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CASESERIES

History, risks, and early referral insights from three reported cases of Cervical Vascular Incidence: The importance of valid informed consent for cervical spine adjustments

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Background: This paper aims to provide evidence and the importance of obtaining consent by reviewing the association between cervical spinal adjustments or manipulation (CeSAM) and cervical vascular accidents (CeVA) in patients presenting with headaches and neck pain, considering the Montgomery ruling in the UK. Thus, informed consent is obtained, and patients can decide whether to proceed with care or treatment.

Intervention: Reviewing factors in a patient's history, including past medical history, family medical history, and medication, considering both modifiable and non-modifiable risk factors associated with cervical vascular accidents (CeVAs), and performing a neurovascular examination to mitigate the risk of CeVAs associated with cervical spine adjustments. It links other relevant activities and professions to CeVA, which are recorded in peer-reviewed papers that place less emphasis.

Outcome: A summary of the most common risk factors directly linked to cervical vascular accidents. It presents three cases recorded at the educational institution, which were considered as potential cervical vascular accidents (CeVAs), with their subsequent management. This supports a positive view showing that Chiropractors screen for potential CeVA and refer accordingly.

Conclusion: Cervical artery dissection is the most serious recorded iatrogenic complication associated with cervical spinal adjustments or manipulation. Currently, the evidence is weak for an association between CeSAM and CeVA, and the available data suggest no causal effect from CeSAM. With the change in law and the introduction of the Montgomery ruling in 2015, it is imperative to recognise that a direct or indirect association or causal link between chiropractic adjustments and CeVA is no longer relevant.

It is essential to explain to the patient that '*We have taken a detailed history and recorded modifiable and non-modifiable risks, medications, past medical history, and family history, along with neurovascular examination, which are all within normal limits. From the history and examination, the signs and symptoms you have presented are musculoskeletal. However, we must make you aware that these signs and symptoms are also a presentation for an increased risk of a cervical vascular dissection or stroke and may be exacerbated by the adjustment, manipulation, or any cervical joint treatment. The positive is that treating the presenting signs and symptoms should give you the relief you want*'.

According to peer-reviewed literature, Chiropractic adjustments are still associated with a risk factor. However, is this a balanced view? Many articles report the most serious adverse effects, but few report the positive impact of appropriate referral. This paper covers three such cases. We encourage those who have used the neurovascular screening criteria, identified a potential CeVA, and made the appropriate referral to the hospital to document their experiences, providing a balance to the discussion.

Indexing terms: Cervical vascular accident; carotid artery accident; vertebral artery accident; cervical chiropractic adjustments; osteopathic manipulation; physiotherapy manipulation; CVA.

Introduction

Cerebrovascular disease refers to all diseases that cause loss or reduced blood flow to the brain, resulting from narrowing of blood vessels (stenosis), clot formation (thrombosis), blockage (embolism), or rupture of blood vessels (haemorrhage) (1). Lack of sufficient blood flow (ischaemia) causes death of brain tissue due to hypoxia and can result in a vascular accident or stroke.

> *... The current consensus is that patients who present with signs and symptoms that are similar to cervical artery dissection must be given an explanation that the signs and symptoms match a possible CeVA....'*

Patel et al (2020) (2) recorded over 113,000 new strokes in the UK, with a current incidence of 145 per 100,000. But by 2025, it is predicted that the number of new strokes would reach 150,000, and continue to rise as reported by the Stroke Association (2018) (3). They are divided into three main types: strokes, transient ischaemic attack (TIA), and rare cerebral venous occlusion. (4) (5) It is estimated that the aggregate societal cost of stroke is £26 Billion [US$35B, AUD$52B]per year for 2014/15, including £8.6 Billion [US$11.6B, AUD$17.2B] for social care in the UK. (5)

Jatuzis et al. (2012) (6) described migraine or unilateral headache as a key presenting factor of a stroke with posterior neck pain or stiffness. Unilateral headache with neck pain or stiffness was supported by Abbott et al. (2017) (7) Patients will present with these signs and symptoms to primary contact practitioners, including Chiropractors, Osteopaths, Physiotherapists, and Medical practitioners. (8) The former often use cervical spinal adjustments or manipulation to relieve the presenting complaint as part of a care package. (9, 10, 11)

Brown (2024) (12) considered three primary areas to analyse for those involved in cervical spinal adjustments or manipulation (CeSAM): valid informed consent, meticulous medical history, and a detailed neurovascular examination.

Valid informed consent explaining the associated risk of thromboembolic or thrombotic stroke from CeSAM is required. (13) The General Chiropractic Council (GCC) Guidance on Consent states that registrants must provide patients with accurate, relevant, and precise information to enable them to make informed decisions about their health needs and appropriate care options. (13)

Patients have the right to be involved in decisions about their treatment, and seeking and obtaining consent from the patient is a fundamental part of respecting their rights. Obtaining and recording consent from a patient before starting their care plan is necessary. (13) It is a legal and ethical principle that informed, valid consent must be obtained from a patient before commencing their assessment or care. A Chiropractor who fails to obtain informed, valid consent from a patient may be liable to legal action by the patient and face fitness to practice proceedings from the GCC. Consent is an ongoing process, not a one-off event, and it is essential to note that a patient has the right to withdraw their consent at any time. (13)

A detailed medical history should include modifiable and non-modifiable risk factors relevant to a specific age group. It is essential to document the exact onset of symptoms, including the diagnosis, timing, pain level, anatomical location, and any associated factors, as well as the medications being taken. (14) Assessing for the '5 Ds A 3 Ns': **d**iplopia, **d**ysphagia, **d**ysarthria, **d**rop attacks, **d**izziness, **a**taxia, **n**ausea, **n**umbness, and **n**ystagmus is valuable. Lastly, an examination should include a neurovascular assessment to minimise cervical vascular accidents (CeVA) signs before performing CeSAM, covering vital signs, cranial nerve function, cerebellar tests, and sensory, motor, and reflex assessments. (14)

Association and causation of vascular accidents related to informed consent

Rosner (2004) (15) stated that many articles in the study by Smith et al. (2003) (16) are negative and focus on the rarest but most severe cases. Tuchin (2024) (17) found that rather than giving a balanced view of the well-documented benefits of CeSAM, they fail to compare the risks or alternatives to CeSAM, such as using medications or other therapies. The Office for National Statistics, responsible for England and Wales, recorded 5,448 deaths related to drug poisoning in 2023, equivalent to 93.0 deaths per million people. (18)

According to Gorrell et al. (2023) (19), the evidence that CeSAM can cause trauma to the vertebrobasilar vascular system, leading to dissections in the normal vertebral artery (VA), is weak. The actual incidence of complications following CeSAM is presently unknown. However, Brown (2024) (12) found plausible associated causal mechanisms for thromboembolism and thrombosis from CeSAM but no direct causation.

Association and causation are rooted in observation, yet they can often be misleading. As Carnes et al (2010) (20) noted, while an association between two variables is essential for establishing causation, such an association does not automatically imply that one variable causes the other. (21) A causal relationship between the two factors can exist with or without a discernible association. (22) A critical criterion for concluding medical research is that the observed relationship between variables must achieve statistical significance. (23)

> Confusion often arises when attempting to establish a link between Chiropractic adjustments and vascular accidents or strokes. The key question is whether Chiropractic adjustments cause these events, a determination that cannot be made solely based on association. (23)

Consider the following scenario: a patient undergoes an assessment and receives a CeSAM for a headache, after which they report relief. This situation suggests an association between chiropractic treatment and headache relief. However, to establish a causal relationship, it is essential to demonstrate that chiropractic adjustment directly alleviates headaches while accounting for other factors, such as natural recovery, placebo effects, or concurrent treatments.

Recognising that the observed association (relief occurring after the Chiropractic adjustment) does not necessarily imply causation (the relief caused by the adjustment) is essential. This distinction can help explain why Chiropractic adjustments are associated with events such as cervical vascular accidents and headache relief. Still, these associations may be due to chance, bias, or overlooked signs and symptoms. Research is needed to provide evidence for causal associations while acknowledging that chiropractic treatments have benefits. (23, 24)

Chiropractors have been debating this for many years. They cannot agree among themselves whether the problem is significant enough to inform patients that vascular accidents or strokes are possibly associated with adjustments, because they are sporadic and unpredictable. (25, 26). In 1993, the Canadian Chiropractic Association published a consent form which said, in part:

> 'Doctors of Chiropractic, Doctors of Medicine, and physical Therapists using manual therapy treatments for patients with neck problems are required to explain that there have been rare cases of injury to a vertebral artery associated with treatment. Such an injury has been known to cause stroke,

> sometimes with serious neurological injury. The chances of this happening are incredibly remote, approximately one in a million treatments'. (27)

Winterbottom et al (2015) (28) stated that consent is mandatory before either examination or treatment commences, in accordance with the UK GCC guidelines. (13) In 2015, the Supreme Court's judgment in Montgomery v Lanarkshire Health Board (2015) UKSC 11, paragraph 87 (29), made a significant change in doctor-patient communication in the UK. Initially, the Bohlen ruling stated that doctors are not negligent if they follow best practices accepted by a body of responsible peers; however, this has now been superseded. (30)

The new Montgomery ruling states that the Doctor's role is advisory, involving dialogue that ensures the patient understands the seriousness of their condition and the anticipated benefits and risks of the proposed treatment, allowing them to make a valid, informed decision. (29) So, whether there is a causal association or not, the risk of association must now be given to patients so that they can understand and decide whether they want treatment, and the practitioner works in an advisory capacity. (31)

What constitutes a Stroke

Strokes, transient ischaemic attacks, and cerebrovascular accidents are types of cerebrovascular disease. There are three well-documented types of strokes:

- ischaemic (87%)
- hemorrhagic (10%)
- subarachnoid haemorrhage, cerebral venous thrombosis (3%) and
- spinal cord stroke.

They all result in causing insufficient blood flow to the brain, damaging brain tissue, and resulting in a cerebrovascular infarction. (4)

Strokes

Neck pain, stiffness, or headache are presenting symptoms that can be effectively treated with cervical or thoracic adjustments, offering a sound prognosis. (32) However, these signs can also be early indicators of developing cervical vascular complications, as represented in some literature, where patients undergo cervical vascular accidents with signs and symptoms before the Chiropractor has seen them. (4, 20, 33, 34) Serious signs and symptoms include numbness in the face or one side of the body with weakness, speech difficulties, loss of balance, or dizziness leading to problems walking. These signs and symptoms often lead patients to visit their GP or hospital. (14)

Ischaemic strokes account for approximately 87%, of which 60% are thrombotic, and 40% are embolic. Thrombotic strokes result from a thrombosis, or a clot, that blocks the small arteries, causing vascular occlusion in the brain. (35) Thromboembolic strokes are caused by emboli or clots that form elsewhere in the body due to atherosclerosis in the large arteries, which break off circulate and lodge in the small arterioles of the brain. Other substances that have an embolic effect are fat cells from the marrow of fractures, air bubbles in the blood vessels, and, less frequently, sepsis. (35)

Thirugnanachandran et al. (2021), (36) stated that dissection of an arterial wall leads to a haematoma, which causes an ischaemic stroke from a thromboembolism mechanism. Arterial dissections are idiopathic, rare, but more frequent in young and middle-aged adults. (37) This is relevant to Chiropractors, Osteopaths, and Physiotherapists because this presentation is usually musculoskeletal, involving neck pain or headache, and this type of stroke, known as cerebral vascular accidents, has been associated with adjustments to the cervical spine. (5, 38)

The remaining 13% of strokes are caused by bleeding in the brain, referred to as haemorrhagic strokes, and caused by a primary intracerebral haemorrhage, which is bleeding within the brain tissue, subarachnoid haemorrhage, which is bleeding between the layers that cover the brain, or cerebral venous occlusion.

Transient ischaemic attack (TIA)

A transient ischaemic attack (TIA), often called a 'mini-stroke', is similar to a stroke without permanent damage and results from a temporary decrease in blood supply to part of the brain. Symptoms usually resolve completely within 24 hours. In the literature, TIA have been linked as warning signs of a potential future stroke. (39)

Cerebro-venous occlusion

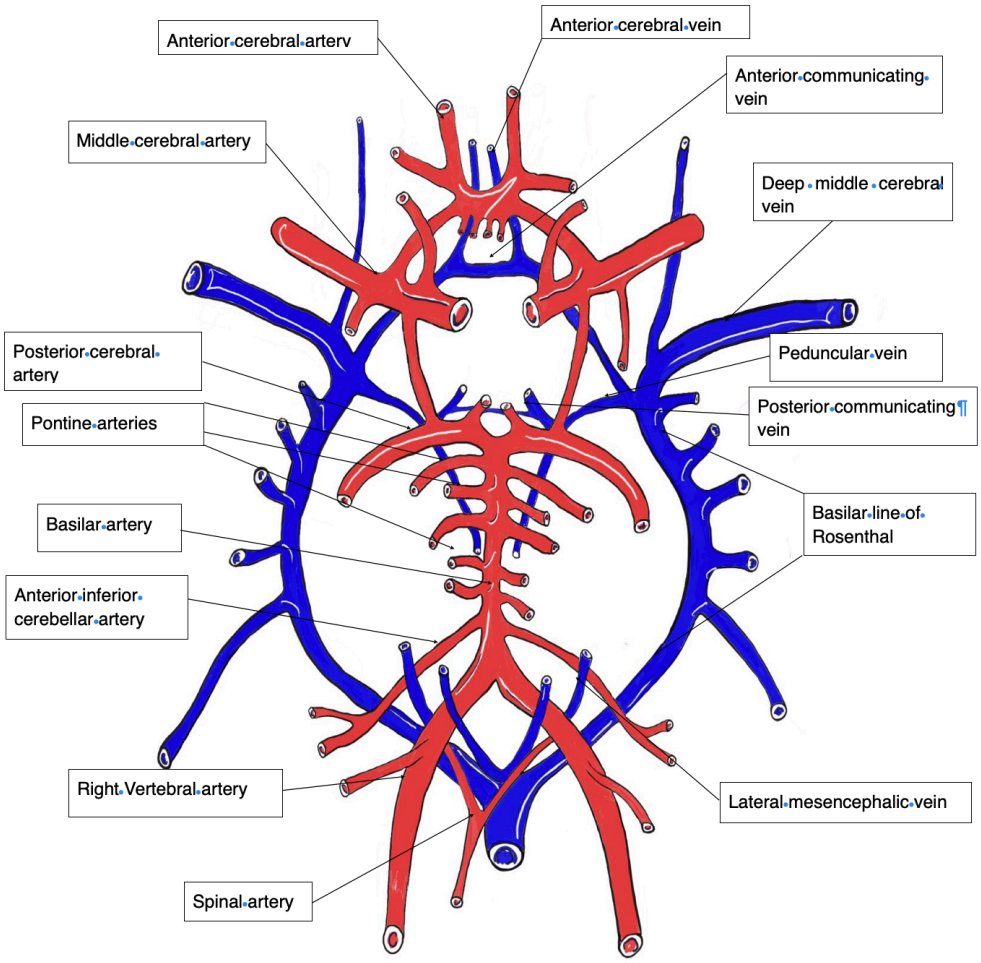
Finally, cerebral venous thrombosis (CVT) and vascular dementia are two conditions that warrant attention. Cerebral venous thrombosis is a blood clot that forms in the brain's venous sinuses, specifically at the base of the brain, known as the venous circle of Trolard, also referred to as the anastomotic venous circle of Willis. (Figure 1) This is a blood clot that forms in the dural sinuses, preventing normal drainage and increasing intracranial pressure, leading to venous congestion of the brain's venous system, which can potentially result in a stroke. (35, 40, 41, 42)

Vascular dementia results from long-term damage to the brain's blood vessels, leading to decreased blood flow and impaired cognitive function. (43) These warning signs are headache and/or neck pain, vertigo, unilateral facial paraesthesia, cerebellar signs, lateral medullary signs, and visual field defects. The literature shows that these signs and symptoms should be used as a red flag for possible future cervical vascular accidents (CeVA). (44)

Table 1: Other activities associated with Cerebrovascular and Vertebrobasilar artery accidents or injury

Activities Associated with Vertebrobasilar Cerebrovascular Accident/Injury Artery Triano et al (2006) (46); Engelter et al (2021) (47)	
Childbirth	Archery
Head movements by the surgeon or anaesthetist during surgery	Golf
Calisthenics	Wrestling
Athletics/ Fitness/football/ tai chi/ Swimming	Emergency resuscitation
Yoga	Stargazing
Overhead work, painting	Sleeping position
Hanging out laundry	Sexual intercourse
Neck extension during radiography/Dentistry	Dancing
Neck extension for a bleeding nose	Fitness exercise
Turning the head while driving a vehicle	Beauty salon activity
Sneezing, nose blowing, coughing	Tai Chi
Amusement ride	

Figure 1: The circle of Willis (Red) and its counterpart, the circle of Trolard (Blue), drawing by the author NRN 2025



Strokes can involve any of the vascular elements from the cervical artery as they travel up either side of the cervical vertebrae, from C6 to C1, and continue into the base of the brain via the basilar artery to the circle of Willis. The vertebral artery is often referred to as part of the vertebrobasilar system. It is a location for spontaneous cervical vascular accidents (SCVA), which can involve any of the vertebral or carotid arteries and/or the circle of Willis. (45)

Triano et al (2006) (46) found several peer-reviewed articles associated with many activities with cervical artery accidents. (See Table 1) However, the activity may be the result but a vascular accident may already be in progress, and thus, it is viewed as an association unless a direct causal relationship is established.

Modifiable risk factors

Risk factors for strokes can be divided into modifiable and non-modifiable risk factors. Modifiable factors are lifestyle choices that individuals can alter. They included high blood pressure, high cholesterol, obesity, type 2 diabetes, poor diet, excess alcohol, drug abuse, smoking, and lack of exercise. Smoking doubles the risk of stroke. (48) Eating high amounts of fruit and vegetables can reduce the risk of stroke by up to 30%, and the more fruit and vegetables eaten, the lower the risk. (49, 50, 51, 52) Obesity or overweight increases the risk of ischaemic stroke and type 2 diabetes. (53) People regularly consuming a large amount of alcohol have a threefold increased risk of stroke. (54) Moderate physical activity can reduce the risk of stroke by

up to 27%. (55) Reducing cholesterol levels with the use of statins has been shown to reduce the risk of stroke by 21% (5, 56) (Table 2)

Table 2 presents various common modifiable and non-modifiable risk factors associated with vascular accidents (.65, 66, 67) According to Terrett (2006) (68) and supported by Triano et al. (2006), (46, the most important non-modifiable risk factors are highlighted in bold.

MODIFIABLE RISKS	NON-MODIFIABLE RISKS (high risk in bold Triano et al. 2006 (46)
High blood pressure	**Age <45**
High cholesterol	**Sudden severe neck or head pain never experienced before (thunderclap headache)**
Obesity	Biological sex
Type 2 diabetes	Genetics, Race or ethnicity
Oral contraceptives	Type 1 Diabetes
Poor diet	Kidney disease
Excess alcohol, smoking	Heart disease or a family history of stroke or heart disease
Air pollution	People with blood type AB
Lack of exercise	Atrial fibrillation
Illicit drug use	congenital conditions
Migraine	Viral infection
Homocysteine	**Dizziness, Giddiness, vertigo**
	Migraine history
	Polycystic kidney disease
	Connective tissue disorder, Ehlers-Danlos type IV
	Marfan's syndrome
	Fibromuscular dystrophy
	Recent infection of the upper respiratory tract

Non-modifiable risk factors

Secondly, the non-modifiable risk factors are hard-wired and include type 1 diabetes, ethnicity, age, biological sex, heart disease or family history of heart disease, and atrial fibrillation (AF). (57) People with diabetes are twice as likely to have a stroke compared to those without the condition, (The Emerging Risk Factors Collaboration,2010) (58) and AF increases the risk of stroke by up to five times. (59) Approximately 12,500 or 12% of strokes a year can be directly attributed to atrial fibrillation. (59) Two scoring systems used for the risk of stroke from AF are the CHADS2, with a maximum score of 6, and the CHA2DS2-VASc, with a score of 9 due to the additional 'stroke risk modifier', which is more comprehensive and accurate in its prediction. (60) The extra risk factor categories include age 65–74, female, and vascular disease (61, 62, 63, 64) (Table 2)

Table 2 presents various common modifiable and non-modifiable risk factors associated with vascular accidents. (65, 66, 67) According to Terrett (2006) (68) and supported by Triano et al (2006) (46) the most important non-modifiable risk factors are highlighted in bold.

The most common risk factors and activities listed in Table 2 and the literature associating adjustment or manipulation with cervical vascular accidents, the most common, lowest published ratio or average of CeVA and CeSAM appears to be equivalent to the background incidence of spontaneous vertebral artery dissection or carotid artery dissection. Massage therapy and vertebral arterial dissection (VAD) was reviewed by Tuchin (2024), (17) who concluded that the risk of VAD after chiropractic adjustments was no greater than that of other professions involved in neck treatments. The association between CeVA and CeSAM is document in the literature, but few articles on best practices who identify and make the appropriate referrals.

Are primary contact practitioners able to identify patients presenting with a pending cervical vascular dissection using elements of the history and a physical examination? (69, 70) Chaibi & Russell (2019). (71) explained that injuries can occur in three ways

- The injury may be purely coincidental
- the injury may be iatrogenic, or
- some patients may be vulnerable to arterial dissection because of hypermobility syndrome, a condition characterised by excessive joint movement. (71)

Extensive research has been conducted to understand the mechanisms of iatrogenic injury. A review by Thomas (2016) (72) concluded that the existing damage to a blood vessel may cause an embolism to detach. Symons et al. (2002) (73) strained the cadaver vertebral artery to cause damage and concluded that a typical force from an adjustment is unlikely to cause mechanical damage to the vertebral artery but could cause a emboli to detach.

The adjustment to the cervical spine may cause arterial vasospasm, altering the blood flow to the brain. (72) The end-range rotation of the upper cervical spine for an adjusting or manipulative technique stretches the vertebral artery. It can reduce blood flow in the vertebral artery on the side opposite to rotation but not occlude it. (45, 74) Saeed et al (2000) (75) found that 53% of their patients who showed signs and symptoms of vascular dissection had been involved in either sports activity or Chiropractic manipulation before their onset, adding weight to the existing damage to a blood vessel, causing an embolism to detach. (72)

It is important to note that the brain has four main arteries that enter the Circle of Willis: the vertebral arteries (two) and the internal carotid arteries (two) (76) (Figure 1). Changing head position for upper cervical adjustment does not significantly affect blood flow in the vertebral arteries because of the four-point of arterial entry. (77, 78) This reiterates the safety of upper cervical adjustments and should provide reassurance to the audience.

Currently, there is no simple, inexpensive screening test that is reliable. Recognising signs and symptoms of CeVA, such as neck pain, headache, and dizziness, from the history may indicate CeVA. (79) The most valuable tool is history, paying close attention to the site, onset, character, radiating symptoms, associations, timing, exacerbating, and relieving factors. Both Long et al. (2019) (80) and Perry et al (2020) (81) stated that the severity of the headache can be variable, usually gradual. However, it may be a 'thunderclap' headache that mimics a subarachnoid haemorrhage, but paired with neck pain localised on one side of the upper anterolateral neck should be considered CeVA. (82) Silbert et al (1995) (83) stated that the average time for the appearance of neurological symptoms is 9 days (range, 1 - 90 days) after the onset of neck pain or headaches.

Several inheritable connective tissue disorders are associated with an increased risk of vertebral and carotid artery dissection, including:

- Ehlers-Danlos Syndrome (EDS) type IV is an inherited disorder characterised by skin and joint hyper-extensibility due to weakened blood vessel walls, which can also affect the intestine (84)
- The characteristics of Marfan's Syndrome are a connective tissue disorder associated with increased height and long, thin, hyper-extensible fingers, hyper-kyphosis, and ocular and cardiovascular complaints (85)
- Osteogenesis Imperfecta is another heritable disorder of the connective tissue, leading to skeletal fragility and multiple fractures or bruising, blue sclerae, easy bruising, and abnormal dentition. (86, 87, 88)

Three cases are presented, demonstrating that patients are identified and referred in accordance with the current guidelines. Each is given in the order of:

- history
- past medical history
- physical examination
- clinical reason
- support for the vascular hypothesis, and
- action taken.

Case Reports

Patient A

History:

A 79-year-old male presented with a recurrent episode of lumbopelvic pain. The patient had previously been attending the AECC clinic intermittently for over 20 years for chronic LBP episodes. On 15 July the patient became unwell in the examination room, reporting left arm and facial 'heaviness' and blurring of his vision in his left eye, which he had experienced after parking the car. He did not exercise and had a BMI of 33; he smoked 15 cigarettes a day and reported drinking 20 units of alcohol a week. The patient's medications included Mebeverine, Ramipril, Lansoprazole, Atorvastatin, Bisoprolol, and Tamsulosin.

PMHx

Benign prostatic hyperplasia and myocardial infarction

Physical examination:

BP 196/113 left arm and 220/150 right arm.

SMR findings:

Upper limb muscle weakness and hyper-reflexia, cranial assessment II, III, IV, VI blurred vision, VII showed left-sided facial weakness, positive cerebellar signs, unbalanced gait, and upper limb coordination.

Clinical reason:

Vascular history of high BP, positive SMR, positive cranial assessment, and cerebellar signs.

Action:

The patient was transported to the emergency department (A&E) by paramedics at Bournemouth Hospital. CT confirmed right hemisphere blood clot, and prescribed clopidogrel.

2nd History:

Now in his 80th year, he returned to the HSU AECC chiropractic clinic with a low back complaint the following year. Again, he felt unwell while attending the clinic with a 'dead' right arm and visual changes. His BMI was still 33, and he continued to smoke 15 per day and consume 20 units of alcohol a week.

Physical examination:

BP 150/90 bilaterally. The patient then experienced dizziness and visual changes after using the toilet.

Clinical reason:

Previous history, high BP, positive SMR, cranial nerves, and cerebellar signs like last visit.

Support for Vascular Hypothesis:

VERY HIGH

Action:

Paramedics took the patient to A&E, had a CT scan, and a left hemisphere TIA was diagnosed. Edoxaban was prescribed. The patient was advised not to drive for one month; since then, he has returned to the HSU AECC chiropractic clinic for his MSK problem and is being monitored.

As can be seen from the cases written up for patient A, the non-modifiable index factors included age 79, male biological sex, high blood pressure (196/113 in the left arm and 220/150 in the right arm), blurring of vision in his left eye, sudden onset of left arm pain, and facial heaviness. He is taking heart and cholesterol medication. His modifiable factors include being obese, lacking exercise, drinking excessive alcohol, and being a heavy smoker.

Patient B

History:

A 64-year-old female presented on 18 October with 30 years of low back pain, which has been intermittent and getting worse over the last 5 years. She has pain in her left leg (knee and hip area) but is unsure if this is linked to her lower back. She rated the pain as dull and 5/10. It can interrupt her sleep in the morning and for around 2 hours after getting up. Previous and current work has been office-based and involves sitting at a computer. She described having a skiing accident after being hit in her lower back in 1983.

She admitted to being overweight, did not exercise daily, just walked the dog, was a nonsmoker, and was a social drinker, five units a week.

Past medical history:

She is on hormone replacement therapy and had a colon polyp removed in 2018. She has, on occasion, suffered from reactive depression related to grief. She was taking no medication.

She returned on 26 October with mild confusion, inability to speak clearly, bilateral upper limb tremor, visual disturbance, memory loss, and feeling unwell.

Physical examination:

Findings on 26 October - BP 203/114 in the left arm and 200/114 in the right arm; the patient then experienced dizziness. BMI 30.7, Negative SMR, cranial nerves II, III, IV, VI visual disturbance, speech difficulty, positive Romberg's test, bilateral upper limb hand tremor.

Clinical reasons:

High BP, inconclusive cranial nerves test, and cerebellar signs.

Support for Vascular Hypothesis:

HIGH

Action:

She was referred to A&E with a suspected TIA, which was confirmed on 26th October. She is now taking Clopidogrel, Atorvastatin, Amlodipine, and Lansoprazole. She has responded well to her lower back treatment.

In patient B, the non-modifiable index factors included age, biological sex, visual disturbance, mild confusion, inability to speak, bilateral tremor, memory loss, and a general feeling of unwellness. Her high BP and her feeling of dizziness prompted a direct referral to the A&E, taken by her partner. A suspected TIA was confirmed, and she was medicated accordingly.

Patient C

History:

A 70-year-old female presented to the HSU chiropractic clinic on 14 November with a 3-year history of central low back pain, right hip, and lateral thigh pain accompanied by subjective lower limb pins and needles. She had two rounds of physiotherapy through the NHS for this complaint, one in the year before and the other at the beginning of the year, which she reported did not help. She reported struggling with fine motor skills, such as fastening buttons, and stated that her hands frequently felt hot and 'burning.' She also experienced frequent cramps in her calves and paraesthesia in her hands and feet bilaterally. In the last six months, she has noticed that she feels weak in her hands, legs, and arms. She reported feeling unsteady on her feet and has a history of falls:

Past medical history:

- Fall in 2020 at the bottom of an escalator, backward into the steps. She did not seek help following this but had an XR 1 year following, which showed a 'closed wedge fracture' in the LB

- Fall in 2022

- Fall 31 October, walking over a bump in the path. She went to A&E following this and received X-rays of the left wrist, which showed no fractures. She also had 'internal bruising' in her chest.

She had no family history, as she was adopted. She was presently taking Azathioprine, Bisoprolol, Citalopram, and Omeprazole.

Physical examination:

Wide-based, shuffling gait, positive Romberg's sign. Repetitive hand movements were positive. SMR +3 for upper and lower limb reflexes bilaterally. Upper limb muscle testing revealed global weaknesses of the four deltoids, triceps, biceps, wrist extension, wrist flexion, finger abduction, and finger adduction. Lower limb muscle testing revealed global weaknesses in four areas: knee extension, hip flexion, ankle inversion, and ankle eversion; toe extension was within normal limits. She struggled with hand-eye coordination tasks. The nose-finger test was positive due to overshooting. No observable intention tremor. No nystagmus was observed. BP: 132/87 left arm and 137/ 83 right arm.

Clinical reason:

Vascular medication due to high BP, history of falls, positive upper and lower limb SMR findings, and positive cerebellar signs.

Support for Vascular Hypothesis:

HIGH

Action:

These signs and symptoms did not appear to be related to her MSK problems, and she was referred to her GP. In the third case, the non-modifiable index factors were age and biological sex, while the modifiable index factors were the remaining variables. Her blood pressure was under control with medication. She had no eye problems, but her balance was poor and was responsible for the many falls, indicating a possible TIA. With her positive SMR and cerebellar findings, we wanted refer her to A/E, but she declined. Instead, she saw her GP on 18th November, and her daughter informed us that she had been admitted to the hospital for a suspected stroke by her GP, which her daughter later confirmed.

Discussion

In each case, the Chiropractic student and supervisor addressed the vascular conditions and made appropriate referrals as supported by these cases. Thomas et al (2024) (89) found that the most valid diagnostic support tool as an 'excellent' predictor of CeVA was history, including key points-

- Age between 40 and 55 years (2 points)> 55 (1 points)
- Acute onset of headache or neck pain (2 points)
- Recent history of trauma or infection (1 point)
- Presence of one (1 points) or more focal neurological symptoms. (2 points)

From our cases, these are the vascular scores

- Case A score 1+2+0+2 =6
- Case B score 1+0+1+2 =4
- Case C score 1+0+1+2 =4

A score greater than four confirmed the case as high for the vascular hypothesis. These cases were not direct referrals for the vascular hypothesis. Still, they scored four or more, and a referral was deemed appropriate, following NICE guidelines, by communicating with the GP or by direct referral to A&E for consideration of anticoagulant therapy and an MRA. (90) Kerry et al (2000) (91) reported that recording blood pressure is an appropriate objective test for manual therapists before cervical spine adjustments.

Valid informed consent

The current consensus is that patients who present with signs and symptoms that are similar to cervical artery dissection must be given an explanation that the signs and symptoms match a possible CeVA.

With a change in the law and the introduction of the Mongomery ruling (2015), (29) it is imperative to recognise that an association or causal clinical possibility is now redundant and

that it is essential for both the patient's health and all professionals to explain that an association in the eyes of the law and that a potential presence of CeVAs could be in progress due to their signs and symptoms and may be exacerbated by the adjustment or manipulation using current peer-reviewed data to establish facts. (92, 93, 94)

Table 4 suggests a Chiropractic report of findings (ROF) for headache or neck pain may read as follows:

Suggested template
'I have reviewed your history and examination, which indicate that your headaches, as well as other symptoms, are due to tight muscles and restrictions in the joints of your neck. We can help with this problem by adjusting the restricted joints and relaxing the tight muscles, thus improving the function'.
'A legal ruling states that all information must be explained so you can make an informed decision about your treatment. The fact that you have headaches or other symptoms may indicate a vascular cause for your problem, such as a stroke or a TIA (Transient Ischaemic Attack)'.
'Research also shows there is an association between cervical adjusting and stroke of around 1-5 in 100,000. However, most of these associations stem from misinterpreting the signs and symptoms, which could exacerbate the underlying cause if left untreated. 'My tests do not indicate a vascular cause; they primarily indicate tight muscles and joint restrictions in the neck region'.
'I know the risks and benefits are complex, but explaining the association is necessary to allow you to make an informed decision about your health. Would you like some time to think, or is everything clear? How would you like to proceed?'
'If your symptoms change and get worse. Please let me know, or go to the A&E department'.

Futch et al (2015) (96) and Kier et al (2006)(33) clearly demonstrate that a thorough vascular examination performed by qualified Chiropractors or Chiropractic students under supervision is essential for identifying the signs and symptoms of cervical artery dissection (CeVA). (97)

When there is any suspicion of a vascular event, these professionals must promptly refer the patient for further evaluation. In cases where a patient presents with a new and unprecedented headache, it is imperative to obtain a detailed medical history, particularly concerning any previous conditions related to connective tissue disorders. (98) Furthermore, critical assessments, including blood pressure measurements to gauge atherosclerotic risk factors, pulse rate checks for atrial fibrillation, and comprehensive cranial nerve and cerebellar evaluations to assess facial symptoms, balance, and coordination, are vital to ensure accurate diagnosis and effective management. (91, 99, 100)

Consent is not a one-time event; it is an ongoing process that must be obtained at every stage of treatment to ensure that the patient can withdraw from treatment if they choose. Ioannidis et al (2004) (101) emphasised the need for better reporting of adverse effects. Equally important is the need for improved documentation of best practices, and we encourage those who have identified patients with cervical vascular accidents (CeVA) to share their findings. (102)

Cervical vascular accidents, which involve the carotid and vertebral arteries, are rare but can have serious consequences. We must place patient safety at the forefront of our efforts, uphold the highest standards of the Chiropractic profession through current diagnostic support for the early identification of these conditions, and work to elevate our reputation within the medical community. (89,90)

Practical application

A presentation of headache which is unlike anything they have ever experienced before … a CeVA should be considered.

The examination should include the **d**iplopia, **d**ysphagia, **d**ysarthria, **d**rop attacks, **d**izziness, **a**taxia, **n**ausea, **n**umbness, and **n**ystagmus (5D 1A and 3N), gait analysis, connective tissue disorders, PMHx, FHx of TIA or strokes and medication.

Conclusion

This paper and its companion in this Journal …

> Nunn NR, Battiston A, Breeze S, Harrison J. Cervical Arterial Events and spinal manipulation: A scoping review of terminology and ratio risk. Asia-Pac Chiropr J. 2025;6.2 apcj.net/papers-issue-6-2/#NunnCxArteryEvents

…have reviewed the current body of knowledge on cerebrovascular disease relating to Cervical Arterial Vascular accidents (CeVA).

We have addressed the other modifying and non-modifying factors that can influence CeVA, including the association to CeSAM, a point of contention noted by numerous authors, while acknowledging that recent legal precedents have rendered much of the argument for causation academically obsolete.

Nevertheless, the ethical obligation for valid informed consent remains paramount. All available information must be communicated to patients, enabling them to make well-informed choices, particularly those presenting signs suggestive of CeVA.

As shown in these three cases, patients are being appropriately identified and referred in line with established clinical guidelines. We advocate for the continued reporting of such cases through reflective, case-based discussions within the literature. These contributions will help balance the prevailing narrative and offer tangible guidance for clinicians involved in CeSAM, reinforcing the responsibility to recognise, act appropriately, and refer with clinical diligence.

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Author contributions

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Ethics approval and consent to participate

All participants provided informed consent to participate in this study. This study was approved on 17/02/2025 by the HSU Ethics Approval Number: SOC – 1224 -001

Competing interests

The authors declare no potential conflicts of interest concerning research, authorship and/or publication of this article.

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Abbreviations

CAD: Cervical artery dissection

CeVA: Cervical vascular accident

CeSAM: Cervical spine adjustment or manipulation

CD: Cervical arterial dissection

CMT: Cervical manipulative therapy

CVT: Cerebral venous thrombosis

CVAD or CAD: Cerebrovascular artery disease /dissection

CVI: Cerebrovascular incidence/injury

CCD: cranio-cervical dissection

CVA: Cerebrovascular accident

CCD: Cranio-cervical dissection

ICAD: Internal carotid artery dissection

PCP: Primary contact practitioner

VAI: Vertebral artery Incidence/injury

VBAI: Vertebral basilar artery insufficient

VA: vertebral artery

VAD: Vertebral arterial dissection

VAO: Vertebral artery occlusion

PMHx, Past medical history

FHx, Family medical history

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