JOURNAL OF CONTEMPORARY CHIROPRACTIC

LETTER TO THE EDITOR: WILDER J, DEMETRIOUS J, CONWAY P ET AL. INFORMED CONSENT IN CHIROPRACTIC: COMMENTARY OFNBROWN AND LEHMAN'S "INFORMED CONSENT REGARDING RISK OF STROKE FROM CERVICAL SPINE MANIPULATION." J CONTEMPORARY CHIROPRACTIC 2025;8(1).

To the Editor,

We read with interest the August 2025 commentary in the Journal of Contemporary Chiropractic by Wilder et al. entitled, Informed Consent in Chiropractic: Commentary on Brown & Lehman's "Informed Consent Regarding Risk of Stroke from Cervical Spine Manipulation." (1) The authors were responding to our 2025 narrative review in the Journal of the International Academy of Neuromusculoskeletal Medicine. (2)

Wilder et al. argue that informed consent to the risk of stroke from cervical spine manipulation (CSM) is not indicated because there is no evidence that CSM can dislodge a thrombus from an existing cervical artery dissection (CAD) and cause immediate thromboembolic stroke.

Wilder et al. argue that because there is no evidence that CSM can cause CAD, (3), there is also no evidence that CAD can cause stroke. We agree there is no convincing evidence that CSM can cause CAD in normal cervical arteries. (3) However, CAD and stroke are separate medical conditions. CAD is a tear in the inner lining of a cervical artery. (4-6) Ischemic stroke is a loss of blood supply to the brain. (7) While CAD can cause stroke, CAD is not a stroke. Only 2% of all strokes are estimated to be caused by CAD. (5) The majority of CADs will not progress to stroke with medical treatment,8 and CADs may heal and become asymptomatic without any treatment. (9,10)

There is support in the literature that sudden neck movement from CSM can dislodge a loosely adherent thrombus from an existing CAD and cause immediate thromboembolic stroke. (11) This support comes from 18 studies consisting of 1 case report (12), 6 case series (13-18), 6 review studies (19-24), 1 biomechanical study (25), 3 epidemiological studies (26-28) and 1 systematic review. (29) These studies come from researchers in chiropractic, medicine, physical therapy, osteopathy, and biomechanics. Epidemiological studies conclude the risk of stroke following CSM is low but not zero. (26,27,30,31)

Due to the life-threatening nature of stroke, randomized controlled trials (RCTs) to establish causation are unethical. (32) In the absence of RCTs, probabilistic reasoning and inference using the best available evidence to assess risk must be relied on. (33)

Chiropractors should adhere to the standard of care by employing evidence-based risk assessment strategies to exclude CAD prior to performing CSM. (4,34-36) Implementing thorough clinical evaluations, including patient history, physical examination, and, when indicated, advanced imaging (CTA, MRA), can mitigate the risk of stroke and enhance patient safety.

By acknowledging this risk and prioritizing informed consent, the chiropractic profession can uphold its commitment to patient-centered, evidence-based care. (2,37,38)

Steven Brown, DC, DIAMA

James Lehman, DC, MBA, DIANM

In Response:

We appreciate the opportunity to respond to Brown and Lehman (JCC, October 2025), who once again advance the hypothesis that cervical spine manipulation (CSM) can dislodge a thrombus from a pre-existing cervical arterial dissection (CAD) and precipitate ischemic stroke. This hypothesis remains unsubstantiated by empirical, biomechanical, and epidemiologic evidence.

Brown and Lehman's reliance on low-level evidence consisting of anecdotal, case-based, or temporal associations, to the exclusion of existing higher-quality evidence, suggests selective author bias. Their interpretation of the current research literature results in erroneous opinions and determinations.

Multiple authors have pointed out that the apparent temporal association of CSM with CAD in case studies is due to protopathic bias. Protopathic bias is "when an exposure is delivered in the early prodrome of a disease before it is diagnosed" as defined by Cassidy et al. This sequence can lead to a mistaken inference of causation rather than coincidence. (1-7)

No epidemiologic, pathological, or biomechanical studies have demonstrated that cervical CSM can cause CAD or dislodge a mural thrombus within a dissected artery.

Several highly powered epidemiologic studies, encompassing over 500 million person-years of data, consistently indicate that patients who experience vertebral or carotid dissection are equally likely to have visited a chiropractor or a primary care physician due to symptomatic expression, typically head or neck pain. These findings strongly indicate that CSM does not increase the risk of CAD or stroke. (1-2, 6, 7-11)

Numerous biomechanical studies have shown that measured forces during skilled high-velocity, low-amplitude adjustments are lower than those of daily head movements and have not been shown to alter arterial integrity or blood flow. (3-5, 12-24) Accordingly, the thromboembolic (TE)-dislodgement theory remains physiologically implausible.

Collectively, these highly-powered studies indicate that CSM has a null effect as a cause of CAD or TE events and affirm the safety of CSM when performed by skilled practitioners. While we strongly encourage clinicians to remain vigilant for neurovascular compromise, spontaneous CAD, or other unusual vascular symptoms, unsubstantiated theories should not inform clinical practice or patient consent.

Advancing a CSM -thromboembolic (TE)-dislodgement theory without sufficient rigor lacks scientific credibility and may undermine evidence-based discourse. Until more compelling evidence of thrombus dislodgement after CSM is collected, we urge against promoting this hypothesis. Clinical decision-making and informed consent should be guided by objective evidence, which overwhelmingly demonstrates no causal relationship between CSM, CAD, TE, and stroke.

Respectfully submitted,

Jeffrey Wilder, DC, DABCO, James Demetrious, DC, DABCO, Phil Conway, DC, BPE, FCCPOR(C), David Graber, DC, DACBSP, Peter Tuchin, DC, PhD

REFERENCES

1. Wilder J, Demetrious J, Conway P, Graber D, Tuchin P. Informed Consent in Chiropractic: Commentary on Brown & Lehman's "Informed Consent Regarding Risk of Stroke from Cervical Spine Manipulation." JCC. 2025;8(1):265-295
2. Brown S, Lehman J. Informed consent regarding risk of stroke from cervical spine manipulation: a narrative review. JIANM. 2025;1(2):2-12
3. 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
4. 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
5. Tavakoli SG, Britt TB, Agarwal S. Vertebral artery dissection. In: StatPearls. StatPearls Publishing; 2025. Accessed August 26, 2025. http://www.ncbi.nlm.nih.gov/books/NBK441827/

6. Goodfriend SD, Tadi P, Koury R. Carotid rtery dissection. In: StatPearls. StatPearls Publishing; 2022. Accessed October 9, 2022. http://www.ncbi.nlm.nih.gov/books/NBK430835/

7. Alwood BT, Dossani RH. Vertebrobasilar stroke. In: StatPearls. StatPearls Publishing; 2023. Accessed August 17, 2023. http://www.ncbi.nlm.nih.gov/books/NBK556084/

8. Morris NA, Merkler AE, Gialdini G, Kamel H. Timing of incident stroke risk after cervical artery dissection presenting without ischemia. Stroke. 2017;48(3):551-555. doi:10.1161/STROKEAHA.116.015185

9. Lee VH, Brown RD, Mandrekar JN, Mokri B. Incidence and outcome of cervical artery dissection: a population-based study. Neuro. 2006;67(10):1809-1812. doi:10.1212/01.wnl.0000244486.30455.71

10. 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

11. 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

12. 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

13. Norris JW, Beletsky V, Nadareishvili ZG. Sudden neck movement and cervical artery dissection. The Canadian Stroke Consortium. CMAJ. 2000;163(1):38-40.

14. Krueger BR, Okazaki H. Vertebral-basilar distribution infarction following chiropractic cervical manipulation. Mayo Clin Proc. 1980;55(5):322-332.

15. Haldeman S, Kohlbeck FJ, McGregor M. Risk factors and precipitating neck movements causing vertebrobasilar artery dissection after cervical trauma and spinal manipulation. Spine. 1999;24(8):785-794. doi:10.1097/00007632-199904150-00010

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

17. Schwartz NE, Vertinsky AT, Hirsch KG, Albers GW. Clinical and radiographic natural history of cervical artery dissections. J Stroke Cerebrovasc Dis. 2009;18(6):416-423. doi:10.1016/j.jstrokecerebrovasdis.2008.11.016

18. Albuquerque FC, Hu YC, Dashti SR, et al. Craniocervical arterial dissections as sequelae of chiropractic manipulation: patterns of injury and management. J Neurosurg. 2011;115(6):1197-1205. doi:10.3171/2011.8.JNS111212

19. Tuchin P. Chiropractic and stroke: association or causation? Int J Clin Pract. 2013;67(9):825-833. doi:10.1111/ijcp.12171

20. Thomas LC. Cervical arterial dissection: An overview and implications for manipulative therapy practice. Man Ther. 2016;21:2-9. doi:10.1016/j.math.2015.07.008

21. Neeb L, Reuter U. Stroke after chiropractic manipulations. In: Tsiskaridze A, Lindgren A, Qureshi A, eds. Treatment-related stroke. 1st ed. Cambridge University Press; 2016:123-129. doi:10.1017/CBO9781139775397.013

22. Reggars JW, French SD, Walker BF et al. Risk management for chiropractors and osteopaths: neck manipulation & vertebrobasilar stroke. Australas Chiropr Osteopathy. 2003;11(1):9-15.

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

24. 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 Therap. 2016;24:42. doi:10.1186/s12998-016-0123-x

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

26. 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 (Phila Pa 1976). 2008;33(4 Suppl):S176-183. doi:10.1097/BRS.0b013e3181644600

27. 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

28. Haldeman S, Kohlbeck FJ, McGregor M. Stroke, cerebral artery dissection, and cervical spine manipulation therapy. J Neurol. 2002;249(8):1098-1104. doi:10.1007/s00415-002-0783-4

29. Haynes MJ, Vincent K, Fischhoff C, Bremner AP, Lanlo O, Hankey GJ. Assessing the risk of stroke from neck manipulation: a systematic review. Int J Clin Pract. 2012;66(10):940-947. doi:10.1111/j.1742-1241.2012.03004.x

30. 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 Therap. 2015;23:19. doi:10.1186/s12998-015-0063-x

31. 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. 2017;26(4):842-850. doi:10.1016/j.jstrokecerebrovasdis.2016.10.031

32. 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

33. Freeman MD, Rossignol AM, Hand ML. Forensic Epidemiology: a systematic approach to probabilistic determinations in disputed matters. J Forensic Leg Med. 2008;15(5):281-290. doi:10.1016/j.jflm.2007.12.009

34. 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

35. Harper B, Miner D, Vaughan H. Proposing a new algorithm for premanipulative testing in physical therapy practice. J Phys Ther Sci. 2020;32(11):775-783. doi:10.1589/jpts.32.775

36. Thomas LC, Seth T, Der A, et al. Improving the recognition of cervical arterial dissection in clinical practice: investigation of a five criteria diagnostic support tool. Physiotherapy Theory and Practice. 2023;39(6):1297-1304. doi:10.1080/09593985.2022.2035033

37. 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

38. Brown S, Cooperstein R. The Connecticut law on chiropractic informed consent to cervical artery dissection and stroke: a narrative review. J Contemporary Chiropr. 2025;8:162-169.

39. 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.49

40. Moser N, Mior S, Noseworthy M, Côté P, Wells G, Behr M, Triano J. Effect of cervical manipulation on vertebral artery and cerebral haemodynamics in patients with chronic neck pain: a crossover randomized controlled trial. Br Med J Open 2019; 9:e025219. doi:10.1136/bmjopen-2018-025219

41. Quesnele JJ, Triano JJ, Noseworthy MD, et al. Changes in vertebral artery blood flow following various head positions and cervical spine manipulation. J Manipulative Physiol Ther 2014;37:22–31. DOI: 10.1016/j.jmpt.2013.07.008

42. Erhardt JW, Windsor BA, Kerry R et al. The immediate effect of atlanto-axial high velocity thrust techniques on blood flow in the vertebral artery: a randomized controlled trial. Man Ther 2015;20:614–22. https://doi.org/10.1016/j.math.2015.02.008

43. J. David Cassidy, Eleanor Boyle, Pierre Côté et al, Risk of carotid stroke after chiropractic care: a population-based case-crossover study, J Stroke Cerebrovascular Dis 2017. 26: 842-850, https://doi.org/10.1016/j.jstrokecerebrovasdis.2016.10.031

44. Chu V, Lin K, Perle SM. Response to differential risk factors of ischemic stroke. Cerebrovas Dis. 2021;50(4):483-484. https://doi.org/10.1159/000515105

45. Whedon JM, Petersen CL, Schoellkopf WJ,

Haldeman S, MacKenzie TA, Lurie JD. The association between cervical artery dissection and spinal manipulation among US adults. Eur Spine J. 2023 Oct;32(10):3497-3504. doi: 10.1007/s00586-023-07844-9

46. Whedon JM, Petersen CL, Li Z et al. Association between cervical artery dissection and spinal manipulative therapy – a Medicare claims analysis. BMC Geriatrics 22, 917 (2022). https://doi.org/10.1186/s12877-022-03495-5

47. Whedon JM, Mackenzie J, Yung-Chieh T. Phillips. 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):93–101.https://doi.org/10.1016/j.jmpt.2014.11.012.

48. 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 Therap. 2015;23:19. doi: 10.1186/s12998-015-0063-x

49. Symons B, Herzog W. Cervical artery dissection: a biomechanical perspective. J Can Chiropr Assoc. 2013;57(4):276-8.

50. Herzog W, Leonard TR, Symons B, Tang C, Wuest S. Vertebral artery strains during high-speed, low amplitude cervical spinal manipulation. J Electromyogr Kinesiol. 2012;22(5):740-6. doi: 10.1016/j.jelekin.2012.03.005

51. 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 Aug;31(4):261-269. doi: 10.1080/10669817.2022.2148048

52. Fagundes C, Herzog W. Strain of the vertebral artery during passive neck movements and spinal manipulation of the cervical spine: an observational study. J Bodyw Mov Ther. 2024;40:569-74. doi: 10.1016/j.jbmt.2024.05.011

53. Wuest S, Symons B, Leonard T, Herzog W. Biomechanics of vertebral artery segments C1-C6 during cervical spinal manipulation: a preliminary report. J Manipulative Physiol Ther. 2010;33(4):273-8. doi: 10.1016/j.jmpt.2010.03.007

54. Symons BP, Leonard T, Herzog W. Internal forces sustained by the vertebral artery during spinal manipulative therapy. J Manipulative Physiol Ther. 2002;25(8):504-10. doi: 10.1067/mmt.2002.127076

55. Gorrell LM, Kuntze G, Ronsky JL, Carter R, Symons B, Triano JJ, Herzog W. Kinematics of the head and associated vertebral artery length changes during high-velocity, low-amplitude cervical spine manipulation. Chiropr Man Therap. 2022;30(1):28.

56. Haynes M, Cala L, Melsom A, Mastaglia FL, Milne N, McGeachie JK. Vertebral arteries and cervical rotation: modeling and magnetic resonance angiography studies. J Manipulative Physiol Ther. 2002;25(6):370-83. doi: 10.1067/mmt.2002.126130

57. Herzog W et al. Changes in vertebral artery blood flow following various head positions and cervical spine manipulation." Journal of Manipulative and Physiological Therapeutics 37, no. 9 (2014): 693-699. https://doi.org/10.1016/j.jmpt.2014.06.004.

58. Carey R et al. Effect of cervical manipulation on vertebral arterty and cerebral haemodynamics in patients with chronic neck pain: a crossover randomised controlled trial." BMC Neurology 2019;19: Article 237. https://doi.org/10.1186/s12883-019-1480-8.

59. Yelverton C, Wood JJ, Petersen DL, Peterson C. Changes in vertebral artery blood flow in different head positions and post-cervical manipulative therapy. J Manipulative Physiol Ther. 2020 Feb;43(2):144-151. doi: 10.1016/j.jmpt.2019.09.001. Epub 2020 May 30. PMID: 32482436.

60. Kranenburg HAR, Tyer R, Schmitt M, Luijckx GJ, van der Schans C, Hutting N, Kerry R. Effects of head and neck positions on blood flow in the vertebral, internal carotid, and intracranial arteries: a systematic review. J Orthop Sports Phys Ther. 2019 Oct;49(10):688-697. doi: 10.2519/jospt.2019.8578. Epub 2019 Jul 5. PMID: 31276624.

61. Fagundes C, Duarte F, Herzog W. STRAIN in vertebral artery during passive cervical range of motion and spinal manipulation therapy: A systematic review and meta-analysis Clinical Biomechanics, Article in Press, October 22, 2025