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RESEARCH PAPER

Perianesthetic morbidity and mortality in dogs undergoing cervical and thoracolumbar spinal surgery

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Abstract

Objective To evaluate and compare perioperative morbidity and mortality in dogs undergoing cervical and thoracolumbar spinal surgery.

Study design Prospective case series.

Animals 157 dogs undergoing cervical or thoracolumbar spinal surgery.

Methods Data were collected sequentially on canine cases presented from the Neurology Section of the North Carolina State University Veterinary Teaching Hospital for anesthesia and surgery for cervical spinal cord disease. Simultaneously, data were collected on all thoracolumbar spinal surgery cases during the same time period. Data included signalment, drugs administered, surgical approach, disease process, cardiac arrhythmias during anesthesia, and outcome.

Results Data were collected from 164 surgical events in 157 dogs. There were 52 cervical approaches; four dorsal and 48 ventral. All thoracolumbar surgeries were approached dorsolaterally. Four dogs 4/52 (7.6%) undergoing a cervical approach did not survive to discharge. Two dogs (2/8; 25%) underwent atlanto-axial (AA) stabilization and suffered cardiovascular arrest and two dogs (2/38; 5.2%) undergoing cervical ventral slot procedures were euthanized following anesthesia and surgery due to signs of aspiration pneumonia. All dogs undergoing thoracolumbar surgery survived until discharge (112/112). Mortality in dogs undergoing cervical spinal surgery was greater compared with dogs undergoing thoracolumbar spinal surgery ($p = 0.009$), however, in dogs undergoing decompressive disc surgery, intraoperative death rates were not different between dogs undergoing a cervical compared with thoracolumbar approaches ($p = 0.32$) nor was there a significant difference in overall mortality ($p = 0.07$).

Conclusion and clinical relevance Overall, dogs undergoing cervical spinal surgery were less likely to survive until discharge compared with dogs undergoing thoracolumbar spinal surgery. Mortality in dogs undergoing cervical intervertebral disc decompression surgery was no different than for dogs undergoing thoracolumbar intervertebral disc decompression surgery. However, dogs undergoing cervical intervertebral disc decompression surgery should be considered at risk for aspiration pneumonia.

Keywords cervical, dog, morbidity, mortality, spinal, surgery.

Introduction

Cervical spinal surgery in dogs is associated with reportedly high perioperative mortality. Mortality rates for cervical vertebral fractures, atlanto-axial subluxations, and cervical spinal cord decompressive surgery have been reported as high as 36%, 21% and 8%, respectively (Clark 1986; Thomas et al.

1991; Hawthorne et al. 1999). This is in contrast to an overall expected perioperative mortality rate of 0.15% in dogs (Brodbelt et al. 2008). Some clinicians have gone so far as to suggest avoiding cervical surgery, if possible, due to those statistics (Hawthorne et al. 1999). Reported causes of perioperative morbidity and mortality in cervical spinal cord decompressive surgery include hemorrhage during surgery (Clark 1986; Rossmeisl et al. 2013), dysrhythmias (Stauffer et al. 1988), and respiratory arrest (Clark 1986).

Either due to the known increased risk, or personal experience, many anesthetists appear to have greater concern for dogs undergoing cervical spinal cord decompressive (CSD) surgery compared with thoracolumbar decompressive (TLD) surgery (personal observation by LPP). However, in the authors' opinion current morbidity and mortality rates appear to be less than previously reported (8%) or perceived. Therefore, this study was designed to test the hypothesis that current perioperative mortality for CSD is less than the 8% previously reported and similar to that for TLD.

Materials and methods

Data were prospectively collected from all dogs presented from the Neurology Service at the North Carolina State University Veterinary Teaching Hospital for anesthesia and cervical spinal surgery beginning on June 29, 2009. Patients were enrolled in the study if they were canine and were scheduled for cervical spinal surgery. Once enrolled, each dog was assigned an individual data sheet to record a list of standard information (Appendix 1). Dogs were enrolled sequentially until 52 dogs were enrolled. Simultaneously, the same data were recorded for all dogs presented to the Neurology Service for anesthesia and surgery for thoracolumbar spinal cord disease. Anesthesia and pain management were administered as determined optimal by the attending anesthesiologist, and were not modified based on enrollment in this study.

Following anesthesia and surgery, the outcome of each dog was assessed and was recorded as discharged, euthanized, or cardiac arrest. For comparisons between groups, 2×2 contingency tables were generated and analyzed using a two-sided Fisher's Exact Test. The level of significance was set at $p < 0.05$. Statistical tests were performed with a commercially available software program (Prism, Graphpad Software, CA, USA).

Results

Summary statistics

Data from 164 surgical procedures were collected from 157 dogs from June 29, 2009 to August 17, 2010. Fifty three of 164 (32%) cases were transferred while anesthetized from an independent onsite magnetic resonance imaging (MRI) facility. There were 52 cervical surgical procedures performed in 49 dogs. These procedures included ventral slot for cervical intervertebral disc disease ($n = 38$), exploratory surgery on a previous ventral slot with inadequate resolution of clinical signs ($n = 2$), atlanto-axial (AA) stabilization (ventral approach, $n = 7$), surgical revision on a failed AA stabilization (ventral approach, $n = 1$), dorsal laminectomy for caudal cervical spondylomyelopathy (CCSM) ($n = 3$) or decompression of an inflammatory lesion of undetermined etiology ($n = 1$). All of the 112 thoracolumbar procedures were through a dorsolateral surgical approach. These procedures included hemilaminectomy for thoracolumbar intervertebral disc disease ($n = 107$), exploratory surgery on a previous hemilaminectomy with inadequate resolution of clinical signs ($n = 3$), neoplasia removal ($n = 1$), or vertebral fracture repair ($n = 1$).

Dog breeds represented are presented in Table 1. Weight and age statistics for primary procedure groups are presented in Table 2.

Anesthetic protocols

The majority of dogs were premedicated with either hydromorphone (94/164 dogs) at 0.1 mg kg^{-1} by intramuscular (IM) injection or fentanyl (70/164 dogs) at 2–5 μg kg^{-1} intravenously (IV). Acepromazine, dexmedetomidine or midazolam were co-administered in 2/164, 10/164, and 5/164 dogs, respectively. Propofol was administered IV to effect for induction of anesthesia in 159/164 dogs. Anesthesia was induced in the remaining dogs with midazolam (0.2 mg kg^{-1}) plus ketamine (5 mg kg^{-1}) IV (3/164) or midazolam (0.2 mg kg^{-1}) plus etomidate (approximately 1.0 mg kg^{-1}) IV (2/164). None of the dogs received an anticholinergic drug with the premedications.

Cardiac complications

Sinus bradycardia requiring treatment with an anticholinergic drug was noted in 107/164 (65%)