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Cervical Artery Issues and Chiropractic Care—An Update

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GERARD W. CLUM, D.C.



Cervical Artery Issues and Chiropractic Care—An Update

Today's presentation is **not** going to address the ABC's of cervical spine adjusting and cervical artery issues. If you would like a review of the basics a PPT has been posted to the website of The Rubicon Group at www.TheRubiconGroup/conferences/2019/CVA/Basics

Today, we will be reviewing several key conversations that are active and alive in reference to the cervical artery issues and chiropractic care based on the published literature on the subject.

The current
conversations:

1. Epidemiology

2. Blood flow alterations based on
cervical spine position and movement

3. Hypertension and its role—if any—in
the question of cervical artery dissection

4. Increasing the safety of cervical spine
adjusting

Epidemiology

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1. **Risk of Vertebrobasilar Stroke and Chiropractic Care:** Results of a Population-Based Case-Control and Case-Crossover Study, Cassidy et al. *SPINE* Volume 33, Number 4S, pp S176–S183 2008

 2. **Cervical Arterial Dissections and Association With Cervical Manipulative Therapy** A Statement for Healthcare Professionals From the American Heart Association/American Stroke Association, Biller et al. *Stroke*. 2014;45:3155-3174

 3. **Chiropractic care and the risk of vertebrobasilar stroke: results of a case–control study in U.S. commercial and Medicare Advantage populations**, Kosloff et al. *Chiropractic & Manual Therapies* (2015) 23:19

 4. **Systematic Review and Meta-analysis of Chiropractic Care and Cervical Artery Dissection: No Evidence for Causation**, Church et al. *Cureus* 8(2): e498.

Epidemiology

1. Cassidy et al. **Conclusions:**

“The increased risks of VBA stroke associated with chiropractic and PCP visits is likely due to patients with headache and neck pain from VBA dissection seeking care before their stroke. We found no evidence of excess risk of VBA stroke associated chiropractic care compared to primary care”.

Epidemiology

2. Biller et al. Conclusions:

“...mechanical forces play a role in a considerable number of CDs, and population-controlled studies have found an association of unclear etiology between CMT and VAD stroke in young patients...the incidence of CD in CMT patients is probably low, and causality difficult to prove...strongly consider the possibility of CD and inform patients of the statistical association between CD and CMT, prior to performing manipulation...”

Epidemiology

3. Kosloff et al. Conclusions:

“We found no significant association between exposure to chiropractic care and the risk of VBA stroke... manipulation is an unlikely cause of VBA stroke. The positive association between PCP visits and VBA stroke is most likely due to patient decisions to seek care for the symptoms (headache and neck pain) of arterial dissection.”

Epidemiology

4. Church et al. Conclusions:

“Our analysis shows a small association between chiropractic neck manipulation and cervical artery dissection. This relationship may be explained by the high risk of bias and confounding in the available studies, and in particular by the known association of neck pain with CAD and with chiropractic manipulation. There is no convincing evidence to support a causal link between chiropractic manipulation and CAD.”

Blood flow
alterations
based on
cervical spine
position and
movement:

1. Vertebral artery flow and spinal manipulation: a randomized, controlled and observer-blinded study, Licht et al. J Manipulative Physiol Ther. 1998 Mar-Apr;21(3):141-4.

2. Changes in vertebral artery blood flow following various head positions and cervical spine manipulation, Quesnelle et al. J Manipulative Physiol Ther. 2014 Jan;37(1):22-31

3. The effect of end-range cervical rotation on vertebral and internal carotid arterial blood flow and cerebral inflow: A sub analysis of an MRI study. Thomas et al. Man Ther. 2015 Jun;20(3):475-80.

Blood flow
alterations
based on
cervical spine
position and
movement:

4. **Effect of cervical manipulation on vertebral artery and cerebral haemodynamics in patients with chronic neck pain: a crossover randomized controlled trial**, Moser et al., *BMJ Open* 2019;9:e025219.
5. **Effects of head and neck positions on blood flow in the vertebral, internal carotid and intracranial arteries, a systematic review**. Kranenburg et al. *J Orthop Sports Phys Ther.* 2019 Oct;49(10):688-697.

Blood flow alterations based on cervical spine position and movement:

1. Licht et al: CONCLUSION:

“...this is the first study comparing flow velocity in the vertebral artery before and after spinal manipulative therapy. We found no significant changes in otherwise healthy subjects with a biomechanical dysfunction of the cervical spine. Major changes in peak flow velocity might in theory explain the pathophysiology of cerebrovascular accidents after spinal manipulative therapy. However, in uncomplicated spinal manipulative therapy, this potential risk factor was not prevalent.

Blood flow alterations based on cervical spine position and movement:

2. Quesnelle et al.

RESULTS: The side-to-side difference between ipsilateral and contralateral VA velocities was not significant for either velocities ($P = .14$) or flows ($P = .19$) throughout the conditions. There were no other interactions or trends toward a difference for any of the other blood flow or velocity variables.

CONCLUSIONS: There were no significant changes in blood flow or velocity in the vertebral arteries of healthy young male adults after various head positions and cervical spine manipulations.:

Blood flow alterations based on cervical spine position and movement:

3. Thomas et al.

Conclusions: It appears that in healthy adults the cerebral vasculature can compensate for decreased flow in one or more arteries by increasing flow in other arteries, to maintain cerebral perfusion. Sustained end-range rotation may therefore reflect the compensatory capacity of the system as a whole rather than isolated vertebrobasilar function

Blood flow alterations based on cervical spine position and movement:

4. Moser et al.

Conclusions: Our results are in accordance with previous work, which has shown a decrease in blood flow and velocity in the contralateral vertebral artery with head rotation. This may explain why we also observed a decrease in blood velocity with manipulation because it involves neck rotation. Our work is the first to show that cervical manipulation does not result in brain perfusion changes compared with a neutral neck position or maximal neck rotation. The changes observed were found to not be clinically meaningful and suggests that cervical manipulation may not increase the risk of cerebrovascular events through a haemodynamic mechanism

Blood flow alterations based on cervical spine position and movement:

5. Kranenburg et al. RESULTS: Of the 1453 identified studies, 31 were included and comprised 2254 participants. Most studies mentioned no significant hemodynamic changes during maximal rotation ($n = 16$). A significant decrease in hemodynamics was identified for the vertebral artery, with a hemodynamic decrease in the position of maximum rotation ($n = 8$) and combined movement of maximum extension and maximum rotation ($n = 4$). A similar pattern of decreased hemodynamics was also identified for the internal carotid and intracranial arteries. Three studies focused on high-velocity thrust positioning and movement. None of the studies reported hemodynamic changes. The synthesized data suggest that in the majority of people, most positions and movements of the craniocervical region do not affect blood flow.

CONCLUSION: The findings of this systematic review suggest that craniocervical positioning may not alter blood flow as much as previously expected.

Hypertension and its role— if any—in the question of cervical artery dissection

1. **Arterial hypertension as risk factor for spontaneous cervical artery dissection. A case-control study**, Pezzini, J Neurol Neurosurg Psychiatry 2006;77:95–97
2. **Association of Vascular Risk Factors With Cervical Artery Dissection and Ischemic Stroke in Young Adults**, Debette et al, Circulation 2011;123;1537-1544
3. **Pathophysiology and risk factors of cervical artery dissection: what have we learnt from large hospital-based cohorts?** Debette, S., [Curr Opin Neurol](#). 2014 Feb;27(1):20-8

Hypertension and its role--if any--in the question of cervical artery dissection

4. **A risk–benefit assessment strategy to exclude cervical artery dissection in spinal manual-therapy: a comprehensive review**, Chiabi et al. *ANNALS OF MEDICINE* 2019, VOL. 51, NO. 2, 118–127

5. **Commentary on: A risk–benefit assessment strategy to exclude cervical artery dissection in spinal manual therapy: a comprehensive review**, Harold Pikus & Robert Harbaugh, *Annals of Medicine*, 51:5-6, 330-331

6. **A risk–benefit assessment strategy to exclude cervical artery dissection in spinal manual therapy: a comprehensive review**, Aleksander Chaibi & Michael Bjørn Russell, *Annals of Medicine*, 51:2, 118-127

Hypertension and its role—if any—in the question of cervical artery dissection

1. Pezzini (2006)

Abstract: “...a trend towards a significant association was seen when the prevalence of hypertension was compared among patients with sCAD and controls (26.8% v 17.0%;

Hypertension was also significantly associated with the subgroup of patients with sCAD and cerebral infarction (OR, 1.94; 95% CI, 1.01 to 3.70; $p = 0.045$), particularly when involving the vertebral arteries (OR, 2.69; 95% CI, 1.20 to 6.04; $p = 0.017$)”

Hypertension and its role—if any—in the question of cervical artery dissection

2. Debette (2011)

Conclusions: These results, from the largest series to date, **suggest** that hypertension, although less prevalent than in patients with a non-CEAD IS, **could** be a risk factor of **CEAD**, whereas hypercholesterolemia, obesity, and overweightness are inversely associated with CEAD. (emphasis added)

Hypertension and its role—if any—in the question of cervical artery dissection

3. DeBette (2014)

Recent Findings: In large multicenter series of CeAD patients, compared to age matched healthy controls and patients with an ischemic stroke of another cause, **hypertension and migraine, especially without aura, were confirmed as risk factors for CeAD,** in addition to cervical trauma and recent infection. Hypercholesterolemia and being overweight were shown to be inversely associated with CeAD.

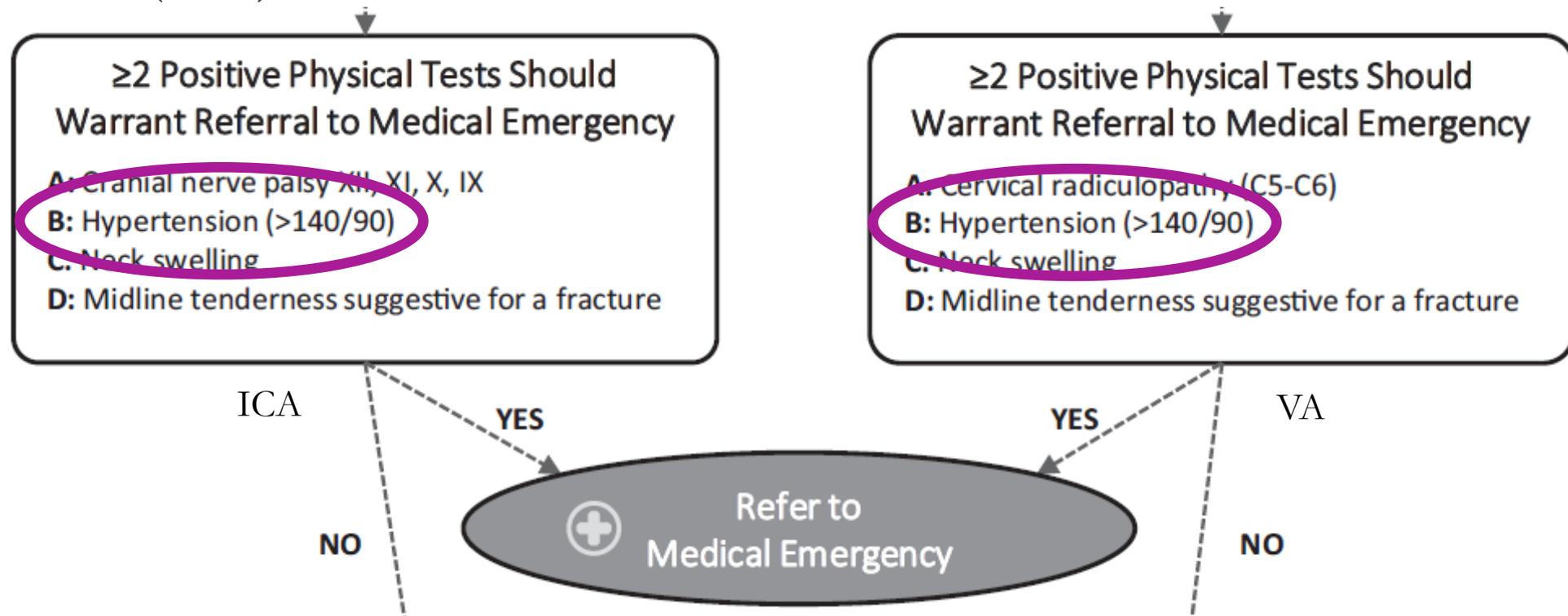
Hypertension and its role—if any—in the question of cervical artery dissection

3. DeBette (2014) Discussion

In this article DeBette makes the strongest statement in the literature to date noting: “hypertension was confirmed as a risk factor for cervical artery dissection.” In making this claim DeBette cites her work from 2011 which states: “These results, from the largest series to date, **suggest** that hypertension, although less prevalent than in patients with a non-CEAD IS, could be a risk factor of CEAD” (emphasis added)

Hypertension and its role—if any—in the question of cervical artery dissection

4. Chiabi (2019)



Hypertension and its role—if any—in the question of cervical artery dissection

4. Chiabi (2019)

Discussion: The Chiabi risk assessment tool bases its emphasis on hypertension on the work of Debette (2014) citing: “The pathophysiology of CAD is not fully understood but multiple coexisting pathological processes leading to a predisposing weakness of the arterial wall namely...hypertension...**have been proposed to increase the risk of CAD**”

Hypertension and its role—if any—in the question of cervical artery dissection

4. Chiabi (2019)

Discussion: “As there are known important risk factors for CAD that have been shown to increase the incidence rate, clinicians and, especially, manual therapists should specifically be aware of the importance of history taking (Figure 3). That is, environmental risk factors such as **recent acute respiratory infection [1,4]; hyperhomocysteinaemia, namely, B-6, -9, and 12 vitamin deficiency [1,4]; a low body mass index and low cholesterol [1,4]; smoking [1]; and pulsating tinnitus [4]**. While inherited risk factors include medical and/or family history of arterial anomalies and/or CAD, respectively [1,4], and connective tissue disorders, i.e. **Ehlers–Danlos syndrome type IV, Marfan’s syndrome, Osteogenesis Imper or Loeys-Dietz syndrome**

Hypertension and its role—if any—in the question of cervical artery dissection

5. Pikus (2019)

Commentary: “Hypertension is so prevalent in the general population that its inclusion in a decision tree is of no practical value. In some series, the prevalence of hypertension is similar in CAD and control populations [4].

[4] Cassidy JD, Boyle E, Cote 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:S176–S183.

Hypertension and its role—if any—in the question of cervical artery dissection

Cervical-artery dissections: predisposing factors, diagnosis, and outcome, Lancet 2009 DeBette “...other risk factors have been suggested, such as infection, migraine, hyperhomocysteinaemia...”

Cervical Artery Dissection: A Review of the Epidemiology, Pathophysiology, Treatment, and Outcome, Blum, 2015

“Patients with cervical artery dissection are more likely to have hypertension and less likely to have hypercholesterolemia than matched healthy controls”

Hypertension and its role—if any—in the question of cervical artery dissection

Risk Factors and Clinical Presentation of Cervical Arterial Dissection: Preliminary Results of a Prospective Case-Control Study. Kranenburg, et al. [J Orthop Sports Phys Ther.](#) 2015 Jul;45(7):503-11. “General cardiovascular risk factors, with the exception of migraine, were not important risk factors for dissection in this cohort.”

Adverse events associated with the use of cervical spine manipulation or mobilization and patient characteristics: A systematic review, Kranenburg, *Musc Sci and Pract* V. 28, 2017, 32-38 “Despite the fact that clinical characteristics such as smoking, cervical trauma, recent infection, hypertension, migraine, low cholesterol and low body mass index are well described as **possible** risk factors...Other risk factors described are hypertension, migraine, connective tissue disorders and a recent history of cervical trauma (Debette et al., 2011).”

Increasing the safety of cervical spine adjusting re: cervical artery issues

1. A risk–benefit assessment strategy to exclude cervical artery dissection in spinal manual-therapy: a comprehensive review, Chiabi et al. ANNALS OF MEDICINE 2019, VOL. 51, NO. 2, 118–127

.2. Effects of Head and Neck Positions on Blood Flow in the Vertebral, Internal Carotid, and Intracranial Arteries: A Systematic Review, Kranenburg et al., [J Orthop Sports Phys Ther.](#) 2019 Oct;49(10):688-697.

Increasing the safety of cervical spine adjusting re: cervical artery issues

Chiabi (2019)

“Cervical mobilization and/or manipulation have been suspected to be able to trigger cervical artery dissection (CAD). However, these assumptions are based on case studies which are unable to established direct causality.”

“The World Health Organization regards manual mobilization and/or spinal manipulative treatment conducted by chiropractors to be a safe and effective treatment with few, mild, transient AEs”

Increasing the safety of cervical spine adjusting re: cervical artery issues

Chiabi (2019)

“A few case studies have reported serious AEs following cervical spinal manipulative therapy (SMT) [56–64], but whether there is a causal relationship between cervical SMT and CAD has not been “determined”

“several extensive cohort studies and meta-analyses have found no excess risk of CAD resulting in secondary ischaemic stroke for chiropractic SMT compared “to primary care follow-up...retrospective cohort studies have reported no association with traumatic injury to the head or neck after SMT for neuromusculoskeletal pain”

Increasing the safety of cervical spine adjusting re: cervical artery issues

Chiabi (2019)

“Invasive studies have further disproven any misconception as to whether VA strains during head movements, including SMT, exceed failure strains [70,71]. No changes in blood flow or velocity in the VA of healthy young male adults were found in various head positions and during a cervical SMT”

Increasing the safety of cervical spine adjusting re: cervical artery issues

Kranenburg (2019)

“Results: The synthesized data suggest that in the majority of people most positions and movements of the cranio-cervical region do not have an effect on blood flow.

Conclusions: The findings of this systematic review suggest that cranio-cervical positioning may not alter blood flow as much as previously expected”

Increasing the safety of cervical spine adjusting re: cervical artery issues

Kranenburg (2019)

“studies have been unable to identify specific variables which relates to the increase or mediation of risk for adverse events.”...“It seems unlikely that a healthy artery would be traumatised by a therapeutic intervention alone.”...“it is plausible that a CAD is not an adverse event of the treatment itself, but exists *in situ* prior to treatment.”...“The positions and movements utilized in high velocity thrust techniques do not seem to alter blood flow”

Increasing the safety of cervical spine adjusting re: cervical artery issues

Kranenburg (2019)

“A clinical implication from this review is that the relationship between cranio-cervical movement and alterations in blood flow does not seem to be as obvious as previous data suggested. Considering blood flow as a robust measure of vessel stress, based on these data it is unlikely that head and neck movement alone, even if forceful, could mechanistically explain the aetiology of adverse events which have conventionally been purported to be related to therapeutic interventions.”

Increasing the safety of cervical spine adjusting re: cervical artery issues

Kranenburg (2019)

Conventional thought within the domain of manual therapy has been that rapid, forceful interventions such as HVT techniques are considered to constitute a higher risk for neuro-vascular events resulting from cervical arterial compromise. However, we found that studies which focused specially on HVT reported no hemodynamic changes. Furthermore, studies that reported positioning and movement were not unambiguous in reporting hemodynamic changes.

Increasing the safety of cervical spine adjusting re: cervical artery issues

Kranenburg (2019)

The present data supports this reasoning which suggests that adverse events related to cervical spine interventions might be the result of something other than the therapeutic positioning or movement of the head and neck

Increasing the safety of cervical spine adjusting re: cervical artery issues

Use of fluoroquinolones and the risk of spontaneous cervical artery dissection, E. Del Zottoa and A. Pezzini, European Journal of Neurology 2019, 26: 1028–1031

Background and purpose: Because of their potential to alter the integrity of collagen and other components of the extracellular matrix, fluoroquinolone antibiotics might be involved in the pathogenesis of spontaneous cervical artery dissection (sCeAD).

Increasing the safety of cervical spine adjusting re: cervical artery issues

Results: Overall, 284 cases (mean age 43.2 ± 10.4 years; 58.5% men) and 568 controls qualified for the analysis. Thirty (10.6%) patients in the sCeAD group and 16 (2.8%) in the non-CeAD IS group were fluoroquinolone users ($P \leq 0.001$). The use of these antibiotics was associated with a more than twofold increased risk of sCeAD [odds ratio (OR) 2.31; 95% confidence interval (CI) 1.00–5.30] after adjusting for confounders. The risk was more substantial in the subgroup of patients with dissection involving the carotid artery (OR 2.78; 95% CI 1.14–6.78), in females (OR 4.58; 95% CI 1.04–20.1) and compared to that conferred by other antibiotics (OR 2.42; 95% CI 1.02–5.75).

Increasing the safety of cervical spine adjusting re: cervical artery issues

Use of fluoroquinolones and the risk of spontaneous cervical artery dissection, E. Del Zottoa and A. Pezzini, European Journal of Neurology 2019, 26: 1028–1031

Conclusions: Fluoroquinolones may represent a novel contributing factor involved in the pathogenesis of sCeAD

Increasing the safety of cervical spine adjusting re: cervical artery issues

One last thought on risk re: hypertension versus
fluoroquinolones;-

- According to Pezzini in 2006 the OR imposed by hypertension re;
CEAD is 1.94
- According to Debette, 2011 the OR imposed by hypertension in
CEAD is 1.67
- According to Zotto in 2019 the OR imposed by hypertension in
CEAD is 2.31



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