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. In human medicine, with this increase in popularity, has come a recognition that MIS procedures are not without surgical morbidity and in some cases may be associated with higher levels or different types of complications compared to open surgery.¹ Complications in MIS can be anesthesia-related, access-related or directly procedure-associated.

Creation of a pneumoperitoneum is central to most laparoscopic procedures. Hypercarbia can occur from rapid absorption of CO₂ across the peritoneal membrane and the compressive effect of pneumoperitoneum on the diaphragm. Excessively high intra-abdominal pressure (IAP) can cause depression of cardiac output, increases in systemic vascular resistance and a decrease in hepatic blood flow.² Gas embolism is a rare but potentially fatal consequence of high pressure pneumoperitoneum or the direct inoculation of gases into vascular spaces during laparoscopic access and insufflation.³ To increase the working space during more advanced thoracoscopic procedures, thoracic insufflation or one-lung ventilation (OLV) are generally used. A significant ventilation-to-perfusion mismatch occurs during OLV as a result of non-ventilated lung tissue remaining perfused necessitating careful anesthetic monitoring. Displacement of double-lumen endobronchial tubes or bronchial blockers used to create OLV can result in either loss of OLV intraoperatively or complete airway obstructions.

In humans it has been shown that initial access to the peritoneal cavity is the most dangerous step in any laparoscopic procedure. One study showed that 82% of vascular injuries and 75% of visceral injuries occur at the time of first trocar insertion.⁴ Splenic laceration is the most frequently reported access injury in cats and dogs with incidences of 3-18% being reported in several small studies.⁵-⁸

In general good case selection, experience and the availability of high-quality equipment are critical to avoidance of a high procedure-related complication and conversion rate especially when advanced procedures are being performed. Several general factors such as patient size play a role in case selection. Currently OLV is challenging in small breed dogs and cats therefore limiting the potential use of thoracoscopic techniques in this patient population. In specific interventions such as laparoscopic adrenalectomy, advanced imaging to rule out vascular invasion and lesion size are very important. Lesions over 3-4 cm in diameter will become progressively more challenging especially when located on the right side but good case selection has resulted in good outcomes in two small case series reported.⁹,¹⁰ In the case of thoracoscopic lung lobectomy lesion size, lobe affected and location within the lobe are all important factors to consider when starting out and smaller peripherally located masses have been recommended as good cases to attempt early on.¹¹ In the author’s experience, however, given the correct equipment, the learning curve can be rapid and case selection criteria can be widened to include larger masses located closer to the pulmonary hilus.

Minimally invasive surgery is an exciting new field in veterinary medicine, which in time will transform the standard of care for a substantial subset of surgical patients. At this time, the
process of establishing which procedures lend themselves well to an MIS approach and which are associated with significant morbidity is ongoing. Veterinary surgeons must continue to be diligent in reporting outcomes and complication rates of MIS procedures to allow more evidence-based analysis of surgical morbidity and mortality, thereby directing case selection guidelines for different procedures in the future.

References