

Fehlings et al respond

We wish to thank Joost J. van Middendorp for his interest in our research article entitled “Early versus delayed decompression for traumatic cervical spinal cord injury: results of the Surgical Timing in Acute Spinal Cord Injury Study (STASCIS),” which was published in the *PLoS One* journal earlier this year [1]. Surgical Timing in Acute Spinal Cord Injury Study (STASCIS) enrolled a total of 313 patients with cervical spinal cord injury (SCI) from six North American centers over a 7-year study period and represents the largest prospective analysis performed to date investigating the optimal timing of surgery for traumatic SCI.

In his letter, Dr van Middendorp suggests that our analysis contains a technical mistake. He attempts to demonstrate that an alternative analysis of the data would lead to a non-statistically significant association between the timing of surgery and the American Spinal Injury Association impairment scale grade conversion. However, Dr van Middendorp’s analysis is incorrect, as he is excluding 30% of the sample population, thus reducing the statistical power of his analysis to a mere 59%. Such an underpowered analysis has an unacceptably high possibility of Type II error (ie, finding a nonsignificant difference when one actually exists), and this is likely what accounts for his observation. Dr van Middendorp should be aware of the limitations associated with performing an underpowered analysis when he discusses the statistical power of our study in his letter. Finally, even his underpowered subgroup manipulation of our data demonstrated that 26.8% of early surgery patients experienced at least a 2 American Spinal Injury Association impairment scale grade improvement compared with 13.6% of patients who underwent late decompression. Although this post hoc analysis demonstrates superior improvement in the early surgery group, for the reasons listed previously, we stand by the results of the primary analysis indicating a statistically significant result favoring the early surgery group. The statistical approach chosen in our article is not only statistically correct but also simple and interpretable, allowing spinal care practitioners to incorporate our findings when making treatment decisions and counseling patients.

We have recently published a smaller prospective Canadian study investigating the impact of surgical timing on motor recovery after SCI that corroborates the results of our analysis from STASCIS and reinforces the association between early surgery and improved neurologic outcomes [2]. Finally, the findings from STASCIS validate recent treatment guidelines and also reflect international practice patterns in the management of SCI [3,4].

Moving forward, we feel that duplication of previous research efforts on this topic should be avoided in favor of examining efficacy within specific SCI subgroups, evaluating for synergistic effects of decompression with other SCI therapies, and pursuing knowledge translation activities with a focus on developing SCI surgical best practice guidelines.

References

- [1] Fehlings MG, Vaccaro A, Wilson J, et al. Early versus delayed decompression for traumatic cervical spinal cord injury: results of the Surgical Timing in Acute Spinal Cord Injury Study (STASCIS). *PLoS One* 2012;7:1–8.
- [2] Wilson JR, Singh A, Craven C, et al. Early versus late surgery for traumatic spinal cord injury: the results of a prospective Canadian cohort study. *Spinal Cord* 2012 May 8 [Epub ahead of print].
- [3] Fehlings MG, Wilson JR, Dvorak MF, et al. The challenges of managing spine and spinal cord injuries: an evolving consensus and opportunities for change. *Spine* 2010;35(21 Suppl):S161–5.
- [4] Fehlings M, Rabin D, Sears W, et al. Current practice in the timing of surgical intervention in spinal cord injury. *Spine* 2010;35:166–73.

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