

# Traumatic spinal cord injury

## Epidemiology

[Traumatic spinal cord injury epidemiology.](#)

## Classification

[Penetrating Spinal Cord Injury.](#)

[Acute Spinal Cord Injury.](#)

[SCIWORA.](#)

[Spinal cord concussion](#) is a variant of [mild spinal cord injury](#).

see also [Cervical traumatic spinal cord injury](#).

## Pathophysiology

[Traumatic spinal cord injury pathophysiology.](#)

## Diagnosis

[Traumatic spinal cord injury diagnosis.](#)

Following diagnosis, several interventions need to be rapidly applied, including haemodynamic monitoring in the intensive care unit, early surgical decompression, blood pressure augmentation and, potentially, the administration of methylprednisolone. Managing the complications of SCI, such as bowel and bladder dysfunction, the formation of pressure sores and infections, is key to address all facets of the patient's injury experience <sup>1)</sup>.

## Outcome

[Traumatic spinal cord injury outcome.](#)

## Prognosis

[Traumatic spinal cord injury prognosis.](#)

## Treatment

see [Traumatic spinal cord injury treatment](#).

## Case series

Fifteen TSCI patients and fifteen non-TSCI patients were prospectively recruited from [Aarhus University Hospital, Denmark](#). [Peripheral blood](#) (PB) and [cerebrospinal fluid](#) (CSF) were collected at median day 0 [IQR: 1], median day 9 [IQR: 2], and median day 148 [IQR: 49] after injury. PB and CSF were analyzed for [immune cells](#) by [flow cytometry](#), [cytokines](#) by multiplex immunoassay, and BSCB integrity by IgG Index.

Eleven TSCI patients completed follow-up. Results showed alterations in innate and adaptive immune cell counts over time. TSCI patients had significantly increased cytokine concentrations in CSF at the first and second follow-up, while only concentrations of interleukin (IL)-4, IL-8, and tumor necrosis factor- $\alpha$  remained significantly increased at the third follow-up. In PB, TSCI patients had significantly increased IL-6, IL-8, and IL-10 concentrations and significantly decreased interferon- $\gamma$  concentrations at the first follow-up. Results further showed increased IgG Index indicative of BSCB disruption in seven TSCI patients at the first follow-up, five TSCI patients at the second follow-up, and two patients at the third follow-up.

The results suggest that TSCI mainly triggers innate inflammatory responses that resolves over time, although with some degree of non-resolving inflammation, particularly in CSF. The results cannot confirm BSCB disruption in all TSCI patients <sup>2)</sup>.

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Sixty-four TSCI patients from [St George's University Hospitals](#), grades A-C (American spinal injuries association Impairment Scale, [AIS](#)), were analyzed. For 24 h after surgery, Hogg et al. monitored ISP and SCPP and computed SCPPopt (SCPP that optimizes pressure reactivity). They studied how well 28 factors correlate with mean ISP or SCPPopt including 7 patient-related, 3 injury-related, 6 management-related, and 12 preoperative MRI-related factors.

All patients underwent surgery to restore normal spinal alignment within 72 h of injury. Fifty-one percentage had U-shaped sPRx versus SCPP curves, thus allowing SCPPopt to be computed. Thirteen percentage, all AIS grade A or B, had no U-shaped sPRx versus SCPP curves. Thirty-six percentage (22/64) had U-shaped sPRx versus SCPP curves, but the SCPP did not reach the minimum of the curve, and thus, an exact SCPPopt could not be calculated. In total 5/28 factors were associated with lower ISP: older age, excess alcohol consumption, nonconus medullaris injury, expansion duroplasty, and less intraoperative bleeding. In a multivariate logistic regression model, these 5 factors predicted ISP as normal or high with 73% accuracy. Only 2/28 factors correlated with lower SCPPopt: higher mean ISP and conus medullaris injury. In an ordinal multivariate logistic regression model, these 2 factors predicted SCPPopt as low, medium-low, medium-high, or high with only 42% accuracy. No MRI factors correlated with ISP or SCPPopt.

Elevated ISP can be predicted by clinical factors. Modifiable factors that may lower ISP are: reducing surgical bleeding and performing expansion [duroplasty](#). No factors accurately predict SCPPopt; thus,

invasive monitoring remains the only way to estimate SCPPopt<sup>3)</sup>.

1)

Ahuja CS, Wilson JR, Nori S, Kotter MRN, Druschel C, Curt A, Fehlings MG. Traumatic spinal cord injury. Nat Rev Dis Primers. 2017 Apr 27;3:17018. doi: 10.1038/nrdp.2017.18. Review. PubMed PMID: 28447605.

2)

Wichmann TO, Kasch H, Dyrskog S, Høy K, Møller BK, Krog J, Hviid CVB, Hoffmann HJ, Rasmussen MM. The inflammatory response and blood-spinal cord barrier integrity in [traumatic spinal cord injury](#): a prospective pilot study. Acta Neurochir (Wien). 2022 Oct 3. doi: 10.1007/s00701-022-05369-6. Epub ahead of print. PMID: 36190569.

3)

Hogg FRA, Gallagher MJ, Chen S, Zoumprouli A, Papadopoulos MC, Saadoun S. Predictors of Intraspinal Pressure and Optimal Cord Perfusion Pressure After Traumatic Spinal Cord Injury. Neurocrit Care. 2018 Oct 16. doi: 10.1007/s12028-018-0616-7. [Epub ahead of print] PubMed PMID: 30328047.

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