Trends in rates of ASIA Impairment Scale conversion in traumatic complete spinal cord injury.

Marino R, Leff M, Cardenas D, Chen D, Kirshblum S, Leiby B.
1Thomas Jefferson University, Philadelphia, PA, USA; 2Sidney Kimmel Medical College at Jefferson University, Philadelphia, PA, USA; 3University of Miami, Miami, FL, USA; 4The Shirley Ryan AbilityLab, Chicago, IL, USA; 5Kessler Institute for Rehabilitation, Rutgers NJMS, West Orange, NJ, USA

Abstract

Objective: Recent studies on conversion of ASIA Impairment Scale (ASI) grades report higher rates of conversion than older studies. The purpose of this study is to examine the rate of conversion over time in persons with ASIA Impairment Scale (ASI) grade A spinal cord injury (SCI), accounting for level of injury.

Methods: Subjects were injured between 1995 and 2015, enrolled in the National SCI Database as Day-1 admissions, at least 16 years old at the time of injury, classified as ASIA A, and had an initial examination within 2 weeks of injury. Change in AIS grade was determined for subjects who had followup examinations at least 30 days post injury. Subjects were grouped in 3-year intervals and trends in AIS grade conversion were assessed for the total sample and by tetraplegia (Tetra), high paraplegia (HPara) and low paraplegia (LPara).

Results: There were 2037 subjects with usable initial examination data, of whom 1877 had a followup examination at least 30 days post injury. Average age at injury was 35.0 +/-15.4 years. SCI was classified as cervical and thoracic in 50% and 40%, respectively. Change in AIS grade differed by level of injury: between 30 days and 2 years post-injury. Subjects were grouped by level of injury at time of injury. Follow up exams were the latest of either discharge from rehabilitation or annual examination, between 30 days and 2 years post-injury. Subjects were grouped by level of injury at time of injury. Prospective followup examinations at least 30 days post injury. Subjects were grouped in 3-year intervals and trends in AIS grade conversion were assessed for the total sample and by tetraplegia (Tetra), high paraplegia (HPara) and low paraplegia (LPara).

Conclusion: Although there is some variability in rates, conversion from complete to incomplete or motor incomplete has been increasing over time, particularly for persons with tetraplegia.

References

Methods
Subjects were day-1 admissions to a SCIIS from 1995-2015, with exams within 2 weeks of injury, AIS A on admission, > 15 years old at time of injury. Follow up exams were the latest of either discharge from rehabilitation or annual examination, between 30 days and 2 years post-injury. Subjects were grouped by level of injury at admission: Tetra, C1-CB, High Paraplegia (T1-17) and Low Paraplegia (T10-T12). Change in AIS grade by time period was examined. Logistic regression was used to determine effect of time of injury (3-year intervals), level of injury, age at injury (in 10-year intervals), sex and violent vs. non-violent etiology.

Figures
Figure 1. Conversion in AIS grade over time: cervical and thoracic.
Figure 2. Conversion in AIS grade: cervical.
Figure 3. Conversion in AIS grade: high thoracic (T1-79).
Figure 4. Conversion in AIS grade: low thoracic (T10-T12).

Results
Overall there was an 18.2% rate of conversion to incomplete, and an 8.8% conversion to motor incomplete status. Conversion to incomplete increased from 11.4% in 1995-1997 to 30.5% in 2013-2015, while conversion to motor incomplete increased from 5.8% to 16.4% (Fig 1). The increased rate of conversion was most pronounced for persons with cervical SCI (Fig 2), where conversion to incomplete increased from 17.1% to 50%, and conversion to motor incomplete increased from 9.4% to 28.1%

Discussion
Rates of conversion from complete to incomplete and motor incomplete injuries have increased over the past 20 years. The reasons for this improvement in prognosis is unclear. The SCIIS database does not include the information on treatment received that might have contributed to specific factors related to conversion rates. Practices have changed over the time period of the study. Neurological guidelines recommend maintaining an elevated mean arterial pressure for 5-7 days (Ryken et al., 2013). Early surgical decompression may account for some of the improvement (Ter Wengel 2019). The effect of age may be due to other factors; older persons rarely had a violent etiology and more often had tetraplegia. Based on these findings, historical controls should be avoided in studies of interventions for neurologic recovery in complete SCI.