LAPAROSCOPY: WHAT IS POSSIBLE?
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- Ovariectomy, gastropexy and cryptorchidectomy can be performed with laparoscopy in private practice
- Adrenalectomy, cholecystectomy and nephrectomy are feasible with laparoscopy
- Case selection is the key to success with laparoscopy

As the popularity of laparoscopic surgery in veterinary medicine grows so does the armamentarium of procedures that are deemed “possible” with this approach. In human medicine a much more advanced evaluation of different minimally invasive surgical (MIS) techniques has taken place and is still evolving to try and establish the relative advantages of MIS approaches. In many cases clear superiority is reported in well-designed studies with large case numbers but in others significant controversy still exists. In veterinary medicine we are at a point where the field of human MIS was in the late 1980’s and early 1990’s with small numbers of cases reported of a variety of different interventions with, in many cases, non-selective case recruitment criteria and lack of controlled, randomized study designs. In our defense we are hampered by the challenge of recruiting large case numbers in a short period of time and the challenges of attracting significant grant support to evaluate the procedures we are performing more critically. We also have a far less well-regulated system for reporting of complications and adverse events during surgery. This makes it challenging to design multi-institutional studies with the necessary statistical power to provide truly evidence-based outcome data.

Laparoscopic surgery in small animals is going through a slow but sustained evolution that began with the description of some simpler laparoscopic and laparoscopic-assisted procedures and is now in the process of moving into next-generation, less invasive versions of laparoscopic-assisted procedures as well as more advanced procedures performed totally laparoscopically.

To those who perform MIS on a regular basis it will be obvious that instrumentation is as key to success as surgical experience and good case selection. Besides a high quality endoscopic tower and the basic laparoscopic version of standard open surgical instruments, certain other pieces of equipment are considered essential for those seeking to move beyond the most basic procedures. Access to a variety of hemostatic modalities is essential for the more advanced procedures. A vessel-sealing device (Ligasure™, Covidien Inc, Enseal™. Ethicon Endosurgery, or the Harmonic scalpel™, Ethicon Endosurgery) is vital for hemostasis as well as tissue dissection if complex procedures are going to be performed. Hemostatic clips are very useful for situations where larger vessels or non-vascular luminal organs (e.g. bile duct, ureter etc) are going to require ligation. This author uses both metal clips (ML/10, Microline surgical Inc.) as well as self-locking polymer clips (Hem-o-lok™, Teleflex medical Inc.). Specimen retrieval bags are essential to use when any potentially infected or neoplastic tissue is being exteriorized through a portal site to avoid infection or port-site metastasis. Endoscopic stapling devices are used more frequently for thoracoscopic procedures but can also be used to good effect in laparoscopy. Used extensively for bariatric and other gastrointestinal applications in humans, endoscopic staplers are effective for sealing the bile duct or renal or splenic hilus in veterinary patients although cost concerns are always present when these expensive devices are used. Suction/irrigation devices can be very helpful for laparoscopic procedures as small
accumulations of hemorrhage or serous fluid cannot easily be removed using the techniques usually used in open surgery.

Currently the following laparoscopic procedures are carried out on a very regular basis by a large number of practitioners: OVE/OVH, cryptorchidectomy, gastropexy, abdominal organ biopsy, feeding tube placement and cystotomy. Although the results of large numbers of these types of cases have not been reported they are generally very successful techniques and associated with low complication and conversion rates in the hands of most experienced surgeons. The following are an increasingly complex group of procedures which have been described largely anecdotally or are the subject of current investigation: laparoscopic adrenalectomy, ureteronephrectomy, splenectomy, cholecystectomy. Our experience with these is variable from some, which might truly become standard of care to those where we feel that our techniques are still evolving. Hepatic and pancreatic resection, intracorporeal gastrointestinal procedures and a variety of herniorraphies are some examples of procedures that we have not yet performed using MIS techniques but might warrant further investigation in the future.

Laparoscopic adrenalectomy is performed regularly in humans for resection of both adrenocortical tumors as well as pheochromocytomas and has been reported in small cohorts of veterinary patients. We have performed this procedure now in 15 dogs and 2 cats and feel that it can be performed efficiently, safely and with a very low conversion rate. In our series of cases so far there have been no conversions in dogs or cats that underwent LA for resection of an adrenal mass up to 4cm and all animals have been discharged from the hospital. We have not performed LA in dogs or cats with tumors >4cm or in those with ultrasound or CT-confirmed vascular invasion. Vascular invasion is perhaps one example of how the future evolution of surgical technology might allow those tumors with minor vascular impingement to become candidates for LA in the future. We believe that LA is one procedure that lends itself so well to a laparoscopic approach that in the future, adrenal gland tumors might be routinely approached in this fashion, by those with the appropriate equipment and experience.

Experience with laparoscopic ureteronephrectomy (LU) is difficult to come by as ureteronephrectomy is an infrequently performed procedure in dogs and cats. Additionally, the field of minimally invasive urology is developing rapidly making ureteronephrectomy a less frequently indicated procedure for certain types of renal disease. Despite these advances, LU and partial LU remain commonly performed techniques in human surgery and small numbers of these cases have been successfully performed in veterinary patients by the authors group. Caution is urged with LU as the underlying anatomical derangements that have led to the recommendation for the procedure are highly variable depending on whether a neoplastic, obstructive or other type of pathology is present. Ideal candidates for LU include those cases where normal anatomy has not been grossly deranged by the disease process. Situations where the author has encountered problems have included those with massive hydroureter (difficulty in safely ligating the distal ureterovesicular junction), those with renal hilar lymphadenopathy (which can significantly derange local anatomy) and those with massive hydronephrosis (lack of working space). Surgeons should also take care to be aware of the location of the contralateral ureter at all times as this procedure is performed in lateral recumbency, where in this position the two ureters lie in surprisingly close proximity to one another.

Laparoscopic cholecystectomy (LC) is the most frequently performed procedure in human MIS. In dogs and cats a very different spectrum of disease of the extra-hepatic biliary tract is encountered compared to humans. Currently only LC for treatment of uncomplicated gall bladder mucocele has been described in a small cohort of veterinary patients. The development
of laparoscopic biliary tract procedures is hampered by the relatively low numbers of cases affected. In the future, if therapies such as endoscopic or laparoscopic bile duct exploration can be performed reliably and efficiently, a greater subsection of cases may become available for a laparoscopic approach. Currently, this author recommends that only uncomplicated gall bladder mucoceles (those without any evidence of obstruction or rupture) or symptomatic cholelithiasis restricted to the gall bladder, be considered good cases for an LC approach. This procedure is technically demanding especially in the smaller dogs that are most commonly affected by mucoceles. Although first performed using extracorporeal ligation for common bile duct closure the use of stapling devices or self-locking clips may significantly shorten the surgical times reported for this procedure.

Laparoscopic splenectomy (LS) is also commonly performed in human patients and open splenectomy is one of the most frequently performed procedures in small animal surgery. Small numbers of LS have been described in experimental and clinical canine patients in the literature.4-6 The principal indication for splenectomy in cats and dogs is for resection of potentially neoplastic lesions, which in many cases can be very large. If splenic size and/or lesion size is substantial a careful assessment needs to be made as to whether a laparoscopic approach is recommended. One difficulty with this procedure is that physical manipulation of heavy organs can be challenging laparoscopically and care has to be taken not to cause iatrogenic rupture of splenic lesions, which could lead to seeding of neoplastic cells within the abdominal cavity. Consideration should also be given to organ and lesion size when considering organ removal. In the absence of a morcellator, to macerate the tissue that has been resected, removal through a significant enlargement of the portal sites might rapidly approximate the incision created for “open” resection of the organ. However, there is a significant subset of dogs and cats that present for splenectomy that have smaller lesions or diffuse splenic disease that may be good candidates for this procedure. The authors group have performed laparoscopic splenectomy in small numbers of dogs (<5) and cats (<5) and have found the procedure to be feasible although are still in the process of developing the technique.

Constant re-evaluation and refinement of the procedures that have been described is an absolutely necessary part of the evaluation of new procedures in both human and veterinary MIS. Currently there is significant interest in human laparoscopy in single port surgery. The idea is particularly attractive in people as it allows the prospect of a single umbilical surgical site that is hidden from view and is thus to some extent “scarless”. A number of device companies have developed single access devices to facilitate these procedures and some of them (e.g. Single Incision Laparoscopic Surgery (SILS) device) have been used in small animal patients.7 The author currently uses the SILS port for all gastropexy/OVE/OVH combinations, cryptorchidectomies and has used them for splenectomy in small dogs. Originally designed to be used with specialized articulating instruments they can also be used with regular laparoscopic instruments and allow for the placement of three portals (two 5mm and one 5-12mm portal). Using the SILS device despite the close positioning of the three portals significant triangulation is still possible due to the malleable nature of the device.

Other new areas of development in human MIS include the use of robotic surgery and natural orifice translumeral endoscopic surgery (NOTES). Robotics has not yet gained traction in veterinary medicine principally due to the high cost of the equipment, particularly the disposables that are used on the robotic arms. The robotic market is dominated by a small number of companies with existing patents that limit generic versions of the technology becoming available. Some excellent work has been performed using both NOTES and hybrid
NOTES at Purdue University in veterinary species. The popularity of NOTES is currently limited by the costs involved and perhaps by the required skillset which involves routine use of flexible endoscopy. However, the advancement of technology and the evolution of surgical practice may make it entirely plausible that in the future some or all of these newer modalities may become part of the routine armamentarium of the veterinary minimally invasive surgeon.

References