Effects of Traumatic Brain Injuries and Spinal Cord Injuries on Spine Surgery Outcomes

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Disclosure

• No relevant disclosures
• All disclosures can be found on http://www7.aaos.org/education/disclosure/search
Introduction

- **Traumatic spinal cord injuries (SCI)** are a major cause of morbidity and mortality
  - Can lead to chronic impairment and disability

- SCI has also been found to be associated with several other injuries, particularly **traumatic brain injuries (TBI)**

- Both injuries have the potential to be catastrophic, and patients who sustain them concurrently are often difficult to manage, with the clinical consequences of each diagnosis capable of compounding the other

- Frequency of patients with comorbid SCI and TBI and their surgical treatments remain controversial in the literature
Material and Methods: Retrospective Cohort Study

Data: Nationwide Inpatient Sample (NIS) hospital discharge data from 2005 to 2013

Inclusion criteria:

• SCI: with and without fracture, TBI: skull fracture, intracranial injury, injury to the optic nerves and pathways, and unspecified head injury
  – With available data regarding time from admission to surgical procedure

• Statistical Analysis:

  • Clusters analysis determined greatest post-op complications within SCI-TBI groups.
  • Groups were compared using t-tests and chi-squared tests for continuous and discrete variables, respectively.
  • Analysis was performed using SPSS; statistical significance was set to p < 0.05
Results: Cohort Overview

• 61,195 patients included
  – 49.9 years old
  – 26% Female
  – Length of Hospital Stay: 14.1 days

• 12,231(20%) of those with SCI, also had concurrent TBI
Results: Mechanisms of Injury (MOI)

**SCI Only**
- 45.3% fall
- 29.8% car accidents
- 16.9% pedestrian accidents
- 5.8% assault
- 5.5% sports related

**SCI-TBI**
- 40.8% car accident
- 27.8% fall
- 26.7% pedestrian accidents
- 9.1% motorcycle accidents
- 5.2% miscellaneous accidents

- Fall-related and assault MOIs were more common for only traumatic SCI patients.
- SCI-TBI patients had significantly more MVAs, pedestrian accidents, and motorcycle accidents ($p<0.001$)
- SCI-TBI patients had more overall concurrent injuries (55.1% vs 18.3%, $p<0.001$)
Results: Surgical Overview

• Procedures rates:
  – 41.5% spinal fusion (30.7% anterior, 2.4% posterior)
  – 5.9% interbody device placement
  – 5.9% decompression only

• Overall, patients with concurrent SCI and TBI underwent fewer spinal fusions ($p<0.001$) and had a lower invasiveness score than those with just SCI (2.13 vs 2.77, $p<0.001$).

• Overall operative rates between SCI and SCI-TBI groups were not significant (63.3% vs 63.1%, $p=0.681$)
Results: Postoperative Outcomes-SCI-TBI vs SCI

• 18% of SCI-TBI patients **died** during their length of stay versus 7% of SCI patients (p<0.001).

• SCI-TBI patients had:
  - Increased **LOS** (p<0.001)
  - More **total hospital charges** ($197,226.35 vs $147,833.13, p<0.001)
  - More **post-op complications** (48.2% vs 39.5%, p<0.001)

• **Clusters analysis** determined the 5 most frequent SCI-TBI complications within the postop period:
  1. 18.5% acute respiratory distress syndrome
  2. 13.8% anemia
  3. 10.7% traumatic shock
  4. 6.9% bowel-related issues
  5. 4.1% bladder concerns
Discussion

• Estimated rates of co-occurring TBIs in SCI patients varies widely in the literature, which could be potentially explained by factors such as the sensitivity and specificity of diagnostic measures for TBI and the variability of diagnostic measures used in different studies.

• SCI-TBI patients had more overall concurrent injuries (55.1% vs. 18.3%), both major (51.9% vs. 15.2%) and minor (13% vs. 5.4%), than SCI-only patients.
  – This is likely related to the MOI, as an additional TBI diagnosis suggests a more serious injury, and mechanisms such as motor vehicle collisions that are more likely to cause co-occurring SCI and TBI are also likely to cause additional injury.
Summary

• One fifth of patients with traumatic spinal cord injury had concurrent traumatic brain injury.

• While the most common mechanism for SCI were falls, those who obtained both injuries were mostly caused by motor-vehicle accidents.

• Though surgical rate was similar for SCI and concurrent SCI and TBI groups, fusion rate and invasiveness was lower in patients with both injuries, while postop complications increased significantly.