexion, internal and external rotation, lateral abduction, and cross body adduction.

Alternative Research Outcomes

Physical therapy remains a cornerstone of adhesive capsulitis treatment, demonstrating significant improvements in pain and function compared to passive modalities.[10] Alternative treatment options to use in frozen shoulder therapy include passive treatment modalities such as local heat, ice, ultrasound, shockwave, and dry needling.[2] There are also options of NSAIDs, local steroid injection, hydrodistension, and manipulation under anesthesia.[9] NSAID studies to treat frozen shoulder show that reduction of pain in early stages may benefit better than rehabilitation or placebo but this is not shown/maintained for the long term.[16] NSAIDs are typically recommended for short-term use to manage acute pain and inflammation in the early stages of frozen shoulder. Over-the-counter doses of NSAIDs like ibuprofen or naproxen can be taken for pain relief. Interarticular injections can be poorly tolerated due to the procedure not requiring anesthetization. This can cause significant pain during the procedure making it slightly less desirable.[16] These injections are powerful anti-inflammatory agents that help reduce swelling, pain, and inflammation in the shoulder joint. They are especially beneficial during the freezing stage when inflammation is high. Manipulation under anesthesia (MUA) has the drawback of stretching tissues while the patient is unconscious, which can lead to pain upon waking and potentially delay recovery. When surgical release is combined with MUA, it introduces additional trauma to the shoulder, which may further slow rehabilitation. Despite these concerns, many patients experience notable improvements in range of motion and pain relief shortly after the procedure, with some regaining up to 80–90% of shoulder function.[9]

The procedure can provide long-lasting relief, particularly when combined with a comprehensive physical therapy program post-procedure. Arthroscopy is a valuable tool in the management of adhesive capsulitis and is widely accepted as an effective treatment approach. The primary pathology involves tightening of the coracohumeral ligament, the rotator interval, and contraction of the joint capsule, including the axillary pouch. These structures can be released using arthroscopic instruments, helping to restore range of motion - often supplemented by manipulation when needed.[9] Overall, most of these studies demonstrate various degrees of improvement in pain scores, ROM, and function regarding treatment options.

Limitations

The findings are based on a single case and may not generalize to all patients. Additionally, long-term follow-up was not conducted to assess sustained improvements.

Implications

This case emphasizes the need for multidisciplinary approaches in managing adhesive capsulitis, integrating surgical intervention with comprehensive rehabilitation strategies and chiropractic care.

CONCLUSION

This report demonstrates successful post-surgical management of adhesive capsulitis using chiropractic adjustments, manual therapy, and targeted exercises. Reactive neuromuscular training was particularly beneficial in re-establishing shoulder stability, while core exercises supported overall kinetic chain functionality.[8] The outlined care plan provides a valuable reference for clinicians in managing similar cases, underscoring the importance of individualized, multimodal rehabilitation programs.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

COMPETING INTERESTS

The authors declare no competing interests.

REFERENCES

1. Itoi E, Arce G, Bain GI, Diercks RL, Guttmann D, Imhoff AB, Mazzocca AD, Sugaya H, Yoo YS. Shoulder stiffness: Current concepts and concerns. *Arthroscopy : The Journal of Arthroscopic & Related Surgery*. Accessed February 4, 2025. https://pubmed.ncbi.nlm.nih.gov/27180923/.

2. Cho C-H, Bae K-C, Kim D-H. Treatment strategy for frozen shoulder. *Clinics in Orthopedic Surgery.* September 2019. Accessed February 4, 2025. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6695331/.

3. Sung JH, Lee JM, Kim JH. The effectiveness of ultrasound deep heat therapy for adhesive capsulitis: A systematic review and meta-analysis. *Int J Environ Res Public Health.* 2022;19(3):1859. Published 2022 Feb 7. https://doi.org/10.3390/ijerph19031859.

4. Page MJ, Green S, Kramer S, et al. Manual therapy and exercise for adhesive capsulitis (frozen shoulder). *Cochrane Database Syst Rev*. 2014;2014(8):CD011275. Published 2014 Aug 26. doi:10.1002/14651858.CD011275

5. Hsu SY, Chan KM. Arthroscopic distension in the management of frozen shoulder. *Int Orthop.* 1991;15(2):79-83. https://doi.org/10.1007/BF00179702.

6. Mayo Clinic. Shoulder replacement surgery. February 2, 2024. Accessed February 4, 2025. https://www.mayoclinic.org/tests-procedures/shoulder-replacement/about/pac-20519121.

7. Verma NN, Harris JD. Surgery: Preserving shoulder movement in advanced OA--yes we CAM!. *Nat Rev Rheumatol.* 2013;9(7):386-388. https://doi.org/10.1038/nrrheum.2013.77.

8. Guido JA Jr, Stemm J. Reactive neuromuscular training: A multi-level approach to rehabilitation of the unstable shoulder. *N Am J Sports Phys Ther.* 2007;2(2):97-103.

9. Manske RC, Prohaska D. Diagnosis and management of adhesive capsulitis. *Curr Rev Musculoskelet Med.* 2008;1(3-4):180-189. https://doi.org/10.1007/s12178-008-9031-6.

10. Chan HBY, Pua PY, How CH. Physical therapy in the management of frozen shoulder. *Singapore Med J.* 2017;58(12):685-689. https://doi.org/10.11622/smedj.2017107.

11. Jain TK, Sharma NK. The effectiveness of physiotherapeutic interventions in treatment of frozen shoulder/adhesive capsulitis: A systematic review. *J Back Musculoskelet Rehabil.* 2014;27(3):247-273. https://doi.org/10.3233/BMR-130443.

12. Kazemi M. Adhesive capsulitis: A case report. *J Can Chiropr Assoc.* 2000;44(3):169-176.

13. Comella T. Frozen Shoulder. *E3 Rehab.* December 14, 2023. Accessed February 4, 2025. https://e3rehab.com/frozenshoulder/.

14. Murphy FX, Hall MW, D'Amico L, Jensen AM. Chiropractic management of frozen shoulder syndrome using a novel technique: A retrospective case series of 50 patients. *J Chiropr Med.* 2012;11(4):267-272. https://doi.org/10.1016/j.jcm.2012.07.001.

15. Role of homoeopathic medicines in the treatment of frozen shoulder with integrated approach of physiotherapy - scientific figure on ResearchGate. Available from: https://www.researchgate.net/figure/Chart-shows-the-clinical-presentation-of-frozen-shoulder-Icons-with-facial-expressions_fig3_352537203. Accessed May 6, 2025.

16. Dehghan A, Pishgooei N, Salami MA, et al. Comparison between NSAID and intra-articular corticosteroid injection in frozen shoulder of diabetic patients; A randomized clinical trial. *Exp Clin Endocrinol Diabetes.* 2013;121(2):75-79. https://doi.org/10.1055/s-0032-1333278.

Chiropractic Treatment of Dorsal Scapular Nerve Entrapment

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ABSTRACT

Objective: The purpose of this case series is to describe the diagnosis and management of dorsal scapular nerve neuralgia in two patients. Both patients presented uniquely by having full strength of their rhomboids and levator scapula, and had a chief complaint of burning and tingling along the medial scapular border.

Clinical Features: Two patients presented with a chief complaint of paresthesia in the dorsal scapular nerve distribution. While the differential diagnosis included dorsal scapular nerve entrapment and notalgia paresthetica, these cases show the efficacy of treating without the use of advanced imaging techniques, nerve blocks, and/or electrodiagnostic studies.

Interventions and Outcomes: Both patients received chiropractic manipulation to their cervical and/or thoracic joints, had skin rolling performed over the distribution of the dorsal scapular nerve, and post-isometric relaxation (PIR) performed on the posterior and/or middle scalene muscles. Both patients had complete resolution of the presenting complaints at follow up.

Conclusion: Chiropractic care, including spinal adjustments, skin rolling, and PIR may be beneficial for patients with dorsal scapular nerve entrapments. While confirming a diagnosis may require advanced imaging, nerve blocks, and electrodiagnostics, it may not be needed to treat a patient successfully.

Key Words: Dorsal Scapular Nerve; Chiropractic

INTRODUCTION

Dorsal scapular nerve entrapment is a relatively rare diagnosis. In fact, the anatomy of the dorsal scapular nerve is highly variable, along with the potential locations of the entrapment and causes of symptoms. Discussion of the treatment of dorsal scapular nerve entrapments is also lacking and highly variable, including conservative care, hydrodissection, extracorporeal shockwave therapy, and botulinum toxin injections.[1,2,3,4] When dorsal scapular nerve symptomatology is present, it can result in a spectrum from no motor weakness to complete atrophy and weakness of the rhomboids, and occasionally the levator scapula.[5] When motor weakness occurs, it generally results in a winged scapula.[6] It also may create tightness in the muscles it innervates.[5] Additional symptoms may include paresthesia (tingling, burning, itching) medial to the scapula.[3,5] This is thought to be caused by stretching and/ or compression of the nerve, causing inflammatory mediators to create scar tissue, swelling, and adhesions that prevent the nerve's ability to move.[7,8,9] Due to entrapments at the scalene, cervical rotation and extension may recreate or intensify symptoms.[10] It is often associated with repetitive overhead athletes and workers, chronic postural strain, post-surgery/ bracing, or post motor vehicle accident (MVA).[5]

The dorsal scapular nerve generally originates from the C5 nerve root anterior ramus through the middle scalene, and projects inferolaterally between the upper trapezius and the levator scapula, traveling inferiorly down the medial border of the scapula to about T7. The dorsal scapular nerve innervates the rhomboid major and minor. 48% of the time it innervates the levator scapula, and 52% of the time it innervates the rhomboid major, minor, and levator scapula.[11] **Table 1** shows the variance of the origin of the dorsal scapular nerve.

Table 1:

Origin of Dorsal Scapular Nerve	**Percentage of Origin of Dorsal Scapular Nerve**
C5 nerve root anterior ramus	17.9%[12], 95%[6], 75.8%[13], 70%[9]
C4 nerve root anterior ramus	28.4%[14], 22%[9]
C6 nerve root anterior ramus	8%[9]
C4 and C5 nerve roots anterior rami	7.6%[13], 100%[15], 23.1%[12]
C5 and C6 nerve roots anterior rami	5%[6]
C5 nerve root anterior ramus with a shared trunk with long thoracic nerve	30.4%[11]
C3-4 nerve root anterior ramus bilaterally	100% [n=1][8]
Superior trunk of brachial plexus	9%[7]

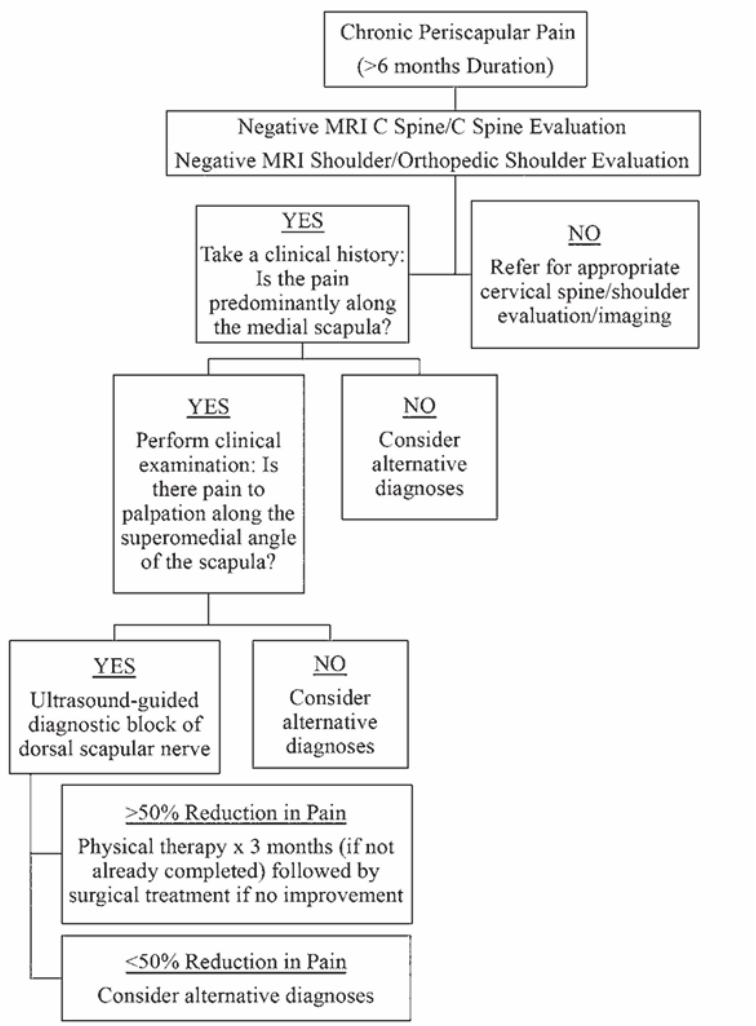
Additionally, the entrapment points vary. The most common entrapment point is the middle scalene, but the middle and posterior scalene can entrap the dorsal scapular nerve, as well as the levator scapula. **Table 2** shows the common entrapment sites and how likely the dorsal scapular nerve is entrapped at that sight.

Table 2:

Entrapment Site	**Percentage of Entrapment at Site**
Middle Scalene	74%[11]
Middle and Posterior Scalene	6.4%[13]
Levator Scapula	25.7%[14]
Anterior to Middle Scalene	13%[11]
Posterior to Middle Scalene	13%[11]

There is no gold standard to diagnose dorsal scapular neuralgia. Ottestad et. al used **Figure 3** to diagnose dorsal scapular neuralgia in chronic periscapular pain.[16]

Figure 3



Sultan et. al used electrodiagnostic studies to diagnose dorsal scapular neuralgia.[8] Electrophysiologic abnormalities of the dorsal scapular nerve were found in 52.7% (29 of 55) of people with unilateral periscapular pain.[8] Interestingly, only 16.4% (9 of 55) had scapular winging.[8]

While utilization of these studies are both appropriate and effective, conservative care providers may have difficulty following the flowchart. It would be difficult to clinically justify all advanced diagnostic tests required due to the need for referrals and authorization. Justification is difficult prior to initiating a trial of care due to the amount of time needed for prior authorization to become approved, both in the amount of time needed to spend on the paperwork and/ or phone calls on the prior authorization, and the amount of time needed to wait for a response. In 2017, the American Medical Association conducted a study that found each physician needs 14.6 hours per week dedicated solely to completing prior authorization forms.[17] Individual insurance carriers also vary in the time it takes to accept or deny prior authorization. This does not include the amount of time needed before an imaging center has an availability for the patient and the time needed to write the report. Conservative care providers also must consider the risk of rejection of the advanced diagnostic tests, further increasing the amount of time between initial presentation and the patients' diagnosis and treatment. In the amount of time this would take, a trial of care may be nearly complete and the patient can experience relief of symptoms.

The differential diagnosis for disorders that must be ruled in/ out when considering dorsal scapular neuralgia include notalgia paresthetica, and C5 radiculopathy.[5] The key difference between dorsal scapular neuralgia and notalgia paresthetica is the absence of weakness of the rhomboids with notalgia paresthetica. There may, however, be a link between notalgia paresthetica and dorsal scapular neuralgia.[5] Dorsal scapular neuralgia may cause adhesions and taut bands within the rhomboids, resulting in entrapment of the thoracic medial cutaneous nerves from the thoracic posterior primary rami that supply the area.[5] Without motor weakness, it is difficult to differentiate between notalgia paresthetica and dorsal scapular neuralgia. Clinically, recreating the tingling/burning/itching by moving the neck or sustaining pressure on an entrapment point may assist in deciding whether it is dorsal scapular neuralgia causing notalgia paresthetica, or only notalgia paresthetica. The dysesthesia and pruritis commonly seen medial to the scapula can be created due to the adhesions along the course of either the dorsal scapular nerve or thoracic medial cutaneous nerves.[5] A C5 radiculopathy differs by having pain/ symptoms in the C5 dermatomal distribution, weakness of the biceps and deltoid muscles, sensory loss, and reflex loss. Additionally, the orthopedic cluster of cervical distraction relieving arm symptoms, Spurling's recreating arm symptoms, positive upper limb tension test, and cervical rotation <60 degrees with recreation of arm symptoms should have 3 of 4 or 4 of 4 positive in a C5 radiculopathy. 3 of 4 positive tests lead to a specificity of .94 and a + Likelihood Ratio of 6.1 and 4/4 positive tests has a specificity of .99 and a + Likelihood Ratio of 30.3.[18]

CASE PRESENTATION 1

Subjective: A 32-year-old female presented to the clinic with chief complaints of right sided neck pain and burning along the medial border of her scapula to about T6-7. This had

been present for greater than 2 years without known cause. She had received cervical radiographs, which were deemed unremarkable, as well as corticosteroid injections, muscle relaxants, and a trial of physical therapy; none of which resolved her problem. She stated that when she works as a Certified Nursing Assistant, the symptoms increase, especially when wrapping her arm around a patient. Symptoms also increased when driving while holding the steering wheel with her right hand, and sitting. Symptoms are present throughout the day. The only remarkable past medical history of the patient was an overactive bladder, diagnosed seven months prior.

Objective: Upon inspection, she had no evidence of scapular winging, rhomboid atrophy, or hyperpigmentation in her thorax. The patient had full cervical range of motion in all directions. Active range of motion was less than passive range of motion, with minor neck pain noted on flexion, extension, and bilateral rotation. No arm symptoms were elicited upon cervical ranges of motion. Soft tissue examination revealed a hypertonic right levator scapula, relatively hypotonic right paraspinal/ intrinsic muscles at C3, tenderness and trigger points over the medial right rhomboid major, tenderness at the superior angle of the scapula, and hypertonic right middle and posterior scalene muscles. With sustained compression of the posterior scalene, burning increased at the border of her right medial scapula. Palpation along the length of the dorsal scapular nerve induced patient reported tenderness. A C3 left lateral flexion restriction was found that did not change the burning symptoms or induce change in the patient's thoracic spine. The performed neurological examination was unremarkable with the exception of mild loss of pinprick sensation lateral to C3 on the right. Her motor strength in her upper extremities were all 5/5 and symmetrical including scapular protraction and retraction. All other sensory tests were unremarkable in all dermatomes, reflexes were 2+ at the biceps, brachioradialis, and triceps. Hoffman's sign and Tromner's sign were unremarkable. Orthopedic tests performed included Spurling's, Cervical Compression, and Cervical Distraction, all of which were unremarkable.

Assessment/Plan: The patient was diagnosed with a chronic dorsal scapular nerve entrapment, likely at the posterior scalene. A trial of conservative care was recommended for 2x/ week for 3 weeks consisting of cervical adjusting, post-isometric relaxation of the right posterior scalene, and skin rolling over the course of the dorsal scapular nerve. At subsequent treatments, PIR of the right middle scalene and manual cervical traction for 6 sets of 10 seconds were also administered.

Results: The patient was noncompliant with the treatment frequency, but after 4 visits over 22 days, on her 5th visit on day 24, she reported that she had no neck pain and minimal burning, which now is concentrated to just her superior angle of the scapula. After a subsequent 5 treatments, she reported complete relief of symptoms. There were 9 total treatments over the course of 56 days.

CASE PRESENTATION 2

Subjective: The second patient was a 41-year-old female with a 3-month history of right sided posterolateral and anterolateral neck pain and pain and tingling down the medial border of her right scapula to about the level of T6-7. Although she could not pinpoint an

exact cause, the patient stated her rolling onto her pillow using her neck may be the cause. She has had no prior treatment for this condition. She states that turning her neck to the left increases her neck pain and both neck pain and pain/ tingling at her right medial border of the scapula get worse as the day progresses. Using a massage gun on her neck and back are the only temporary palliative factors. They also reported full strength in her arm, shoulder, and scapula, and denied radiating arm symptoms. She has had no prior imaging for this condition. Her past medical history was remarkable for a partial thyroidectomy 13 years ago, a tonsillectomy, seasonal allergies, GERD, and a hiatal hernia.

Objective: Upon objective examination, no evidence of scapular winging, rhomboid atrophy, or hyperpigmentation in her thorax was noted. Her cervical range of motion was full in all directions, with neck pain upon bilateral rotation and lateral flexion, with her active range of motion being less than passive range of motion. Range of motion testing did not create arm symptoms. Soft tissue examination revealed a hypertonic right posterior scalene that did not increase the symptoms with digital overpressure, a trigger point in her right upper trapezius that recreated her posterolateral neck pain, tenderness at the superior angle of the scapula, and tenderness with mild tautness of the medial portion of the right rhomboid major. Tenderness along the course of the dorsal scapular nerve was elicited with palpation. A right rotation restriction of C2 and a C3 left lateral flexion restriction were present with pain in the cervical spine only, along with restrictions from T5-T10 with local tenderness only. Her neurologic examination was unremarkable- she had full strength in both upper extremities, full sensation for both upper extremities, and 2+ reflexes at the biceps, brachioradialis, and triceps. Orthopedic examination was unremarkable for Spurling's, Cervical Compression, Cervical Distraction, and Maximal Foraminal Compression testing.

Assessment/Plan: She was diagnosed with a chronic dorsal scapular nerve entrapment, likely at the posterior scalene. A six-appointment trial of conservative care was recommended, on a schedule of 2x/week for 3 weeks. Recommended treatment would consist of cervical and thoracic adjusting, PIR of the right posterior scalene, ischemic compression of the trigger point in the right upper trapezius, and skin rolling along the course of the dorsal scapular nerve. She also presented with a separate hip complaint that is unrelated to the dorsal scapular nerve entrapment that was treated simultaneously. That treatment consisted of PIR to the left tensor fascia latae, blocking her sacroiliac joints, and adjusting her left hip.

Results: The patient was treated two times over one week, and reported complete elimination of the tingling on the third visit two weeks later. There were 3 total treatments over 21 days.

DISCUSSION

The ability to definitively diagnose dorsal scapular neuralgia as a conservative care provider is challenging due to barriers in obtaining additional diagnostic tests. While following evidence-based procedures for diagnosis would be ideal, clinically for conservative care providers, they are near impossible to follow. A patient may be able to have reduction of

symptoms in the amount of time necessary for a patient to receive advanced diagnostic testing. After ruling out cervical spine pathology with an exam, having no evidence of shoulder pathology due to no weakness, and ruling out contraindications to treatment, conservative care providers will be tasked with deciding whether to treat the patient with a likely diagnosis of dorsal scapular neuralgia, or dorsal scapular neuralgia causing notalgia parasthetica, or ordering advanced diagnostic tests and waiting for the results. In these two cases, there was no cervical pathology and no contraindication to treat.

There are no meta-analyses or systematic reviews present on the conservative treatment of dorsal scapular neuralgia. The only case study that was purely conservative care treated a case of dorsal scapular neuralgia with chiropractic manipulation to the cervical and thoracic spine as well as the upper posterior ribs, trigger point therapy to the scalene muscles, upper trapezius and rhomboids, PIR to the scalene muscles in office and as an at home stretch, as well as applying a high volt galvanized current to the left rhomboids.[1] The patient was treated 5 times over a 1-month timeframe and was symptom free at 1 and 6 months.[1]

A study on the comparison of the effectiveness of Extracorporeal Shockwave Therapy (ESTW) vs. isotonic saline injections at both the sternocleidomastoid and middle scalene showed that both had significant impact on reduction of a visual analog scale score (VAS) and percent pain intensity difference, where the injection therapy had a larger treatment effect size than ESTW.[2] The study, however, did not differentiate between the dorsal scapular nerve entrapment and the spinal accessory nerve in patients, and appeared to apply an intervention to both in both groups. While ESTW can be administered by conservative care providers, more research and/ or data from the current study would be needed prior to its recommendation.

One case study by Agkun followed a patient treated partially with conservative care for a patient with dorsal scapular neuralgia, beginning with using Codman's Pendulum exercises 5x5min/ day, cold gel packs 5x20min/day, paracetamol tablets (4x/ day, 500mg) and meloxicam (1x/ day, 15mg).[19] The patient then progressed to active and passive range of motion of the affected side shoulder and neck, strengthening the rhomboid and levator scapula, and general conditioning training (3x/ week for 1 month) followed by a home exercise program.[19] At both one and two year follow up, the patient had no symptoms.[19]

Another case study in which a patient had dorsal scapular neuralgia diagnosed four years post trauma, confirmed by electromyography (EMG) and unremarkable cervical spine MRI and rotator cuff ultrasound, along with rhomboid weakness and scapular winging, had increased rhomboid strength and use of her arm from treatment.[20] Treatment consisted of "ultrasound treatment of the left shoulder, continuous passive motion, back and shoulder massage, lymphatic drainage of the upper limb, transcutaneous electrical nerve stimulation applied to the left shoulder and arm, shoulder kinesitherapy, EMG biofeedback (to release the trapezius and better activate the rhomboid), and electrical stimulation of the deltoid. In order to further improve the shoulder ROM, a 100 IU dose of botulinum toxin A (BTA) was injected into the left trapezius, in two sites, to relax the trapezius" as well as pharmacologic pain control measures.[20] The duration of rehabilitation, as well as the type, duration, and amount of pharmacologic pain control measures were not mentioned in the report. The

patient was treated with at least two more trials of care over the next 14 months (not explicitly mentioned in the study) before muscle strength and functional arm movements were stated as "satisfactory", per the report.[20] Again, the treatment extends beyond traditional conservative care, and used advanced imaging to diagnose, which may not be accessible to many conservative care providers.

Medical interventions include landmark guided injections, radiofrequency lesioning, botulinum toxin, and surgery. For surgery, 22 patients went through resection of the middle scalene, and all 22 patients reported their symptoms were "mostly relieved" post-surgery.[21] Radiofrequency lesioning was used in one case study, where the patient reported a 60% reduction in their pain.[22] Landmark guided injections into pain points at the neck and T3-4 in 128 patients with dorsal scapular neuralgia showed "excellent" results in 87 patients, "good" in 28 patients, "poor" in 3 cases, and "ineffective" in 2 cases at 6-12 months post injection[21]. 90.9% of patients who required 4 to 6 injections ended up having symptoms after 6-12 months.[4] Ultrasound guided hydrodissection of the dorsal scapular nerve completely resolved symptoms in a patient at 4 weeks post second injection and 16 weeks after.[3] In a study conducted with the use of dorsal scapular nerve decompression surgery on 21 patients, VAS scores decreased significantly ($p<.001$) post operatively, and 71% had a "good" outcome determined by DASH scores, where longer duration of symptoms led to poorer outcomes.[16]

To our knowledge, there are no studies that have examined the therapeutic effect of skin rolling on dorsal scapular neuralgia. Skin rolling has been utilized by Maigne to treat thoracolumbar syndrome (Maigne Syndrome) by treating the intersegmental cutaneous nerve supply.[23] The utilization of this technique may be more effective for notalgia parasthetica and the thoracic medial cutaneous nerves. There are some studies reporting patient benefit with skin rolling for fibromyalgia and chronic musculoskeletal pain.[24,25]

Dysesthesia secondary to dorsal scapular neuralgia appears to be infrequently mentioned in the literature. It is important for clinicians to consider this diagnosis even when motor findings are not present. This follows the theory that the dorsal scapular nerve can become symptomatic due to adhesions and fibrous bands around the nerve after inflammatory chemical release by the nerve. Theoretically, this may cause neuralgia without the patient experiencing loss of nerve function. In order to allow for proper blood flow to the nerve and allow it to move more freely, it makes sense from a neurophysiologic perspective to decrease the tone of the muscles that entrap the dorsal scapular nerve, as well as theoretically reducing the entrapment of the nerve in the fascia due to the adhesions and fibrous bands via skin rolling.

LIMITATIONS

This case series shows a positive response to care for two patients with dorsal scapular neuralgia. This may not necessarily correlate to the general population or others with this condition. More high-quality research and case studies are needed to establish a relationship between the therapies and response to treatment. Due to having multiple interventions for the same diagnosis, one cannot say definitively if one intervention led to the greatest results,

or if it was due to multiple interventions applied together. Patient responses were based on patient subjective statements, not validated outcome assessment tools. No long term follow up was performed on these patients.

CONCLUSION

This case series describes two patients who presented with dorsal scapular neuralgia who appeared to respond positively to conservative treatment that included cervical adjusting, PIR of the posterior and middle scalene, and skin rolling over the distribution of the dorsal scapular nerve. While a definitive diagnosis is lacking due to no utilization of advanced diagnostic testing, providers may be able to treat these patients effectively.

CONSENT

Both patients gave written informed consent for their information to be used in this case series and did not withdraw written consent at a later date.

COMPETING INTERESTS

The author declares no competing interests.

REFERENCES

1. Plezbert JA, Nicholson CV. Dorsal scapular nerve entrapment neuropathy: a unique clinical syndrome. *J Neuromusculoskel System.* 1994;2(4):206–211.
2. Park SH, Kim SH, Kim M, et al. A Novel Therapeutic Approach Targeting Spinal Accessory and Dorsal Scapular Nerves for the Relief of Posterior Neck, Trapezius, and Interscapular Pain. *J Clin Med*. 2024;13(24):7754.
3. Sharma GK, Botchu R. Dorsal scapular nerve entrapment neuropathy managed by ultrasound-guided hydrodissection - a case report. *J Ultrason*. 2021;21(84):74-76.
4. Liu Q-j, Zhang X-p, Xia P, Zhu J, Li J. Clinical analysis of 128 patients with dorsal scapular nerve compression treated with painpoint injections. *Pain Clin J*. 2010;1:10–2.
5. Muir B. Dorsal scapular nerve neuropathy: a narrative review of the literature. *J Can Chiropr Assoc*. 2017;61(2):128-144.
6. Tubbs RS, Tyler-Kabara EC, Aikens AC, et al. Surgical anatomy of the dorsal scapular nerve. *J Neurosurg*. 2005;102(5):910-911.
7. Sultan HE, Younis El-Tantawi GA. Role of dorsal scapular nerve entrapment in unilateral interscapular pain. *Arch Phys Med Rehabil*. 2013;94(6):1118-1125.
8. Mackinnon SE. Pathophysiology of nerve compression. *Hand Clin*. 2002;18(2):231-241.
9. Aker PD, Gross AR, Goldsmith CH, Peloso P. Conservative management of mechanical neck pain: systematic overview and metaanalysis. *BMJ*. 1996;313(7068):1291-1296.
10. Nguyen VH, Liu HH, Rosales A, Reeves R. A Cadaveric Investigation of the Dorsal Scapular Nerve. *Anat Res Int*. 2016;2016:4106981.

11. Ballesteros LE, Ramirez LM. Variations of the origin of collateral branches emerging from the posterior aspect of the brachial plexus. *J Brachial Plex Peripher Nerve Inj*. 2007;2:14.
12. Tubbs RS, Tyler-Kabara EC, Aikens AC, et al. Surgical anatomy of the dorsal scapular nerve. *J Neurosurg*. 2005;102(5):910-911.
13. Martin RM, Fish DE. Scapular winging: anatomical review, diagnosis, and treatments. *Curr Rev Musculoskelet Med*. 2008;1(1):1-11.
14. Malessy MJ, Thomeer RT, Marani E. The dorsoscapular nerve in traumatic brachial plexus lesions. *Clin Neurol Neurosurg*. 1993;95 Suppl:S17-S23.
15. Ottestad E, Wilson TJ. Assessment of outcomes in consecutive patients undergoing dorsal scapular nerve decompression. *J Neurosurg*. 2022;138(5):1411-1418
16. Sharma, S, Russo, A, Deering, T. et al. Prior Authorization: Problems and Solutions. *J Am Coll Cardiol EP.* 2020 Jun, 6 (6) 747–750
17. Wainner RS, Fritz JM, Irrgang JJ, Boninger ML, Delitto A, Allison S. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. *Spine*. 2003;28(1):52-62.
18. Akgun K, Aktas I, Terzi Y. Winged scapula caused by a dorsal scapular nerve lesion: a case report. *Arch Phys Med Rehabil*. 2008;89(10):2017-2020.
19. Benedetti MG, Zati A, Stagni SB, Fusaro I, Monesi R, Rotini R. Winged scapula caused by rhomboid paralysis: a case report. *Joints*. 2017;4(4):247-249.
20. Chen D, Gu Y, Lao J, Chen L. Dorsal scapular nerve compression. Atypical thoracic outlet syndrome. *Chin Med J (Engl)*. 1995;108(8):582-585.
21. Restrepo-Garces CE, Gomez CM, Jaramillo S, Ramirez L, Vargas F. Dorsal scapular nerve block under ultrasound guidance. Poster presentation ASRA 11th Annual meeting. Miami. 2012
22. Liu Q-j, Zhang X-p, Xia P, Zhu J, Li J. Clinical analysis of 128 patients with dorsal scapular nerve compression treated with painpoint injections. *Pain Clin J*. 2010;1:10–2.
23. Maigne R. Low back pain of thoracolumbar origin. *Arch Phys Med Rehabil*. 1980;61(9):389-395.
24. Hirschberg, GG. Case Report: A Case of Chronic Musculoskeletal Pain Treated Successfully by Skin-rolling Massage. *Journal of Orthopaedic Medicine*, 2000;22(3):99-101.
25. Hirschberg, GG. Skinfold Tenderness and Skinrolling Massage in Fibromyalgia. *Journal of Orthopaedic Medicine*. 1997;19(3)77-82.