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Tension band stabilization of thoracic vertebral luxation in a dog

Biswadeep Jena, Indramani Nath, Ajay Dhandha, Sagar Sahoo and Pritish Kumar Rath

Abstract
An 8 months old German shepherd dog was presented with trauma after fallen from a height, non-weight bearing and hypoesthesia hind limbs. Radiography revealed presence of T_{12} dorsal luxation after being compressed between T_{11} and T_{13} courtesy of trauma. Tension band stabilization of the luxated vertebrae and adequate physiotherapeutic modalities resulted in normal ambulation.

Keywords: Tension band stabilization, modified spinal stapling, thoracic vertebral luxation and dog

Introduction
Vertebral fracture and luxation are a major cause of neurologic injury in small animal patients, associated with severe external trauma. These resulted mostly from motor vehicle accidents or falls (Bali *et al*., 2009; Bruce *et al*., 2008 and Jeffery 2010) [2, 3, 4].
Variety of techniques have been used to stabilize fractures and luxations of the thoracolumbar vertebrae in cats and dogs, including external splinting, spinal stapling, modified segmental spinal instrumentation, spinous process plating, vertebral body plating, spinal process plating in combination with application of a Kirschner-Ehmer apparatus, composite fixation with pins or screws and polymethyl methacrylate, and stabilization with an external fixator. Each of these techniques has advantages and disadvantages in regard to invasiveness of the technique, ease of application, fixation stability, clinical results, applicability to various portions of the vertebral column, applicability to animals of various sizes, and risk of infection. However, reports describing results of specific techniques in large numbers of animals are sparse (Voss *et al*., 2004) [1]. The purpose of the study here was to report the outcome of tension band technique which had been used to stabilize traumatic luxation of the thoracic vertebrae.

Material s and Methods
An 8 months old German shepherd dog was presented with trauma, LMN at hind limbs. Radiography revealed presence of T_{12} dorsal luxation after being compressed between T_{11} and T_{13} courtesy of trauma. Preoperative neurologic status revealed Grade III i.e., non-ambulatory paraparesis. Surgery was performed in the patient as soon as a diagnosis of vertebral luxation was confirmed radiographically and the animal's condition was considered stable. The surgical approach consisted of a dorsal midline incision extending from 3 vertebrae cranial to 3 vertebrae caudal to the lesion. The dorsal fascia was incised bilaterally on each side of the 4 spinous processes centered over the lesion, leaving the supraspinous and interspinous ligaments intact. The epaxial musculature was then elevated from the dorsal lamina with a periosteal elevator. Muscular attachments on the mammillary and accessory processes were left intact in patients that did not require decompressive procedures. The musculature was retracted bilaterally with 2 self-retaining Gelpi retractors. A #1.8 mm Kirschner wire (K-wire) was then passed through the skin and epaxial muscles and through the base of the largest spinous process cranial or caudal to the involved spinal segment. To avoid inadvertent damage to the vertebral canal, the K-wire was inserted dorsal to an imaginary curved line between 2 adjacent articular processes. The K-wire was and 30 cm long and 1.8 mm in diameter. The entire K-wire was passed through to the opposite side of the vertebra above the epaxial musculature, and the insertion side of the vertebra was cleared of skin and musculature so that the wire could be freely reinserted to its midpoint. The K wire was then bent into a U shape with bending pliers and positioned bilaterally along the dorsal lamina in the groove between the spinous and articular processes of 4 vertebrae.

The free ends of the K-wire were then secured with a hemicerclage wire through the spinous process of the first of the 4 vertebrae. Holes were then drilled through the bases of the spinous processes ventral to the K-wire on each side of the lesion. An orthopedic wire (22 gauze) was passed through the holes and placed over the U-shaped K-wire and beneath the supraspinous and interspinous ligaments in a figure 8 fashion. The wire was tightened bilaterally under visual control to ensure correct positioning of the articular facets. If the K-wire was correctly positioned, the fracture was reduced as the figure 8 wire was tightened. Radiographs were obtained immediately after surgery to assess adequacy of reduction. Postoperative treatment included pain management, bladder management in patient with urine retention, and physiotherapy in nonambulatory patients. Animals were generally discharged from the hospital as soon as they were able to urinate spontaneously. Physiotherapeutic rehabilitation modalities were performed by hind quarter lift harness sling and normal ambulation was achieved within 6 months. Post-operatively antibiotic (Ceftriaxone + Tazobactum), anti-inflammatory glucocorticoid (Depo-medrol®) therapy along with nootrophic drug (Renerve plus®) was administered.

According to Brue *et al*. (2008), thoracolumbar (T3 to L3) vertebral fracture and luxation reported most (54.5%) in his study. Vertebral fracture and luxation invariably cause pain and neurologic deficits. Neurologic deficits result from compression or contusion of neural tissue, while pain may arise because of neural compression or through direct mechanical injury. In addition, persistent compression of the spinal cord or the nerve roots causes demyelination, progressive axonal injury, and neuronal and axonal destruction. The prime focus of therapy is preservation of function in surviving neural tissue, which often requires surgical decompression and stabilization of skeletal elements to prevent further trauma, plus physiotherapy and rehabilitation (Voss *et al*., 2004; Bali *et al*., 2009; Bruce *et al*., 2008 and Jeffery 2010) [1, 2, 3, 4]. Spinal stapling or, tension band vertebral stabilization is an easy and relatively noninvasive technique designed to stabilize vertebral fractures in small dogs and cats, for which small bone size limits the feasibility of other techniques (Voss *et al*., 2004) [1].

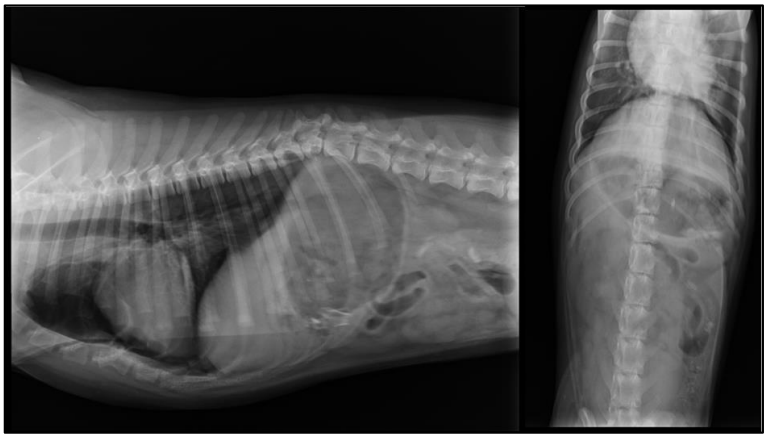

Fig 1: Showing right lateral and ventro-dorsal radiography revealed presence of T_{12} dorsal luxation after being compressed between T_{11} and T_{13}.

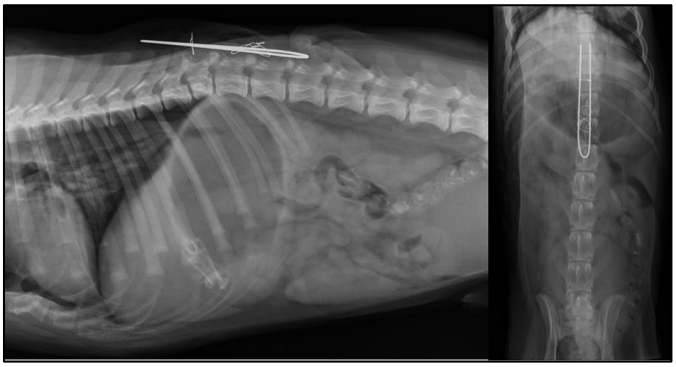

Fig 2: Showing right lateral and ventro-dorsal radiography revealed tension band stabilization of luxated thoracic vertebrae.

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