INTERNATIONAL SPINAL CORD INJURY DATA SETS

SPINAL COLUMN INJURY BASIC DATA SET (Version 1.0)

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Although some spinal cord injuries (SCIs) occur without concomitant spinal column fractures and or ligamentous injury[1], the vast majority of SCIs occur as a result of associated spinal column injury which often results in mechanical instability and requires potentially complex management[2, 3].

In accordance with the aims of the International SCI Data Sets[4, 5] the aim of the International SCI Spinal Column Injury Basic Data Set is to standardize the collection and reporting of a minimal amount of clinically relevant information on spinal column injury useful both for recording in daily practice and for reporting and basic analysis of spinal cord and spinal column trauma. Low intra- and inter-observer variability across cultures is desirable[6, 7]. The International SCI Spinal Column Injury Basic Data Set makes it possible to evaluate data related to spinal column injuries and achieve comparability between scientific publications on SCI.

The International SCI Spinal Column Injury Basic Data Set is applicable to skeletally mature and skeletally immature individuals with traumatic spinal cord injuries. To ensure that data are collected in a uniform manner, each variable and each response category within variables has been specifically defined. In recording occipito-cervical injury patterns, identification of the affected level and the presence or absence of ligamentous injury and translation will form a meaningful component of the basic data set.

The International SCI Spinal Column Injury Basic Data Set should be used primarily in connection with the background information collected in the International SCI Core Data Set[4,5]. The Core Data Set records the presence or absence of a spinal column injury. This data set is designed to be applied to the recording of data by clinicians working with patients who have suffered spinal and/or spinal cord trauma, with relatively little special training and with or without the input of a trained radiologist. For some research purposes, the International SCI Spinal Column Injury Basic Data Set would need to be augmented by a more detailed extended data set. As medical imaging and our understanding of its significance has progressed, so has our use of spinal injury classifications.

The complex anatomy of each vertebra and the many variations between vertebrae in different portions of the spine render simple classification of fractures and fracture dislocations challenging. Several classification schemes have been proposed over the last half century[2, 3, 8-22]. Several scoring systems for assessment of spinal column injury and the resulting symptoms have been proposed, but none has yet been generally accepted for use as a tool for the standardization of data collection. While none of these classification schemes have been long lasting, basic principles have carried from one proposed classification system to another. For a classification system to be useful, an

ideal system would be robust in terms of its simplicity, ease of use and be valid, reliable and able to predict clinical outcome.

This International SCI Spinal Column Injury Basic Data Set is based largely upon the collaborative work cited in the reference list. Although this classification may change with time as more knowledge is gained, we do expect this simple classification to retain its utility for some years.

International Spinal Cord Injury Spinal Column Injury Basic Data Set Variable Definitions and Comments (Version 1.0)

VARIABLE NAME: Penetrating/blunt injury

DESCRIPTION: This variable documents the mechanism of injury

LENGTH: 1

FORMAT: Numeric

CODES: 0 - Blunt

1 - Penetrating

9 - Unknown

COMMENTS: Blunt injury is defined as an injury where damage to the neural elements is caused by an impact that was transferred through the patient's tissues without penetrating the skin and thus potentially penetrating the underlying spine.

Penetrating injury is defined as an injury where damage to the neural elements was caused by a piercing object or projectile (such as a knife, bullet or shrapnel).

VARIABLE NAME: Spinal column injury-(ies)

DESCRIPTION: This variable documents whether there was any disruption through the spinal column including the bony vertebral elements and their supporting ligaments, capsules, discs, and other supporting soft tissues.

LENGTH: 1

FORMAT: Numeric

CODES: 0 - No

1 - Yes

9 - Unknown

COMMENTS: Injury through the spinal column is defined as any break, rupture, ligament tear, disruption, or crack through the bony vertebral elements or through the non-bony disc and ligamentous soft tissues between the vertebrae from the occipital condyles to the sacrum. Patients with cervical spondylosis and spinal stenosis may suffer a traumatic spinal cord injury without a spinal column injury.

VARIABLE NAME: Single or multiple level spinal column injury-(ies)

DESCRIPTION: In the presence of an injury through the spine, this variable documents whether there is a single level spinal column injury or if there are multiple levels involved. Definitions of these terms are described in the comments

LENGTH: 1

FORMAT: Numeric

CODES: 0 – Single Level Spinal Column Injury involves one or more adjacent vertebral levels and/or one or more adjacent and contiguous motion segments

1 – Multiple – There are two or more discrete spinal column injuries, each separated by at least one intact vertebral level.

9 - Unknown

COMMENTS: Being able to distinguish between single versus multiple levels of spinal column injury is often challenging. Critical to this distinction is the fact that a single injury may occur; i) at one vertebral level (e.g. C6 Burst Fracture); ii) at a single motion segment (e.g. a C5-6 bilateral facet dislocation) where a motion segment is defined as two adjacent vertebrae and their interconnecting discs and ligamentous structures; or iii) over two or more adjacent and contiguous motion segments (e.g. a “teardrop” fracture of C6 where the injury spans C5-C7).

Alternately, a multiple level injury consists of two or more single column injuries separated by at least one completely intact vertebra or motion segment (e.g. a C5-6 facet dislocation and a C2 hangman’s fracture). See figures 1, 2, and 3.

VARIABLE NAME: Spinal column injury number

DESCRIPTION: This variable documents the number assigned to the spinal column injury that is described in the variable below "Spinal column injury level". The spinal column injuries are assigned numbers starting with the most cephalic spinal column injury.

LENGTH: 1-2

FORMAT: Numeric

CODES: 1 – Most cephalic spinal column injury involving one or more adjacent vertebral levels and/or one or more adjacent and contiguous motion segments

2 – If there are two or more discrete spinal column injuries, this is the second most cephalic spinal column injury involving one or more adjacent vertebral levels and/or one or more adjacent and contiguous motion segments separated by at least one intact vertebral level to the above or below spinal column injury.

3, 4, etc. If there are three or more discrete spinal column injuries, this is the third, fourth, etc. most cephalic spinal column injury involving one or more adjacent vertebral levels and/or one or more adjacent and contiguous motion segments separated by at least one intact vertebral level to the above or below spinal column injury.

99 - Unknown

COMMENTS: The code 99 should be used only if the number of levels of spinal column injuries is completely unknown.

VARIABLE NAME: Spinal column injury level

DESCRIPTION: This variable documents each of the level(s) of the spinal-injured vertebra(e). For a single vertebral level injury, e.g. burst fracture, the affected level is identified. For a single motion segment injury, e.g. a C 5-6 facet dislocation, both the cephalad and caudad of the two adjacent vertebrae are identified and separated by a dash (-).

The prefix “v” signifies that we are referring to the spinal column level (or vertebral level) and thus serves to distinguish the spinal column injury level from the neurological level.

LENGTH: 4 to 9

FORMAT: Character

CODES: vC00-vC07 - Cervical (C0-C7)

vT01-vT12 - Thoracic (T1-T12)

vL01-vL05 - Lumbar (L1-L5)

vS01 - vSacrum (S1-S5)

vC99 – Unknown cervical (C0-C7)

vT99 – Unknown thoracic (T1-T12)

vL99 – Unknown lumbar (L1-L5)

vS99 – Unknown sacral (S1-S5)

vX99 - Unknown level

COMMENTS: vC00 represents C0 and is the occiput.

The code vX99 should be used only if the level is completely unknown.

In the case of multiple spinal injuries, a separate entry will be completed for each spinal column injury level.

VARIABLE NAME: Disc and posterior ligamentous complex injury

DESCRIPTION: This variable documents for each of the level(s) of the spinal-injured vertebra(e) whether there was evidence of either a disc or a posterior ligamentous complex injury (occiput to sacrum).

LENGTH: 1

FORMAT: Numeric

CODES: 0 - No

1 - Yes

9 - Unknown

COMMENTS: Posterior ligamentous complex injury will be defined as the presence of acute disruption or injury to the posterior ligamentous complex through the spinal column from the occiput to the level of the sacrum. Acute injury to the posterior ligamentous complex will be diagnosed clinically or radiographically[23-26]. Clinical evidence relies on the presence of marked local bruising and/or a palpable interspinous gap possibly with local tenderness. Radiologic diagnosis is dependent on the existence of a widened interspinous space on AP or lateral x-ray or reformatted CT of the spine, or by appropriate MRI. It may also appear as avulsion of a bone from the spinous processes or lamina.

Disc Injury will be defined as a traumatic disruption of the annulus of the disc through either distraction, translation, or rotation[12, 20, 24]. It will also include a traumatic disc protrusion causing a spinal cord injury. Isolated traumatic disc injuries commonly occur with hyper-extension mechanisms in the cervical spine. When a traumatic injury to the disc and annulus occurs in association with posterior element distraction, subluxation, or dislocation, this will be recorded as a disc and posterior ligamentous complex injury.

In the case of multiple spinal column injuries, a separate entry will be filled out for each level of spinal column injury.

VARIABLE NAME: Traumatic translation

DESCRIPTION: This variable documents for each of the spinal column injury level(s) whether there was any traumatic translation. (occiput to sacrum)

LENGTH: 1

FORMAT: Numeric

CODES: 0 - No

1 - Yes

9 - Unknown

COMMENTS: Translation will be defined as sagittal and/or coronal plane mal-alignment of adjacent vertebra as seen on lateral and/or AP radiographs respectively; it consists of movement of 3.5 mm or more of one cervical vertebra on top of the adjacent vertebra or movement of 2.5 mm or more of one thoracic and lumbar vertebra on top of the adjacent vertebra[1] (on available imaging).

Malalignment that was caused by a degenerative process such as degenerative spondylolisthesis is not considered traumatic translation, and the value "0" (No) should be recorded.

In the case of multiple spinal injuries, a separate entry will be filled out regarding each level.

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International Spinal Cord Injury – Spinal Column Injury Basic Data Set Form

Penetrating/blunt injury □ Blunt □ Penetrating □ Unknown

Spinal column injury □ No □ Yes □ Unknown

Single or multiple spinal column level injury (-ies)

□ Single □ Multiple □ Unknown

Spinal Column Injury (one to be filled in for each level of injury, starting with the most cephalic injury):

Spinal column injury number _ _ _ _

Spinal column injury level _ _ _ _

vC00-vC07 - Cervical (C0-C7)

vT01-vT12 - Thoracic (T1-T12)

vL01-vL05 - Lumbar (L1-5)

vS01 – vS05 - Sacrum (S1-5)

vC99 – Unknown Cervical (C0-C7)

vT99 – Unknown Thoracic (T1-T12)

vL99 – Unknown Lumbar (L1-L5)

vS99 – Unknown Sacral (S1-S5)

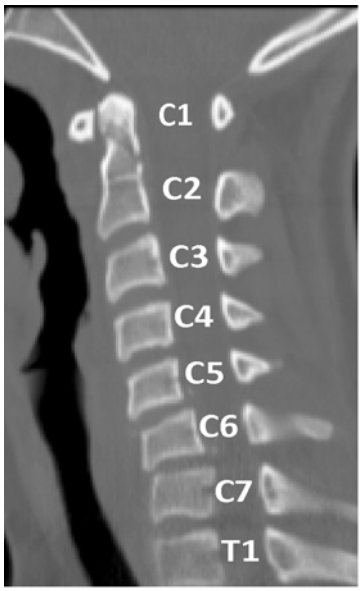
vX99 - Unknown level

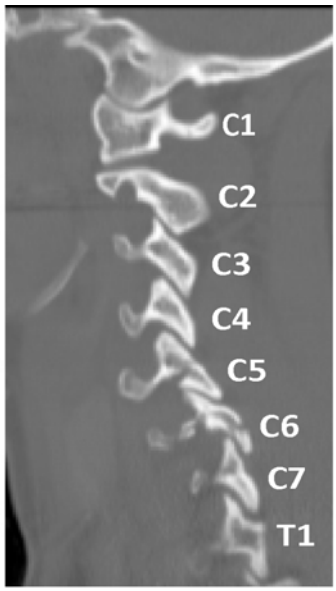
Disc / Posterior ligamentous complex injury

□ No □ Yes □ Unknown

Traumatic translation □ No □ Yes □ Unknown

Figure 1: This patient has sustained multiple closed injuries of the cervical spine. In addition to the Type II odontoid fracture, there are fractures of the C5 and C6 facet joints with a subluxation at both the C5-6 and C6-7 levels.



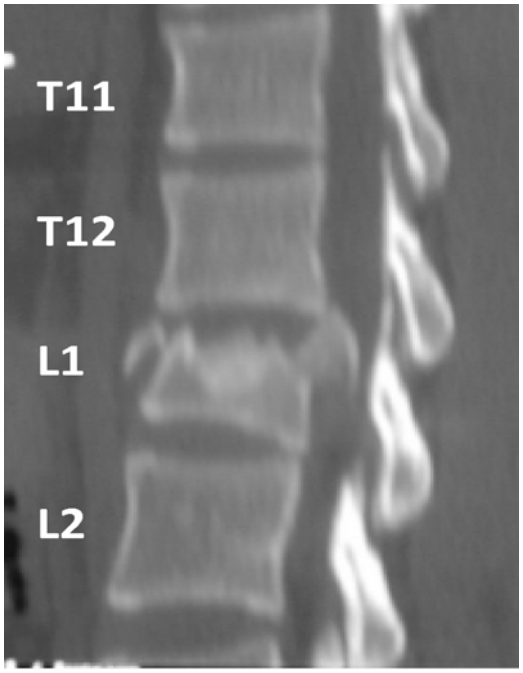


Blunt Injury
Spinal Column Injury: Yes
Multiple Injuries

Spinal Column Injury #1
vC02;
Disc/PLC: No
Translation: No

Spinal Column Injury #2
vC05-vC07
Disc/PLC: Yes
Translation: Yes

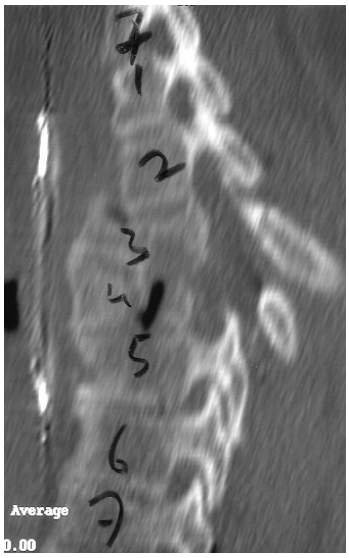
Figure 2: This patient has sustained an L1 Burst fracture without ligament injury.



Blunt Injury
Spinal Column Injury: Yes
Single Injury

Spinal Column Injury #1
vL01;
Disc/PLC: No
Translation: No

Figure 3: This patient sustained a complex thoracic fracture dislocation with an incomplete thoracic level spinal cord injury involving several vertebrae and segments from T3 to T5, multiple transverse process and spinous process fractures are observed on imaging.



Blunt Injury
Spinal Column Injury: Yes
Single Injury

Spinal Column Injury #1
vT02-vT05;
Disc/PLC: Yes
Translation: Yes