Pediatric Thoracolumbar Spine Fracture

- Alternative Strategies to Generate Class Activation Maps Supporting AI-based Advice in Vertebral Fracture Detection in X-ray Images
- Thoracolumbar Injury Classification and Severity Scale Can Help Identify Intra-Abdominal Injury in Children Injured in an MVC
- Retrospective Review of 181 Patients with Pathologic Vertebral Compression Fractures
- Epidemiology of pediatric thoracolumbar spinal fractures and associated injuries: a single-center experience
- Pediatric Spine Trauma
- Comment on "Thoracolumbar fracture and spinal cord injury in blunt trauma: a systematic review, meta-analysis, and meta-regression"
- Frequent Unrecognized Vertebral Fractures Associated with Increased Body Fat Mass in Children and Adolescents with Duchenne Muscular Dystrophy
- The Thoracolumbar Injury Classification and Severity Score Appropriately Predicts Treatment in Children Aged 10 and Under

Classification

see Thoracolumbar Spine Fracture classification.

Systematic review

Thoracolumbar Spine Fractures represent 10-14% of pediatric fractures. Most children concerned by such fractures are above 10 years of age. No guidelines presently exist. Analysis of spine pathophysiology and of the various common therapeutic attitudes led Gavira et al. to conduct a review of the different therapeutic approaches in pediatric Thoracolumbar spine fracture using the Medline and Embase databases with the search-term “pediatric thoracic lumbar spine fractures”.

The systematic review identified 44 studies, 24 of which were selected, and 19 were included for analysis. Physiological age was categorized on Risser classification. In Risser 1 with Magerl A1 fracture, surgical treatment was not necessary and functional (rest and analgesics) or conservative treatment (bracing for 6 weeks) was sufficient. In Risser 1 with Magerl A2, A3 or B fracture, conservative treatment (bracing for 3 months) was the first-line option. In Risser 2-4, conservative treatment with bracing for 3 months was possible in the absence of instability, with kyphosis>20° and canal compression>33%; otherwise, treatment should be surgical. Subsequently, in case of onset of secondary instability, surgical treatment can be proposed. We highlight the importance of MRI assessment for diagnosis of Thoracolumbar spine fracture and associated lesions of the intervertebral discs and posterior ligament complex. Children classified as Risser 5 can undergo the same treatment as adults.

Two main parameters should be assessed in treatment decision-making for Thoracolumbar spine fracture: the Risser scale and the Magerl classification [1)].

Diagnosis

Initial imaging should include AP and Lateral plain radiographs of the entire spine.

If neurological deficits are noted MRI imaging would be the next imaging modality. MRI is also useful to determine if the posterior ligamentous complex of the spine is intact, helping guide therapy. CT scanning of the spine has widely been an accepted practice in adults, however risks associated with radiation exposure make it an unsafe screening tool in children. Some studies have shown that excess use of CT scan predispose children to an increased risk of thyroid cancer as they transition into adulthood. CT scan is a better modality at identifying osseous detail compared to MRI, however as stated previously the radiation exposure needs to be considered.

Management

Thoracolumbar spine trauma is an important cause of morbidity and mortality in pediatric patients. Special attention to this population is necessary because several unique features of the growing pediatric spine separate these patients from adult patients. These injuries are frequently associated with high-energy trauma and concurrent thoracic or abdominal injuries that require coordinated multidisciplinary care. Thoracolumbar spine trauma in pediatric patients may lead to compression fractures, burst fractures, flexion-distraction injuries (ie, Chance fracture), fracture-dislocation injuries, apophyseal fractures/herniations, and spinous process and transverse process fractures. Depending on the nature of the injury and the patient's level of skeletal maturity, thoracolumbar spinal injuries may have substantial ability to heal and remodel. Because the impact of thoracolumbar spinal injury on pediatric patients can be devastating, appropriate early diagnosis and management, as well as long-term follow-up, are imperative [2)].

Research

Further research is recommended on the reliability of modifiers, neurological classification and the application of ATLICS in a paediatric context [3)].

Case series

A retrospective multicentre study includes patients up to 16 years of age who were suffering from thoracolumbar spine injuries who had been treated in six German spine centres between 01/2010 and 12/2016. The clinical database was analysed for patient-specific data, trauma mechanisms, level of injury, and any accompanying injuries. Diagnostic imaging and subsequent treatment were investigated. Patients were divided into three age groups for further evaluation: age group I (0-6 years), age group II (7-9 years) and age group III (10-16 years).

Results: A total of 153 children with 345 thoracolumbar spine injuries met the inclusion criteria. The mean age at the time of hospitalization due to the injury was 12.9 (± 3.1) years. Boys were likelier to be affected (1:1.3). In all age groups, falls and traffic accidents were the most common causes of

thoracolumbar spine injuries. A total of 95 patients (62.1%) were treated conservatively, while 58 (37.9%) of the children underwent surgical treatment. Minimally invasive procedures were the most chosen procedures. Older children and adolescents were likelier to suffer from higher-grade injuries according to the AOSpine classification. The thoracolumbar junction (T11 to L2) was the most affected level along the thoracolumbar spine (n = 90). Neurological deficits were rarely seen in all age groups. Besides extremity injuries (n = 52, 30.2%), head injuries represented the most common accompanying injuries (n = 53, 30.8%). Regarding spinal injuries, most of the patients showed no evidence of complications during their hospital stay (96.7%).

The thoracolumbar junction was more frequently affected in older children and adolescents. The majority of thoracolumbar spinal column injuries were treated conservatively. Nevertheless, 37.9% of hospitalized children had to be treated surgically, and there was an acceptable complication rate for the surgeries that were performed [4].

1)
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