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SHORT COMMUNICATION

Anesthetic complications in dogs undergoing hepatic surgery: cholecystectomy *versus* non-cholecystectomy

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Abstract

Objective To determine if dogs that undergo laparotomy for cholecystectomy suffer from a greater number or magnitude of perianesthetic complications, including hypotension, hypothermia, longer recovery time, and lower survival rate, than dogs that undergo laparotomy for hepatic surgery without cholecystectomy.

Study design Retrospective cohort study.

Animals One hundred and three dogs, anesthetised between January 2007 and October 2011.

Methods The variables collected from the medical record included age, weight, gender, surgical procedure, pre-operative bloodwork, American Society of Anesthesiologists (ASA) status, emergency status, total bilirubin concentration, anesthetic agents administered, body temperature nadir, final body temperature, hypotension, duration of hypotension, blood pressure nadir, intraoperative drugs, anesthesia duration, surgery duration, time to extubation, final diagnosis, days spent in the intensive care unit (ICU), total bill, survival to discharge, and survival to follow-up.

Results No significant difference in body temperature nadir, final temperature, presence of hypotension, duration of hypotension, blood pressure nadir, the use of inotropes, or final outcome was found between dogs undergoing cholecystectomy and dogs undergoing exploratory laparotomy for other hepatic disease. Dogs that had cholecystectomy had longer anesthesia durations and longer surgery durations than dogs that did not have cholecystectomy. No significant differences existed for temperature nadir (34.8 *versus* 35.3 °C; non-cholecystectomy *versus* cholecystectomy), final temperature (35.6 *versus* 35.9 °C), time to extubation (30 *versus* 49 minutes), duration of hypotension (27 *versus* 21 minutes), or MAP nadir (56 *versus* 55 mmHg). Hypotension occurred in 66% and 74% and inotropes were used in 64% and 53%, for non-cholecystectomy and cholecystectomy patients, respectively.

Conclusions and clinical relevance Dogs that underwent cholecystectomies did not suffer a greater number of anesthesia complications than did dogs undergoing hepatic surgery without cholecystectomies.

Keywords anesthesia complications, cholecystectomy, gallbladder disease, hypotension, liver disease.

Introduction

Hepatic disease affects several body functions that are important to consider from an anesthetic standpoint. In the perioperative period, patients with hepatic disease may have alterations in glucose metabolism, neurologic function, and blood coagulation, and ascites may be present (Greene & Marks 2007). Biliary disease in dogs can involve gall bladder mucoceles, sludge, or rupture, bacterial cholecystitis, or extrahepatic bile duct obstruction

due to neoplasia or pancreatitis. A dog with ongoing cholecystitis, mucocele, gallbladder rupture, or cholelithiasis may undergo a cholecystectomy.

In the authors' clinical experience, patients with gallbladder disease tend to have a higher incidence of complications during anesthesia, including hypotension during manipulation of the gallbladder or following cholecystectomy. Hypotension from surgical manipulation can be complicated by anesthetic agents that decrease cardiac output or systemic vascular resistance (Gaynor et al. 1999). Hypotension during gallbladder manipulation may result from vagus nerve stimulation (Alcon et al. 2001) or may be a consequence of release of bacterial toxins and transient bacteremia or endotoxemia. In addition, immediate postoperative hypotension can also be associated with poor clinical outcome (Malek et al. 2013).

Retrospective studies in veterinary medicine about the surgical management of gallbladder disease (Crews et al. 2009) and factors affecting long-term survival in dogs (Amsellem et al. 2006) have not focused on the anesthetic implications or management of cholecystectomy. While the retrospective study of Malek et al. (2013) analyzed clinical findings and prognostic factors for outcome in dogs undergoing cholecystectomy for gallbladder mucocele, to our knowledge, a retrospective cohort study has yet to be published that compares the anesthesia complications that arise in dogs undergoing cholecystectomy with those that arise in dogs undergoing liver surgery without cholecystectomy. The purpose of this retrospective study is to determine if there is a difference in the incidence and severity of anesthetic complications between dogs with biliary disease with or without hepatic disease undergoing cholecystectomy compared to dogs undergoing other types of hepatic surgery not involving cholecystectomy. The hypothesis is that dogs that undergo cholecystectomies would suffer a greater number and severity of anesthesia complications, including hypotension, hypothermia, longer recovery times, and lower survival rates, than dogs that do not undergo cholecystectomy.

Materials and methods

Animals

The medical records of dogs that underwent exploratory laparotomy for surgical management of liver disease at the University of Georgia's Small Animal Teaching Hospital over 4 years (January 2007–October 2011) were reviewed. The hospital anesthesia logs, which include all small animal patients anesthetized, were searched manually to find patients that underwent exploratory laparotomy. The electronic hospital information system was then used to narrow down the sample population by isolating canine cases in which the diagnosis involved hepatic disease or dysfunction. Dogs that had abdominal surgery and a diagnosis of any liver disease were included. Cases were excluded if any of the variables being examined were missing.

Data collection

This study was a cohort study in which cases were dogs with cholecystectomy and the controls were dogs that underwent laparotomy for liver disease that did not receive cholecystectomies. The variables collected from the medical record included age, weight, gender, pre-operative glucose, albumin, creatinine, platelet count, white blood cell count, and coagulation tests, surgical procedure, American Society of Anesthesiologists (ASA) status, emergency status, serum total bilirubin concentration (tbili) before surgery, and anesthetic agents administered (including premedication, induction, and maintenance agents). Recorded intraoperative variables included rectal temperature nadir, final rectal body temperature, presence of hypotension, duration of hypotension, arterial blood pressure nadir, intraoperative drugs, anesthesia duration, surgery duration, and time to extubation following the end of surgery. Post-operative variables included final diagnosis, days spent in the intensive care unit (ICU) after surgery, total hospital bill, survival to discharge, and survival to follow-up examination.

Blood pressure measurements were collected through the use of either direct arterial blood pressure monitoring via a peripheral artery and transducer or by indirect blood pressure monitoring via a Doppler and sphygmomanometer. For patients whose blood pressure was measured directly, blood pressure nadir was defined as the lowest MAP documented during anesthesia. For patients whose blood pressure was measured using the Doppler method, blood pressure nadir was defined as the lowest SAP documented during anesthesia. Rectal temperature nadir was defined as the lowest temperature documented during anesthesia. Final rectal temperature was defined as the last recorded temperature during surgery. Hypotension was defined as