

Pediatric Spinal Cord Injury

A Review by Organ System



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KEYWORDS

- Pediatric spinal cord injury • Spinal cord injury without radiographic abnormality
- Spasticity • Autonomic dysreflexia • Temperature regulation • Phrenic pacer
- Neurogenic bladder • Neurogenic bowel

KEY POINTS

- Congenital and acquired pediatric spinal cord injuries (SCI) pose unique management challenges because of the dynamic nature of cognitive and physical development in the growing child and the impact of the SCI on this complex process.
- Care for children and adolescents with SCI should be developmentally based, using appropriate strategies to facilitate adjustment and maximize independence across the spectrum of physical and emotional maturity levels.
- The goal of SCI rehabilitation for children and adolescents is to maximize function and independence and to prepare them for a successful transition to adulthood.
- Depending on age at injury, the acquisition of certain skills (eg, bowel and bladder continence) may not be rehabilitation, but rather habilitation, because they may have never achieved this skill previously.



Video of tendon transfer surgery accompanies this article at <http://www.pmr.theclinics.com/>

INTRODUCTION

Congenital and acquired pediatric spinal cord injuries (SCI) pose unique management challenges because of the dynamic nature of cognitive and physical development in the growing child and the impact of the SCI on this complex process. In this

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review, an overview is provided of pediatric SCI rehabilitation management, highlighting how it differs from adult SCI management. Care for children and adolescents with SCI should be developmentally based, using appropriate strategies to facilitate adjustment and maximize independence across the spectrum of physical and emotional maturity levels. Emphasis should be placed on a family-centered approach to patient care, given the central role of parents and family in a child or adolescent's life.¹ Adolescents may not identify with the traditional pediatric model of care but are often not appropriate for an adult rehabilitation unit, which creates additional challenges when choosing the optimal therapeutic environment. Ideally, children and adolescents would receive care in a setting with age-appropriate peers having similar disabilities. However, the low incidence of pediatric SCI in the United States and the multitude of regional pediatric rehabilitation centers make the reality of a dedicated SCI unit for this population difficult to maintain and may require patients to receive care a great distance from their home and extended peer and community support network. The goal of SCI rehabilitation for children and adolescents is to maximize function and independence and to prepare them for a successful transition to adulthood. Depending on age at injury, the acquisition of certain skills (eg, bowel and bladder continence) may not be rehabilitation, but rather habilitation, because they may have never achieved this skill previously. For this reason, goal setting in therapy must be developmentally appropriate and may require a staged approach, whereby advanced level skills for a young child are deferred to a later date.

EPIDEMIOLOGY

A population-based database for SCI in the United States does not exist, and, thus, the epidemiology of pediatric and adult SCI has been extrapolated from the National SCI Statistical Center database and the Shriners Hospital SCI database. Using these data sets, the annual incidence of SCI in the United States is estimated to be between 25 and 59 new cases per million.² Assuming an average of 40 cases/million, this incidence means approximately 12,400 new SCI as estimated for the year 2010.² Of these new injuries, approximately 3% to 5% of the SCIs are in individuals younger than 15 years.^{1,3} In adolescents, as in adults, males outnumber females by a ratio of 4:1. The preponderance of males over females with SCI decreases with earlier age at onset, and by 3 years of age, the number of females with SCI equals that of male.⁴

The neurologic level of injury and degree of completeness of the SCI varies with age. For example, infants and younger children with tetraplegia are more likely to have upper cervical injuries (C1-3) compared with adolescents (C4-8), because of a disproportionately large head and underdeveloped neck musculature.⁴ The International Standards for Neurological Classification of SCI (ISCS) is the means by which the neurologic level of injury and degree of completeness is determined. In children, the reliability of the ISCS motor and sensory scores is good for children 5 years of age and older.⁵ However, the anorectal examination, which is a frequent determinant of completeness of injury, is less reliable in younger children and therefore makes comparison between children and adults challenging.

The most common cause of SCI in children and adolescents is motor vehicle crashes, followed by violence and sports.⁴ Unique causes of SCI in children include trauma resulting from lap belt injuries, child abuse, and birth injuries; and nontraumatic causes, such as instability of the upper cervical spine seen in Down syndrome, spinal stenosis seen in skeletal dysplasias, and inflammatory conditions,

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