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CASE REPORT / *OLGU SUNUMU*

MULTILEVEL THORACIC VERTEBRAE FRACTURES IN CHILDREN: A CASE REPORT AND REVIEW OF THE LITERATURE

ÇOCUKLARDA ÇOK SEVİYELİ TORAKAL VERTEBRA KIRIKLARI: OLGU SUNUMU VE LİTERATÜR İNCELEMESİ

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SUMMARY:

Spinal injuries in children are relatively uncommon and represent a small number in all injuries. The incidence of paediatric spinal traumas has been reported approximately 1% to 10% of all spinal injuries. However, multilevel involvement of vertebrae fractures reported 50% of all fractures in children. In this report, we report a case of 10-year-girl that referred to our hospital after a motor vehicle accident. Evaluation of the patient revealed thoracic multilevel fractures. She was operated via posterior approach and spinal fusion was performed with instrumentation and allograft bones. Postoperative period was uneventful and patient was able to walk independently. Spinal injuries in childhood period and treatment modalities are discussed with a review of literature. In order to assess the stability of the fractures, posterior elements and ligamentous structures should be evaluated with detailed radiological examination. Appropriate documentation and the classification of the fractures for paediatric spinal injuries may be helpful for precise treatment.

Key words: *Burst fractures, Children, Multiple fractures, Spinal injury.*

Level of Evidence: *Case Report, Level IV*

ÖZET:

Çocukluk çağında spinal travmalar göreceli nadir görülmekte ve bütün yaralanmalar içinde küçük bir oranı temsil etmektedirler. Bütün spinal travmalar içinde pediatrik spinal yaralanmaların oranı yaklaşık olarak %1-10 arasında rapor edilmektedirler. Bununla beraber çocuklarda çok seviyeli vertebral kırıklar %50 oranında bildirilmektedir. Bu vakada 10 yaşında trafik kazası nedeni ile hastanemize refere edilmiş bir kız hastayı sunduk. Hastanın değerlendirilmesi sonrasında çok seviyeli torakal kırıklar tespit edildi. Posterior yaklaşımla opere edilerek, instrumentasyon ve kemik greftler ile spinal füzyon yapıldı. Postoperatif dönem sorunsuz olarak seyretti ve hasta bağımsız olarak yürüyebiliyordu. Çocukluk çağı spinal travmaları ve tedavi seçenekleri literatür bilgileri eşliğinde tartışıldı. Kırıkların stabilitesini tesbit edebilmek için posterior elemanlar ve ligamentöz yapılar ileri radyolojik tetkikler ile mutlaka değerlendirilmelidir. Pediatrik spinal yaralanmalara uygun şekilde yapılan dökümentasyon ve klasifikasyon kesin tedavinin belirlenebilmesi için faydalı olacaktır.

Anahtar Kelimeler: *Patlama kıkları, Çocuk Multiple kırıklar, spinal yaralanma*

Kanıt Düzeyi: *Olgu sunumu, Düzey IV*

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INTRODUCTION:

Spinal injuries in children are relatively uncommon and have been reported 1% to 10% of all spinal injuries [3,8]. However, multilevel involvement of spinal fractures reported up to 50% of all spinal traumas in children. Treatment of these paediatric spinal fractures remains still controversial. Due to the supportive effects of ribs, thoracic fractures are relatively more stable than other spinal segments. But if the posterior structures are involved in trauma, posttraumatic spinal deformity may develop gradually [14]. Associated posterior elements involvement makes the fractures unstable, thus aggressive treatment should be done in order to stabilize the fractures and to prevent posttraumatic deformity [15]. Owing to this fact, detailed radiological investigations should be done for diagnosing of posterior elements disruption to determine the exact type of treatment. We report a case of 10-year-girl that referred to our hospital after a motor vehicle accident. Evaluation of the patient revealed thoracal multilevel fractures. She was operated via posterior approach and spinal fusion was performed with instrumentation and allograft bones. Postoperative period was uneventful and patient walked without assistance, then discharged on postoperative one week. Spinal injuries in childhood period and treatment modalities are discussed with a review of literature.

CASE REPORT:

A 10-year-old, healthy, unrestrained, girl passenger was ejected through the car in a traffic accident and referred to our hospital. She was neurologically intact but she had severe back pain, right periorbital edema and minimal cutaneous lacerations. Her computerized tomography (CT) of cranium revealed normal findings. Magnetic resonance imaging of the spine was displayed thoracal 5-6-7-8 compression fractures and acute bone marrow edema (Fig.1a). CT of thoracal spine displayed thoracal 5-6-7 compression fractures (Fig.1b); burst fracture of thoracal-6 vertebral body (Fig.1c), bone fragment in spinal canal (Fig.1d). In addition, sagittal reconstruction of thoracal CT revealed kyphosis angle 46º and disruption of posterior elements (Fig.1b). According to these findings, diagnosis of flexion-distraction type injury was made. Patient was operated via dorsal midline approach. Intraoperatively, interspinous ligament disruption, spinous process and lamina fractures were observed (Fig.2). Due to the patient's spinal instability, segmental fixation with pedicle screw instrumentation (Stryker spine OasysTM system, Michigan, USA) from T2 to T12 was used with allograft bones. Operation time was three hours and no intraoperative complication and significant blood loss was encountered. Patient was mobilised 3 days after operation with an external brace. Postoperative period was quite uneventful and she was discharged on postopertive 10th day. Subsequently, the patient recovered completely and no hardware problems were observed during the 1-year follow-up (Fig.3). Dynamic graphies revealed fusion at postoperative 1-year. On postoperative second year she was 146 cm tall (over 90 percentile) and she had no back pain.

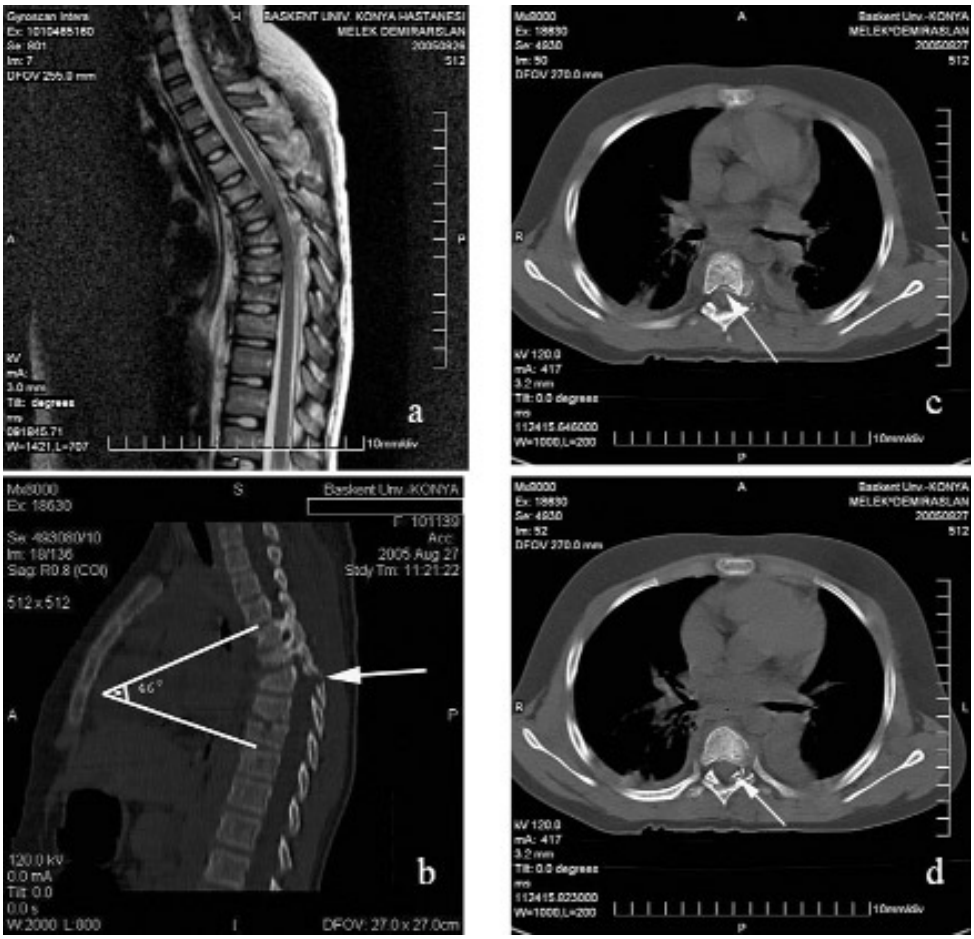

Figure 1. (a) T2- Weighted sagittal images of MRI show compression in Thoracal 5-6-7-8 vertebral bodies, **(b)** Sagittal reconstruction of Thoracal computed tomography (CT) shows disruption of posterior elements (Arrow) and kyphosis angle is 46º. **(c)** Axial thoracal CT shows burst fracture of T6 vertebral body. Arrow indicates fracture of cortex of posterior wall. **(d)** Arrow indicates bony fragment in spinal canal.

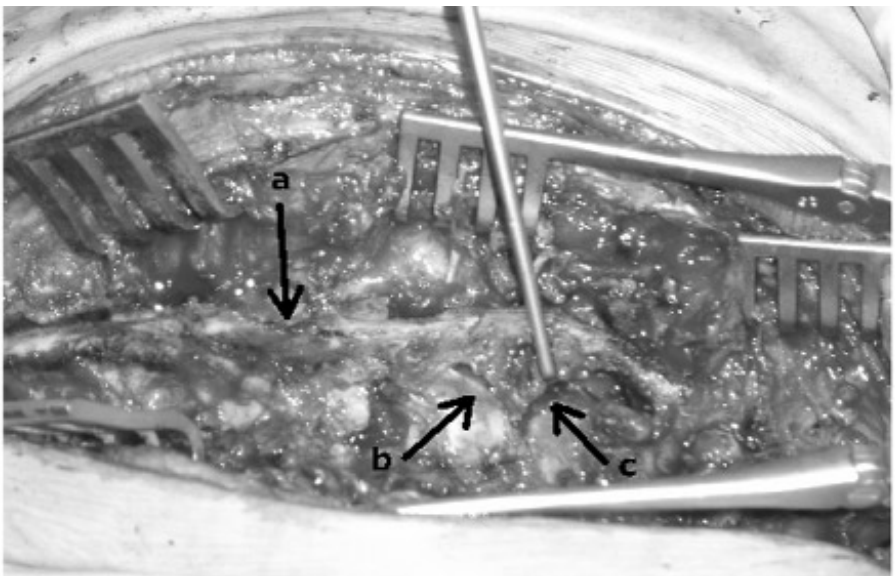

Figure 2. (a) disruption of interspinous ligament. **(b, c)** Fractured laminas and spinous processes.

Figure 3. Postoperative lateral view of the thoraco-lumbar spine at 1-year follow-up.

DISCUSSION:

Pediatric spine injuries still remain infrequent and reported 1% to 10% of all spinal injuries [1]. The anatomical and biomechanical differences of pediatric spine result a distinctive injury model compared with adults. As a result of these differences cervical region is injured mostly. Cirak et al reported that in their series most commonly injured level is cervical region with a frequency of 46% then thoracic region [3]. Although cervical region is mostly defined, thoracal and lumbar region is involved respectively also [2,3,10]. Due to the supportive effects of ribs, thoracic region is rarely involved and fractures are relatively more stable than other spinal segments. On the other hand, multilevel spinal fractures in pediatric population have been documented with an incidence of 11 to 16% [6,7]. Multilevel involvement is resulted from high-energy trauma that caused by motor vehicle accident (MVA) or falls like in our case [3,13].

There is no clearly defined management algorithm for patients with multilevel spinal fractures. Generally, decision of treatment options are done according to the stability of fractures classified by Denis which known as 3-column theory [4]. But this classification describes bony lesions; posterior ligaments and discs. On the other hand, due to the differences of pediatric spine, this classification may be unsuitable for pediatric flexion-distruction fractures. De Gauzy et al described a different classification for flexion-distraction type injury based on MRI findings [5] that resembles the Rumbal and Jarvis [11] classification, which based on radiographic images. De Gauzy et al described three types of for flexion-distraction injury. Type I, Physeal injury of the superior growth plate. The posterior lesion passes above the pedicle (ligamentous injuries associated with articular process dislocation or superior facet fracture). Type II, Fracture through the vertebral body, pedicle, lamina, and spinous process. Type III, Physeal injury of the inferior growth plate. The posterior lesion passes below the pedicle (ligamentous injuries associated with articular process dislocation or inferior facet fracture). According to this classification, we diagnosed type II fracture in our patient. Patients with compression fractures that less than a loss of 50% anterior vertebral body height should be treated conservatively [9]. A short period of bed rest, oral analgesics and early mobilization with external brace sufficient for these type fractures whereas as unstable burst fractures, fracture-dislocations, shear fractures, unstable hyperextension injuries, as well as anterior compression injuries with greater than 25° of segmental kyphosis or greater than 55° of total thoracic kyphosis with

concomitant posterior element disruption must be treated surgically [12,15]. A stable burst fracture is, one in which there is less than 20° of kyphosis, less than a 50% loss of anterior vertebral body height, and preservation of the posterior column in a patient who does not have a progressive neurological deficit. Stable burst fractures may be treated in a hyperextension cast or brace. In the present case, anterior column fracture with posterior elements involvement and segmental hyperkyphosis made the fracture unstable. Based on this diagnosis, we operated the patient for spinal fusion. Vaccaro et al reported that injuries that involve the posterior ligamentous structures, such as advanced staged burst flexion– compression injuries or flexion–distraction injuries, are prone to post-traumatic deformity if aggressive measures to prevent this occurrence are not taken [14]. In presented patient, no additional kyphosis developed in follow-up period and this finding also confirmed that surgical treatment is suitable for this case.

Based on our case, pediatric spinal injury should be undertaken in respect to special anatomical and biomechanical properties. In order to assess the stability of the fractures, posterior elements and ligamentous structures should be evaluated with detailed radiological examination. Documentation and the classification of the fractures suitable for pediatric spinal injuries may be helpful for precise treatment.

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