Open reduction and internal fixation of a lumbar Chance fracture in a child using Songer cable and lamina plates

Case report

Ali A. Baaj, M.D., Juan S. Uribe, M.D., and Fernando L. Vale, M.D.
Department of Neurosurgery, University of South Florida, Tampa, Florida

Chance-type fractures of the spine have been associated with seat-belt injuries in the pediatric population. Non-operative management is appropriate in most cases of Chance fractures, but surgical intervention is occasionally warranted to deter progression of kyphosis and neurological deterioration. Internal fixation using pedicle screws has been widely used in the surgical repair of this injury. The authors report on a 6-year-old girl who suffered an L-2 Chance fracture with facet disruption, kyphosis, and significant posterior ligamentous injury. She underwent open reduction and internal fixation using Songer cable wiring augmented with bilateral lamina plating. At the 18-week follow-up, she continued to be free of any neurological deficits and her alignment was stable on plain radiographs of flexion-extension. The authors have therefore described a feasible option in the surgical management of Chance-type fractures in the pediatric spine. (DOI: 10.3171/2008.11.PEDS08177)

Key Words: • Chance fracture • lumbar fracture • seat-belt injury
Thus, bilateral lamina plates (Synthes Maxillofacial System) were placed between the L-1 and L-2 laminae (Fig. 3). Decortication was then performed followed by insertion of demineralized bone matrix substrate (Synthes, Inc.) as an onlay bone graft.

The patient’s postoperative recovery was unremarkable. She was discharged on postoperative Day 4 with a clamshell thoracolumbosacral orthosis brace. At her 18-week follow-up evaluation, plain radiographs of flexion-extension (Fig. 4) demonstrated good fusion and normal alignment. Her neurological examination results remained normal, and the use of the brace was discontinued.

Discussion

Chance fracture was originally described as a “horizontal splitting of the spine and neural arch.”5 This lesion is now recognized as a flexion-distraction type injury that involves splitting of either the soft tissue, the bone tissue, or both.3,5 The occurrence of Chance fractures of the lower spine as part of the seat-belt syndrome in the pediatric population is well described.12,15,19 The seat belt, in effect, acts as a fulcrum over which the upper body flexes and distracts. The center of gravity in children is higher than that of adults, rendering them more prone to this type of injury. Several classification schemes have been devised for both adult and pediatric Chance fractures, with an emphasis on whether the horizontal splitting is through the bone tissue, the ligamentous and soft tissue, or both.8,9,11

Published reports on the management of pediatric Chance fractures consist of case reports and small patient series.1,4,7,14 The original treatment recommended by Chance was reduction in hyperextension and immobilization in a cast. Most investigators have reported good results using such conservative management.16,17 These original recommendations, however, were based on bone splitting as the main feature of these fractures, demonstrated by plain radiographs. Magnetic resonance imaging, however, can now better delineate the extent of ligamentous and soft-tissue injury with or without bone lesions. Some authors have proposed internal fixation for such injuries.6,9,20,21 Glassman and colleagues10 reviewed 12 cases of Chance-type injuries in children < 16 years old. This group determined that bracing was an appropriate option for patients with < 20° of kyphosis. The 4 patients that failed bracing had > 20° of kyphosis initially, progressed to 30° of angulation on follow-up, and ultimately required surgical reduction and fixation. Delayed kyphotic progression with neurological deterioration, however, has been reported but is rare.2 In our case, a hyperextension case would have been well-tolerated and may have provided satisfactory results, but the extent of anterior and posterior ligamentous disruption on MR imaging, in addition to the disrupted facet and kyphotic deformity, led us to favor surgical intervention.

Pedicle screw fixation has been reported in the treatment of pediatric and adolescent Chance-type fractures. Given that the pedicle size at the L-1 to L-3 levels was 3.5 mm, which is near the lowest acceptable size for safely inserting pedicle screws in pediatric thoracolumbar fractures, and given our desire to limit fixation to a single motion segment, we did not elect to use the pedicle screw fixation technique. Instead, reduction was achieved by drilling the facet and Songer wiring was used for stabilization. The construct was then fortified with bilateral lamina plates. The follow-up radiographs demonstrated good alignment and no instability on lateral radiographs of flexion-extension.
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When skeletal anatomy or immaturity precludes pedicle screw fixation, other surgical techniques must be used in the treatment of pediatric Chance-type fractures. Cable wiring with lamina plate augmentation can be used to preserve alignment, limit construct size, and achieve spinal fusion. Longer clinical and radiographic follow-up will be necessary to assess the effectiveness of this technique. This treatment modality represents one of several treatment options in pediatric Chance fractures.

Disclaimer
The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

References

Address correspondence to: Fernando L. Vale, M.D., USF Health-care, South Building, 7th floor, 2A Columbia Drive, Tampa, Florida 33626. Email: fvale@health.usf.edu.