



**BMJ Head to Head debate "Should we abandon C-spine manipulation for mechanical neck pain? Yes"**

Journal:	<i>BMJ</i>
Manuscript ID:	BMJ.2012.004048.R1
Article Type:	Head to Head
BMJ Journal:	BMJ
Date Submitted by the Author:	n/a
Complete List of Authors:	Wand, Benedict; University of Notre Dame Australia, School of Physiotherapy Heine, Peter; University Of Warwick, Warwick Clinical Trials Unit O'Connell, Neil; Brunel University, Centre for Research in Rehabilitation, School of Health Sciences and Social Care
Keywords:	cervical spine manipulation, vertebral artery dissection, vertebrobasilar stroke, risk

SCHOLARONE™  
Manuscripts

1  
2  
3  
4  
5  
6 **Title:** BMJ Head to Head debate "Should we abandon C-spine manipulation for mechanical neck  
7 pain? Yes"  
8

9  
10  
11 **Authors:** Benedict M Wand<sup>1</sup>, Peter J Heine<sup>2</sup>, Neil E O'Connell<sup>3</sup>  
12

13 <sup>1</sup> Associate Professor, School of Physiotherapy, The University of Notre Dame Australia  
14

15 19 Mouat Street, Fremantle, WA 6959, Australia.  
16

17 <sup>2</sup> Research Fellow, Warwick Clinical Trials Unit, Division of Health Sciences, University of Warwick,  
18 Gibbet Hill Rd, Coventry, CV4 7AL, UK  
19

20 <sup>3</sup> Lecturer, Centre for Research in Rehabilitation, Brunel University, Kingston Lane, Uxbridge,  
21 Middlesex, UB8 3PH, UK  
22  
23  
24  
25  
26

27 **Corresponding Author**

28  
29 Neil O'Connell  
30

31 Email: [neil.oconnell@brunel.ac.uk](mailto:neil.oconnell@brunel.ac.uk)  
32

33 Tel: 01895 268814  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 Cervical spine manipulation (a high-velocity, low-amplitude, end-range thrust manoeuvre) is a  
4 common treatment option for mechanical neck pain yet may carry the potential for serious  
5 neurovascular complications, specifically vertebral artery dissection and subsequent vertebrobasilar  
6 stroke. The non-superiority of manipulation to alternative treatments, coupled with concerns  
7 regarding safety, renders cervical spine manipulation unnecessary and inadvisable.  
8  
9

10  
11 The controversy surrounding the association between manipulation and neurovascular  
12 complications is longstanding and not fully resolved, hampered particularly by the difficulty in  
13 obtaining conclusive evidence regarding rare adverse events. What can be accepted is that the  
14 incidence of vertebral artery dissection is low with estimates between 1 (95% Confidence intervals  
15 (CI) 0.5-1.4) and 1.7 (95% CI 1.1-2.3) per 100,000 person years in the USA [1]. The estimates for  
16 stroke resulting from vertebral artery pathology are lower still, ranging from 0.75 to 1.12 per  
17 100,000 person years [2] and many are unlikely to be the result of cervical manipulation.  
18  
19

20  
21 Nevertheless, a large number of case-studies report neurovascular complications immediately  
22 following cervical manipulation [3] and more robust case-control studies provide consistent  
23 evidence of an association between neurovascular injury and recent exposure to cervical manual  
24 therapy, particularly manipulation [4,5,6]. While absolute risk increases cannot be accurately  
25 estimated, these studies have reported large effects in general populations (adjusted odds ratios  
26 (OR) 6.62, 95% CI 1.4-30 [4]; 12.67, 95% CI 1.43-112.0[5]), and in patients under 45 (adjusted OR  
27 5.03 95% CI 1.58–16.07 [6]). However, the causal nature of this association has recently been called  
28 into question by the findings of one case-crossover study [7]. Although demonstrating an association  
29 between vertebrobasilar stroke and chiropractic care in patients under 45 (adjusted OR 3.13,95% CI  
30 1.48–6.63), a comparable relationship was found between vertebrobasilar stroke and primary care  
31 practitioner visits (adjusted OR 3.57, 95% CI 2.17–5.86). The authors suggest that the increased risk  
32 after chiropractic treatment may be an artefact of patients seeking care for neck pain resulting from  
33 existing vertebral artery dissection and that their results indicate no excess risk associated with  
34 chiropractic treatment. This finding certainly suggests that some cases of vertebrobasilar stroke may  
35 be misattributed to manipulation but to rule out all association ignores the possibility of three  
36 distinct clinical populations: patients experiencing spontaneous dissection (who largely consult their  
37 GP but may present to a manipulative therapist), patients experiencing spontaneous dissection in  
38 which the clinical sequelae is potentially worsened by manipulation, and dissection specifically  
39 induced by manipulation.  
40  
41  
42  
43  
44  
45  
46  
47

48 To conclude that all adverse neurovascular events seen post-manipulation are the manifestation of a  
49 pre-existing spontaneous dissection is at odds with a number of findings. This interpretation is not  
50 congruent with the results of a previous case-control study which reported that manipulation  
51 remained an independent risk factor for dissection after controlling for the prior presence of neck  
52 pain (adjusted OR 6.62, 95%CI 1.4-30)[4], nor is it consistent with the finding that patients with  
53 vertebral artery dissection and previous exposure to manipulation are more likely to present with  
54 damage to the more mechanically vulnerable upper cervical portion of the artery than those without  
55 exposure (increase in prevalence ratio attributable to manipulation 4.14) [8]. Furthermore, patients  
56 presenting with conditions that do not share symptoms with vertebral artery dissection (such as low  
57 back pain) have reported neurovascular complications following neck manipulation [9], and it  
58 appears the vast majority of reported cases of vertebral artery dissection and stroke after manual  
59  
60

1  
2  
3 therapy have followed chiropractic care rather than osteopathy or physiotherapy, where  
4 manipulation is used less frequently [9]. While causality is not proven, legitimate concerns remain  
5 regarding the risk of such serious events. Whether there are factors that leave some patients more  
6 susceptible to VAD remains a matter of conjecture [1,5] and there are no satisfactory screening  
7 procedures that acceptably mitigate this risk [5]. It follows that neck manipulation should only be  
8 used if there is substantial and unique benefit associated with this technique.  
9  
10

11  
12 On this point the literature is clearer. A recent Cochrane review of randomised controlled trials of  
13 neck manipulation or mobilisation concluded that as a stand-alone treatment, manipulation  
14 provides only moderate short-term pain relief versus waiting list control, sham manipulation or  
15 muscle relaxants (standardised mean difference (SMD) -0.90, 95%CI -1.78 to -0.02 ), is unlikely to  
16 offer meaningful long term benefit for people with neck pain, and does not appear to be superior to  
17 other manual therapy techniques such as cervical mobilisations (SMD -0.07, 95%CI -0.47-0.32 [10]. A  
18 recent clinical trial suggests this equivalence remains even in patients who the clinician deemed  
19 particularly suitable for manipulation [11]. Other recent large, high-quality randomised trials  
20 reinforce the message that manipulation is not superior when directly compared with, and confers  
21 no additional benefit when added to, other physical interventions such as exercise [12,13].  
22  
23  
24  
25  
26

27 Given the equivalence in outcome with other forms of therapy, manipulation appears to be clinically  
28 unnecessary. The potential for catastrophic events and the clear absence of unique benefit lead to  
29 the inevitable conclusion that cervical spine manipulation should be abandoned as part of  
30 conservative care for neck pain. In the interests of patient safety, we suggest that regulatory and  
31 professional bodies associated with professions which utilise manual therapy should consider the  
32 adoption of formal policies in this regard.  
33  
34

### 35 References

- 36 1. Debette S, Leys D. Cervical-artery dissections: predisposing factors, diagnosis and outcome. *Lancet*  
37 *Neurol* 2009; 8: 668–78
- 38 2. Boyle E, Côte P, Grier AR, Cassidy JD. Examining vertebrobasilar artery stroke in two Canadian  
39 provinces. *J Manipulative Physiol Ther* 2009;32:S194-S200
- 40 3. Ernst E. Adverse effects of spinal manipulation: a systematic review. *J R Soc Med* 2007;100:330–  
41 338
- 42 4. Smith WS, Johnston SC, Skalabrin EJ, Weaver M, Azari P, Albers GW, Gress DR. Spinal manipulative  
43 therapy is an independent risk factor for vertebral artery dissection. *Neurology*. 2003; 60: 1424-8.
- 44 5. Thomas LC, Rivett DA, Attia JR, Parsons M, Levi C. Risk factors and clinical features of  
45 craniocervical arterial dissection. *Manual Therapy*. 2011; 16: 351-56.
- 46 6. Rothwell DM, Bondy SJ, Williams JI, Bousser MG. Chiropractic manipulation and stroke: a  
47 population-based case-control study. *Stroke*. 2001; 32: 1054-60.
- 48 7. Cassidy JD, Boyle E, Côté P, He Y, Hogg-Johnson S, Silver FL, Bondy SJ. Risk of vertebrobasilar  
49 stroke and chiropractic care. Results of a population-based case-control and case-crossover study.  
50 *Spine*. 2008; 33: S176-83.  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3  
4  
5  
6  
7  
8. Kawchuk GN, Jhangri GS, Hurwitz EL, Wynd S, Haldeman S, Hill MD. The relation between the spatial distribution of vertebral artery compromise and exposure to cervical manipulation. *J Neurol*. 2008; 255: 371-7.
- 8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
9. Ernst E. Vascular accidents after neck manipulation: cause or coincidence? *Int J Clin Pract*. 2010; 64: 673-7.
10. Gross A, Miller J, D'Sylva J, Burnie SJ, Goldsmith CH, Graham N, Haines T, Brønfort G, Hoving JL. Manipulation or mobilisation for neck pain. *Cochrane Database of Systematic Reviews*. 2010; Issue 1. Art. No.: CD004249. DOI: 10.1002/14651858.CD004249.pub3.
11. Leaver AM, Maher CG, Herbert RD, Latimer J, McAuley JH, Jull G, Refshauge KM. A randomized control trial comparing manipulation with mobilization for recent onset neck pain. *Arch Phys Med Rehabil*. 2010; 91: 1313-8.
12. Evans R, Bronfort G, Schulz C, Maiers M, Bracha Y, Svendsen K, Grimm R Jr, Garvey T, Transfeldt E. Supervised Exercise with and Without Spinal Manipulation Perform Similarly and Better Than Home Exercise for Chronic Neck Pain: A Randomized Controlled Trial. *Spine*. 2011; Epub ahead of print
13. Bronfort G, Evans R, Anderson AV, Svendsen KH, Bracha Y, Grimm RH. Spinal manipulation, medication, or home exercise with advice for acute and subacute neck pain: a randomized trial. *Ann Intern Med*. 2012; 156: 1-10.

The Corresponding Author has the right to grant on behalf of all authors and does grant on behalf of all authors, a worldwide licence to the Publishers and its licensees in perpetuity, in all forms, formats and media (whether known now or created in the future), to i) publish, reproduce, distribute, display and store the Contribution, ii) translate the Contribution into other languages, create adaptations, reprints, include within collections and create summaries, extracts and/or, abstracts of the Contribution, iii) create any other derivative work(s) based on the Contribution, iv) to exploit all subsidiary rights in the Contribution, v) the inclusion of electronic links from the Contribution to third party material where-ever it may be located; and, vi) licence any third party to do any or all of the above.

All authors have completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available on request from the corresponding author) and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

Benedict M Wand, Peter J Heine and Neil E O'Connell all played a key role in the conception, drafting and revising of this manuscript critically for important intellectual content, and in the final approval of the version to be published.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

Benedict M Wand, Peter J Heine and Neil E O’Connell are the guarantors of this manuscript and accept full responsibility for the work and controlled the decision to publish.

Confidential: For Review Only