

ORIGINAL ARTICLE

Traumatic Brain Injury in Patients With Traumatic Spinal Cord Injury: Clinical and Economic Consequences

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ABSTRACT. Bradbury CL, Wodchis WP, Mikulis DJ, Pano EG, Hitzig SL, McGillivray CF, Ahmad FN, Craven BC, Green RE. Traumatic brain injury in patients with traumatic spinal cord injury: clinical and economic consequences. *Arch Phys Med Rehabil* 2008;89(12 Suppl 2):S77-84.

Objective: To evaluate the clinical and economic burden of traumatic brain injury (TBI) in people with traumatic spinal cord injury (SCI).

Design: Prospective, case-matched control study.

Setting: Inpatient spinal cord rehabilitation program.

Participants: Patients (n = 10) diagnosed with traumatic SCI and concomitant TBI matched to an SCI-only control group.

Interventions: Not applicable.

Main Outcome Measures: Inpatient rehabilitation length of stay, health care costs (patient care hours), clinician resource allocation, behavioral and critical incidents, FIM, Personality Assessment Inventory, and neuropsychological assessment findings.

Results: Prolonged loss of consciousness, increased rehabilitation costs, and greater demands on clinician resources (trend) were found in the SCI with TBI group relative to the SCI-only group. Neuropsychological test performance was significantly worse in the SCI with TBI group, while the FIM cognition score did not discriminate because of ceiling effects. Greater evidence of psychopathology was observed in the SCI with TBI group.

Conclusions: The presence of TBI in SCI has a range of clinical and economic consequences. This dual diagnosis has the potential to affect SCI rehabilitation negatively, as well as quality of life and reintegration in the community. Specialized care appears to be needed to improve outcomes and to minimize clinical and economic burden, but further research is required.

Key Words: Brain injuries; Rehabilitation; Spinal cord injuries.

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THE CO-OCCURRENCE OF TBI with traumatic SCI represents a comorbidity with debilitating consequences. This dual diagnosis can pose clinical challenges that are more complex than either of these traumas on its own.¹ At present, there is a paucity of specialized dual diagnosis care, although it has been suggested that specialized care is critically needed to improve rehabilitation outcomes.¹⁻³ Aside from the complexity and expense, we suggest that the lack of specialized care may be a result of a dearth of information regarding the clinical and economic impact of TBI on patients with SCI. Thus, a fuller understanding of the impact of TBI on SCI may well be of significant clinical import.

In most cases of traumatic SCI and TBI, the causes of injury are the same, with motor vehicle collisions and falls accounting for approximately 70% of all TBI and traumatic SCI.³⁻⁵ Co-occurrence is common, with estimates of dual diagnosis ranging from approximating 25% of all traumatic SCIs to over 70%.³⁻¹⁴ Methodologic differences across studies likely explain this disparity.¹⁵ For example, incidence studies have differed in experimental design (eg, prospective vs retrospective),^{10,12-14} inclusion criteria,¹⁶ time postinjury,^{7,11,17} sampling techniques,¹⁸ and diagnostic criteria for TBI.^{1,13}

While even the most conservative estimates of dual diagnosis are of scientific interest and clinical concern, there is little research to date on its clinical and economic consequences. Conventional SCI rehabilitation involves the acquisition of new knowledge and skills in order to regain functional independence and facilitate recovery.¹⁸⁻²⁰ Cognitive sequelae would logically hamper or prolong this relearning.²¹ Moreover, behavioral sequelae might impede progress by causing patients to be branded as "difficult."²² Rehabilitation costs should also be higher if rehabilitation takes longer and/or is less effective. Arraga et al² speculated that the post-SCI medical and adjustment difficulties would be compounded by the presence of concurrent TBI; however, to our knowledge, only 2 studies have empirically examined this speculation. Richards et al²² conducted a prospective evaluation of the long-term consequences of TBI on SCI. Here, patients with dual diagnosis were compared with a matched SCI-only group on measures of

List of Abbreviations

GCS	Glasgow Coma Scale
LOC	loss of consciousness
LOS	length of stay
MRI	magnetic resonance imaging
PAI	Personality Assessment Inventory
PTA	posttraumatic amnesia
SCI	spinal cord injury
TBI	traumatic brain injury
WAIS-III	Wechsler Adult Intelligence Scale- Third Edition
WMS-III	Wechsler Memory Scale- Third Edition
WTAR	Wechsler Test of Adult Reading

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