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Thoracolumbar fractures and luxations

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INTRODUCTION

Traumatic spinal injuries generally result from road traffic accidents. Other forms of trauma include falls from heights, collision with stationary objects and gunshot injuries. Vertebral fractures and luxations and traumatic disc extrusions are the most common types of injury. A detailed neurological examination should enable the severity of spinal cord damage to be graded. Malalignment of the spine may be palpable, or inded visible. Reduced pelvic limb spinal reflexes may be due to a caudal lumbar injury (L4-S1), progressive ascending descending myelomalacia or spinal shock (Smith and Jeffery 2005). The presence or absence of pain perception is a key prognostic factor (Olby and others 2003).

RADIOGRAPHY

Many thoracolumbar fractures and luxations are readily diagnosed on survey radiographs. There is a poor correlation between the degree of vertebral displacement and the severity of neurological dysfunction. Vertebral subluxations may be minimally displaced and be difficult to detect, especially in the thoracic spine where there is superimposition of rib heads. In these cases narrowing of the intervertebral disc may be the principle abnormality. Disc space narrowing is also the key radiographic feature of traumatic disc extrusion. Differentiation of these two injuries is important, especially since vertebral subluxations may be unstable and necessitate stabilisation surgery. Surgery is rarely indicated for traumatic disc extrusion. Obtaining dynamic flexion-extension views of the spine aids differentiation of traumatic non-displaced vertebral subluxations and traumatic disc extrusions. These views should be obtained with extreme care to minimise the risk of iatrogenic spinal cord injury. Spinal manipulations should be minimal and if necessary incremental. Myelography (cisternal) may aid detection of subtle malalignment of affected vertebrae. It also enables assessment of potential spinal cord compression and detection of other lesions. Myelography with traumatic disc extrusions demonstrates a small extradural space-occupying lesion with no evidence of vertebral instability on flexion-extension views. It is possible CT and MR imaging may aid differentiation of these two conditions (Kinns and others 2006).

MANAGEMENT

The choice of treatment for animals with spinal trauma is controversial. Many authors adopt a conservative approach while others favour vertebral stabilisation and, or, decompressive procedures. Surgery is the most effective way of aligning and stabilising the vertebral column and thus decompressing the spinal cord. It assists nursing care and permits early patient mobilisation and physiotherapy / hydrotherapy. Surgery controls long-term scar formation, soft tissue hypertrophy and inappropriate new bone formation that could result in spinal cord compression. Non-surgical management may be appropriate in ambulatory patients with inherent vertebral stability where any pain is readily controlled (Carberry and others 1989).

VERTEBRAL FIXATION TECHNIQUES

The technique employed should be sufficiently rigid to encourage fracture or luxation healing and strong enough to withstand the intrinsic and extrinsic forces exerted on the vertebral column during this period. When subjected to bending vertebral body plating is the most strong and most rigid single technique (Walter and others 1986). When subjected to rotational deformation vertebral body pins and bone cement provide the greatest stability and strength compared to other techniques (Waldron and others 1991).

CRANIAL AND MID-THORACIC FRACTURES AND LUXATIONS

Injuries in this area of the spine are uncommon. They tend to be inherently stable due to the ribs, intercostal muscles and epaxial musculature. Utilisation of the vertebral bodies is difficult because of their depth and triangular cross-sectional shape. Dorsal spinous processes plating or wiring are applicable techniques (Shores and others 1991).

CAUDAL THORACIC AND LUMBAR FRACTURES AND LUXATIONS

Vertebral body pins / screws and bone cement and vertebral body plates can be applied in this region of the spine and bilateral fixation may be performed. In addition, intact articular facets may be stabilised with K-wires or screws. Hypodermic needles are used to identify the intervertebral discs. A recent report determined the optimal implantation angles in thoracolumbar vertebral bodies using computed tomography (Watine and others 2006). The angle of pin / screw placement in the caudal thoracic spine (25-45 degrees) is less than in the cranial lumbar spine (55-65 degrees). Plates are positioned at the level of the tubercle of the ribs in the thoracic spine and the junction of the pedicles and transverse processes in the lumbar spine. Where nec-
essential, the dorsolateral aspect of the tubercle of the rib is removed to enable optimal positioning of the plate. Care is necessary to avoid entering the pleural cavity or injuring the aorta.

RETROSPECTIVE STUDY OF THORACIC FRACTURES AND LUXATIONS IN 42 DOGS

There are a number of publications on lumbar fractures and luxations in small animals but to the author’s knowledge there are no specific reports on thoracic injuries. The thoracic spine differs from the lumbar spine in a number of ways including the presence of ribs, the more triangular shape of the vertebral bodies, the less critical function of the spinal nerves, and the presence of the pleural cavity. A retrospective study was performed in 42 dogs presented to Willows Referral Service between December 1996 and May 2008 with thoracic vertebral fractures and luxations. Age at presentation ranged from five months to 13 years (mean 4.5 years). Mean body weight was 23 kg (range 2.6 to 52 kg). Cause of vertebral injury was road traffic accident (25), collision (6), fall (4), hit by blunt object (2), boisterous play (2), dog fight (1), unknown (2). Neurological status between injury and presentation remained unchanged in 32, progressed in nine and improved in one dog. Duration of injury prior to presentation ranged from one to 28 days (median 1.5, mean 2.8).

At presentation one dog had no neurological deficits, five were ambulatory paraparetic, 14 were non-ambulatory paraparetic, eight were paralysed, and 14 were paralysed with loss of pain perception caudal to the lesion. Progressive myelomalacia was not recognised. Thirteen dogs had one or more concomitant injuries (rib fractures 5, pulmonary contusion / pneumothorax 4, pelvic fractures 3, long bone fracture 2, elbow luxation 1, eye rupture 1). Twenty-eight vertebral body luxations and 14 vertebral body fractures were recorded. The causal thoracic vertebrae (T11-13) were most commonly affected (18 luxations, 12 fractures). Lateral radiographs showed no evidence of vertebral malalignment in seven cases. Myelography was performed in 17 dogs. Flexion-extension studies in 10 of these showed dynamic spinal cord compression in eight and static compression in two. Ten dogs were euthanatised at the time of presentation (all had lost pain perception). Twelve were managed non-surgically (one with a back splint). Twenty were managed surgically; bilateral vertebral body pins / screws and bone cement (12), unilateral vertebral body plate (7), dorsal spinous process wiring (1). Two dogs had concomitant laminectomy procedures and one had olfactory glial cell transplantation (Jeffery and others 2005). One dog had revision surgery to improve vertebral alignment. Four other dogs had mild vertebral malalignment evident on postoperative radiographs. One dog developed a seroma following surgery. The dog with no neurological deficits remained normal. All five ambulatory paraparetic cases improved (3 normal, 2 residual neurological deficits). All 22 non-ambulatory dogs with intact pain perception regained the ability to ambulate (6 normal, 16 residual neurological deficits). None of the four dogs with loss of pain perception improved.

CONCLUSIONS

Fracture or luxation of thoracic vertebrae may result in severe spinal cord injury (33%) had loss of pain perception). Progressive spinal cord injury due to vertebral instability and repetitive spinal cord injury is not uncommon (21%). Vertebral luxations are more common than fractures (67%). Lateral radiographs may show no evidence of vertebral malalignment (17%). Differentiating non-displaced vertebral luxations from traumatic disc extrusions is important. Flexion-extension myelography is useful in selected cases. Vertebral body fixation with pins / screws and bone cement or a bone plate is associated with a low complication rate. Laminectomy procedures are generally not warranted. With appropriate management the prognosis in dogs that retain pain perception is good.

REFERENCES


