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LETTERS TO THE EDITOR

The INSPIRE studies for spinal cord injury

TO THE EDITOR: We read with interest the results of the INSPIRE study,[1] in which bioresorbable polymer Neuro-Spinal Scaffolds were implanted into the damaged spinal cords of patients with complete (ASIA Impairment Scale [AIS] grade A) thoracic traumatic spinal cord injuries (TSCIs) within 96 hours postinjury (Kim KD, Lee KS, Coric D, et al. A study of probable benefit of a bioresorbable polymer scaffold for safety and neurological recovery in patients with complete thoracic spinal cord injury: 6-month results from the INSPIRE study. *J Neurosurg Spine*. 2021;34[5]:808-817). The authors are currently recruiting patients into the INSPIRE 2 study, a randomized, controlled, single-blind, two-arm, multicenter trial comparing the safety and benefit of inserting the Neuro-Spinal Scaffold into the damaged spinal cord (treatment arm) versus standard-of-care open spine surgery (comparator arm) in patients with thoracic AIS grade A TSCIs.[2]

There is now evidence that, after a severe TSCI, the spinal cord swells and becomes compressed against the dura,[3] thus generating high intraspinal pressure (ISP) and reduced spinal cord perfusion pressure (SCPP).[4] ISP is local pressure at the injury site, which differs from cerebrospinal fluid (CSF) pressure above or below the site and is not effectively reduced by draining lumbar CSF.[5] Spinal cord compression by the dura results in a compartment-like syndrome; therefore, after TSCI, osseous decompression alone may not effectively decompress the injured spinal cord. This is analogous to traumatic brain injury (TBI), in which decompressive craniectomy requires opening the dura to effectively decompress the brain. Several groups have recently proposed duroplasty to treat TSCI,[6–8] and a randomized controlled multicenter trial, known as DISCUS, is underway to investigate whether bony decompression plus duroplasty improves outcome compared with bony decompression alone.[9]

Based on these observations, the authors' claim that it is the Neuro-Spinal Scaffold that probably contributes to the neurological recovery in the INSPIRE study may be premature. The neurological improvements shown in INSPIRE, and any neurological benefits of the treatment arm of INSPIRE 2 over the comparator arm, are probably due to intradural decompression, as illustrated in the article's video,[1] rather than the Neuro-Spinal Scaffold. Durotomy plus myelotomy reduces ISP and increases SCPP, which probably improves patient outcome even without inserting the Neuro-Spinal Scaffold. There are analogies between TSCI and TBI (Fig. 1): the bony plus dural decompression for TSCI being evaluated in the DISCUS

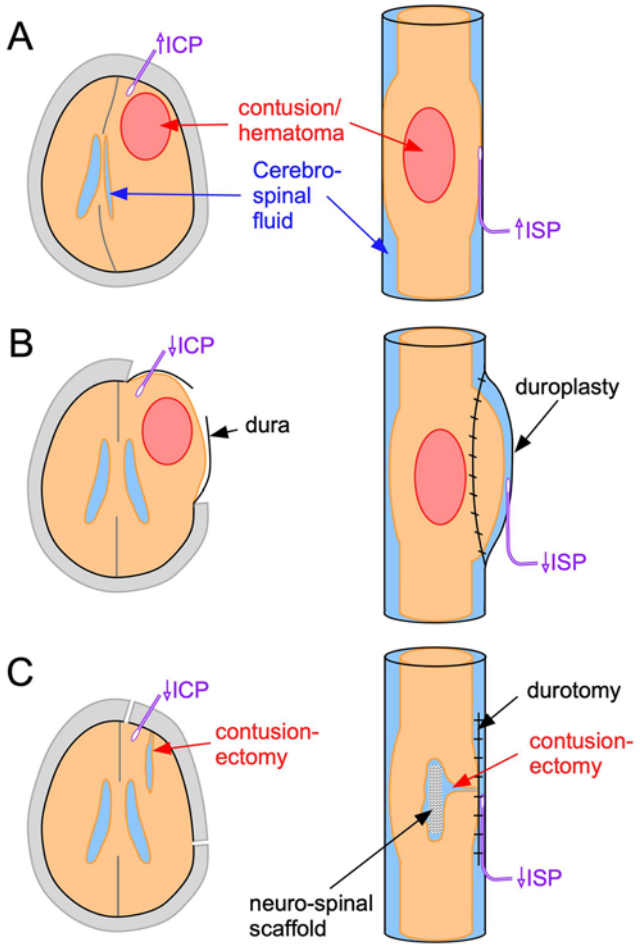

FIG. 1. Analogy between traumatic brain injury (*left*) and traumatic spinal cord injury (*right*). **A:** Contusion/hematoma causes brain or spinal cord swelling with dural cord compression, resulting in high intracranial or intraspinal pressure (ICP and ISP, respectively). **B:** Bony and dural decompression (decompressive craniectomy for TBI, duroplasty for TSCI). **C:** Contusionectomy reduces ICP and ISP. Figure is available in color online only.

trial[9] may be analogous to the decompressive craniectomy for TBI that was evaluated in the RESCUEicp trial.[10] Durotomy plus myelotomy (including evacuation of compressive hemorrhagic/necrotic material from the contusion site, as shown in the video[1]) in the INSPIRE trials for TSCI may be analogous to removing traumatic hematoma/contusion to decompress the brain in TBI.

In our view, the comparator arm in INSPIRE 2 should include durotomy plus myelotomy in addition to standard bony decompression but without inserting the Neuro-Spinal Scaffold. The currently used comparator arm (bony decompression alone) does not account for the probable beneficial effect of intradural decompression (durotomy plus myelotomy). Without addressing this issue, it may be difficult to justify inserting the Neuro-Spinal Scaffold into the spinal cords of patients with TSCI, even if the findings of the INSPIRE studies show that the surgical procedure is safe and beneficial.

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Disclosures

The authors report no conflict of interest.

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