Spinal Cord Concussion

Spinal cord concussion is a variant of mild spinal cord injury, clinically designated as transient paraplegia or neurapraxia, and characterized by variable degrees of sensory impairment and motor weakness that typically resolve within 24–72 hours without permanent deficits [1) 2) 3)].

Classification

A grading system was developed based on the duration of symptoms, ranging from Grade I (< 15 minutes) to Grade III (> 24 hours) [4) 5)].

Etiology

Spinal cord concussion is predominantly a sport-related injury occurring in a wide variety of contact sports in adult and pediatric athletes including wrestling, hockey, gymnastics, and diving, but most commonly in American football, although spinal concussions can also occur after minor car accidents as “whiplash injuries” and falls [6)].

In the series of Del Bigio et al., spinal cord concussion is often associated with pre-existing vertebral abnormalities that result in narrowing of the spinal canal or areas of hypermobility [7)].

In the series of Asan et al., as a result of the vertebral column being affected by vertical forces, the most frequently affected are the thoracic segments of the spinal cord. These cases show similarities to real SCIWORA cases when evaluated along with clinical and radiological symptoms. Absolute differential diagnosis from real SCIWORA cases cannot be made until total neurological recovery takes place [8)].

In the series of Zwimper et al., concussion occurred at the two most unstable spinal regions, 16 involving the cervical spinal and three the thoracolumbar junction. Fifteen cases presented with combined sensorimotor deficits, while four exhibited only sensory disturbances. Many patients showed signs of recovery with the first few hours after injury and most had completely recovered within 24 hours. Only one case involved an unstable spinal injury. There was no evidence of ligamentous instability, spinal stenosis, or canal encroachment in the remaining 18 cases. Two patients, both children, suffered recurrent SCC injuries. No delayed deterioration or permanent cord injuries occurred. Spinal abnormalities that would predispose the spinal cord to a compressive injury were present in only one of the 19 cases. This suggests that, as opposed to direct cord compression, SCC may be the result of an indirect cord injury [9)].

Case series

2018

A total of 43 cases were diagnosed with spinal concussion. All of the cases were cases of fall from height where it was determined that the vertebral column had been exposed to the effects of vertical forces and the spinal cord had been affected under the effect of vertical forces. In all cases, spinal MRI and dynamic x-ray examinations were performed at the time of admission. Clinical symptoms of the cases were recorded by scoring based on the Torg Grading System.

Cases were started on conservative treatment as radiological symptoms that would explain the clinical symptoms could not be detected. Most frequently encountered were the neurological symptoms related to the upper thoracic and lower cervical segments being affected. In 7 cases, urinary incontinence was also detected. It was determined that symptoms related to the spinal cord being affected were completely recovered in 1-3 days in all cases.

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1997

One hundred ten cases of the transient neurological phenomenon, cervical cord neurapraxia (CCN), are presented. The authors established a classification system for CCN, developed a new computerized measurement technique for magnetic resonance (MR) imaging, investigated the relationship of the cervical cord to the canal, and analyzed clinical, x-ray, and MR data. One hundred nine males and one female were included in the study; the average age of the participants was 21 years (range 13-33 years). All episodes occurred during sports participation; 87% occurred while the patient was playing football. Follow-up review lasting an average of 3.3 years was available for 105 patients (95%). Narrowing of the sagittal diameter of the cervical canal in the adult spine was confirmed to be a causative factor. Cervical cord neurapraxia was not associated with permanent neurological injury and no permanent morbidity occurred in patients who returned to contact activities. Of the patients returning to contact activities, 35 (56%) experienced a recurrent episode. The risk of recurrence was increased with smaller spinal canal/vertebral body ratio ($p < 0.05$), smaller disc-level canal diameter ($p < 0.05$), and less space available for the cord ($p < 0.05$). There was no correlation between either the classification of the CCN episode or the disease noted on MR imaging and x-ray films and the risk of recurrence. The authors conclude that: 1) CCN is a transient neurological phenomenon and individuals with uncomplicated CCN may be permitted to return to their previous activity without an increased risk of permanent neurological injury; 2) congenital or degenerative narrowing of the sagittal diameter of the cervical canal is a causative factor; 3) the overall recurrence rate after return to play is 56%; and 4) the risk of recurrence is strongly and inversely correlated with sagittal canal diameter and it is useful in the prediction of future episodes of CCN ($p < 0.001$). These data will enable the physician to counsel individuals regarding a predicted risk of recurrence based on canal measurements [11)].

1990

The clinical and radiological features of 19 SCC injuries in the general population are presented. Spinal cord injuries were classified as concussions if they met three criteria: 1) spinal trauma

immediately preceded the onset of neurological deficits; 2) neurological deficits were consistent with spinal cord involvement at the level of injury; and 3) complete neurological recovery occurred within 72 hours after injury. Most cases involved young males, injured during athletics or due to falls. Concussion occurred at the two most unstable spinal regions, 16 involving the cervical spinal and three the thoracolumbar junction. Fifteen cases presented with combined sensorimotor deficits, while four exhibited only sensory disturbances. Many patients showed signs of recovery with the first few hours after injury and most had completely recovered within 24 hours. Only one case involved an unstable spinal injury. There was no evidence of ligamentous instability, spinal stenosis, or canal encroachment in the remaining 18 cases. Two patients, both children, suffered recurrent SCC injuries. No delayed deterioration or permanent cord injuries occurred. Spinal abnormalities that would predispose the spinal cord to a compressive injury were present in only one of the 19 cases. This suggests that, as opposed to direct cord compression, SCC may be the result of an indirect cord injury [12].

1989

Thirteen cases with a variety of clinical presentations, all of which can be explained on the basis of the magnitude or direction of acceleration of the spinal cord. The cervical cord is most commonly affected, but concussion can occur at any level of the spinal cord. Spinal cord concussion is often associated with pre-existing vertebral abnormalities that result in narrowing of the spinal canal or areas of hypermobility [13].

[1] [7] [13]
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[3] [5] [11]
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[8] [10]
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