ORIGINAL RESEARCH

RISK OF STROKE AFTER CHIROPRACTIC SPINAL MANIPULATION IN MEDICARE B BENEFICIARIES AGED 66 TO 99 YEARS WITH NECK PAIN

James M. Whedon, DC, MS,[a] Yunjie Song, PhD,[b] Todd A. Mackenzie, PhD,[c] Reed B. Phillips, DC, PhD,[d] Timothy G. Lukovits, MD,[e] and Jon D. Lurie, MD, MS[f]

ABSTRACT

Objective: The purpose of this study was to quantify risk of stroke after chiropractic spinal manipulation, as compared to evaluation by a primary care physician, for Medicare beneficiaries aged 66 to 99 years with neck pain.
Methods: This is a retrospective cohort analysis of a 100% sample of annualized Medicare claims data on 1 157 475 beneficiaries aged 66 to 99 years with an office visit to either a chiropractor or primary care physician for neck pain. We compared hazard of vertebrobasilar stroke and any stroke at 7 and 30 days after office visit using a Cox proportional hazards model. We used direct adjusted survival curves to estimate cumulative probability of stroke up to 30 days for the 2 cohorts.
Results: The proportion of subjects with stroke of any type in the chiropractic cohort was 1.2 per 1000 at 7 days and 5.1 per 1000 at 30 days. In the primary care cohort, the proportion of subjects with stroke of any type was 1.4 per 1000 at 7 days and 2.8 per 1000 at 30 days. In the chiropractic cohort, the adjusted risk of stroke was significantly lower at 7 days as compared to the primary care cohort (hazard ratio, 0.39; 95% confidence interval, 0.33-0.45), but at 30 days, a slight elevation in risk was observed for the chiropractic cohort (hazard ratio, 1.10; 95% confidence interval, 1.01-1.19).
Conclusions: Among Medicare B beneficiaries aged 66 to 99 years with neck pain, incidence of vertebrobasilar stroke was extremely low. Small differences in risk between patients who saw a chiropractor and those who saw a primary care physician are probably not clinically significant. (J Manipulative Physiol Ther 2015;38:93-101)
Key Indexing Terms: *Stroke; Spinal Manipulation, Adverse Effects; Neck Pain; Chiropractic; Vertebral Artery Dissection; Medicare*

RISK OF STROKE AFTER SPINAL MANIPULATION

Manipulation of the cervical spine is a treatment for neck pain often performed by chiropractic physicians, but the safety of cervical spine manipulation has been questioned because observational studies have linked cervical spine manipulation to vertebral artery dissection and subsequent vertebrobasilar stroke (VBS).[1-3] A considerable amount of controversy persists regarding the safety of cervical spine manipulation.[4]

Vertebrobasilar stroke is an uncommon type of stroke, with a reported population incidence of 0.97 cases per 100 000.[5] The likelihood of VBS after spinal manipulation has been examined in 3 studies using case-control designs, an approach well suited to the evaluation of rare conditions such as VBS. Smith et al[3] compared patients with ischemic stroke or transient ischemic attack, with and without vertebral artery dissection, and concluded that spinal manipulation is an independent risk factor for vertebral artery dissection. Rothwell

[a] Instructor, The Dartmouth Institute for Health Policy & Clinical Practice, Dartmouth College, Grantham, NH.
[b] Research Associate, The Dartmouth Institute for Health Policy & Clinical Practice, Dartmouth College, Grantham, NH.
[c] Associate Professor, The Dartmouth Institute for Health Policy and Clinical Practice, Dartmouth College, Grantham, NH.
[d] President Emeritus, Southern California University of Health Sciences, Whittier, CA.
[e] Associate Professor of Neurology, Geisel School of Medicine, Dartmouth College, Grantham, NH.
[f] Associate Professor, The Dartmouth Institute for Health Policy and Clinical Practice, Dartmouth College, Grantham, NH.
Submit requests for reprints to: James M Whedon, DC, MS, Instructor, The Dartmouth Institute for Health Policy & Clinical Practice, Dartmouth College, PO Box 11 Grantham, NH 03753. (e-mail: *james.m.whedon@hitchcock.org*).
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et al[2] studied 582 cases of VBS and found that patients with stroke younger than 45 years were 5 times more likely than controls to have visited a chiropractor within 1 week of the stroke. Cassidy et al[1] also found an increased association between chiropractic visits and vertebrobasilar artery stroke in patients younger than 45 years, but the association was no greater than that associated with visits to primary care physicians. Taken together, the results of these case-control studies constitute the strongest evidence regarding the association between spinal manipulation and VBS.

More subject to bias in favor of a stronger association with spinal manipulation was an observational study of 1897 subjects conducted by Engelter et al,[6] who used a questionnaire to assess for "prior cervical trauma." Spinal manipulation was found to be a determinant of cervical (vertebral or carotid) artery dissection but not an independent risk factor. Also with greater potential for bias—in either direction—was the use of an ecological study design by Boyle et al,[7] who found that marked increases in the rates of VBS in 2 Canadian provinces in 2000 were unassociated with increased utilization of chiropractic services.

Several recent systematic reviews on the safety of chiropractic care and spinal manipulation have been largely inconclusive with regard to risk of adverse events in general and stroke in particular. In 2005, Rubinstein et al[8] evaluated risk factors for cervical artery dissection. They found strong associations for "trivial trauma" (including spinal manipulation) but conducted no meta-analysis. They urged caution with regard to attributing cervical artery dissection to spinal manipulation, pending further research.[8] In 2007, in a systematic review on the adverse effects of spinal manipulation, Ernst[9] concluded that spinal manipulation can cause vertebral artery dissection, but in 2012, a replication of that review found numerous errors and omissions that threatened its validity.[10] A review of the safety of chiropractic interventions published in 2009 found no robust data on the incidence of adverse reactions after chiropractic care. Estimates of the risk of serious adverse events such as stroke ranged from 0.05 to 1.46 per 10 000 000 manipulations.[11] A systematic review published in 2010 was also unable to draw any conclusions regarding the risk of adverse events associated with manipulation of the cervical spine for care of neck pain in adults.[12] Similarly, a review published in 2012 found the evidence inadequate to either confirm or refute a significant association between manipulation of the cervical spine and stroke.[13]

Age as a Risk Factor for VBS After Spinal Manipulation

Efforts to identify either risk factors or populations at risk for VBS have been largely unsuccessful.[14,15] The risk of stroke in general increases with age,[16] but it is not known how age might affect the risk of stroke after spinal manipulation.[17] Current best knowledge of the risk of stroke temporally associated with spinal manipulation in older patients is based upon the work of Rothwell et al[2] and Cassidy et al,[18] who collectively found only 53 patients older than 45 years with stroke after spinal manipulation, of a total of 1400 cases of VBS. Rothwell et al analyzed 582 cases of VBS and found no significant association between VBS and chiropractic care for those 45 years and older. Cassidy et al analyzed 818 cases of VBS, stratified by age, and also found no association between VBS and chiropractic care for those 45 years and older.[1] Subsequently, Choi et al[17] examined patient demographic data in 3 case series and 3 surveys on characteristics of patients with stroke after spinal manipulation. Where reported, mean patient age in these studies ranged from 34.0 years (n = 10) [19] to 44 years (n = 74).[20] However, Choi et al[17] found a population at risk that was significantly older than that previously reported: in a population-based case series of 93 patients with VBS who had visited a chiropractor in the previous year, mean patient age was 57.6 years.

Risk of Stroke After Chiropractic Spinal Manipulation in Elderly US Adults

No population-based studies of risk of stroke after spinal manipulation have been conducted in the United States or focused upon older adults. In this study, we sought to answer the research question: "In Medicare beneficiaries aged 66-99 with neck pain, what is the probability of stroke following chiropractic spinal manipulation, as compared to a control group of subjects evaluated for neck pain by a primary care physician?" Among Medicare beneficiaries aged 66 to 99 years, we hypothesized no difference in risk of stroke between those exposed to chiropractic spinal manipulation for neck pain and those exposed to evaluation by a primary care physician for neck pain. Because chiropractors frequently treat neck pain with spinal manipulation and the temporal association between provider office visits and stroke has been observed to be stronger in patients with neck pain,[18] we limited our sample to beneficiaries with neck pain. (Choi et al[17] found that among 93 patients with VBS and a chiropractic visit within the previous year, the most common comorbidities [reported by 67%] were neck pain and headache.) An understanding of the relationship between spinal manipulation and stroke among US Medicare beneficiaries should help facilitate the safe and appropriate utilization of chiropractic care for neck pain in older adults. Thus, the purpose of this study was to quantify risk of stroke after chiropractic spinal manipulation, as compared to evaluation by a primary care physician, for Medicare beneficiaries aged 66 to 99 years with neck pain.

Methods

The Dartmouth College Committee for Protection of Human Subjects reviewed and approved the research plan. This study was supported by the National Institutes of Health under Award Number K01AT005092.