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Case Report

Pediatric Spinal Cord Contusion: A Case Report Highlighting Clinical Symptoms and Management Strategies in a 2-Year-Old Patient

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Abstract

Spinal cord injuries (SCI) can be resulted in permanent disability, often caused by high-intensity incidents such as car accidents, falls, and violent crimes. Although relatively rare in children, they can have profound effects. This case report was aimed to elucidate the clinical symptoms of Th1-Th3 spinal contusion in a 2-year-old patient. A 2-year-old boy presented to a private peripheral hospital with complaints of back pain following a traffic accident. The examination revealed complete motor weakness (0/5) in both lower extremities, with preserved sacral sparing. Thoracolumbar MRI demonstrated spinal cord contusion and edema at the level of Th1-Th3. Based on history, physical examination, and supporting tests, the patient was diagnosed with SCI ASIA Impairment Scale B and upper thoracic spinal cord contusion, leading to the decision to perform laminectomy at the Th2-Th3 level. This case underscores the importance of recognizing initial symptoms in spinal cord injury cases and being vigilant for red flags in spinal trauma cases. Prompt initial trauma treatment, such as patient immobilization, is crucial. In this instance, laminectomy decompression was undertaken to address the contusion. A high level of vigilance was required as neurological symptoms could evolve or be initially obscured. Spinal cord injuries often manifest within days of an accident, although they can remain undetected for extended periods. Cord contusions may present with neurological symptoms, necessitating prompt diagnosis via spinal magnetic resonance imaging (MRI) and potential emergency surgical intervention, such as laminectomy.

Keywords: Cord contusion; Neurosurgical procedures; Paraplegia; Spinal cord injury

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Introduction

Paediatric spinal cord injuries (SCIs) provide a distinct and intricate set of difficulties for families, researchers, and physicians. A significant number of children suffer SCIs each year for a variety of reasons, such as acquired diseases, trauma, and congenital abnormalities.[1,2] According to estimates, there is only one SCI for every 29,000 neonates. Crucially, children heal from injuries at a substantially faster rate than adults do. The degree of SCI varies by age as well; preteen groups tend to have C2 lesions, teen groups tend to have C4 lesions, and adults tend to have C4–5 lesions. Children's spinal cord injuries account for less than 4% of all SCI cases per year, according to the National Spinal Cord Injury Statistical Centre. The general health, functional skills, and quality of life of a kid are all significantly impacted by these injuries. Understanding the intricacy of

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paediatric SCIs and creating efficient therapies are therefore crucial.[1] Blunt trauma is the most common cause of spinal cord injury, while there are other causes as well. The two most common causes of spinal cord injuries are motor vehicle accidents and falls, especially in children under the age of eight.[3,4] In comparison to adults, spinal injuries in children are very rare. But if they are not properly handled, they may have serious consequences. A crucial factor is a child's spine's exceptional flexibility and resilience, which can both help and hinder treatment strategies. The substantial growth and maturation of children's spines makes them more vulnerable to particular injury patterns. A single paediatric trauma center's retrospective analysis of successive SCIs revealed that motor vehicle accidents accounted for 52% of injuries and sports injuries for 27%.[5–7] The prognosis for function recovery is greatly impacted by the degree of the spinal cord damage. Compared to complete damage, incomplete lesions have a better prognosis. After total spinal cord injuries, only 10–25% of people recover completely, whereas 64% recover partially. Prior to their growth spurt, children who had spinal trauma may develop scoliosis as a result of cord injury. When it comes to neurological injury, children have a better prognosis than adults.[8] Here we present case report aims to elucidate the clinical symptoms of Th1-Th3 spinal contusion in a 2-year-old patient.

Case

Anamnesis

A 2-year-old 8-month-old male patient was a referral from Tabanan Hospital, came with complaints of abdominal pain after a traffic accident 20 hours before admitted (26/04/24). History of unconsciousness (-), complaints of headache (-), vomiting (-), seizures (-). The mechanism of injury was that the patient was a motorcycle passenger, not wearing a helmet, was carried by his uncle then grazed by another motorcycle rider from the right and hit the rear of a parked truck with the mechanism of the front of the head hitting the truck first. History of systemic disease was denied.

Physical Examination

Primary Survey obtained clear airway, stable C-spine, spontaneous breathing, RR 18 x / minute, SpO_2 98% on NC 3 lpm, stable circulation, BP 112/80 mmHg, N 121 times per minute, CRT <2 seconds, disability pGCS E4V5M6, round pupils isochor 3 mm/3 mm, pupil reflex (+ / +) lateralization impression (-), temperature 36 ^{o}C. Secondary Survey obtained the results of the head examination, namely Vulnus Appertum Frontal region measuring 6x1cm base tissue, terhecting (+). Eye examination found periorbital hematoma (-/-), palpebral edema (-/-). Facial examination showed rhinorrhea (-/-), otorrhea (-/-). Neck examination found injury (-), midline tenderness (-). Thorax showed symmetry (+/+), Heart examination found single S1S2, regular, murmur (-). Pulmo showed Vesicular (+/ +), Rhonchi (-/-), Wheezing (-/-). Abdomen showed distension (-), tenderness (-), vulnus excoriate epigastric region, bowel sounds (+) Normal. Extremities showed warm (+/+//+/+).

On 4th day of observation, the patient complained unable to move his leg. The patient also felt hypoesthesia below the clavicle. Laboratory examination showed the normal results. Thoracic X-ray examination showed normal. Pulmonary contusion, minimal bilateral pleural effusion, currently no visible fractures and joint dislocations in the visualized thoracic region. The results of the FAST USG examination was normally obtained that there was no free echo fluid in the hepatorenal space, splenorenal space, paravesica or right and left paracolica. The appearance of free echo fluid in the right pleural cavity suggests a negative right pleural effusion.

Supporting Examination

Thoracolumbar MRI demonstrated spinal cord contusion and edema at the level of Th1-Th3 (Fig. 1). Based on history, physical examination, and supporting tests, the patient was diagnosed with SCI ASIA Impairment Scale B and upper thoracic spinal cord contusion, leading to the decision to perform laminectomy at the Th2-Th3 level.

Management

Management of the patient was head elevation

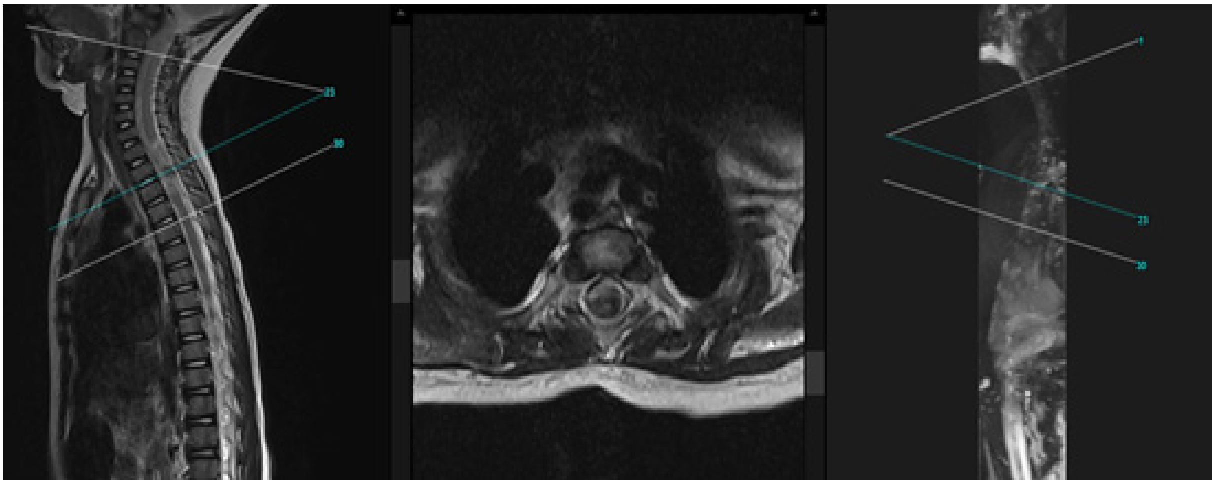

Figure 1. Thoracolumbar MRI

30^o, O_2 Nasal 2-3 lpm, IVFD D5 ¼ NS 1150 cc, Ceftriaxone 200mg every 12 hours IV, omeprazole 10mg every 12 hours IV, paracetamol 200mg every 6 hours PO, wound care every 2 days or if the wound oozes, and Th2-Th3 Decompression Laminectomy H12.

Discussion

The patient in this case is 2-year-old 8-month-old male patient who was a referral from Tabanan Hospital, came with complaints of abdominal pain after a traffic accident. Particularly according to the earlier study, the yearly incidence of SCI is roughly 54 cases per million, with a higher incidence in men than in women. Additionally, the prevalence of SCI in children has altered significantly over time. Besides that, it is believed that there is only one instance of SCI for every 29,000 neonates. According to studies, 10% of autopsies of perinatal neonatal fatalities or stillbirths have birth-related SCIs.[1] Despite being a very uncommon occurrence, spinal cord injury (SCI) before the age of 15 can have significant physiological and psychological effects. The precise frequency is unclear, however it accounts for less than 4% of all SCI cases each year without exception. The frequency rises sharply with age, with almost 30% of injuries happening between the ages of 17 and 23 and 53% happening between the ages of 16 and 30. Additionally, it is believed that children recover from SCI at a faster rate.[9] In this case, patient came with complaints of abdominal pain after a traffic accident While there are many other causes of spinal cord injuries, blunt trauma accounts for the majority of them. Falls and car crashes are the two main causes of spinal cord injuries, especially in children under the age of eight. As development progresses, sports-related injuries become more prevalent. Spinal cord injuries in teenagers and young adults can also be caused by firearm injuries and other types of violence. Spine injury can also result from neonatal birth trauma.[3,4] The pathogenesis of spinal injuries in children and adults is very different. In the following ways, the spines of children and adults are different: (1) Children's relatively large heads cause them to have a different cervical fulcrum than adults. The ligaments of children are securely affixed to more horizontal articular bone surfaces, and their vertebrae are not fully ossified. The relationship between age and spine flexibility is inverse. In youngsters, neurological damage is therefore more likely to happen than physical harm. The older one becomes, the lower the chance of cervical cord injury.[3,4]

A combination of radiographic and clinical evaluation is used to diagnose SCI. This is especially important for the paediatric population since children may have trouble verbally communicating their symptoms and because the results of diagnostic imaging may be faint. Because the growing spine has unique characteristics, scans should, if possible, be reported by a radiologist skilled in imaging the juvenile spine. The signs and symptoms that are frequently seen in paediatric spinal trauma differ according on the location and severity of the damage. Mild to severe localized pain may be experienced by children at the site of the injury. When moving or palpating the spine, the pain could get worse. Range of motion in the spine may be restricted, especially in the afflicted location. Attempts by children to bend, twist, or rotate their spines may be resulted in pain or resistance to movement. Severe spinal injuries might be resulted in obvious abnormalities.[8,10–12] Problems standing or walking may be caused by pain or damage to the nervous system. Young patients may choose to remain sitting or lie down to reduce discomfort, or they may walk irregularly. Numbness, tingling, paralysis, urine retention, and incontinence are examples of neurological symptoms. Youngsters who are older are more likely to report having paresthesias. It could result in neck pain or persistent headaches that worsen with movement or certain sitting positions. When someone loses consciousness, it may indicate a head injury and necessitate a spinal cord injury examination.[13,14]

Young patients who have had trauma should have a thorough physical examination, particularly if there are suspicions of numerous injuries. Hypotension along with tachycardia could be a sign of serious haemorrhage. Concomitant pulmonary damage may be indicated by abnormal oxygen levels and breathing rates. An examination of the skin may show contusions, abrasions, or open sores. It is important to check for symptoms of head injuries such as skull abnormalities, bruises, or scalp cuts. Evaluation of cervical spine range of motion and discomfort is also necessary. Examining the chest and abdomen may show discomfort in the chest wall, irregular breath sounds, bruises, crepitus, and tenderness in the abdomen. Bruising, haemorrhage, and bone dislocation may be discovered during a pelvic.[13,14]

A thorough diagnosis and evaluation of paediatric spine trauma is achieved by a mix of imaging testing and clinical evaluation. The approved diagnostic techniques for assessing paediatric spine trauma include radiography, CT, and MRI. The sensitivity of plain films is reduced at the craniocervical and cervicothoracic junctions, where CT scanning is extremely sensitive and specific for assessing the cervical spine. When a patient has severe blunt trauma and is unconscious, the scan should be taken. Uncertainty exists around whether a follow-up MRI is necessary or if a negative CT scan is sufficient in an unconscious patient. It is noteworthy that damage, especially in children, cannot be ruled out even in the absence of radiographic abnormalities.[15,16] SCIWORA in patients under the age of eight can be caused by spinal cord stretching. This injury is probably brought on by the elastic intervertebral ligaments and the horizontal orientation of the facet joints, which causes the upper cervical spinal parts to shift under force rather than break.[17–19]

Thoracolumbar MRI in this case demonstrated spinal cord contusion and edema at the level of Th1-Th3. Many people believe that MRI is the most sensitive imaging technique for identifying spinal cord and ligamentous lesions, especially in young patients who are susceptible to SCIWORA. An efficient way to detect spinal cord haemorrhage is with gradient-echo MRI sequences. The tectorial membrane, alar ligaments, and transverse ligaments, on the other hand, are better visible on proton-density-weighted or T2-weighted MRI sequences. Approximately 24% of children with cervical spine clearance have occult injuries that can be shown on MRI, according to studies.[13,14] CIWORA is common in children, which emphasizes how important it is to select and have access to the right imaging. On 55 children with SCIWORA, 15 of the patients had delayed onset neurological abnormalities, frequently with mild, temporary warning symptoms including subjective weakness or paraesthesia.[13]

The amount of time that passed before the degradation started varied from 30 to 96 hours. A second SCIWORA occurred in eight additional infants three days to ten weeks following the first incident. Childhood SCI is difficult to diagnose at first because of the complexities of SCIWORA, delayed onset. Magnetic resonance imaging (MRI) is advised when children have neurological spinal cord symptoms without abnormalities on X-ray or CT scans. Early neurologic outcome can be predicted using MRI, it has been demonstrated.[13,14,19] In this case, the patient underwent Th2-Th3 Decompression Laminectomy H12. Management of paediatric SCI required more than early diagnosis; it involved comprehensive acute, surgical, and rehabilitative strategies. Prior to surgery, anesthesia preparation included airway evaluation, haemodynamic stabilization, and invasive monitoring, given the high risk of cardiovascular instability in children with thoracic cord injury. Intraoperatively, meticulous neuroprotection is essential, this includes avoidance of hypoxia, hypotension, and hypothermia, as well as the use of controlled anaesthesia and neurophysiological monitoring. Postoperatively, management extends to intensive care monitoring with attention to ventilatory support, prevention of secondary spinal cord injury (e.g., maintaining mean arterial pressure above recommended thresholds), and pain control tailored to the paediatric population. Early physiotherapy and occupational therapy are vital to prevent joint contractures, promote mobility, and maintain functional independence. Bowel and bladder management, as well as prevention of complications such as pressure ulcers, deep vein thrombosis, and recurrent infections, are also crucial components of care. The multidisciplinary team, comprising neurosurgeons, anesthesiologists, intensivists, rehabilitation specialists, and nursing staff, plays a central role in optimizing outcomes.

In the paediatric population, conservative therapy approaches are frequently used since surgical fusion may delay the expected growth and anatomical changes of paediatric patients. Conservative therapy is advised when dealing with hyperextension damage, unless there is persistent compression, oedema, progressive neurologic impairment, or elevated intramedullary pressure; in these cases, immediate decompression is advised. Surgical fusion is advised for SCIs brought on by canal compression as well as spinal instability (irreducible AARF, ligamentous injuries, and irreducible fractures leading in deformity). For 12 weeks, external immobilization is advised for SCIWORA.[17,18] Long-term management focuses on rehabilitation and psychosocial support. Because spinal injury in children can have lifelong consequences, integration of educational support, counselling, and family involvement is recommended. Technological aids such as mobility devices and adaptive equipment further enhance quality of life. Advances in regenerative medicine and neurorehabilitation research continue to provide hope for improved neurological recovery in this population. The prognosis for function recovery is greatly impacted by the degree of the spinal cord damage.[4,9,20] Compared to complete damage, incomplete lesions have a better prognosis. After total spinal cord injuries, only 10–25% of people recover completely, whereas 64% recover partially. Prior to their growth spurt, children who had spinal trauma may develop scoliosis as a result of cord injury. When it comes to neurological injury, children have a better prognosis than adults.[1,8]

Conclusion

Spinal cord injuries often manifest within days of an accident, although they can remain undetected for extended periods. Cord contusions may present with neurological symptoms, necessitating prompt diagnosis via spinal MRI and potential emergency surgical intervention, such as laminectomy.

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