

Enduring Controversy of Cervicogenic Vertigo

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The idea of cervicogenic vertigo (CV) was proposed nearly a century ago, yet despite considerable scrutiny and research, little progress has been made in clarifying the underlying mechanism of the disease, developing a confirmatory diagnostic test, or devising an appropriately targeted treatment. Given the history of this idea, we offer a review geared towards understanding why so many attempts at clarifying it have failed, with specific comments regarding how CV fits into the broader landscape of positional vertigo syndromes, what a successful diagnostic test might require, and some practical advice on how to approach this in the absence of a diagnostic test.

Keywords: vertigo ; cervicalgia ; proprioception ; multisensory integration ; migraine ; vestibular testing ; oculomotor testing ; vascular imaging ; physical therapy

1. Introduction

Investigations of CV often appear motivated by the frequently encountered clinical scenario of a patient with neck symptoms and dizziness, in whom no other cause for the dizziness has been identified. Since mere co-occurrence does not prove causality, a skeptical audience would understandably eschew regarding CV as a “diagnosis,” and prefer the more neutral term, “syndrome”.

Discussions of cervicogenic vertigo (CV) usually characterize the idea as “controversial” ^{[1][2][3]}, and acknowledge that the lack of a diagnostic test contributes to the controversy ^{[3][4][5][6]}.

With these points in mind, we shall review why CV is controversial, beginning with an appraisal of candidate mechanisms for its pathophysiology, how these mechanisms could be tested, why tests have failed, and a more general discussion of why it has proven so difficult to devise a sensitive and specific test. We conclude with a brief review of treatments.

2. Candidate Pathophysiological Mechanisms

Reports have documented a variety of oculomotor abnormalities occurring in association with neck rotation or neck pain; usually these appear to be abnormalities in the cervico-ocular reflex ^{[7][8][9]}, but reports also describe other “Deficits in oculomotor control, such as decreased smooth pursuit velocity gain, altered velocity and latency of saccadic eye movements” ^[3]. Some investigators have gone so far as to say that “The smooth pursuit neck torsion test developed by Tjell et al. ^[10] is considered to be specific for detecting eye movement disturbances due to altered cervical afferent input” ^[3], but we will discuss below that this was not borne out.

The first manner in which erroneous cervical proprioception could manifest with vertigo is through “sensory mismatch”—which is to say a discrepancy between the erroneous input from cervical proprioception, and the correct input from vision and the inner ear ^{[3][5][11][12]}.

The first possibility is that neck problems may trigger migraine ^{[13][14][15][16][17]}, and migraine can cause vertigo ^{[18][19][20]}; on this hypothesis, neck problems are the initial trigger for migraine, and migraine in turn causes vertigo.

The second possibility is that migraine may manifest with both neck pain ^{[16][21][22][23][24][25][26][27][28]} and vertigo ^{[18][19][20]}; on this hypothesis, migraine is the common underlying etiology of both symptoms.

3. Many Patients Preliminarily Diagnosed with CV Are Found to Have Other Disorders

Mistaking BPPV for CV is a particularly good illustration of why, when a diagnosis of CV is being considered, one must maintain a broad differential.

Yacovino and Hain comment that, “Many patients preliminarily diagnosed with such a disorder are ultimately found to have other pathologies” [6]. Brandt states this more forcefully: “Reliable and well-established signs and tests can support a convincing alternative diagnosis in almost all patients presenting with vertigo” [1].

This serves as a reminder that CV remains a diagnosis of exclusion.

4. A Diagnosis of Exclusion

Given the difficulty of devising a “proof positive” test for CV, and the repeatedly cited observation that most cases preliminarily diagnosed with CV are ultimately found to have a different cause, most reviews come to the conclusion that CV is a diagnosis of exclusion [2][3][6][29].

Taking the “diagnosis of exclusion” criterion with the definitions, conditions, and assumptions mentioned earlier brings us back to Wrisley’s description that “the diagnosis of cervicogenic dizziness is suggested by (1) a close temporal relationship between neck discomfort and symptoms of dizziness, including time of onset and occurrence of episodes, (2) previous neck injury or pathology, and (3) elimination of other causes of dizziness” [29].

5. Treatment

The controversy surrounding CV has not prevented clinicians from attempting to treat it, though the optimal therapeutic protocol is uncertain since the underlying mechanism of the disease remains unclear.

5.1. Physical Therapy

There has been extensive reporting on physical therapy for the neck as treatment for CV [30][31][32][33][34][35][36][37][38], though, “Regarding the treatment of proprioceptive cervical vertigo, in which pain and imbalance or vertigo are the limiting symptoms, the quality of published studies in the current literature is poor” [6].

Some authors suggest that a multimodal approach to treatment may be warranted, as evidenced here: “A combined approach is likely to best address the perpetuation of a vicious cycle of events where secondary adaptive changes in the sensorimotor control system could lead to altered cervical muscle function and joint mechanics further altering cervical afferent input... Physical therapy interventions such as pain management, manipulative therapy, active range-of-motion exercises, and exercises to improve neuromuscular control will all be important in reducing possible causes of altered afferent cervical input and subsequent disturbances to sensorimotor control” [3]. It may also be helpful to incorporate treatment from other disciplines, such as vision therapy.

Although vertigo is one of the cardinal symptoms of CV, “Vestibular physical therapy is not a substitute for physical therapy for the neck” [5].

5.2. Why Does PT Work at All?

If we do not yet know the pathophysiological mechanism underlying CV, then applying physical therapy in this clinical scenario is treating blindly, and seems unlikely to correct the problem by chance; and yet, the physical therapy literature generally describes encouraging outcomes. How can this be?

Whichever factor initiates the process that manifests with one of the symptoms (vertigo or neck pain) may in turn provoke the other, leading to the vicious cycle of a positive feedback loop. Patients who are dizzy from any cause tend to develop neck stiffness [6][39], and neck problems causing vertigo defines CV. In other words, these phenomena may exacerbate each other; “interconnections between the cervical proprioceptors and the vestibular nuclei may contribute to a cyclic pattern, such that cervical muscle spasms contribute to dizziness and dizziness contributes to muscle spasm” [29].

Whether the neck symptoms are the cause or the consequence of vertigo, any treatments that reduce neck pain and normalize cervical muscle tone and joint mobility—basically any treatments that normalize cervical mechanics [40][41]—will interrupt this positive feedback loop, thereby increasing the opportunity for recovery. This idea is reflected in Brandt’s comment that “If CV exists, appropriate management is the same as that for the cervical pain syndrome” [1].

5.3. Medication

Most pharmacologic attempts at management have included muscle relaxants, though there are no good data to suggest that this is effective. On the theory of “migraine-associated cervicogenic vertigo,” a trial of migraine prophylaxis may be

reasonable. There has been some exploration of other approaches, such as moxibustion ^[42] and onabotulinum toxin ^[43].

5.4. Surgery and Other Invasive Procedures

A variety of invasive interventions for CV have been explored, including cervical medial branch blocks ^{[44][45]}, percutaneous cervical nucleoplasty ^[46], radiofrequency ablation nucleoplasty ^[47], percutaneous laser disc decompression ^[48], intervertebral disc replacement ^[49], and surgery for cervical spondylosis or disc herniation ^[50]. Case series of the various invasive treatments for presumed CV generally report variable outcomes. Given the uncertainty in establishing the diagnosis, and the risks of invasive procedures, we would view invasive procedures as a last-resort approach.

5.5. Alternative Therapies

Dry needling ^[51] and acupotomy ^[52] have been explored, with limited data.

References

1. Brandt, T. Cervical vertigo—reality or fiction? *Audiol. Neurotol.* 1996, 1, 187–196.
2. Li, Y.; Peng, B. Pathogenesis, Diagnosis, and Treatment of Cervical Vertigo. *Pain Physician* 2015, 18, E583–E595.
3. Kristjansson, E.; Treleaven, J. Sensorimotor function and dizziness in neck pain: Implications for assessment and management. *J. Orthop. Sports Phys. Ther.* 2009, 39, 364–377.
4. Peng, B. Cervical vertigo: Historical reviews and advances. *World Neurosurg.* 2018, 109, 347–350.
5. Hain, T.C. Cervicogenic causes of vertigo. *Curr. Opin. Neurol.* 2015, 28, 69–73.
6. Hain, T.C.; Yacovino, D.A. Clinical characteristics of cervicogenic-related dizziness and vertigo. *Semin. Neurol.* 2013, 33, 244–255.
7. Huygen, P.L.; Verhagen, W.I.; Nicolaisen, M.G. Cervico-ocular reflex enhancement in labyrinthine-defective and normal subjects. *Exp. Brain Res.* 1991, 87, 457–464.
8. Kelders, W.P.A.; Kleinrensink, G.J.; Geest, J.V.D.; Schipper, I.B.; Feenstra, L.; Zeeuw, C.D.; Frens, M.A. The cervico-ocular reflex is increased in whiplash injury patients. *J. Neurotrauma* 2005, 22, 133–137.
9. Takemori, S.; Suzuki, J.I. Eye deviations from neck torsion in humans. *Ann. Otol. Rhinol. Laryngol.* 1971, 80, 439–444.
10. Tjell, C.; Rosenhall, U. Smooth pursuit neck torsion test: A specific test for cervical dizziness. *Am. J. Otol.* 1998, 19, 76–81.
11. Thompson-Harvey, A.; Hain, T.C. Symptoms in cervical vertigo. *Laryngoscope Investig. Otolaryngol.* 2019, 4, 109–115.
12. Foster, C.A.; Jabbour, P. Barre-Lieou syndrome and the problem of the obsolete eponym. *J. Laryngol. Otol.* 2007, 121, 680–683.
13. Bartsch, T. Migraine and the neck: New insights from basic data. *Curr. Pain Headache Rep.* 2005, 9, 191–196.
14. Bartsch, T.; Goadsby, P.J. The trigeminocervical complex and migraine: Current concepts and synthesis. *Curr. Pain Headache Rep.* 2003, 7, 371–376.
15. Piovesan, E.J.; Kowacs, P.A.; Oshinsky, M.L. Convergence of cervical and trigeminal sensory afferents. *Curr. Pain Headache Rep.* 2003, 7, 377–383.
16. Pradhan, S.; Choudhury, S.S. Clinical characterization of neck pain in migraine. *Neurol. India* 2018, 66, 377–384.
17. Wöber, C.; Brannath, W.; Schmidt, K.; Kapitan, M.; Rudel, E.; Wessely, P.; Wöber-Bingöl, Ç.; the PAMINA Study Group. Prospective analysis of factors related to migraine attacks: The PAMINA study. *Cephalalgia* 2007, 27, 304–314.
18. Neuhauser, H.; Leopold, M.; von Brevern, M.; Arnold, G.; Lempert, T. The interrelations of migraine, vertigo, and migrainous vertigo. *Neurology* 2001, 56, 436–441.
19. Beh, S.C.; Masrour, S.; Smith, S.V.; Friedman, D.I. The spectrum of vestibular migraine: Clinical features, triggers, and examination findings. *Headache* 2019, 59, 727–740.
20. Hain, T.; Cherchi, M. Migraine associated vertigo. *Adv. Otorhinolaryngol.* 2019, 82, 119–126.
21. Blaschek, A.; Milde-Busch, A.; Straube, A.; Schankin, C.; Langhagen, T.; Jahn, K.; Schröder, S.A.; Reiter, K.; von Kries, R.; Heinen, F. Self-reported muscle pain in adolescents with migraine and tension-type headache. *Cephalalgia* 2012, 32, 241–249.
22. Blau, J.N.; MacGregor, E.A. Migraine and the neck. *Headache* 1994, 34, 88–90.

23. Calhoun, A.H.; Ford, S.; Millen, C.; Finkel, A.G.; Truong, Y.; Nie, Y. The prevalence of neck pain in migraine. *Headache* 2010, 50, 1273–1277.
24. Dornhoffer, J.R.; Liu, Y.F.; Donaldson, L.; Rizk, H.G. Factors implicated in response to treatment/prognosis of vestibular migraine. *Eur. Arch. Otorhinolaryngol.* 2021, 278, 57–66.
25. Kelman, L. Migraine pain location: A tertiary care study of 1283 migraineurs. *Headache* 2005, 45, 1038–1047.
26. Lampl, C.; Rudolph, M.; Deligianni, C.I.; Mitsikostas, D.D. Neck pain in episodic migraine: Premonitory symptom or part of the attack? *J. Headache Pain* 2015, 16, 566.
27. Ozer, G.; Benlier, N. Neck pain: Is it part of a migraine attack or a trigger before a migraine attack? *Acta Neurol. Belg.* 2020, 120, 289–293.
28. Schoonman, G.G.; Evers, D.J.; Terwindt, G.M.; van Dijk, J.G.; Ferrari, M.D. The prevalence of premonitory symptoms in migraine: A questionnaire study in 461 patients. *Cephalalgia* 2006, 26, 1209–1213.
29. Wrisley, D.M.; Sparto, P.J.; Whitney, S.L.; Furman, J.M. Cervicogenic dizziness: A review of diagnosis and treatment. *J. Orthop. Sports Phys. Ther.* 2000, 30, 755–766.
30. Karlberg, M.; Magnusson, M.; Malmstrom, E.M.; Melander, A.; Moritz, U. Postural and symptomatic improvement after physiotherapy in patients with dizziness of suspected cervical origin. *Arch. Phys. Med. Rehabil.* 1996, 77, 874–882.
31. Alqahtani, M.; Kashoo, F. Physical therapy in cervicogenic dizziness. *Saudi J. Health Sci.* 2020, 9, 1–6.
32. Borg-Stein, J.; Rauch, S.; Krabak, B. Evaluation and management of cervicogenic dizziness. *Crit. Rev. Phys. Rehabil. Med.* 2001, 13, 10.
33. Lystad, R.P.; Bell, G.; Bonnevie-Svendsen, M.; Carter, C.V. Manual therapy with and without vestibular rehabilitation for cervicogenic dizziness: A systematic review. *Chiropr. Man. Therap.* 2011, 19, 21.
34. Reid, S.A.; Callister, R.; Katekar, M.G.; Rivett, D.A. Effects of cervical spine manual therapy on range of motion, head repositioning, and balance in participants with cervicogenic dizziness: A randomized controlled trial. *Arch. Phys. Med. Rehabil.* 2014, 95, 1603–1612.
35. Reid, S.A.; Rivett, D.A. Manual therapy treatment of cervicogenic dizziness: A systematic review. *Man. Ther.* 2005, 10, 4–13.
36. Yaseen, K.; Hendrick, P.; Ismail, A.; Felemban, M.; Alshehri, M.A. The effectiveness of manual therapy in treating cervicogenic dizziness: A systematic review. *J. Phys. Ther. Sci.* 2018, 30, 96–102.
37. Yao, M.; Tang, Z.Y.; Cui, X.J.; Sun, Y.L.; Ye, X.L.; Wang, P.; Zhong, W.H.; Zhang, R.C.; Li, H.Y.; Hu, Z.J.; et al. Shi-style cervical mobilizations versus massage for cervical vertigo: A multicenter, randomized, controlled clinical trial. *J. Altern. Complement. Med.* 2020, 26, 58–66.
38. Hoppes, C.W.; Romanello, A.J.; Gaudette, K.E.; Herron, W.K.; McCarthy, A.E.; McHale, C.J.; Bares, J.; Turner, R.; Whitney, S.L. Physical therapy interventions for cervicogenic dizziness in a military-aged population: Protocol for a systematic review. *Syst. Rev.* 2020, 9, 62–67.
39. Brandt, T.; Bronstein, A.M. Cervical vertigo. *J. Neurol. Neurosurg. Psychiatry* 2001, 71, 8–12.
40. Johnston, J.L.; Daye, P.M.; Thomson, G.T. Inaccurate saccades and enhanced vestibulo-ocular reflex suppression during combined eye-head movements in patients with chronic neck pain: Possible implications for cervical vertigo. *Front. Neurol.* 2017, 8, 23.
41. Williams, G.; Sarig-Bahat, H.; Williams, K.; Tyrrell, R.; Treleaven, J. Cervical kinematics in patients with vestibular pathology vs. patients with neck pain: A pilot study. *J. Vestib. Res. Equilib. Orientat.* 2017, 27, 137–145.
42. Li, H.; Yu, T.; Cheng, P.; Qin, S.; Jiao, L.; Chen, R. Moxibustion for cervical vertigo: A protocol for a systematic review and meta-analysis. *Medicine* 2020, 99, e21405.
43. Odderson, I.R. A new treatment for cervical vertigo with botulinum toxin. *J. Clin. Neurosci.* 2020, 73, 316–317.
44. Hahn, T.; Halatsch, M.-E.; Wirtz, C.; Klessinger, S. Response to Cervical Medial Branch Blocks In Patients with Cervicogenic Vertigo. *Pain Physician* 2018, 21, 285–294.
45. Zhu, X.; Grover, M.J. Cervicogenic dizziness successfully treated with upper cervical medial branch nerve radiofrequency ablation: A case report. *AA Pract.* 2018, 10, 150–153.
46. Li, C.; Qi, Y.; Liu, G.; Yin, X.; Jin, Y.; Jiang, Z.; Li, P.; Kang, X.; Ye, C. Long-Term Clinical Outcomes of Percutaneous Cervical Nucleoplasty for Cervical Degenerative Diseases with Neck Pain and Cervical Vertigo. *World Neurosurg.* 2019, 133, e205–e210.
47. Yin, H.-D.; Zhang, X.-M.; Huang, M.-G.; Chen, W.; Song, Y.; Du, Q.-J.; Wu, Y.-N.; Yang, R.-B. Curative effect and mechanism of radiofrequency ablation nucleoplasty in the treatment of cervical vertigo. *Br. J. Radiol.* 2017, 90,

48. Ren, L.; Guo, B.; Zhang, J.; Han, Z.; Zhang, T.; Bai, Q.; Zeng, Y. Mid-term efficacy of percutaneous laser disc decompression for treatment of cervical vertigo. *Eur. J. Orthop. Surg. Traumatol.* 2013, 24, 153–158.
49. Zheng, S.; Muheremu, A.; Sun, Y.; Tian, W.; Wu, C.-A. Preoperative imaging differences of patients with cervical spondylosis with cervical vertigo indicate the prognosis after cervical total disc replacement. *J. Int. Med. Res.* 2019, 48.
50. Freppel, S.; Bisdorff, A.; Colnat-Coulbois, S.; Ceyte, H.; Cian, C.; Gauchard, G.; Auque, J.; Perrin, P. Visuo-proprioceptive interactions in degenerative cervical spine diseases requiring surgery. *Neuroscience* 2013, 255, 226–232.
51. Escaloni, J.; Butts, R.; Dunning, J. The use of dry needling as a diagnostic tool and clinical treatment for cervicogenic dizziness: A narrative review & case series. *J. Bodyw. Mov. Ther.* 2018, 22, 947–955.
52. Xie, R.; You, J.; Liu, L.; Huang, C.; Liang, Y. Acupotomy therapy for cervical vertigo: A protocol for a systematic review and meta-analysis. *Medicine* 2020, 99, e20662.

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