Impact of Initial Clinical and Imaging Parameters on Long-Term Neurological Outcomes in Acute Traumatic Cervical Spinal Cord Injury

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Introduction

The influence of initial clinical and imaging parameters on long-term outcomes following SCI has been examined in prior studies, often with inconsistent or contradictory findings. In this study, we evaluated a comprehensive set of admission parameters and analyzed their relationships with long-term neurologic recovery.

Methods

Institutional databases were used to retrospectively identify consecutive patients with cervical SCI admitted between 2008 and 2015. Admission MR studies were independently examined by 2 reviewers and stratified according to the axial T2 Brain and Spinal injury score (BASIC; score 0-4), length of intramedullary T2 lesion (IML), maximal canal compromise (MCC) and maximal spinal cord compression (MSCC). A combined axial and sagittal score (CASS) was also derived by summing the BASIC and IML scores.

Results

A total of 91 patients with a mean age of 50.9 ± 19.1 years were included. Patients with an injury severity score <25, central cord syndrome, and no associated fracture had comparatively improved neurologic recoveries (positive ASIA conversion) at 1-year (p<0.001). Higher initial BASIC scores and IML length significantly correlated with severe neurological deficits at admission (r= 0.81 and 0.72 respectively; p<0.001) and 1-year (r= 0.82 and 0.79 respectively; p<0.001). Patients with BASIC scores 3 and 4, and IML length >40 mm had decreased chance of neurologic recovery (p=0.036, 0.012, and 0.031, respectively). CASS scores of 4-5 and 6-7 were similarly associated with higher risk of severe neurological deficit on admission (p=0.010 and p<0.001, respectively) and decreased chance of neurologic recovery at 1-year (p=0.021 and p<0.001, respectively). Neurological outcome parameters were not affected by MCC or MSCC.

Conclusions

Taken together, the extent of early axial and longitudinal MRI T2-signal changes appear to reliably correlate with neurologic outcomes. The CASS provides a measurement of overall early T2-signal lesion load and appears to sensitively predict neurologic recovery at 1-year follow-up.

Demographics	n	%
Sex (male/female)	73/18	80.2/19.8
Age (mean, y)	50.9 ± 19.1	
Comorbidities (CCI >1)	33	36.3
Injury mechanism		
MVA	39	42.8
Fall from height	10	11.0
Sports injury	7	7.7
Mechanical fall	23	29.7
OHT	8	8.8
ISS		
≤25	47	51.6
>25	44	48.4
ASIA grade (admission)		
A	32	35.2
B	7	7.7
C	25	27.5
D	27	29.7
Central cord syndrome	46	50.5
Use of steroid	20	22.5
Surgery		
Decompression	4	4.3
Decompression + Fusion	66	72.5
No surgery	15	16.5
Delayed surgery	6	6.6
Injury to decompression time (<24 hours)	29	31.8
Deaths at initial admission	13	14.3
Deaths at 1 year follow-up	22	24.1
Cervical traction	20	21.9

Learning Objectives

The aim of this study is to evaluate the impact of various clinical and radiological factors on outcomes of cervical spinal cord injury patients. This is the first study to have simultaneously examined the influence of cervical T2-signal changes in axial and longitudinal directions. We also derived a novel scoring system taking into account the T2-signal imaging scores in both axes.

BASIC score and ASIA follow-up

CASS score ≤3   CASS score 4-5   CASS score >5