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ADVANCEMENTS IN LAPAROSCOPIC SURGERY FOR VETERINARY MEDICINE: ESSENTIAL INSTRUMENTS AND PROCEDURES

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Abstract

In recent years, laparoscopic surgery has gained from numerous technological advancements, that have improved results and decreased surgical complications. The availability of a wide variety of equipment and instruments enables the performance of surgical procedures, avoiding the need for extensive incisions that are common in the field. Laparoscopic surgery is an expanding domain of knowledge within the veterinary profession, with patients being the primary beneficiaries. Laparoscopic and laparoscopic-assisted procedures are well established in veterinary surgery, with novel minimally invasive approaches and procedures described regularly in the peer-reviewed literature. It is expected that as this field progresses, the benefits associated with accessibility, visualisation, and magnification will continue to demonstrate the superiority of laparoscopic and laparoscopic-assisted procedures over conventional open surgery for specific procedures. This article describes the essential instruments required to perform laparoscopic surgical procedures and examines several laparoscopic procedures that have been implemented in the field of veterinary medicine.

Key words*: laparoscopy, surgery, minimally-invasive-surgery, veterinary medicine.*

INTRODUCTION

Minimally invasive surgery has gained significant popularity in veterinary medicine due to its various benefits, including reduced hospitalization time, faster recovery, decreased stress and discomfort, and improved visualization of abdominal organs (Peteoaca A. et al., 2017).

Hippocrates (460-375 B.C.) conducted the initial endoscopic studies and documented a retroscopy tool that resembles modern-day ones. In 1905, G. Kelling conducted the first laparoscopic surgery on a canine subject, developing an insufflation technique to enhance visualization. In 1913, Jacobeus introduced and carried out the minimally invasive procedure in human medicine, separate from Kelling (Mayhew P., 2011). The inaugural laparoscopic procedure in veterinary medicine took place in 1985, involving the sterilization of a female dog through the closure of the uterine horns (Case JB et al., 2011).

Laparoscopic surgical procedures are recognized for their minimal invasiveness, low incidence of complications, and low death rate. The utilization of contemporary laparoscopic procedures enables the reduction of patients' hospitalization duration, ensuring accelerated recovery and resulting in increased satisfaction among patients (Doerner J. et al., 2012).

Laparoscopic surgery, being a minimally invasive treatment, is thought to decrease the neuroendocrine, immunologic, and metabolic response of the body in comparison to laparotomy surgery, owing to modest tissue injury (Freeman, 1999).

Furthermore, there has been a rise in the quantity of emergency surgeries conducted using laparoscopic techniques. Laparoscopy is used for a variety of purposes, including biopsies of nearly all organs that can be accessed through laparotomy (liver, spleen, pancreas, lymph nodes, kidney, adrenal gland, cholecystocentesis, prostate) (Monnet E et al., 2003). In addition, laparoscopy is a minimally invasive approach for conducting a range of surgical procedures, with the number of procedures performed increasing as experience and expertise grow (abdominal exploratory, ovariectomy, ovariohysterectomy, and/or ovarian remnant removal, abdominal cryptorchid testicle removal, adrenalectomy,

cholecystectomy, liver lobectomy, splenictomy, nephrectomy, artificial urethral sphincter placement, cystotomy and urethrocystoscopy, etc) (Fransson B.A. et al., 2010).
Supplementary surgical procedures (gastrostomy tube, cholecystostomy tube, jejunostomy tube, cystostomy tube), such as the placement of feeding tubes to aid in recovery or to stabilize patients prior to procedures, can also be carried out, as well as a comprehensive examination of the abdominal region for oncologic staging purposes (Micsa C. et al., 2019). The use of laparoscopy offers several advantages over traditional laparotomy, including improved visualization of organs and pathology due to magnification and illumination. This allows for more precise biopsies of specific lesions, resulting in the collection of larger samples than could otherwise be obtained through percutaneous methods (Freeman L.J., 2009). Compared to laparotomy, laparoscopy is associated with decreased patient morbidity, pain, infection rates, and recovery time (Buote N.J. et al., 2011). Additionally, laparoscopy offers the ability to document the pathology of organs, which is beneficial for developing treatment plans, medical record-keeping, monitoring chronic conditions, and educating clients and veterinary colleagues involved in the care of patients (Micsa C. et al., 2018).

MATERIALS AND METHODS

The preoperative patient preparation for minimally invasive surgery of the abdomen shares numerous parallels with standard open abdominal surgery. Preparation involves following a regular preoperative fasting practice and administering perioperative antibiotic prophylaxis based on individual circumstances.
Additional preparatory measures include emptying the urine bladder and making a broader incision in the hair than what would be done for a typical ventral midline laparotomy. Emptying the urine bladder creates more room in the peritoneal cavity during the laparoscopic surgery and reduces the chance of unintentional bladder injury when creating laparoscopic portals. A broader hair clip enables the insertion of laparoscopic portals in a more sideways position, which helps to achieve the desired instrument triangulation (Draghici I et al., 2015).

Laparoscopy principles
In the performance of minimally invasive procedures, several key principles and tactics are essential. Before commencing any surgical intervention, it is necessary to carefully plan and consider the patient's placement, the positioning of the tower, the arrangement of the surgical team, and the location of the instrument table.
The positioning of the patient during minimally invasive abdominal surgery is primarily determined by the specific treatment being performed. A surgeon can utilize the force of gravity to passively retract the abdominal viscera by changing the patient's position. This helps in providing better visibility of the specific anatomical components required for a particular surgical treatment. Throughout the treatment, it may be necessary to alter the posture, therefore necessitating an adjustable operating table capable of accommodating the needed angles. When performing procedures in the retroperitoneal region, it is beneficial to place patients in a lying posture with their chest down and their pelvis supported. This allows the abdominal organs to naturally move away from the retroperitoneal structures that are being examined.
An optimal operating table designed for minimally invasive surgery enables lateral tilting of the table to facilitate sequential access to each side of the reproductive tract. Additionally, it allows tilting of the front and rear ends of the table, such as the Trendelenburg position, to maximize exposure to the caudal abdomen. Securing the meticulous attaching of patients to the table is crucial in order to avoid any unintended slipping or falling incidents while carrying out the surgery. Table top add-on patient positioning systems are increasingly prevalent in the veterinary laparoscopic supplies industry. These devices provide the capability to modify a pre-existing surgical table that does not tilt, in order to make it suitable for laparoscopic procedures.
The positioning of the tower is of utmost importance for ensuring efficient and seamless

surgical procedures. It is crucial that the tower and the monitor be aligned directly with the surgeon's body and the angle of the telescope.

The surgical technique used for minimally invasive abdominal surgery differs based on the specific treatment being performed. The number of intended portals for a certain surgery can vary depending on the surgeon's discretion, which may determine modifications to the precise positioning of the port. Typically, numerous laparoscopic operations involve the use of portals positioned on the front side of the abdomen in a layout resembling a baseball field. This arrangement aids in the precise positioning of equipment in a triangular formation. It is vital to examine alternative methods to improve the visibility of specific organs during certain procedures (Usón J. et al., 2010).

For instance, a paralumbar technique can be employed for adrenalectomy and significantly enhances the visibility of the gland during the operation (Jimenez P. et al., 2008). The use of a 0" telescope that is put into a screw-in threaded trocar during its establishment is optimal for directly identifying the tissues or organs towards which the port is progressing.

Instruments are usually identified by their extended shape and length and varied use. The instruments are introduced into the body through specific hermetically sealed openings with a diameter of either 5 or 10 mm. These ports function to protect the devices and guarantee uninterrupted access. The equipment includes specialised tools for performing intracorporeal suturing, grasping, cutting, and tissue sampling (Peteoaca et al., 2018). To effectively manage bleeding, various specialist sutures and hemoclips can be utilised with little invasiveness. Alternatively, there has been an increased frequency in the creation of several distinct vessel sealing devices. Two examples of these devices include the Ligasure (Covidien), which use electrocautery, and the Harmonic scalpel (Ethicon), which employs ultrasonic technology.

Developing expertise in positioning the surgical team and the operating instrument table is a talent that is honed through practical practice. The ideal team positioning will differ for each process (Tanase A et al., 2015).

Although laparoscopy is often seen as a less invasive procedure, it may not be appropriate for every patient. Laparoscopy should not be performed in patients who have diaphragmatic hernia and significant intra-abdominal adhesions. Avoid doing laparoscopic procedures in animals that are obesse, have respiratory problems, or are in a generally unhealthy condition. Elderly animals may also have an increased probability of encountering challenges when undergoing general anaesthesia in conjunction with pneumoperitoneum. Patients having a history of prior abdominal surgery have an increased difficulty when performing laparoscopy. While pyometra is typically seen as a reason to avoid laparoscopy, there have been documented cases of laparoscopy-assisted ovariohysterectomy being performed successfully in two female dogs with pyometra.

RESULTS AND DISCUSSIONS

Laparoscopic procedures

Before doing laparoscopy on a patient, it is essential to ensure that they are restricted from eating for 12 to 24 hours. The animal must be provided with fresh water throughout the fasting period, except for the 4-hour interval directly preceding the treatment. The urinary bladder, colon, and stomach should be empty of any substances or materials (Lansdowne JL et al., 2012).

Prior to any medical intervention, the abdominal cavity is filled with carbon dioxide gas (CO_2) in order to create a pneumoperitoneum (Catalin M. et al., 2015). This provides sufficient room for the instruments and camera, as well as improved visualisation. Carbon dioxide is advantageous because of its non-combustible properties, affordability, lack of colour and aroma, and high solubility. Consequently, it is rapidly assimilated throughout the entire body following the procedure. Helium gas can be used because of its inert properties, despite its high cost.

Common sites for positioning portals in surgery include the umbilicus for the camera, the ventral midline for instrument ports, and the paramedian area for instrument ports (Sánchez-Margallo F.M. et al., 2007). Portals often have

a diameter of either 5 or 10 mm, and the majority of procedures necessitate the use of 3 to 4 ports.

In the past few years, there have been significant progressions in the implementation of single-point access methods. The procedures are carried out using a specific port called a single incision laparoscopic surgery (SILS) port, which is made by Covidien. These processes employ specialised equipment with flexible components and joints to improve the precision of triangulation (McClaran J.K. et al., 2009).

The following protocols are commonly performed on small domesticated animals:

Laparoscopic ovariectomy, ovariohysterectomy, or ovarian remnant removal

Laparoscopic ovariectomy or ovariohysterectomy is a frequently performed surgery that serves as an initial step for many veterinary surgeons in their laparoscopic practice. The benefits of using a modern technique instead of a classic open approach include improved visualization and quicker recuperation time (Austin B. et al.; 2003).

Patients are positioned in a dorsal recumbency position on a table that can be inclined to the left or right. Various procedures, including 1-, 2-, and 3-port approaches, have been documented. The 1-port approach utilizes a 10-mm operating scope with a 5-mm instrument channel to perform procedures. A widely used method involves using a 2-port technique, in which a port is positioned below the umbilical area, and a second port is positioned either above or below the first port.

Subsequently, it is attached to the body wall using a percutaneous swaged-on needle with a suture or a laparoscopic hook. An ovarian removal procedure can be performed using a vascular sealant device. If the ovary is secured with a suture, it can be left in position and removed once the opposite ovary is removed, or it can be removed right away if a laparoscopic hook is utilized. A 3-port approach can be implemented by positioning all 3 ports along the midline, with 2 ports located below the umbilicus and 1 port positioned above the umbilicus. This technique does not require the suspension of the ovary from the abdominal wall.

The 3-port approach is a viable method for conducting an ovariohysterectomy. The ovarian pedicles on both sides are cut and the wide ligament is also cut around the uterus to reduce the amount of blood vessels and lessen the risk of harm to the ureters and gastrointestinal tract using electrosurgical equipment. This procedure is conducted in a cranial to caudal direction, while maintaining continuous tension on the appropriate ligament (Dupre G. et al., 2009).

The ovaries and uterus are brought outside the body through the incision at the tail end, where the main part of the uterus is tied off and cut in a standard way. problems encompass bleeding and other typical laparoscopic problems. The 3-port procedure can also be used to do an ovariohysterectomy for pyometra (Adamovich-Rippe et al., 2013). A wound retractor device can be utilized at the caudal portal to assist with the extraction of the uterus. It is advisable to carefully choose the cases, following rules for dogs weighing less than 10 kg and having a uterine horn diameter smaller than 2 cm, or dogs weighing more than 10 kg and having a uterine horn diameter smaller than 4 cm. Possible consequences include uterine rupture and bleeding.

A recent study demonstrated that dogs who received laparoscopic ovariohysterectomy required a lower dosage of analgesic medication post-surgery in comparison to those who had an open laparotomy. In 2009, Culp W.T. et al. conducted a study which revealed that laparoscopic surgery in small dogs led to a lower decline in postoperative activity levels as compared to open surgery.

Cryptorchid neutering

Laparoscopic assessment of the peritoneal cavity can be beneficial in both diagnosing and treating abdominal cryptorchidism through either a complete laparoscopic or laparoscopically-assisted approach (Mayhew P., 2009). Laparoscopic surgery has several advantages over conventional surgery, including facilitating the search for the abdominal testicle, reducing the duration of the procedure, and promoting faster recovery in the animal. Employing a retrieval bag for the removal of the abdominal testicle is particularly

advisable when there is any concern for testicular neoplasia.

Gastropexy is a preventive technique that aims to avoid the development of gastric dilatation volvulus (GDV), or to prevent its return upon surgical repair (Dorfelt R. et al., 2012).
Laparoscopically-assisted gastropexy is a highly effective procedure that combines the benefits of a minimally invasive method for safety and the traditional open suturing technique to reduce the time required for the operation. Furthermore, the combination of prophylactic gastropexy and routine ovariectomy, both conducted exclusively through laparoscopy, has demonstrated a significant success rate and little occurrence of complications for dogs who are prone to GDV (Rivier P. et al., 2011). Recently, a technique called laparoscopic gastropexy has been developed. This technique involves using a single port for access and using specialized equipment and telescopes that can move and bend at different angles. Some surgeons prefer laparoscopic-assisted gastropexy due to its technical simplicity and the fact that treatment does not necessitate specific equipment beyond a standard laparoscopic setup.

Laparoscopic-assisted Cystoscopy
The growing prevalence of laparoscopy in diagnostic and therapeutic urologic procedures is remarkable. Nevertheless, it is crucial to highlight that laparoscopically-assisted cystotomy should not be carried out when there is suspicion of transitional cell carcinoma (Defarges A et al., 2013). This is because there is a significant probability of aggressive abdominal metastases occurring if the bladder is breached.
Vesicular calculus is the primary reason for doing cystotomy in dogs. In addition, laparoscopic technique may be beneficial for cases of chronic cystitis that do not respond to medicinal therapy, as well as for the removal of mineral plaques or ulcerated areas (Rawlings C.A. et al., 2003). Moreover, urethrocystoscopy can be utilized to examine a broad spectrum of disorders impacting the lower urinary and reproductive tracts (Zhang J.T., 2010).

Procedure for obtaining liver, renal, spleen and pancreatic tissue samples using laparoscopic techniques
If it is feasible to do abdominal exploratory and organ biopsy using minimally invasive surgery, this approach is preferred over alternative procedures.
There are numerous options for collecting tissue samples, and both laparoscopic and laparoscopically-assisted methods provide a less invasive option for biopsying various organs in the lower abdomen and the thorax (Petre S.L. et al., 2012).
Liver and spleen biopsies are frequently performed for diagnostic purposes using laparoscopy in small animal practice, particularly in situations with hepatic lesions, diffuse diseases, and splenomegaly.
Advantages over blind approaches include the capacity to visually perceive the surface texture and color, the capability to select a precise puncture site, and enhanced control over any potential hemorrhage. Furthermore, it is possible to obtain bigger diagnostic biopsy samples compared to those collected using ultrasound guided spring loaded biopsy needles.
The indications for pancreatic biopsy are to distinguish between acute pancreatitis and acute liver illness, as well as to visualize both organs. In addition to serving as a means of collecting tissue samples, laparoscopic procedures offer the benefit of enabling the surgeon to examine the pancreas in relation to other surrounding organs. By conducting laparoscopic explorations, the most suitable site for biopsy can be identified, thereby minimizing the likelihood of damaging the pancreatic duct (Radhakrishnan A. et al., 2013).
Renal biopsy serves as a valuable diagnostic tool in primary renal disease and in assessing the extent and severity of renal involvement in other systemic disorders. Compared to the traditional blind technique, laparoscopy offers several advantages, including direct visualization of the kidney post-biopsy and the ability to evaluate and control for hemorrhaging (Nowicki M. et al., 2010).
Laparoscopy enables the examination of internal organs and the visual confirmation of hemostasis, without the requirement for invasive open surgery (Micsa C. et al., 2017).

Cholecystectomy.
Laparoscopic cholecystectomy is commonly used for cases of simple gallbladder mucoceles. Nevertheless, it is advisable to refrain from using it in instances of intricate mucoceles, such as coagulopathies, bile peritonitis, extra-hepatic biliary tract obstruction, or when dealing with patients of tiny body size (weighing less than 4 kg) (Micsa C. et al., 2015).
For the surgery, the patient should be positioned lying on their back, and a technique using four ports should be used. These ports include one below the navel, one in the upper left part of the abdomen, and two in the upper right part of the abdomen. These ports are arranged in a triangular pattern around where the gallbladder is expected to be located. The surgeon should assume a Trendelenburg posture, while using a fan retractor in the left port (Lansdowne J.L. et al., 2012). The laparoscope should be placed in the right-sided port closest to the midline, while the other right port, along with the subumbilical port, should be used for instruments controlled by the surgeon (Pascal M. et al., 2015).
It is important to meticulously dissect the cystic duct just before the first hepatic duct and then secure it by either using hemoclips or suturing. Next, the gallbladder should be carefully separated from the hepatic fossa. If there is any occurrence of bile leakage or hemorrhage, it is necessary to take an open approach. It is necessary to enclose the gallbladder in a specimen retrieval bag before removing it.
It is crucial to have knowledge of potential complications linked to the procedure, such as cystic duct rupture, confusion between the cystic and common bile duct, and bile spilling resulting from the cystic duct ligation. In order to reduce these hazards, it is advisable to secure the cystic duct by tying it twice using a single-strand suture, either with knots made outside or inside the body. Moreover, it is advisable to conduct a liver biopsy to get bacterial culture and histology samples, in addition to a bile culture.

Laparoscopic-assisted enterotomy.
Typically, in medical practice, a laparoscopically-assisted technique involves using laparoscopy to grasp on the colon and bringing a section of the bowel outside the body before making an incision to remove the foreign object. This procedure involves making an incision in the intestinal wall to examine the mucosa and remove any foreign objects that are blocking the intestinal passage. It can also be used to take biopsies that penetrate through the entire thickness of the intestinal wall (Gower S.B. et al., 2011). Afterward, the incision in the intestine is closed with sutures. Due to the nature of the procedure, which involves exposing the contents of the bowels, the surgeon must exercise caution to avoid peritonitis. Additionally, the surgeon should possess a comprehensive set of advanced abilities (Catalin M. et al., 2015).

Additional laparoscopic or thoracoscopic procedures
Laparoscopy and thoracoscopy offer a wide range of applications, both for diagnostic and therapeutic treatments. Some more treatments that can be performed via laparoscopy include diaphragmatic hernia repair, cholecystectomy, nephrectomy, and transperitoneal or retroperitoneal lymphadenectomy for cancer staging (Lansdowne J.L. et al., 2005).
Thoracoscopy enables the performance of several treatments, including closure of persistent ductus arteriosus, drainage of chylothorax, and ligation of the thoracic duct (Kim Y.K. et al., 2013).

Thoracoscopy procedures
This is among the most beneficial minimally invasive surgeries (MIS) strategies utilized in small veterinary practices, as it enables the surgeon to execute procedures that are comparable to those carried out via open thoracotomy (Sakals S. et al., 2011).
In addition, thoracoscopy is a minimally invasive surgical procedure that applies a thoracoscope to enable direct visualization and examination of the thoracic cavity and pleural space. Tumour resection can also be accomplished via minuscule incisions, as opposed to open chest surgery, which is renowned for its substantial morbidity and protracted recuperation period. It is important to note that thoracoscopy should only be performed by surgeons who possess prior knowledge and expertise in open thoracic surgery techniques.

CONCLUSIONS

Laparoscopy is a technique that enables the execution of various diagnostic and surgical procedures with minimal invasiveness. Laparoscopy, when executed by a proficient surgeon, is a direct, safe, and efficient technique for performing surgical procedures in animals.

Thoracoscopy and laparoscopy feature a wide range of therapeutic and diagnostic applications. We highlight the following additional procedures that can be performed via laparoscopy: cholecystectomy, nephrectomy, diaphragmatic hernia correction, transperitoneal or retroperitoneal lymphadenectomy for cancer staging, and nephrectomy. Additionally, thoracic duct ligation, drainage of chylothorax, and persistent ductus arteriosus ligation are all procedures that can be performed via thoracoscopy.

Occasionally performed surgeries include oncologic staging/biopsies, splenectomy, intestinal resection and anastomosis, intestinal foreign body removal, portosystemic shunt ligation, and feeding tube installation.

Complications can occur during laparoscopy. Haemorrhage is commonly reported, with a prevalence ranging from 20% to 43% (Micsa C. et al., 2015). Typically, vascular sealant devices are used to manage them, and only in rare cases is it necessary to switch to an open surgical approach. Organ damage, specifically to the spleen, can occur when entering the abdomen prior to insufflation, with a frequency ranging from 3-18% (Mayhew P 2011). However, it rarely requires specific medical intervention. The conversion rate from laparoscopy to laparotomy is approximately 10-20%. Factors that increase the probability of transitioning to an open surgical method include being diagnosed with cancer, having a greater body weight and body condition score, and the surgeon's level of expertise.

It is important to mention that many of these essential challenges associated with MIS are strongly linked to the lack of expertise of the surgeon and their team, with a higher occurrence during the initial stages of the learning process (Fransson B.A. et al., 2012).

Minimally invasive surgical techniques are gaining popularity because they offer several advantages over open surgery for a wide range of procedures. The continual stimulation of further inquiry into the uses of this treatment for specific disease conditions will continue due to the drop in illness rates and the increasing demand from clients. Laparoscopic techniques provide a viable alternative to traditional approaches. The growing popularity of laparoscopic operations in veterinary medicine is due to their low invasiveness, quick hospitalisation, and fast recovery time for animals. This has made them attractive to both veterinarians and pet owners.

REFERENCES

Adamovich-Rippe KN, Mayhew PD, Runge JJ (2013) Evaluation of laparoscopic assisted ovariohysterectomy for treatment of canine pyometra. *Vet Surg* **42**: 572–8. doi: 10.1111/j.1532-950X.2013.12012.x

Austin B, Lanz OI, Hamilton SM, Broadstone RV, Martin, RA (2003) Laparoscopic ovariohysterectomy in nine dogs. *J Am Anim Hosp Assoc* 39: 391–6

Buote NJ, Kovak-McClaran JR, Schold JD (2011) Conversion from diagnostic laparoscopy to laparotomy: risk factors and occurrence. *Vet Surg* **40**: 106–14. doi: 10.1111/j.1532-950X.2010.00759.x

Case JB, Marvel SJ, Boscan P, Monnet EL (2011) Surgical time and severity of postoperative pain in dogs undergoing laparoscopic ovariectomy with one, two, or three instrument cannulas. *J Am Vet Med Assoc* **239**: 203–8. doi: 10.2460/javma.239.2.203

Culp WT, Mayhew PD, Brown DC (2009) The effect of laparoscopic versus open ovariectomy on postsurgical activity in small dogs. *Vet Surg* **38**: 811–17

Catalin M, Manuela Pascal, Bogdan Alexandru Viţălaru, Cătălin Ivaşcu, Ştefăniţă Bogdan Bălăşcău, Alexandru Bociu (2015) :" The effect of midazolam-fentanyl-ketamine mixed administration during laparoscopic surgery in swines" *Abstracts / Journal of Biotechnology vol 208S* pages S97

Catalin M, Bogdan Alexandru Viţălaru, Catalin Ivaşcu, Ştefăniţă Bogdan Bălăşcău, Alexandru Bociu, Alexandru Şonea :"Lap trainer, next step in laparoscopic surgery" *Abstracts / Journal of Biotechnology vol 208S* (2015) pages S99

Defarges A, Dunn M, Berent A (2013) New alternatives for minimally invasive management of uroliths: lower urinary tract uroliths. *Compend Contin Educ Vet* **35**(1): E1

Draghici I, Drăghici L., Litescu M., Munteanu, R., Popa, V., Ginghină, O., Iosifescu, R., Iuliana, Ionaşcu, Predoi, G., Viţălaru, B.A., Manuela, Stănescu (Pascal), Clarisa, Gâdea, Carmen, Gorgan, Anca, Ichiman, Ionescu, M., Pătru, C., Maria-Delia, Popescu, Galinescu, M., Savu, B., Ana Maria Scurtu, Mărgăritescu, D., Şurlin, V., 24-26 aprilie 2014 *Institutionalization of pediatric laparoscopic surgery*

in Romania. Book of abstracts, 1st national Congress of Romanian Society of Paediatric Laparoscopic Surgery and Other Miniinvasive Tehniques in Pediatrics, Bucharest, Romania, ISSN 2360-2260

Doerner J, Fiorbianco V, Dupre G (2012) Intercostal insertion of Veress needle for canine laparoscopic procedures: a cadaver study. *Vet Surg* **41**: 362–6. doi: 10.1111/j.1532-950X.2012.00964.x

Dorfelt R, Ambrisko TD, Moens Y (2012) Influence of fentanyl on intra-abdominal pressure during laparoscopy in dogs. *Vet Anaesth Analg* **39**: 390–7. doi: 10.1111/j.1467-2995.2012.00710.x

Dupre G, Fiorbianco V, Skalicky M, Gultiken N, Ay SS, Findik M (2009) Laparoscopic ovariectomy in dogs: comparison between single portal and two-portal access. *Vet Surg* **38**: 818–24. doi: 10.1111/j.1532-950X.2009.00601.x

Fransson BA, Ragle CA, Bryan ME (2010) A laparoscopic surgical skills assessment tool for veterinarians. *J Vet Med Educ* **37**: 304–13. doi: 10.3138/ jvme.37.3.304

Fransson BA, Ragle CA, Bryan ME (2012) Effects of two training curricula on basic laparoscopic skills and surgical performance among veterinarians. *J Am Vet Med Assoc* **241**: 451–60. doi: 10.2460/javma.241.4.451

Freeman LJ (2009) Gastrointestinal laparoscopy in small animals. *Vet Clin North Am Small Anim Pract* **39**: 903–24. doi: 10.1016/j.cvsm.2009.05.002

Gower SB, Mayhew PD (2011). A wound retraction device for laparoscopic-assisted intestinal surgery in dogs and cats. *Vet Surg* ;40(4):485–8

Jimenez Pelaez M, Bouvy BM, Dupre GP (2008) Laparoscopic adrenalectomy for treatment of unilateral adrenocortical carcinomas: technique, complications, and results in seven dogs. *Vet Surg* **37**: 444–53. doi: 10.1111/j.1532- 950X.2008.00410.x

Kim YK, Park SJ, Lee SY, et al. (2013). Laparoscopic nephrectomy in dogs: an initial experience of 16 experimental procedures. *Vet J* ;198(2):513–7.

Lansdowne JL, Monnet E, Twedt DC, Dernell WS (2005) Thoracoscopic lung lobectomy for treatment of lung tumors in dogs. *Vet Surg* **34**: 530–5

Lansdowne JL, Mehler SJ, Boure LP (2012a) Minimally invasive abdominal and thoracic surgery: principles and instrumentation. *Compend Contin Educ Vet* **34**(5):

Lansdowne JL, Mehler SJ, Boure LP (2012b) Minimally invasive abdominal and thoracic surgery: techniques. *Compend Contin Educ Vet* **34**(5): E2

Mayhew P (2009) Surgical views: laparoscopic and laparoscopic-assisted cryptorchidectomy in dogs and cats. *Compend Contin Educ Vet* **31**: 274–81

Mayhew P (2011a) Developing minimally invasive surgery in companion animals. *Vet Rec* **169**: 177–8. doi: 10.1136/vr.d5125

Mayhew P (2011b) Complications of minimally invasive surgery in companion animals. *Vet Clin North Am Small Anim Pract* **41**: 1007–21, vii-viii. doi: 10.1016/j.cvsm.2011.05.008

McClaran JK, Buote NJ (2009) Complications and need for conversion to laparotomy in small animals. *Vet Clin North Am Small Anim Pract* **39**: 941–51. doi: 10.1016/j.cvsm.2009.05.003

Micsa C., Neagu A.G., Houshaimy K., Tanase A., Sonea A., (2018), Training programmes in laparoscopic surgery. *J Biotechnol, 280(Suppl):S34.*

Micsa C., Togoe D., Balint E., Neagu A.G., Houshaimy K., Sonea A., (2017), Midazolam-fentanyl-ketamine infusion provides myorelaxation for laparoscopic abdominal procedures. *J Biotechnol, 256(Suppl):S47*

Micsa C., Togoe D., Tanase A., Sonea A., (2015), Remediation of hemorrhagic accidents during laparoscopic castration of sows. *Scientific Works, Series C, Veterinary Medicine*, 61(2):90-94

Micșa C., D. Țogoe, V.A.Duțulescu,A.G. Neagu, A. Peteoacă, A. Istrate, A. Tănase (2019) ,,Training in laparoscopic biliary procedures in swine animal model, *Abstracts / Journal of Biotechnology vol 305S* pages S33–S88

Micșa C., Manuela Pascal, Dorin Țogoe, Alin Ion Bîrțoiu, Alexandru Șonea, "MFK Provides Analegesia And Cardiovascular Stability During Laparoscopic Cholecystectomy In Swines" (2015). *Scientific Works. Series C. Veterinary Medicine. Vol. LXIII (2)* vol 63, issue 2, pages 79-84.

Monnet E, Twedt DC (2003) Laparoscopy. *Vet Clin North Am Small Anim Pract* **33**: 1147–63

Nowicki M, Rychlik A, Nieradka R, Kander M, Depta A, Chrzastowska M (2010) Usefulness of laparoscopy guided renal biopsy in dogs. *Pol J Vet Sci* **13**: 363–71

Pascal M, Drăghici I, Drăghici L, Cătălin Micșa, Iuliana Ionașcu, 23-25 Septembrie 2015, Swines Anesthesia Related Accidents During Laparoscopic Training Surgeries *Espes 5th Annual Congress European Society of Paediatric Endoscopic Surgeons, Bucharest*

Peteoaca A., Istrate A., Mocanu J., Micsa C., Tanase A., Ionita L., ,,A review of robotic surgery evolution, current applications and future prospects"(2017). *Scientific Works. Series C. Veterinary Medicine, Vol. LXIV*, Issue 2, ISSN 2065-1295, vol 64, issue 2, pages 59-69.

Peteoaca A., Istrate A., Mocanu J., Micsa C., Tanase A., Ionita L., (2018), The use of swine model in minimally invasive surgical training. *J Biotechnol, 280 (Suppl) : S72-S73*

Petre SL, McClaran JK, Bergman PJ, Monette S (2012) Safety and efficacy of laparoscopic hepatic biopsy in dogs: 80 cases (2004-2009). *J Am Vet Med Assoc* **240**: 181–5. doi: 10.2460/javma.240.2.181

Radhakrishnan A, Mayhew PD (2013) Laparoscopic splenic biopsy in dogs and cats: 15 cases (2006-2008). *J Am Anim Hosp Assoc* **49**: 41–5. doi: 10.5326/ JAAHA-MS-5823

Rawlings CA, Mahaffey MB, Barsanti JA, et al (2003). Use of laparoscopic-assisted cystoscopy for removal of urinary calculi in dogs. *J Am Vet Med Assoc*; 222(6):759–61, 737.

Rivier P, Furneaux R, Viguier E (2011) Combined laparoscopic ovariectomy and laparoscopic-assisted gastropexy in dogs susceptible to gastric dilatation-volvulus. *Can Vet J* **52**: 62–6

Sánchez-Margallo FM, Díaz-Güemes I, Usón-Gargallo J (2007a) Intracorporeal suture reinforcement during laparoscopic gastropexy in dogs *Vet Rec* **160**: 806–7

Sakals S, Schmiedt CW, Radlinsky MG. (2011). Comparison and description of transdiaphragmatic and abdominal minimally invasive cisterna chyli ablation in dogs. *Vet Surg*;40(7):795–801.

Tanase A.O, Micsa C., 2015, Swine laparoscopic cholecystectomy- training model for human medicine *Lucrări ştiinţifice medicină veterinară vol. XLVIII(4), 2015, Timişoara pag.29*.

Usón J, Sánchez FM, Sánches MA, Pérez FJ, Hashizume M (2010) Basisc Principles. In: Usón J, Sánchez FM, Pascual S, Climent S, eds. *Step by Step Training in Laparoscopic Surgery*. 4th edn. "Jesús Usón" Minimally Invasive Surgery Centre, Cáceres: 23–89

Zhang J.T. (2010) Laparoscopy for percutaneous tube cystostomy in dogs. *J Am Vet Med Assoc*; 236(9): 975–7.