

CASE REPORT

Chiropractic Referral for Computed-Tomography Angiography to Rule Out Vertebral Artery Dissection: A Case Report

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ABSTRACT

Objective: This paper describes a case of chiropractic referral to medical emergency services for computed-tomography angiography (CTA) imaging to rule out vertebral artery dissection (VAD).

Clinical Features: A 50-year-old female presented to a chiropractic physician with an idiopathic onset of neck pain, headache, nausea, and dizziness. Differential diagnosis included VAD, internal carotid artery dissection (ICAD), as well as cerebral aneurysm or other intracranial abnormality. Due to symptoms of potential VAD, the patient was referred to medical emergency services for CTA imaging to rule out VAD. CTA revealed a possible posterior communicating artery (PCom) aneurysm vs. infundibulum, and left C3-C4 facet arthropathy. No VAD was noted.

Intervention/Outcome: The patient was referred to a neurosurgeon who concluded the patient's abnormality was an incidental finding of infundibulum, not an aneurysm. The patient was referred to physical therapy for treatment of the C3-C4 facet arthropathy, which resolved her symptoms.

Conclusion: This case report highlights the role of chiropractors in interdisciplinary care by referring suspected non-neuromusculoskeletal conditions to medical emergency services for advanced imaging to ensure patient safety. (J Chiropr Med 2025;00:1-5)

Key Indexing Terms: *Chiropractic; Dissection; Stroke*

INTRODUCTION

The scope of practice for chiropractic physicians is most often limited to the treatment of neuromusculoskeletal (NMS) conditions. However, they are still under a duty to refer suspected non-NMS conditions. Here we present a case of a patient presenting to a chiropractor with a potential vascular issue. Although treatment of vascular conditions is outside chiropractic scope of practice, chiropractors are under a duty to refer suspected vascular conditions to other licensed healthcare professionals.¹

Patients with undiagnosed cervical artery dissection (CAD) causing neck pain and/or headache may seek care from chiropractors.^{2,3} CAD is rare, but Griffin et al. (2024)

estimate 8.93 out of every 100,000 people suffer CAD each year.⁴ With 330 million people in the USA, this equates to 29,469 CADs every year. It is plausible that hundreds or thousands of them are seeking chiropractic care for neck pain and/or headache from undiagnosed VAD or ICAD.

Thromboembolic or thrombotic stroke may be caused by performing cervical spine manipulation (CSM) in the presence of an undiagnosed CAD.⁵ In a thromboembolic mechanism of causation, sudden head and neck movement from CSM could dislodge a loosely adherent cervical artery thrombus. The dislodged embolus may travel and occlude a smaller artery that supplies the brain, resulting in ischemic stroke. In a thrombotic mechanism, a large cervical artery thrombus may be suddenly repositioned by CSM in such a way that it occludes the artery.

There are few reports describing chiropractic interventions. Therefore, the purpose of this report is to describe a case of chiropractic referral to medical emergency services for computed-tomography angiography (CTA) imaging to rule out vertebral artery dissection (VAD).

CASE REPORT

History and Subjective Examination

A 50-year-old female sought diagnosis and treatment from a chiropractor with complaints of constant, severe (7/

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10) left sub-occipital neck pain and constant, severe left occipital headache along with intermittent nausea and dizziness. Onset of the left sub-occipital neck pain occurred 2 months prior, and the left occipital headaches started 2 days prior. The pain was relieved by massage and aggravated by turning the head. The patient was taking medication for hypertension and Metformin for diabetes. The patient had no history of this type of pain, and no history of migraines. The patient reported having been diagnosed with COVID-19 3 months prior.

Objective Examination

The patient was 5'6 tall and weighed 168 pounds, with a body mass index of 27.1 (overweight). Blood pressure was 156/92 (stage 2 hypertension) with a pulse of 61. Tenderness to palpation was noted in the left suboccipital and occipital regions, no swelling was noted. Upper body reflex, myotome, and dermatome testing were normal. Cranial nerve testing was normal and the patient did not report any visual abnormalities.

Due to suspicion of VAD, cervical spine range-of-motion and orthopedic testing were contraindicated and were not performed. Cervical spine range-of-motion and orthopedic examination could dislodge a cervical artery thrombus and result in a thromboembolic event in a patient with pre-existing CAD.^{5,6,7}

Assessment/Diagnosis

Differential diagnosis included, but was not limited to: 1. Vertebral artery dissection, 2. Internal carotid artery dissection, 3. Cerebral artery aneurysm, 4. Vasculitis affecting the vertebrobasilar circulation, 5. Vertebrobasilar atherosclerotic disease, 6. Migraine, 7. Tension-type headache and/or 8. Other intracranial abnormality.

Due to the presence of symptoms of potential VAD, the patient was referred to the emergency department for CTA examination.⁸ ICAD was also in the differential diagnosis, but was less likely due to the posterior location of the neck pain and headache. Migraine and tension-type headache were considered due to headache presentation but deemed unlikely given multiple VAD red flags.

Symptoms of and risk factors for potential VAD in this case included: New unilateral sub-occipital neck pain, distinct, new, and continued ipsilateral occipital headache, no history of migraine headache, nausea, dizziness, stage 2 hypertensive blood pressure reading, and history of recent acute respiratory infection.⁹

Symptoms of Potential Vertebral Artery Dissection

Chaibi and Russell described 5 distinct symptoms of potential VAD which should warrant referral to medical emergency.⁸ If a patient has 2 or more of these symptoms,

they should be referred for emergency medical treatment. The 5 symptoms are presented in the Supplementary File.

The patient had 4 of these 5 distinct symptoms of potential VAD (2, 3, 4c, 4e, 5b) and warranted referral to medical emergency services without any further physical examination.

Physical Tests for Potential Vertebral Artery Dissection

Chaibi and Russell also described 4 positive physical tests for potential VAD that should warrant referral to medical emergency. If a patient has 2 or more of these positive physical tests, they should be referred for emergency medical treatment.⁸ In this case:

1. Testing for cervical radiculopathy was not done, as orthopedic testing was contraindicated pending further evaluation.
2. Testing for a hypertensive blood pressure reading was positive (156/92).
3. Testing for neck swelling was negative.
4. Testing for severe left suboccipital and occipital tenderness was positive.

Even without testing for cervical radiculopathy, the patient had 2 of these 4 positive physical tests and warranted referral to medical emergency services.

Chaibi and Russell do not explicitly define the term "midline tenderness," which creates ambiguity regarding whether they mean tenderness along the mid nuchal line (the horizontal ridge at the base of the occipital bone, near the suboccipital region) or midline tenderness at the spinous processes (the bony prominences along the vertebral column).⁸ Mid nuchal line tenderness is more likely, given Chaibi's focus on VAD and the anatomical vulnerability of the vertebral artery as it transitions near the C1 vertebra and the nuchal line. They describe VAD pain as commonly involving the "unilateral suboccipital region" and progressing "medially along the nuchal line," suggesting tenderness in this area could be a relevant finding.⁸

Procedure/Plan

Due to suspicion of CAD, CSM was contraindicated until further testing could rule out vascular disease. No treatment was performed. The patient was referred to medical emergency services for CTA examination and further evaluation.

Emergency Room Visit and CTA Imaging Results

CTA performed at the emergency department (ED) the same day found the distal vertebral arteries to be tortuous, which has been associated with VAD,¹⁰ but no VAD was

noted. However, an intracranial abnormality was found. Relevant findings were:

1. No features of carotid or vertebral artery discrete dissection flap or pseudoaneurysm.
2. The distal vertebral arteries are tortuous.
3. Questionable 2 mm medially directed left posterior communicating artery aneurysm arising from the dorsal supraclinoid left internal carotid artery versus an infundibulum. (Fig 1)
4. Degenerative changes in the cervical spine with advanced facet arthrosis on the left at the C3-C4 level.

Neurosurgical Referral

The ED referred to a neurosurgeon for further evaluation. The patient saw the neurosurgeon 3 days after the ED visit reporting the same symptoms with left neck pain rated 8/10.

Although records indicate that the neurosurgeon reviewed the results of the CTA scan, the neurosurgeon made no mention of the abnormal finding of PCom aneurysm or infundibulum.

Presumably, the neurosurgeon determined that the abnormal finding was an incidental infundibulum. The neurosurgeon concluded that the left-sided C3-C4 facet arthropathy was the etiology of the patient's symptoms and prescribed physical therapy. In follow-up with the patient 4 years later, the patient stated that the symptoms resolved with physical therapy.

The patient gave consent for this case report to be published.



Fig 1. CTA showing a 2 mm left PCom infundibulum (arrow).

DISCUSSION

An infundibulum is a common (<3 mm) conical outpouching at the PCom origin. It could not be clearly differentiated from PCom aneurysm by the radiologist, necessitating neurosurgical evaluation to confirm its benign nature. The neurosurgeon's omission of any mention of the infundibulum in their records underscores the chiropractor's critical role in ensuring thorough follow-up of imaging findings.

Unlike an aneurysm, an infundibulum is not believed to be at risk for rupture and subarachnoid hemorrhage. Only very rarely does an infundibulum eventually develop into an aneurysm and it is generally not thought that an incidental infundibulum requires follow-up unless additional clinical concern is present.

Not all the patient's presenting symptoms were consistent with left C3-C4 facet arthropathy. Left C3-C4 facet arthropathy would be most likely to cause localized neck pain. It would not be as likely to cause nausea, dizziness, left suboccipital pain, or left occipital headache. However, with vascular conditions ruled out by the CTA examination, the left C3-C4 facet arthropathy was the most probable etiology of the patient's symptoms.

In a case report of late whiplash syndrome in a 62-year-old female, Lehman noted neck pain, vertigo, dizziness, and nausea in a patient with a history of multiple motor vehicle accidents over 35 years.¹¹ These symptoms were alleviated with cervical spine trigger point therapy and gentle, cervical long axis traction. Although no trauma was reported in the current case, advanced left C3-C4 facet arthropathy could have been the sequelae of an unreported injury occurring in the past. It is plausible the nausea and dizziness could have been generated from dysfunction of the cervical spine facet joints and soft tissues.¹²

Some may argue that the chiropractor was over-cautious in their referral to the ED as no significant vascular disorder was found, and that the time, money, and health care resources spent on the CTA exam was an undue burden on the already overworked health care system. However, this argument overlooks critical clinical, ethical, and patient safety considerations.

The argument that the chiropractor was over-cautious fails to account for clinical necessity and patient safety. The patient's history and symptoms justified urgent CTA imaging to rule out VAD as outlined in multiple peer reviewed studies,^{8,13,14,15} and case reports.^{16,17,18} Avoiding CSM was critical, as it could have dislodged a vertebral artery thrombus, risking thromboembolism.⁵ This decision reflects the chiropractor's ethical and legal duty to prioritize patient safety over immediate treatment. While chiropractors are trained to diagnose and refer vascular disorders, treatment of such disorders is outside their scope. Patients with suspected vascular disorders require urgent referral to medical specialists. Erring on the side of caution was reasonable and prudent.

While an ED referral for CTA involves costs, it is far less expensive than managing stroke or aneurysm rupture. The targeted referral enabled same-day imaging and specialist follow-up, preventing complications. Rather than burdening the system, the chiropractor's proactive approach prevented costly complications and reinforced public trust in the profession.

In response to the Chaibi and Russell study, Pikus and Harbaugh object that a physical examination cannot discriminate between neck pain due to CAD and neck pain due to other causes.¹⁹ They are correct. This is why a referral to medical emergency services is indicated when the results of a physical examination reveal potential symptoms of and risk factors for VAD. Out of concern for patient safety, the standard of care for the chiropractic profession is to err on the side of caution.

Pikus and Harbaugh also argue that cervical radiculopathy is not a sign or symptom of VAD.¹⁹ However, in a systematic review, Bucak et al. identified 14 studies including 17 patients with VAD-related radiculopathy, dating as far back as 1996.²⁰ Mattox, et al. also reported such a case.^{21,22}

Additionally, Pikus and Harbaugh claim that hypertension is of no practical value in an evaluation for CAD.¹⁹ However, Chaibi and Russell do not list hypertension as an environmental risk factor for CAD.⁸ They do propose that a hypertensive blood pressure reading (>140/90) taken on the day of the exam may indicate VAD. It is plausible that VAD could cause a hypertensive blood pressure reading through several mechanisms, including pain-induced sympathetic activation, vascular inflammation, or ischemic effects on brainstem centers that regulate blood pressure.

Pikus and Harbaugh further suggest that neck swelling and midline tenderness are not signs or symptoms of CAD.¹⁹ They point out that other etiologies could cause these symptoms.

However, Chaibi and Russell are not proposing that neck swelling and/or tenderness alone warrant referral to an emergency room.⁸ In contrast, they are clearly recommending a multifactorial approach.²³ Neck swelling and/or tenderness in combination with a thorough patient history, subjective examination, and other positive physical tests may warrant referral to an emergency room.

Limitations

This is a single-patient case report, and the results may not be generalizable to other individuals presenting with similar conditions.

CONCLUSION

This case report highlights chiropractors' role in recognizing and referring potential VAD conditions, ensuring patient safety through evidence-based actions. This case

report reinforces the necessity of imaging referrals when clinical differentiation is limited.

FUNDING SOURCES

No funding sources were reported for this study.

CONFLICTS OF INTEREST

Steven Brown, DC, DIAMA, serves as a medicolegal expert witness in malpractice cases of CSM, CAD and stroke. James J. Lehman, DC, MBA, DIANM, is an associate professor of clinical sciences at the University of Bridgeport School of Chiropractic. He is a credentialed chiropractic specialist at the Community Health Center, Inc. of Middletown, Connecticut. He is a qualified expert in both civil and criminal courts.

CONTRIBUTORSHIP INFORMATION

Concept development (provided idea for the research): S.P.B.

Design (planned the methods to generate the results): S.P.B.

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Writing (responsible for writing a substantive part of the manuscript): S.P.B.

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Practical Applications

- This case report describes chiropractic referral to medical emergency services for computed-tomography angiography (CTA) imaging to rule out vertebral artery dissection (VAD).
- Due to symptoms of potential VAD, the patient was referred to medical emergency services for CTA imaging to rule out VAD.
- The patient was referred to a neurosurgeon who concluded the patient's abnormality was an incidental finding of infundibulum, not an aneurysm.
- This case report highlights the role of chiropractors in interdisciplinary care by referring suspected non-neuromusculoskeletal conditions to medical emergency services for advanced imaging to ensure patient safety.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.jcm.2025.09.025](https://doi.org/10.1016/j.jcm.2025.09.025).

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