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Preface: Surgical Complications xi
Christopher A. Adin

Metabolic Complications of Endocrine Surgery in Companion Animals 847
Joao Felipe de Brito Galvao and Dennis J. Chew

Metabolic complications of endocrine surgery occur commonly and precautions should be taken to avoid potentially life-threatening situations and to lessen expense associated with a more extended hospital stay. Common complications of endocrine surgery as well as prevention strategies will be reviewed for pancreatic, parathyroid, and adrenal surgery.

Complications of Upper Urinary Tract Surgery in Companion Animals 869
Christopher A. Adin and Brian A. Scansen

Due to the negative effects of urine on wound healing, the high rate of complications associated with surgical incisions in the ureter and a desire to avoid large open approaches to the abdomen, there is a strong trend in human medicine toward the use of endoscopic methods in the treatment of upper urinary tract disease. However, the small size of urogenital structures in companion animals has prevented the widespread application of endoscopy of the upper urinary tract and surgery continues to be the mainstay of treatment. Through careful decision making, veterinary surgeons now use microsurgical technique and interventional radiology to provide a high success rate. The current review will discuss complications pertaining to surgery of the kidney and ureter in companion animals, using experimental and clinical data to guide the detection and avoidance of these complications.

Complications of Lower Urinary Tract Surgery in Small Animals 889
Mary A. McLoughlin

Surgical procedures of the lower urinary tract are commonly performed in small animal practice. Cystotomy for removal of uroliths and urethrostomy diverting urine outflow due to urethral obstruction are the most commonly performed surgical procedures of the bladder and urethra respectively. Surgical procedures of the lower urinary tract are typically associated with few complications, including leakage of urine, loss of luminal diameter (stricture or stenosis), urine outflow obstruction, tissue devitalization, denervation, urinary incontinence, urinary tract infection, and death. Complications can result from inappropriate or inadequate diagnosis, localization, and surgical planning; failure to respect regional anatomy, and other causes.
Complications of Gastrointestinal Surgery in Companion Animals

Gary W. Ellison

The small animal surgeon creates wounds in the gastrointestinal (GI) tract for biopsy, for foreign body or neoplasm removal, or to relieve obstruction. Unlike a skin wound, dehiscence of a wound of the GI tract often leads to generalized bacterial peritonitis and potentially death. Technical failures and factors that negatively affect GI healing are of great clinical significance. Surgery of the GI tract must be considered clean-contaminated at best; as one progresses aborally down the GI tract, the bacterial population increases. Intraoperative spillage, wound dehiscence, or perforations that occur in the lower small intestine or colon tend to be associated with a relatively higher mortality rate.

Complications of Hepatic Surgery in Companion Animals

Lauren R. May and Stephen J. Mehler

The most common hepatic procedures performed in companion animals are liver biopsies and partial or complete liver lobectomies. Although these procedures are relatively simple to perform in healthy animals, surgery in clinical patients with liver disease is often complicated by the presence of significant systemic illness or by the technical challenges associated with removing massive hepatic tumors. An in-depth understanding of the possible complications that can occur with hepatic surgery helps to provide the best possible outcome for the patient by allowing the surgeon to not only take precautions to try to prevent complications but allows one to monitor for them postoperatively and treat them early if noted.

Complications of the Extrahepatic Biliary Surgery in Companion Animals

Stephen J. Mehler

Surgery of the biliary tract is demanding and is associated with several potentially life-threatening complications. Veterinarians face challenges in obtaining accurate diagnosis of biliary disease, surgical decision-making, surgical hemostasis and bile peritonitis. Intensive perioperative monitoring is required to achieve early recognition of common postoperative complications. Proper treatment and ideally, avoidance of surgical complications can be achieved by gaining a clear understanding physiology, anatomy, and the indications for hepatobiliary surgery.

Complications of Upper Airway Surgery in Companion Animals

Andrew Mercurio

Surgery of the upper airway is performed in dogs for the correction of brachycephalic airway syndrome and laryngeal paralysis and for temporary or permanent tracheostomy. Although technically simple to perform, upper airway surgeries can lead to the development of significant postoperative complications. This article reviews complica-
tions associated with common surgical conditions of the upper airway. It involves a discussion of brachycephalic airway syndrome and associated respiratory and gastrointestinal complications. It also covers laryngeal paralysis with a focus on unilateral arytenoid lateralization and the complication of aspiration pneumonia. The condition of acquired laryngeal webbing/stenosis and potential treatment options is also discussed. Finally, tracheostomies and associated complications in dogs and cats are reviewed.

**Management of Complications Associated with Total Ear Canal Ablation and Bulla Osteotomy in Dogs and Cats**

Daniel D. Smeak

Total ear canal ablation combined with bulla osteotomy is a salvage procedure recommended primarily for end-stage inflammatory ear canal disease but also for neoplasia and severe traumatic injuries. Due to the complexity of the procedure and the poor exposure associated with the surgical approach, there is significant risk for a variety of complications. This review discusses intraoperative, early postoperative, and late postoperative complications reported in large retrospective studies, the causes for these complications, and recommendations about how to prevent them.

**Complications of Reconstructive Surgery in Companion Animals**

Pierre Amsellem

Factors that affect wound healing include the general health of the patient, nutritional status, and wound factors. Treatments such as corticosteroids, chemotherapy, or radiation are also common causes of delayed healing. Multimodal cancer treatment has become more common and the veterinary surgeon may be required to perform reconstructive procedures on an animal that has received or will receive chemotherapy and/or radiation treatments. Complications of reconstructive cutaneous procedures include seroma, hematoma formation, infection, wound dehiscence, distal tip necrosis of skin flaps, paresthesia, and free skin graft failure. Procedures such as maxillectomy or hemipelvectomy also have complications. Knowledge of common complications can facilitate client education and even allow the surgeon to avoid these complications.

**Complications of Minimally Invasive Surgery in Companion Animals**

Philipp D. Mayhew

Minimally invasive surgery (MIS) has become increasingly popular in recent years for diagnosis and treatment of an ever-expanding list of disease processes in small animal patients. Reports in the veterinary literature have documented a large number of MIS alternatives to traditional open surgery albeit mostly in small cohorts of patients. Advantages of MIS have been documented by many investigators and
Complications of Ovariohysterectomy and Orchiectomy in Companion Animals 1023

Christopher A. Adin

Complications following elective spay or neuter procedures are particularly feared by new graduates. However, even the most experienced surgeons may encounter surgical or postoperative complications. At best, complications associated with elective procedures can harm the doctor-client relationship. At worst, these can present legal and financial problems. Veterinary surgeons should be aware of the potential complications associated with elective sterilization, these should be communicated to the client, and there should be a clear plan for action when a complication occurs. This article reviews the reported complications encountered in elective sterilization surgery in companion animals, with a special focus on early detection and prevention.

Surgical Site Infections in Small Animal Surgery 1041

Laura L. Nelson

Surgical site infections (SSIs) are a significant source of morbidity, mortality, and cost associated with small animal surgery. The most well-established strategies to reduce the impact of SSI are preventive, focusing on bolstering host immunity while decreasing wound contamination during surgery. When SSI is identified, the use of consistent definitions and culture-based therapy help to facilitate surveillance and appropriate management. Debridement and open wound management of infected wounds are important for successful treatment.