

POSTGRADDC
EVIDENCE BASED, CLINICALLY INTUITIVE CE

Grand Rounds: Chiropractic Self-Manipulation?

Presented by James Demetrious, DC, DABCO

www.PostGradDC.com

1

James Demetrious, DC, DABCO

Clinician

- Active Practice >37 years
- Diplomate, American Board of Chiropractic Orthopedists
- Diplomate, International Academy of Neuromusculoskeletal Medicine

Educator

- Post-Grad. > 23 years
- NCMIC Speakers' Bureau for >10 years
- Northeast College of Health Sciences
- **PostGradDC**

Honors

- Academy of Chiropractic Orthopedists Distinguished Service and Fellow Awards
- American College of Chiropractic Orthopedists Outstanding Achievement Award

Publications

- Over 31 Peer-Reviewed chiropractic journal articles.
- Many Contributions to **NCMIC Examiner** and **Podcast**

Editorial

- Editorial Reviewer for journals *Spine*, *Annals of Internal Medicine*, and *Clinical Anatomy*
- Former Managing Editor of *Journal of Chiropractic Orthopedists*

Community


- Lower Cape Fear Hospice, Board Member
- Founder, Past-President Wilmington Autism Society
- Optimists Club – Safety Officer

James Demetrious, DC, DABCO - PostGradDC.com

2

Disclosures


- Dr. Demetrious owns and operates **PostGradDC.com**, a company that offers advanced online post-graduate continuing education.
- Dr. Demetrious is a member of the **NCMIC** Speakers' Bureau and teaches advanced continuing education course work throughout the United States.
- Text and graphics on the following slides are presented for educational purposes. Meticulous references and attribution have been made to respective authors and copyright holders.

 James Demetrious, DC, DABCO - PostGradDC.com 3

3

Disclaimer

- The views and opinions expressed in this presentation are solely those of the author.
- Dr. Demetrious and PostGradDC do not set practice standards.
- We offer this only to educate and inform.

 James Demetrious, DC, DABCO - PostGradDC.com 4

4

Earn NCMIC Premium Discounts

Full-time D.C.s can attend an 8-hour qualifying seminar and receive a 5% discount for 3 consecutive years on the renewal of their malpractice insurance premium (2.5% discount for part-time D.C.s).

To receive the discount, the DC can email or fax a copy of their CE form to NCMIC.

NCMIC does not set practice standards. Information and opinions expressed are offered as educational material by the lecturer.



James Demetrious, DC, DABCO - PostGradDC.com



5

What is Our Purpose?



- **To protect our patients.**
 - Attention and Discipline



James Demetrious, DC, DABCO - PostGradDC.com



6

What is Our Purpose?



- **To identify bad science.**
 - Study, Read, Apply.
- **To provide accurate information to our patients.**
 - Informed Consent.
- **To protect our families, practices, and profession.**
 - Respond and Defend.

7

Grand Rounds

Our Grand Rounds Format:

- Case Presentation
- Topical Considerations
- Supportive Research
- Lessons
- Interactive Discussion.

8

Bad Science – A Lack of Causality

Review > J R Soc Med. 2007 Jul;100(7):330-8. doi: 10.1177/014107680710000716.

Adverse effects of spinal manipulation: a systematic review

E Ernst ¹

Affiliations

Affiliation

¹ Complementary Medicine, Peninsula Medical School, Universities of Exeter & Plymouth, Exeter, UK. Edzard.Ernst@pms.ac.uk

- In conclusion, spinal manipulation, particularly when performed on the upper spine, has repeatedly been **associated** with serious adverse events.

9

Refuting Bad Science

Tuchin *Chiropractic & Manual Therapies* 2012, **20**:30
<http://chiroamt.com/content/20/1/30>



RESEARCH

Open Access

A replication of the study 'Adverse effects of spinal manipulation: a systematic review'

Peter Tuchin^{*}

- The number of errors or omissions in the 2007 Ernst paper, reduce the validity of the study and the reported conclusions.
- The omissions of potential risk factors and the timeline between the adverse event and SMT could be significant confounding factors.
- Greater care is also needed to distinguish between chiropractors and other health practitioners when reviewing the application of SMT and related adverse effects.

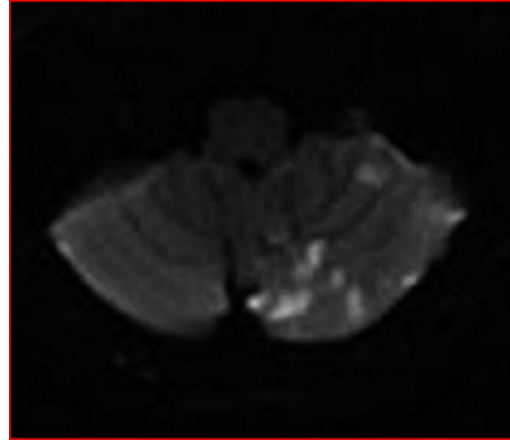
10

Bad Science – A Lack of Causality

Chiropractic Manipulation of the Neck and Cervical Artery Dissection

Background: Chiropractic manipulation of the neck can cause cervical artery dissection and stroke, although the incidence of these complications is unknown (1–4). Patients younger than 45 years with vertebral artery dissection and stroke are 5 times more likely to have visited a chiropractor in the previous 30 days than an age-matched control group (1).

Case Report: In mid-March 2012, a 37-year-old registered nurse with a history of chronic neck pain went to her chiropractor. She had seen the same chiropractor for 12 to 15 years, usually going once a month for cervical spine manipulation. Because of a new symptom (pain when turning her head up and to the right), the current visit had been the fourth in a week. From the patient's perspective, the manipulation done during the current visit was similar to past procedures.



17 July 2012 | *Annals of Internal Medicine* | Volume 157 • Number 2 | 151

11

Bad Science – A Lack of Causality

Conclusion: Although incidence of cervical artery dissection precipitated by chiropractic neck manipulation is unknown, it is an important risk (3, 4). Given that risk, physical therapy exercises may be a safer option than spinal manipulation for treating patients with neck pain.

Raymond E. Bertino, MD

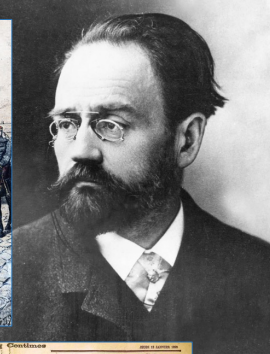
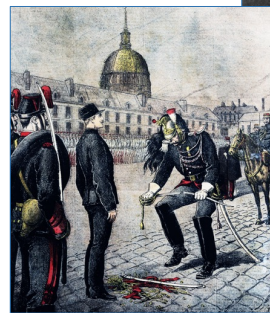
Arun V. Talkad, MD

Jeffrey R. DeSanto, MD

Jane H. Maksimovic, DO

Shyam G. Patel, MD

University of Illinois College of Medicine at Peoria
Peoria, IL 61637



17 July 2012 | *Annals of Internal Medicine* | Volume 157 • Number 2 | 151

12

Bad Science – A Lack of Causality

Case report

A near-fatal consequence of chiropractor massage: massive stroke from carotid arterial dissection and bilateral vertebral arterial oedema

Timothy Yap,¹ Li Feng,² Dan Xu^{3,4}, Jian Zhang²

¹Curtin Medical School, Faculty of Health Sciences, Curtin University, Perth, Western Australia, Australia
²Department of Neurology, First Affiliated Hospital, Sun Yat-sen University, Guangzhou, Guangdong, China
³Curtin School of Population Health, Faculty of Health Sciences, Curtin University Bentley Campus, Perth, Western Australia, Australia
⁴Medical Education & General Practice, First Affiliated Hospital, Sun Yat-sen University, Guangzhou, Guangdong, China

Correspondence to: Professor Dan Xu, danxi.xu@curtin.edu.au

Accepted 27 July 2021

SUMMARY

A 35-year-old Chinese man with no risk factors for stroke presented with a 2-day history of expressive dysphasia and a 1-day history of right-sided weakness. The presentation was preceded by multiple sessions of neck, shoulder girdle and upper back massage for pain relief in the prior 2 weeks. CT of the brain demonstrated an acute left middle cerebral artery infarct and left internal carotid artery dissection. MRI cerebral angiogram confirmed left carotid arterial dissection and intimal oedema of bilateral vertebral arteries. In the absence of other vascular comorbidities and risk factors, massage-induced internal carotid arterial dissection will most likely precipitate the near-fatal cerebrovascular event. The differential diagnosis of stroke in a younger population was consequently reviewed and discussed.

BACKGROUND

Internal carotid artery dissection, the separation of the tunica media and tunica intima of the internal carotid artery, can lead to cerebral infarction in up to two-thirds of patients,¹ accounting for up to

in a healthy man, in which symptom onset coincided solely with massage and neck manipulation. We propose that massage and neck manipulation is an independent risk factor for developing internal carotid artery dissection in healthy individuals. Furthermore, our case highlights the importance of including internal carotid artery dissection in the differential diagnosis of cerebral vascular events in younger patients.

CASE PRESENTATION

A 35-year-old Chinese man was brought to the emergency department by a friend, from home alone with a 2-day history of expressive dysphasia and 1 day of right-sided weakness. On collateral history, the presentation was preceded by multiple sessions of neck, shoulder girdle and upper back massage for pain relief in the prior 2 weeks while he was away on a business trip. He denies having any associated fever, headache, nausea, vomiting, palpitations, syncope, incontinence and neck stiffness. His medical history was unremarkable and was not on any medications or herbal remedies.

BMJ Case Rep: first published as 10.1136/bcr-2021-249976 on 6 August 2021. Downloaded from http://

- This study has demonstrated that the literature infrequently reports useful data toward understanding the association between cSMT, CADs and stroke.
- Improving the quality, completeness, and consistency of reporting adverse events may improve our understanding of this important relation.



POSTGRADDC
EVIDENCE BASED, CLINICALLY INTUITIVE CE

James Demetrious, DC, DABCO

13

13

Refuting Bad Science

Review > J Manipulative Physiol Ther. 2015 Nov-Dec;38(9):672-676.

doi: 10.1016/j.jmpt.2013.09.005. Epub 2014 Jan 3.

The Association Between Cervical Spine Manipulation and Carotid Artery Dissection: A Systematic Review of the Literature

Chadwick L R Chung¹, Pierre Côté², Paula Stern³, Georges L'Espérance⁴

Affiliations + expand

PMID: 24387889 DOI: 10.1016/j.jmpt.2013.09.005

- Although several case reports and case series raise the hypothesis of an association, we found no epidemiologic studies that validate this hypothesis.



POSTGRADDC
EVIDENCE BASED, CLINICALLY INTUITIVE CE

James Demetrious, DC, DABCO

14

14

Case Introduction

CASE REPORT



Case History

A 43-year-old woman reportedly laid down with her neck on the top step of a staircase and attempted to perform a self-chiropractic manipulation to “crack her neck.” She reportedly had done this several times in the past to relieve headache. After

Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



James Demetrious, DC, DABCO - PostGradDC.com

17

17

Case Introduction

very rare, with only a few cases of fatal vertebral artery dissection previously published. A systematic review in 2010 collated all cases in which chiropractic spinal manipulation was followed by death and identified 26 published cases, of which 6 were specifically related to vertebral artery dissection, whereas most other cases were largely from other vascular accidents/thromboses with cerebral or cerebellar infarction.³ There are likely many more



- Ernst E. Deaths after chiropractic: a review of published cases. *Int J Clin Pract.* 2010;64(8):1162–1165.

Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



James Demetrious, DC, DABCO - PostGradDC.com

18

18

Case History

Case History

A 43-year-old woman reportedly laid down with her neck on the top step of a staircase and attempted to perform a self-chiropractic manipulation to “crack her neck.” She reportedly had done this several times in the past to relieve headache. After this attempted procedure, she vomited and complained of headache. A short time later, she became unresponsive. She was transported to the emergency department where she presented with severe hypertension (blood pressure 242/120 mm Hg). Laboratory evaluation was remarkable for glucose and trace ketones in her urine, and there was an elevated white blood cell count in blood. She was unresponsive to painful stimuli, with a Glasgow Coma Scale of 3. A computerized tomography (CT) scan of the

Co-Morbidities:

- 43 years old
- Uncontrolled hypertension
- DM?
- Overweight

Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



James Demetrius, DC, DABCO - PostGradDC.com




19

19

Case History

@theneuroblast

Glasgow Coma Scale

EYE OPENING	VERBAL RESPONSE	MOTOR RESPONSE
		
Spontaneous 4	Oriented 5	Obeys commands 6
To sound 3	Confused 4	Localising 5
To pressure 2	Words 3	Withdrawal 4
None 1	Sounds 2	Abnormal flexion 3
	None 1	Extension 2
		None 1

Glasgow coma scale scoring

Mild	Moderate	Severe
13-15	9-12	3-8



James Demetrius, DC, DABCO - PostGradDC.com

20

20

Case Discussion - Imaging

Coma Scale of 3. A computerized tomography (CT) scan of the head revealed a large right frontal intraparenchymal hemorrhage, subarachnoid hemorrhage, extensive ventricular hemorrhage and ventricular distention and dilation, and midline shift from right to left of 7 mm. A CT angiogram of the head revealed a short segment narrowing of the right vertebral artery at the craniocervical junction with mild irregularity but was inconclusive for vertebral artery dissection or thrombosis. CT angiogram also incidentally found fetal origin of the right posterior cerebral artery and significantly diminutive A1 segment on the right. After evaluation by the neurological service, comfort measures were instituted, and she was subsequently pronounced brain dead. She was an organ

● **Cause of Death:**

- Hemorrhagic stroke?

● **Of Interest:**

- Congenital vessel anomalies.

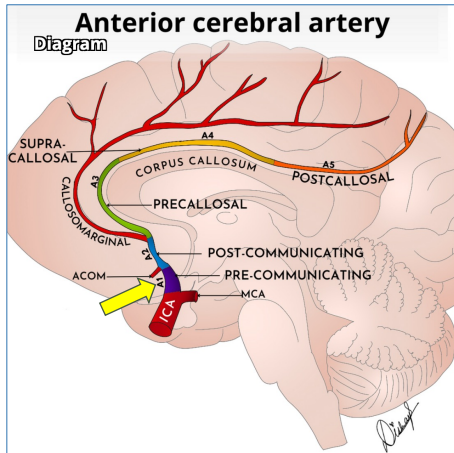
Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



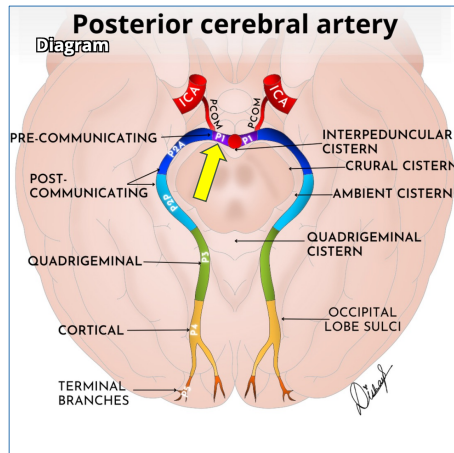
James Demetrius, DC, DABCO - PostGradDC.com

21

Case Discussion - Imaging



Case courtesy of Disha Lokhandwala, Radiopaedia.org, rID: 162601.



Lokhandwala D, Radiopaedia.org rID-161990



James Demetrius, DC, DABCO - PostGradDC.com

22

Case Discussion - Imaging

Published December 15, 2022 as 10.3174/ajnr.A7738

ORIGINAL RESEARCH
EXTRACRANIAL VASCULAR

Association of Left Vertebral Artery Hypoplasia with Posterior Circulation Stroke and the Functional Outcome of Patients with Atrial Fibrillation-Related Cardioembolic Stroke

J.-H. Bae, J.-C. Ryu, S.H. Ha, B.J. Kim, D.-W. Kang, S.U. Kwon, J.-S. Kim, and J.Y. Chang

Recent studies have emphasized the clinical importance of VAH on stroke and reported that patients with VAH are at a high risk of posterior circulation stroke.^{1,2}

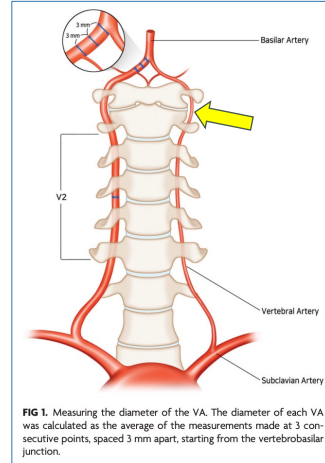


FIG 1. Measuring the diameter of the VA. The diameter of each VA was calculated as the average of the measurements made at 3 consecutive points, spaced 3 mm apart, starting from the vertebrobasilar junction.



James Demetrious, DC, DABCO - PostGradDC.com

23

23

Case Discussion - Imaging

Cureus

Open Access Case Report

DOI: 10.7759/cureus.30463

Lateral Medullary Syndrome Due to a Hypoplastic Vertebral Artery

Albert M. Chung¹, Lisa Sovory²

1. Neuroradiology, California University of Science and Medicine, Colton, USA 2. Neurology, California University of Science and Medicine, Colton, USA

Corresponding author: Albert M. Chung, albertchung47@gmail.com

Review began 10/04/2022
Review ended 10/13/2022
Published 10/19/2022
© Copyright 2022
Chung et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Vertebral artery hypoplasia is an uncommon congenital anatomical variation. Currently, no standard criteria exist for evaluating vertebral arteries as being hypoplastic based on vessel luminal diameter or volume flow. There is debate on the clinical significance of these variants and their relevance as an independent risk factor for posterior circulation strokes. We report a case of a 59-year-old male presenting with lateral medullary syndrome in the setting of a left hypoplastic vertebral artery with absence of atherosclerotic or thrombotic involvement.

Conclusions

Hypoplastic vertebral arteries may predispose one to posterior circulation strokes due to the small vessel diameter, reduced arterial blood flow, or, indirectly, by increasing the curvature of the basilar artery. We suggest that further research should be conducted to study the risk-benefit ratio of screening for VAH on duplex ultrasound, particularly in patients with risk factors for vascular insufficiency.

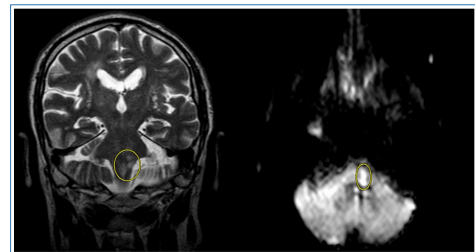


FIGURE 2: MRI of the brain without contrast showing restricted diffusion



James Demetrious, DC, DABCO - PostGradDC.com

24

24

Case Discussion – Pathology Report

A neuropathologist was consulted for the examination of the formalin-fixed brain. Neuropathology findings included diffuse cerebral edema with acute hypoxic-ischemic changes and associated uncal and cerebellar tonsillar herniation. There was acute subarachnoid hemorrhage overlying the cerebrum, the posterior cerebellar hemispheres, and the spinal cord. Focal intraparenchymal hemorrhage was also seen within the right basal ganglia with intraventricular extension (Fig. 3) and within the cervical spinal cord.

Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



James Demetrius, DC, DABCO - PostGradDC.com

25

25

Case Discussion – Pathology Report

Cardiovascular pathology consultation occurred because of heart valve donation and was significant for mild cardiomegaly for body habitus with left ventricular hypertrophy (consistent with hypertension) and diffuse cardiomyocyte hypereosinophilia consistent with global myocardial hypoperfusion. Toxicology testing

The cause of death was determined to be vertebral artery dissection because of the injury sustained during self-chiropractic maneuver, and the manner of death was accident. A potential role for hypertension as a predisposing factor is discussed below.

● **Self-Chiropractic Maneuver???**



Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



James Demetrius, DC, DABCO - PostGradDC.com

26

26

Case Discussion – Pathology Report

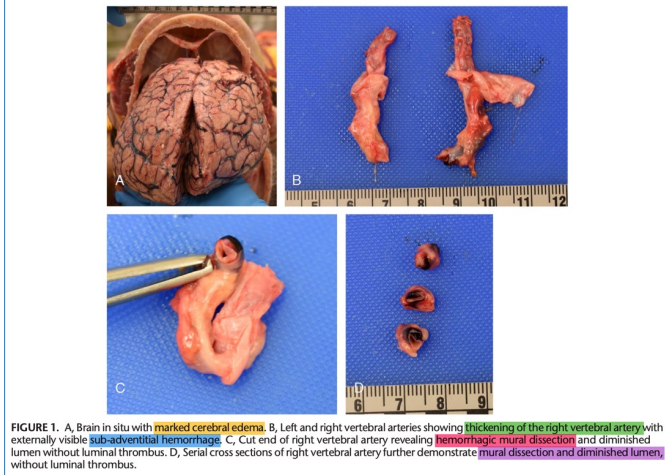
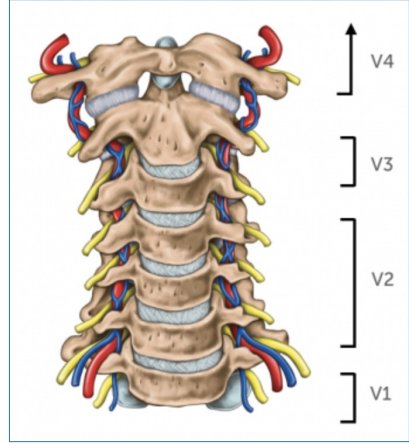


FIGURE 1. A, Brain in situ with marked cerebral edema. B, Left and right vertebral arteries showing thickening of the right vertebral artery with externally visible sub-adventitial hemorrhage. C, Cut end of right vertebral artery revealing hemorrhagic mural dissection and diminished lumen without luminal thrombus. D, Serial cross sections of right vertebral artery further demonstrate mural dissection and diminished lumen without luminal thrombus.



Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.

27

Case Discussion – Pathology Report

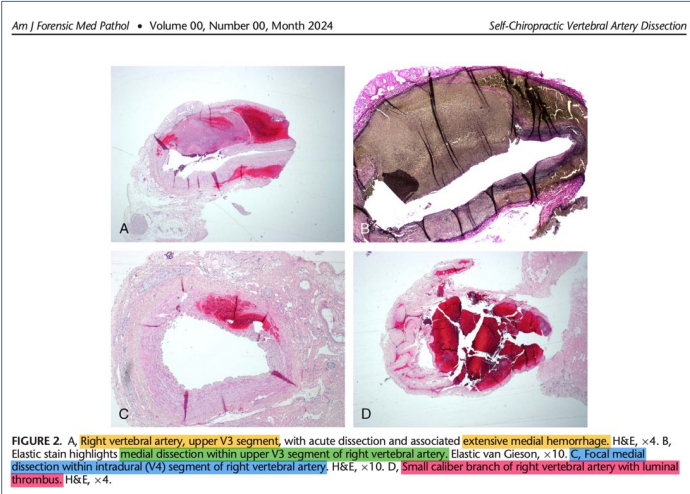
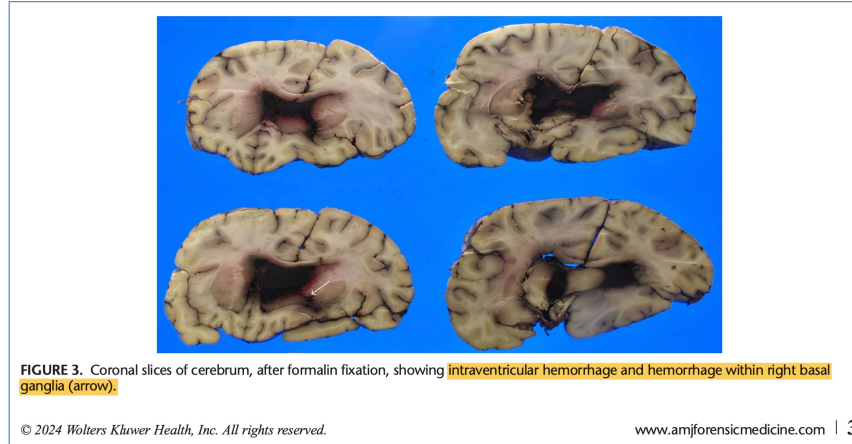


FIGURE 2. A, Right vertebral artery, upper V3 segment, with acute dissection and associated extensive medial hemorrhage. H&E, x4. B, Elastic stain highlights medial dissection within upper V3 segment of right vertebral artery. Elastic van Gieson, x10. C, Focal medial dissection within intradural (V4) segment of right vertebral artery. H&E, x10. D, Small caliber branch of right vertebral artery with luminal thrombus. H&E, x4.

Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.

28

Case Discussion – Pathology Report



Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.

29

Discussion

result in thrombosis. Possible risk factors for vertebral artery dissection independent of chiropractic manipulation identified by Cassidy et al⁵ include connective tissue disorders, hypertension, vessel abnormalities, atherosclerosis, radiation therapy, and diagnostic cerebral angiography. The postmortem examination in our

Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.

30

Iatrogenic Cause

Demetriou *Chiropractic & Manual Therapies* (2018) 26:22
<https://doi.org/10.1186/s12998-018-0193-z>

Chiropractic & Manual Therapies

HYPOTHESIS

Open Access

CrossMark

Spontaneous cervical artery dissection: a fluoroquinolone induced connective tissue disorder?

James S. Demetriou

The first association published of FQ's in the genesis of dissection and stroke. This hypothesis has been initially confirmed by three independent researchers.

> *Eur J Neurol.* 2019 Jul;26(7):1028-1031. doi: 10.1111/ene.13917. Epub 2019 Mar 5.

Use of fluoroquinolones and the risk of spontaneous cervical artery dissection

E Del Zotto ¹, A Pezzini ^{1, 2}

Case Reports > *Intern Med.* 2021 Sep 1;60(17):2863-2865. doi: 10.2169/intermalmedicine.6736-20. Epub 2021 Mar 22.

Vertebral Artery Dissection after Exposure to Levofloxacin: A Report of Two Cases

Taku Harada ^{1, 2}, Yukinori Harada ², Taro Shimizu ²

Archives of Cardiovascular Diseases Supplements
 ELSEVIER
 Volume 15, Issue 1, January 2023, Pages 112-113

Fluoroquinolone use preceding medium-size artery dissection: A case series

L. Wang ^{1, 2}, B. B. Gehrmichen ¹, B. Pariente ¹, N. Mohamedi ¹, C. Cheng ¹, G. Dibraché ¹, A. Galloula ¹, L. Khider ¹, A. Lillo Le Louet ¹, E. Messas ¹, L. Amar ¹, G. Goodet ¹, F. Mirault ¹

James Demetriou, DC, DABCO - PostGradDC.com

31

31

Discussion – How Case Reports Related?

and sites of vertebral artery injury. Modde¹⁴ discussed the case of a 26-year-old woman who visited a chiropractor after 3 weeks of symptoms of a stiff neck. The chiropractor performed a cervical

ache reported in our case. Sherman et al¹⁵ reported an additional case of fatal vertebral artery dissection after several weeks of chiropractic neck manipulations. In this case, a 60-year-old woman

In a case-control study, Pezzini et al¹⁶ hypothesized that the vertebral artery is potentially more prone to damage from the mechanical effects of hypertension, and that an increased susceptibility of the vertebral artery to other triggering conditions (eg, minor trauma) can result from chronic hypertension. In our case, the his-

Cases?

Fink et al. *Am J Forensic Med Pathol.* 2024 Feb 1.

James Demetriou, DC, DABCO - PostGradDC.com

32

32

Discussion – Reasonable Cause

trauma) can result from chronic hypertension. In our case, the history of hypertensive-range blood pressure readings (suspected to represent systemic essential hypertension) may have contributed to the propensity for vascular dissection. A case report by Turner

Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



James Demetrious, DC, DABCO - PostGradDC.com

33

33

Discussion – Reasonable Cause

Blood Pressure Control and Risk of Stroke A Population-Based Prospective Cohort Study

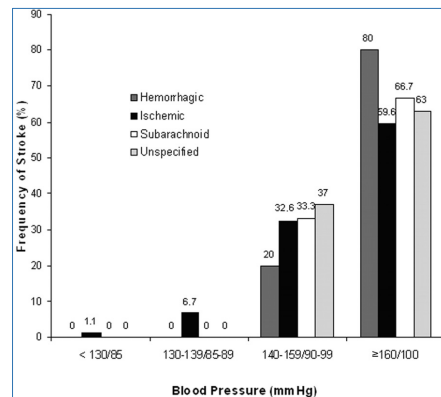
Cairu Li, MD, PhD; Gunnar Engström, MD, PhD; Bo Hedblad, MD, PhD;
Göran Berglund, MD, PhD; Lars Janzon, MD, PhD

Background and Purpose—Adequate control of blood pressure (BP) is a cornerstone in stroke prevention. This study explored the risk of stroke in relation to the quality of BP control in a population-based cohort and whether control of hypertension was related to background characteristics of patients.

Methods—A total of 27 936 subjects (10 953 men and 16 983 women), 45 to 73 years old, living in Malmö, Sweden participated in the study. Incidence of stroke was followed-up for a mean period of 6 years. Controlled BP was defined as BP <140/90 mm Hg in subjects with pharmacological treatment for hypertension.

Results—In the whole cohort, 16 648 subjects (60%) had hypertension (BP ≥140/90 mm Hg) and 23% of them received treatment. Among treated hypertensives, 88.2% had BP levels ≥140/90 mm Hg and 49.5% had BP levels ≥160/100 mm Hg. During the follow-up, 137 strokes occurred among treated hypertensive subjects. The crude incidence of stroke was 289/100 000 person-year in controlled hypertensive subjects and 705/100 000 person-year in treated hypertensive subjects with BP ≥140/90 mm Hg. It was estimated that ≈45% of all strokes among subjects with treatment for hypertension might be attributed to uncontrolled BP. In treated hypertensives, the risk of stroke increased significantly with advancing age, current smoking, high level of diastolic BP, and diabetes. In hypertensive subjects without treatment (n=12 819), incidence of stroke was 363/100 000 person-year.

Conclusion—Uncontrolled BP is highly prevalent in patients with pharmacological treatment for hypertension. **More than 90% of stroke in this group occurred in those with uncontrolled BP.** Adequate hypertension control may prevent a substantial proportion of first-ever stroke among treated hypertensives. (*Stroke*. 2005;36:725-730.)



James Demetrious, DC, DABCO - PostGradDC.com

34

34

Discussion – Reasonable Cause

Of note, a histologic examination of the brain revealed underlying vascular chronic hypertensive changes with concentric mural thickening of intraparenchymal vessels and perivascular rarefaction. The vertebral arteries in our case also exhibit underlying hypertensive degenerative changes, including intimal fibroplasia and focal mineralization. The elastic stains also highlight splitting and duplication of the elastic lamina in the right vertebral artery. These findings appear to confirm the presence of preexisting, chronic hypertensive changes in the central nervous system vasculature.

Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



James Demetrius, DC, DABCO - PostGradDC.com

35

35

Conclusion – Wrong and Right...

CONCLUSIONS

Chiropractic manipulation, including self-performed manipulation, can result in severe complications and death. To our knowledge, this represents the first reported case of fatal vertebral artery dissection due to a self-induced chiropractic manipulation. Postmortem investigation of deaths after chiropractic manipulation should include a careful examination of the vertebral arteries, which requires a specialized neck dissection and can include post-mortem x-rays with injection of angiographic contrast media. A histologic examination of the affected vessels is strongly recommended for confirmation and further documentation of gross findings.



Fink et al. Am J Forensic Med Pathol. 2024 Feb 1.



James Demetrius, DC, DABCO - PostGradDC.com

36

36

Important Considerations?

- **Pre-existing predispositions?**
- Prevalence and commonality of S/S?
- **Proper examination?**
- Mechanisms of injury?:
 - Dissection/occlusion?;
 - sPSA or Thromboemboli?;
 - Coagulopathy – Heritable or acquired?;
- Temporal relationships?
- An impossible diagnosis?
 - Poor disclosure - despite best efforts?;
 - The asymptomatic dissection?
- Standard(s) of care?
- **Recommendations?**
- **Referral - Communication**
- **Informed consent?**

37

Responding to Bias and Baloney

- **How best to respond?**
 - Patient Discussions, Letters to Editors by authorities, Social Media, More Research
- **Some talking points:**
 - Rare:
 - Dissections and strokes rarely occur – 2.9/100,000.
 - Dissection and stroke associated with SMT – 1/5.8 million.
 - Young people who have strokes often have headaches, neck, pain, and other symptoms and risk factors that cause them to seek chiropractic care.
 - The risk of having a stroke in a chiropractic office is the same as going to the PCP.
 - No scientific research has proven that chiropractic care causes cervical artery dissections.
 - Research shows that young people who have cervical artery dissections often have connective tissue disorders and other risk factors that produce the condition.
 - Your chiropractor has taken advanced coursework to better diagnose the developing CAD and stroke.

38

Incidence Rates and Rarity of CAD

- Fortunately, the incidence rate of CAD is relatively low, estimated at 2.9/100,000 individuals per year in the general population.
 - Bejot Y, Daubail B, Debette S, et al. Incidence and outcome of cerebrovascular events related to cervical artery dissection: the Dijon Stroke Registry. *Int J Stroke*. 2014;9:879–882.
- Internal carotid artery dissections (ICADs) occur approximately 3–5 times more frequently than vertebral artery dissections (VADs).
 - Hart RG, Easton JD. Dissections of cervical and cerebral arteries. *Neurol Clin*. 1983;1:155–182.
 - Debette S, Leys D. Cervical-artery dissections: predisposing factors, diagnosis, and outcome. *Lancet Neurol*. 2009;8:668–678.

39

A Lack of Causality

ANNALS OF MEDICINE
2019, VOL. 51, NO. 2, 118–127
<https://doi.org/10.1080/07853890.2019.1590627>

 Taylor & Francis
Taylor & Francis Group

REVIEW ARTICLE OPEN ACCESS 

A risk-benefit assessment strategy to exclude cervical artery dissection in spinal manual-therapy: a comprehensive review

Aleksander Chaibj^{a,b}  and Michael Bjorn Russell^{a,b}

^aHead and Neck Research Group, Research Centre, Akershus University Hospital, Oslo, Norway; ^bInstitute of Clinical Medicine, Akershus University Hospital, University of Oslo, Nordbyhagen, Norway

Manual therapy does not result in an increased risk of CAD.

- Cassidy et al. Risk of vertebrobasilar stroke and chiropractic care: results of a population-based case-control and case-crossover study. *Spine*. 2008;33(4 Suppl):S176–83.
- Church et al. Systematic review and meta-analysis of chiropractic care and cervical artery dissection: no evidence for causation. *Cureus*. 2016;8(2):e498.
- Cassidy et al. Risk of carotid stroke after chiropractic care: a population-based case-crossover study. *J Stroke Cerebrovasc Dis*. 2017;26(4):842–850.

40

A Lack of Causality

Cureus Open Access Original Article DOI: 10.7759/cureus.498

Systematic Review and Meta-analysis of Chiropractic Care and Cervical Artery Dissection: No Evidence for Causation

Ephraim W. Church¹, Emily P. Sieg¹, Omar Zalatimo¹, Namath S. Hussain¹, Michael Glantz¹, Robert E. Harbaugh¹

¹. Department of Neurosurgery, Penn State Hershey Medical Center

✉ **Corresponding author:** Ephraim W. Church, echurch@hmc.psu.edu
Disclosures can be found in Additional Information at the end of the article

- In 2016, Church et al. reported, **"There is no convincing evidence to support a causal link between chiropractic manipulation and CAD."** The authors reported an unfounded belief in causation might have dire consequences.

41

A Lack of Causality

- A few case studies have reported serious AEs following cervical spinal manipulative therapy (SMT), but **whether there is a causal relationship between cervical SMT and CAD has not been determined because of the methodological design, low level of evidence and low prevalence** [40,42,43].
 - [40] Rubinstein SM. Adverse events following chiropractic care for subjects with neck or low-back pain: do the benefits outweigh the risks? J Manipulative Physiol Ther. 2008;31:461–464.
 - [41] Tuchin P. A replication of the study 'Adverse effects of spinal manipulation: a systematic review'. Chiropr Man Ther. 2012;20:30.
 - [42] Wynd S, Westaway M, Vohra S, et al. The quality of reports on cervical arterial dissection following cervical spinal manipulation. PLoS One. 2013;8:e59170.
 - [43] Chung CL, Cote P, Stern P, et al. The association between cervical spine manipulation and carotid artery dissection: a systematic review of the literature. J Manipulative Physiol Ther. 2015;38:672–676.

Chaibi and Russell. ANNALS OF MEDICINE. 2019, VOL. 51, NO. 2, 118–127.

42

SMT Strains Do Not Exceed Failure Strains

- Invasive studies have further disproven any misconception as to whether VA strains during head movements, including SMT, exceed failure strains [70,71].
 - [70] Herzog W, Leonard TR, Symons B, et al. Vertebral artery strains during high-speed, low amplitude cervical spinal manipulation. *J Electromyogr Kinesiol*. 2012;22:740–746.
 - [71] Piper SL, Howarth SJ, Triano J, et al. Quantifying strain in the vertebral artery with simultaneous motion analysis of the head and neck: a preliminary investigation. *Clin Biomech (Bristol, Avon)*. 2014;29:1099–1107.

43

SMT Strains Do Not Exceed Failure Strains

Gorrell et al. *Chiropractic & Manual Therapies* (2022) 30:28
<https://doi.org/10.1186/s12998-022-00438-0>

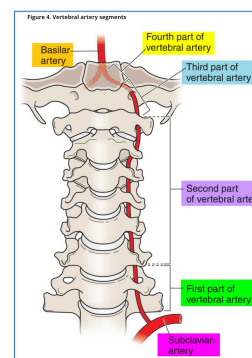
Chiropractic &
Manual Therapies

RESEARCH

Open Access

Kinematics of the head and associated vertebral artery length changes during high-velocity, low-amplitude cervical spine manipulation

Lindsay M. Gorrell^{1,2*}, Gregor Kuntze³, Janet L. Ronsky^{1,4}, Ryan Carter⁵, Bruce Symons⁵, John J. Triano⁶ and Walter Herzog¹



Conclusions: Mean head angular displacements and VA length changes were small during CSM thrusts. Of the four different CSM measured, mean VA length changes were largest during rotation procedures. This suggests that if clinicians wish to limit VA length changes during the thrust phase of CSM, consideration should be given to the type of CSM used.

44

SMT Strains Do Not Exceed Failure Strains

Gorrell et al. *Chiropractic & Manual Therapies* (2022) 30:28
<https://doi.org/10.1186/s12998-022-00438-0>

Chiropractic & Manual Therapies

RESEARCH Open Access

Kinematics of the head and associated vertebral artery length changes during high-velocity, low-amplitude cervical spine manipulation

Lindsay M. Gorrell^{1,2}, Gregor Kuntze³, Janet L. Ronsky^{1,4}, Ryan Carter⁵, Bruce Symons⁶, John J. Triano⁶ and Walter Herzog⁷

Table 2 Angular displacement (degrees) of the head relative to the sternum and VA length change (%) combining data from all donors and clinicians during ipsilateral CSM thrusts

		Rotation				Lateral flexion					
		X	Y	Z	Whole	V3	X	Y	Z	Whole	V3
C1	Mean	25	8.1	-115	1.1	3.7	-30	4.9	-44	0.9	2.6
	SD	2.6	2.8	3.8	0.9	6.4	1.7	4.3	7.8	1.5	4.3
	Minimum	0.2	5.9	-150	0.0	-0.3	-5.3	0.4	-200	-1.1	0.0
C2	Mean	65	125	-58	2.3	10.0	-0.9	10.7	0.7	3.2	10.4
	SD	2.1	10.0	-126	1.6	0.1	-5.3	5.6	-64	1.1	2.3
	Minimum	44	35	45	1.3	5.3	4.2	3.2	8.9	0.8	3.6
C3	Mean	-3.8	-50	-161	0.1	-9.3	-130	1.0	-193	0.2	-0.3
	SD	7.6	13.9	-37	3.2	7.1	-16	9.8	7.9	2.1	8.9
	Minimum	-0.3	7.2	-110	1.9	4.5	-36	4.7	-41	0.7	1.7
C4	Mean	21	23	26	0.7	9.4	2.2	3.2	3.0	0.5	3.6
	SD	-1.9	4.4	-137	0.8	0.0	-70	1.1	-89	0.2	0.0
	Minimum	2.8	10.1	-75	2.4	10.8	-14	9.4	-0.9	1.3	6.7
C5	Mean	1.5	8.9	-98	1.4	2.8	-3.9	6.3	-5.1	0.6	2.1
	SD	2.6	4.5	3.7	1.0	4.0	3.1	2.5	5.1	1.0	7.6
	Minimum	-2.8	2.5	-145	0.2	0.0	-8.1	2.2	-10.7	-0.6	0.0
C6	Mean	50	132	-56	2.7	8.6	-1.7	9.1	2.0	2.1	9.6
	SD	1.4	9.6	-10.7	1.8	2.5	-3.9	5.7	-2.1	1.2	2.6
	Minimum	4.7	2.7	3.1	1.2	3.1	3.0	3.8	4.2	1.0	2.6
C7	Mean	-6.1	5.7	-155	-0.1	0.0	-7.6	1.3	-6.0	0.2	0.0
	SD	5.1	12.6	-74	3.1	6.6	-0.9	12.6	5.5	2.6	6.4
	Minimum	-2.8	2.5	-145	0.2	0.0	-8.1	2.2	-10.7	-0.6	0.0
C6	Mean	32	3.0	2.6	1.2	3.7	3.2	2.0	6.3	0.7	2.4
	SD	-3.9	5.0	-120	-0.4	-0.4	-9.4	1.5	-10.6	0.7	0.0
	Minimum	5.5	14.1	-46	3.1	11.6	-1.1	6.5	5.1	2.1	5.8
C7	Mean	-0.8	8.7	-95	1.3	7.0	-3.5	5.4	-3.3	1.2	7.0
	SD	4.3	2.6	3.0	1.1	2.8	3.5	2.6	4.1	1.0	3.6
	Minimum	-6.6	6.0	-153	0.3	0.1	-8.8	2.3	-7.7	-0.3	0.1
C7	Mean	3.9	12.3	-70	3.3	6.8	0.8	7.9	2.5	2.3	7.1
	SD										
	Minimum										

Ipsilateral manipulations involve contralateral head rotation; positive kinematic values indicate flexion, left lateral flexion and left rotation; positive VA length changes indicate elongation of the vessel
 X, coronal axis; Y, sagittal axis; Z, transverse axis; SD, standard deviation; whole, whole VA; V3, V3 segment of VA



James Demetrious, DC, DABCO

45

45

SMT Strains Do Not Exceed Failure Strains

> J Man Manip Ther. 2022 Nov 15;1-9. doi: 10.1080/10669817.2022.2148048.
 Online ahead of print.

Vertebral arteries do not experience tensile force during manual cervical spine manipulation applied to human cadavers

Lindsay M Gorrell^{1,2}, Andrew Sawatsky², W Brent Edwards², Walter Herzog²

Affiliations: collapse

Affiliations

- Integrative Spinal Research Group, Department of Chiropractic Medicine, University Hospital Balgrist and University of Zürich, Zürich, Switzerland.
- Human Performance Laboratory, Faculty of Kinesiology, University of Calgary, Calgary, Canada.

- During cervical spine manipulations (using cervical spine extension and rotation), arterial length changes remained below that slack length, suggesting that VA elongated but were not stretched during the manipulation.

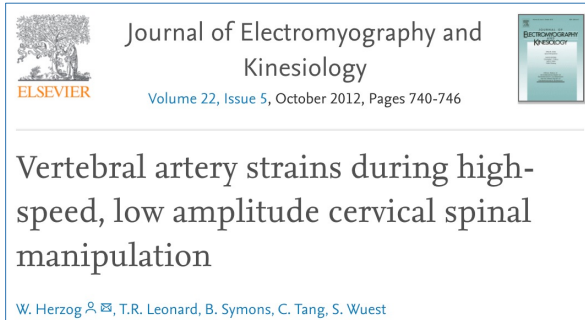


James Demetrious, DC, DABCO

46

46

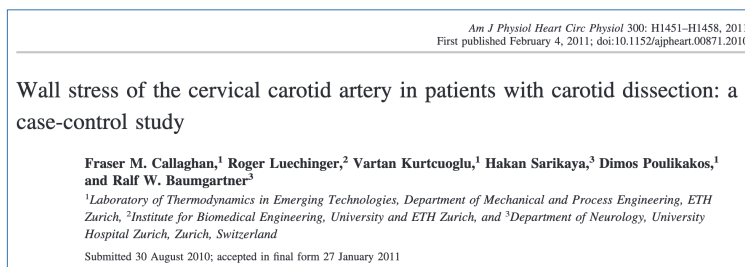
SMT Strains Do Not Exceed Failure Strains



- VA strains obtained during SMT are significantly smaller than those obtained during diagnostic and range of motion testing, and are much smaller than failure strains.
- We conclude from this work that cervical SMT performed by trained clinicians does not appear to place undue strain on VA, and thus does not seem to be a factor in vertebro-basilar injuries.

47

SMT Strains Do Not Exceed Failure Strains



- Because most events of sICAD are connected with normal head movements, this suggests that the carotid arteries of sICAD patients may have distinct functional or anatomical properties important in the initiation of dissection.
- Patients with sICAD have a higher prevalence of hereditary connective tissue disorders such as Marfan syndrome, Ehlers-Danlos syndrome, osteogenesis imperfecta, and, in particular, fibro-muscular dysplasia.

48

SMT Strains Do Not Exceed Failure Strains

Randomized Controlled Trial > J Manipulative Physiol Ther. 2014 Jan;37(1):22-31.

doi: 10.1016/j.jmpt.2013.07.008. Epub 2013 Nov 15.

Changes in vertebral artery blood flow following various head positions and cervical spine manipulation

Jairus J Quesnele¹, John J Triano², Michael D Noseworthy³, Greg D Wells⁴

- 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.



James Demetrious, DC, DABCO

49

49

SMT Strains Do Not Exceed Failure Strains

Open access

Research

BMJ Open Effect of cervical manipulation on vertebral artery and cerebral haemodynamics in patients with chronic neck pain: a crossover randomised controlled trial

Nicholas Moser,¹ Silvano Mior,^{1,2} Michael Noseworthy,³ Pierre Côté,⁴ Greg Wells,⁵ Michael Behr,⁶ John Triano¹

- 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.



James Demetrious, DC, DABCO

50

50

SMT Strains Do Not Exceed Failure Strains

> J Manipulative Physiol Ther. 2020 Feb;43(2):144-151. doi: 10.1016/j.jmpt.2019.09.001.
Epub 2020 May 30.

Changes in Vertebral Artery Blood Flow in Different Head Positions and Post-Cervical Manipulative Therapy

Christopher Yelverton ¹, Jessica Joy Wood ², Diana Lopes Petersen ², Cynthia Peterson ²

- Hemodynamic measurements of the V3 region of the vertebral artery do not show significant changes in the measured head positions or following manipulation of the upper cervical spine in patients **without** pre-existing risk factors.



James Demetrious, DC, DABCO

51

51

Responding to Bias and Baloney

- Inform your patients:
 - Patients may present to physicians with developing CADs.
 - While rare and difficult to diagnose developing CAD, it is vitally important to provide clear HX.
 - The result of an undiagnosed CAD and resultant stroke can be catastrophic:
 - Death
 - Infarcts
 - Paralysis
 - Locked-in Syndrome



James Demetrious, DC, DABCO - PostGradDC.com

52

52

Lessons...The Process of Informed Consent

James Demetriou, DC, DABCO
 Diplomat, American Board of Chiropractic Orthopedists
 4837 Carolina Beach Road, Suite 205 • Wilmington, NC 28412 • Telephone: 910-790-8020

Informed Consent Document

Patient's Name: _____

It is our goal to help you to the best of our ability. Please read this entire document prior to signing it. It is important that you understand the information contained in this document. Please ask questions before you sign if there is anything that is unclear.

What to Expect
 With your permission, Dr. Demetriou will carefully assess your health. He will talk with you about your health history, examine you, and make and/or necessary you based on standards of practice and his clinical experience. He will develop a differential diagnosis and make recommendations for care. With your consent, he will provide you care to the best of his ability.

Chiropractic Care
 The primary treatment offered by Dr. Demetriou is chiropractic adjustments. He may use his hands or a mechanical instrument upon your body in such a way as to move your joints. This may cause a "pop" or "crack" sensation. You may feel a sense of openness. If you feel discomfort with any adjustment, please inform Dr. Demetriou.

The most common side effect of chiropractic care is soreness and stiffness following the first few days of treatment. Sometimes patients experience headaches. This is usually short-term discomfort that is followed by relief.

Risks Inherent to Chiropractic Care
 Disc herniation, pinched nerves, vertebrae change, and spinal biomechanical issues are very common in many people. Many patients without symptoms have these problems and then experience their conditions through the activities of daily living causing them to seek chiropractic care.

Rarely complications from chiropractic care include but are not limited to fractures, disc injuries, dislocations, muscle strain, spinal cord injury, rib, and joint pain. Several dissections and strokes are rare and can lead to death and paralysis. The most current biomechanical research reveals that chiropractic care does not reveal arterial dissections or stroke. It has been reported that patients with arterial dissections experience neck pain, headache, and neurologic symptoms that change them to see chiropractic care. It does not best to be assured that you do not have a developing dissection or stroke.

Please inform us of any risk factors or health issues prior to and during your care:

- ___ Connective tissue disorder, loose joints, Ehlers-Danlos, or Marfan syndrome?
- ___ Recent head or neck trauma?
- ___ Recent headache of your life?
- ___ Elevated homocysteine?
- ___ Recent infection?
- ___ Fluoroquinolone medication in the past (Cipro, Levofloxacin, Norfloxacin, Avelox, etc.)?
- ___ Trouble seeing or blurred vision?
- ___ Dizziness?
- ___ Difficulty swallowing, difficulty swallowing?
- ___ Nausea?
- ___ Numbness or loss of sensation?
- ___ Change in bladder or bowel function?
- ___ Weakness of face, arm, or leg?
- ___ Difficulty walking?
- ___ Atrial fibrillation or atrial septal defect?
- ___ Coagulation disorder or medication?

This Document is a work in progress. Improvements are necessary.

___ Past history of rib or chest injury or pain?
 ___ Osteoporosis or osteopenia?
 ___ Have you been diagnosed with cancer?

I will instruct my medical providers to send this office my medical records and inform Dr. Demetriou of my health history.

Medical Referral
 Dr. Demetriou strongly suggests that you advise your primary medical practitioners that you are seeking chiropractic care for your complaint. He may refer you to your medical doctor or other practitioners who may offer alternative care. Please advise Dr. Demetriou of any hospitalizations, change in treatment, medication, or surgery.

Underlying medical issues may not be initially apparent or may seem to be a musculoskeletal problem that in fact does not. Heart problems, diabetes, infections, hepatitis, and HIV, etc., can cause spinal pain. Sometimes, these problems are very difficult to diagnose early on. Symptoms may be very slight and may not be severe enough to warrant testing or referral. It is vital for you to be honest, telling the doctor of new symptoms, worsening symptoms, and let him know if you are not progressively improving. If you have an underlying condition and discontinue care without consulting Dr. Demetriou, he may not be able to provide you proper medical referrals.

Discontinuing Care
 If you decide to discontinue care in our office, please advise Dr. Demetriou. You may have a more severe condition that is not responding that may require further medical care and he will make medical referrals specific to help you.

Reporting New Problems
 If you experience any new injury, illness, medical care, medication, surgery, or any other change in your medical history, please inform Dr. Demetriou.

Home Care
 Dr. Demetriou may make recommendations for activities of daily living and home exercises. If recommendations produce discomfort during or after activities, please stop immediately and discuss your concerns with Dr. Demetriou.

Consent to Treat Minor
 I hereby request and authorize Dr. James Demetriou to perform diagnostic tests and render chiropractic adjustments and other treatment to my minor son/daughter:

Parent: _____

Consent
 I have read the above explanation of chiropractic care and related treatment. I have discussed it with Dr. Demetriou and have had my questions answered to my satisfaction. By signing below, I state that I have weighed the risks involved in undergoing treatment and have decided that it is in my best interest to undergo the treatment recommended. Having been informed of the risks, I hereby give my consent to examination and treatment.

Date: _____ Date: _____

Patient's Signature: _____ Doctor's Signature: _____

Signature of Parent or Guardian: _____

- Discuss Dangers of Self Manipulation?
- Discuss Risk Factors including HTN?

This Document is a work in progress. Improvements are necessary.



James Demetriou, DC, DABCO - PostGradDC.com

Discussion

- Identifying bad science and disconnects?
- How to appropriately respond?
- How to discuss with patients, the public and ancillary care providers?
- How best to protect patients, our practices and our profession?



James Demetriou, DC, DABCO - PostGradDC.com

The PostGradDC Certifications



The PostGradDC Certifications

- We are building a series of **PostGradDC Certifications**
- Our coursework is approved by the **American College of Chiropractic Orthopedists**, and the **International Academy of Neuromusculoskeletal Medicine** and **PACE**.
- Each certification will entail **10 CE hours** of designated coursework.
 - 7 CE Hours of Recorded ONLINE coursework;
 - 3 CE Hours of LIVE Grand Rounds Webinars.



James Demetrious, DC, DABCO - PostGradDC.com

55

55

My Account | POSTGRADDC | ABOUT | ONLINE CE | LIVE CE | CERTIFICATIONS | CLINICAL PEARLS | Q

The PostGradDC Cervical Artery Dissection Certification

PostGradDC offers the First 10 CE Hour CAD Certification!
 Dr. James Demetrious is internationally recognized for his work related to CAD. This CE has been lauded as coursework that should be taught to every chiropractor and chiropractic student.
 PostGradDC CE is approved by the ACCO, the IANM (MOC), NCMIC, and PACE.
 We offer this CE to protect your patients, practice, and family.

Complete 10 CE Requisite Hours (7 ONLINE + 3 LIVE) to Achieve CAD Certification.
 Register for a minimum of 7 CE Hours from the following ONLINE recorded classes:

- Clinical Risk Management: CAD (1 CE Hour)
- CAD: Diagnosis (2 CE Hours)
- CAD: Risk Factors (1 CE Hour)
- CAD due to Fluoroproliferates (2 CE Hours)
- Differential Diagnosis (1 CE Hour)
- Clinical Risk Management: Informed Consent (1 CE Hour)

Register for a minimum of 3 CE Hours from the following LIVE classes:

- February 6, 2024 - The \$75 Million CAD Malpractice Case (1 CE Hour)
- March 5, 2024 - Vertebral Artery Dissection Due to Self Manipulation (1 CE Hour)
- April 2, 2024 - Spontaneous Vertebral Artery Dissection (1 CE Hour)
- May 7, 2024 - Neurologic Deficits Due to VA Dissection (1 CE Hour)

Additional Live CAD classes will be available.

Once you have completed the required 10 CE Hours, click on the tab below, download, complete, and send the Certification Application to: info@postgraddc.com.
 For more information, click below.

[Click Here for More Information and the Certification Application](#)

Protecting patients.

Protecting your family, practice, and profession.

Professional development.



James Demetrious, DC, DABCO - PostGradDC.com

56

56

Upcoming Grand Rounds Schedule



The First Tuesday of the Month at 8PM EST

Upcoming Rounds

- **April 2, 2024** – Spontaneous VAD
- **May 7, 2024** - Neurologic Deficits Due to VAD

Additional live qualifying CAD classes will be available at the end of the year.



James Demetrious, DC, DABCO - PostGradDC.com

Let's Study Harder to Protect Our Patients...



James Demetrious, DC, DABCO - PostGradDC.com

Thank you!



PostGradDC.com



James Demetrius, DC, DABCO - PostGradDC.com

59

59

Credit and Certification

- **You must complete the Class Survey** to receive your Certificate of Completion and license renewal credit (for those doctors practicing in PACE approved states).
 - Go to PostGradDC.com, log onto your account, go to **My Account** and click on the class.
 - **Complete the survey.** Your Certificate of Completion will be generated and accessible in a PDF format.
- **To achieve PostGradDC CAD Certification**, complete the requisite classes listed on our Certification page and submit your form for processing.



James Demetrius, DC, DABCO - PostGradDC.com

60

60