

Review

## Recent advances in equine abdominal surgery

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### Abstract

Laparoscopy is a minimally invasive procedure that has applications as a diagnostic, therapeutic and prognostic technique. Specialized equipment is necessary to perform equine laparoscopy, and there is a large range of instruments, both disposable and non-disposable available. Laparoscopic procedures described include ovariectomy, cryptorchidectomy, adhesiolysis and herniorrhaphy. Laparoscopy can be performed in a standing or dorsally recumbent position, depending on surgeon preference, patient status and the procedure to be performed.

Stapling equipment is frequently used in gastrointestinal surgery in horses. Advantages include decreased surgical time and a decrease in the risk of contamination. Stapling equipment is often used in creating anastomoses, both in the large and small intestines, as well as in vessel ligation. New surgical techniques intended to decrease adhesion formation include the use of carboxymethylcellulose and bioresorbable patches. Indwelling abdominal drains can be used for peritoneal lavage following surgery and also appear to decrease the risk of adhesion formation.

Improvements in post-operative care, including the treatment of post-operative ileus and endotoxaemia can significantly improve the outcome of horses that have undergone surgery for abdominal disorders. Recommendations for the use of prokinetic agents in horses with ileus vary widely. Prokinetic agents include local anaesthetics, macrolide antimicrobials, cholinergic agonists and dopamine antagonists. Endotoxaemia is common in horses following surgery for gastrointestinal disorders. The antibiotic polymyxin B binds to the circulating endotoxin molecule, decreasing its half-life in the intra-vascular space and reducing associated inflammation. This drug appears to be an effective and affordable treatment option for horses with endotoxaemia. The use of specific cyclooxygenase inhibitors in veterinary medicine have been studied recently. Selective cyclooxygenase-2 inhibitors may provide comparable anti-inflammatory and analgesic properties to the non-selective non-steroidal anti-inflammatory drugs. These drugs appear to have similar clinical effectiveness and will hopefully minimize deleterious side effects. The optimal healing of ventral midline incisions in horses is related to many factors including appropriate suture patterns and bite size, in addition to appropriate post-operative exercise recommendations.

Recent advances in surgical techniques and post-operative care should decrease the morbidity and mortality associated with abdominal surgery. This article provides an overview of some of these advances.

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### 1. Introduction

Gastrointestinal disease continues to be a major concern to the equine industry, and a large proportion of horses referred to surgical centres suffer from

abdominal disorders. Advances in surgical and anaesthetic techniques as well as post-operative care have resulted in an exponential increase in the survival of horses undergoing abdominal surgery. New techniques and procedures are constantly being developed in this field. The purpose of this manuscript is to highlight some of the recent advances in abdominal surgery in the horse.

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## 2. Laparoscopy

Although the first laparoscopic method was described in the early 1900s, it has only been in the last 30 years that laparoscopic procedures have been routinely used in human surgery (Litynski et al., 1995). In the 1960s and 1970s exploratory laparoscopy and gynaecological procedures such as laparoscopic sterilization techniques rapidly gained popularity. With continual improvements in video resolution, human laparoscopy practices have rapidly expanded to include procedures on the uterus and ovaries, gall bladder, appendix and large colon, as well as herniorrhaphy and adhesiolysis. Smaller incisions, decreased peri-operative morbidity and shorter convalescence time are considered important advantages of laparoscopy over traditional laparotomy approaches in humans (Dubois et al., 1991). Recently, equine laparoscopic techniques have been described in the veterinary literature. University Teaching Hospitals and now many private practices have the equipment necessary to perform laparoscopic procedures, and are describing applications for this minimally invasive surgical technique that may have advantages over more traditional approaches.

Laparoscopy has applications as a diagnostic, therapeutic and prognostic technique. It is useful in the investigation of horses with signs of recurrent abdominal pain or weight loss, where other diagnostic techniques have not yielded a definitive diagnosis. Gastrointestinal adhesions can be visualized and broken down, masses such as abscess or tumours can be assessed, and laparoscopy can be used to biopsy specific sites of the abdominal viscera (Bleyaert et al., 1997; Boure et al., 1998; Boure et al., 2002). The integrity of intestinal anastomosis sites and rectal tears can be evaluated and sites of post-operative haemorrhage identified and controlled (Ragle et al., 1997; Trumble et al., 2000; Waguespack et al., 2001). Laparoscopy can also allow visualisation of some structures not seen in a standard celiotomy approach, such as the epiploic foramen and duodenum. Laparoscopic evaluation and surgical manipulation of the male and female reproductive tract has also been extensively described. In addition, laparoscopy can be a useful teaching aid for students, facilitating a better understanding of anatomy and in the development of rectal palpation skills.

Specialized equipment is necessary to perform laparoscopy. Most of the equipment has been designed for use in humans and adapted for use in horses. In general, the majority of laparoscopic procedures can be undertaken with a standard arthroscopic video camera, light source and cable, and video imaging, printing or digital video capture equipment, which is already available in many surgical facilities. Additional equipment necessary includes laparoscopic instruments, a laparoscope and insufflator (see Fig. 1). Laparoscopes are available with



Fig. 1. Laparoscopic equipment necessary for laparoscopy include a video monitor (top), automatic electronic CO<sub>2</sub> insufflator (middle), and 300 W Xenon light source and cable (bottom).

different viewing angles, including 0° and 30° laparoscopes. With 0° laparoscopes, orientation and manipulation of instruments is simplified, and the picture is brighter. The principle advantage of a 30° viewing angle is the wider field of view it offers. Most equine laparoscopes are 10 mm in outer diameter and are available in lengths of 33 and 57 cm. Shorter laparoscopes simplify instrument manipulation while longer laparoscopes are most useful for diagnostic procedures. Illumination can be a limiting factor in abdominal laparoscopy in horses, and it is recommended a 300 W xenon light source be utilized (Chamness, 2002).

A pneumoperitoneum must be established and maintained to provide adequate visualisation of the viscera and allow safe manipulation of the laparoscope and instruments. Carbon dioxide is the most commonly used gas for abdominal insufflation due to its many advantages. It is widely available, affordable, unlikely to cause gas emboli, is non-combustible and only mildly irritating to the peritoneal and serosal surfaces. Other gas options include helium and nitrous oxide (Ragle, 2002). There are mechanical and electronic insufflators available, with the mechanical insufflators being more limiting with respect to controlling pressure and flow rates, but less expensive. The electronic insufflators have supe-

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