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LEARNING CURVE OF LAPAROSCOPIC OVARIECTOMY IN CATS – A CASE SERIES

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Abstract

Minimally invasive surgery is constantly improving and breaking grounds due to its benefits such as, fast recovery and less pain. But these procedures need a lot of effort from the surgeon, more than an opened technique, since the focus becomes a monitor and not a directly visible organ.
In cats two procedures can be performed for spaying, ovariectomy and ovariohisterectomy. The first one can be performed using a two port laparoscopy technique.
This study describes the surgical approach for a laparoscopic two port ovariectomy and emphasizes on the time needed for the procedure, taking into study 8 young healthy short hair cats and a veterinary surgeon with limited experience in laparoscopy, but with some little experience in using the laparoscopic instrumentation.
None of the surgeries needed conversion. In one case we observed a wound dehiscence, that healed by secondary healing. The surgeon's time of surgery improved as the number of cases increased.

Key words: laparoscopic ovariectomy, cats, learning curve

A laparoscopic spay, also known as laparoscopic ovariectomy or laparoscopic-assisted spay, is a minimally invasive surgical technique used to remove either ovaries or both ovaries and uterus in female dogs and cats [Dupres, 2009]. The learning curve for laparoscopic spay refers to the process through which a surgeon becomes proficient in performing this procedure.

Regarding the learning curve in laparoscopic spay there are several key points to be taken into account [Freeman, 2011]. First, the initial training: Veterinarians or surgeons who want to perform laparoscopic spays typically undergo specialized training to learn the technique. This training often includes didactic education, hands-on experience with simulators, and observation of experienced laparoscopic surgeons. Then, skill development: Like any surgical procedure, laparoscopic spay requires the development of specific skills. Surgeons must become proficient in using laparoscopic instruments, camera systems, and maintaining a stable and clear view of the surgical field on the monitor.

Also important is case experience [Rouge, 2013].

The learning curve involves gaining experience by performing actual laparoscopic spays on live patients. As with any surgical procedure, the more cases a surgeon completes, the more skilled and efficient they become.

Over time, surgeons tend to become faster and more efficient at performing laparoscopic spays, which can reduce surgical time and minimize the time the patient is under anesthesia and reduce pain [Brad, 2011].

As for other procedures there are challenges and possible complications. Laparoscopic spay can be technically challenging because it involves working in a limited space, using long, slender instruments, and coordinating movements with a camera system [Freeman, 2011; Lansdowne, 2012, Philip, 2011]. Surgeons must also become skilled at creating pneumoperitoneum (inflating the abdominal cavity with carbon dioxide) and managing insufflation pressures. Part of the learning curve also includes being able to recognize and manage complications that can arise during the procedure. These may include bleeding, organ injury, and other surgical risks. Maintaining a commitment to patient safety and well-being is paramount throughout the learning process [Sherisse, 2018].

This case series describes the learning curve of a limited experienced surgeon in minimally invasive surgery, for two port laparoscopic ovariectomy in cats.

MATERIAL AND METHOD

8 female European Shorthair cats were included in the study. Out of the 8 cats, 7 were 8 months old, and one cat was 2 years old, and their average weight did not exceed 3 kg. The surgeon performing the surgeries had limited experience in minimally invasive surgeries. Nevertheless the surgeon was able to coordinate and knew instrumentations and techniques valid for the procedure.

The patients were assessed from an anesthetic perspective through clinical examination, including inspection and palpation, heart and lung auscultation, rectal temperature measurement, evaluation of dehydration level, and assessment of body mass. Additionally, venous blood was collected for blood gas analysis. All patients were considered clinically healthy and suitable for laparoscopic ovariectomy, falling into ASA class 1, meaning low anesthetic risk and associated mortality risk of 0.1%. General anesthesia was performed using Medetomidine at 10 µg/kg and Buprenorphine at 20 µg/kg administered intramuscularly in premedication. After the cats were lightly sedated, a peripheral venous catheter was placed in the antebrachial cephalic vein. Diazepam at 0.25 mg/kg and Ketamine at 3 mg/kg were administered intravenously. The cats were then intubated and the abdomen was prepared for the surgical procedure. Once clipping on both flank sides was performed and antisepsia was accomplished, using Clorhexidine and Alcohol, each cat was moved in the surgical room where they were connected to the anesthetic machine and inhalatory anesthesia, using Isoflurane for maintenance at 1%.

Each cat was placed in dorsal recumbency and a transparent surgical field was then placed on the animal. Using a scalpel blade, an incision was made through the skin and subcutaneous connective tissue, measuring 0.5 cm in length, in the ventral abdominal region, at a distance of 0.5 cm cranila from the umbilical scar. A piece of adipose tissue, 2-3 mm in size, was excised using surgical scissors. Near the incision site, an anchoring suture was applied, followed by gentle dissection of the abdominal wall. A stab incision was then performed to create an opening into the peritoneal cavity, where the first trocar was secured. It was carefully introduced into the abdominal cavity, through direct visualization, to avoid injuring abdominal organs. Once the first trocar was in place, the anchoring suture became a purse-string suture to achieve a better seal.

The first 5 mm trocar was then connected to a source of CO_2 and the pneumoperitoneum was created. The 5 mm 30° angle telescope was inserted into the first trocar, and the abdominal cavity was briefly explored to check for possible visceral injuries.

A second incision was made through the skin and subcutaneous connective tissue, 2-3 cm caudal to the first incision, on the linea alba and the scalpel blade was then directly introduced through the abdominal wall, while under direct visualization with the laparocopic camera. The length of this incision was 0.5 cm, the size of the second 5 mm trocar. Once the two trocars are secured, with the first one located near the umbilicus and intended for the telescope, and the second one positioned 2-3 cm caudal to the first one, intended for forceps and electrocautery devices (Figure 1), the cat was rotated towards the surgeon to obtain better visibility if the renal area where the ovaries would be found. While observing on the monitor, we proceeded to identify the left uterine horn along with the left ovary, in proximity to the kidney.

Figure 1. Placement of ports for the two port ovariectomy in cats

Once the uterine horn was identified, it was brought to the median plane and suspended in contact with the abdominal wall. Using a suture thread and guided by the telescope, the ovary was transcutaneously suspended (Figure 2). Once the ovary was suspended, the forceps could be removed and bipolar scissors could be inserted through the same port. Once the ovary is removed through cauterization (Figure 3) of the suspensor ligament, ovarian vein and artery and the uterine horn junction, the cats are repositionded in straight dorsal recumbency, the surgical team changes side and the same procedure is repeaded for the right ovary. The two ovaries are removed through the laparoscopic ports.

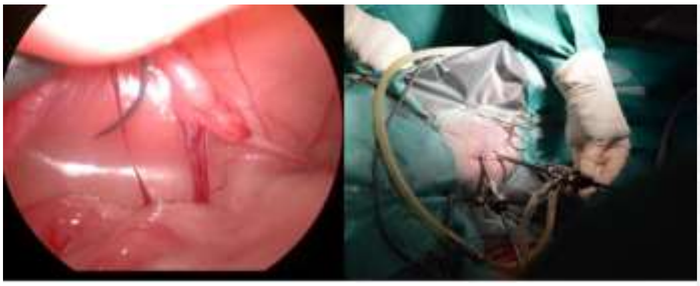

Figure 2. A. Intraabdominal view of suspending the ovary; B.External view of the ovary being suspended

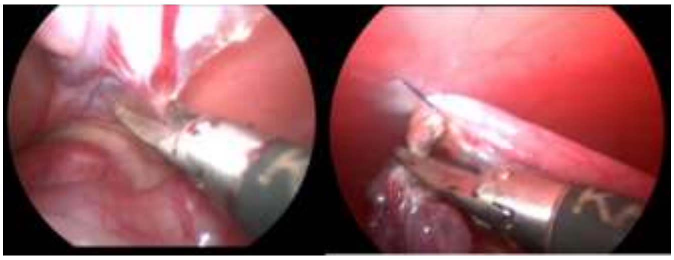

Figure 3. A. Cauterization of the ovarian artery and vein; B. Cauterization of the ovarian uterine junction

Once the instruments are removed, 2 mg/kg bupivacaine is injected intraabdominally and the abdominal wall, subcutaneous tissue and skin are closed with simple cruciate sutures, using a 4.0 monofilament suture material. Postoperatively the animals received Meloxicam at 0.1 mg/kg, for 2 days.

In each case, the surgeries were timed, starting from the moment of the first incision and finishing with the skin suture. There were key moments during surgery when the patients' vital signs were recorded, such as T1: pneumoperitoneum; T2: suspension of the right/left uterine horn; T3: sectioning of the right/left ovary; T4: suspension of the left/right uterine horn; T5: sectioning of the left/right ovary; T6: abdominal wall closure.

RESULTS AND DISCUSSIONS

Mean total time for the surgical procedure was 58 minutes. As can be observed in Figure nr.4 The duration of the procedure became shorter with increase experience of the surgeon.

The long duration for patient nr 4 was due to difficulties in obtaining hemostasis, the cat was the 2 year old cat that was in estrus, making the procedure a bit riskier. Other complications that were observed were wound dehiscence in one case, but the administration of Amoxiciline and clavulanic acid at 20 mg/kg BID for 7 days, decreased any risk of infection.

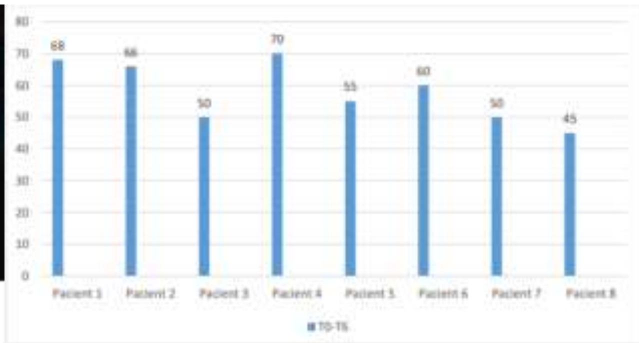

Figure 4. Variations in duration of the surgical procedure for each animal

The duration of the laparoscopic ovariectomy is not reduced compared to the classical approach and the purpose of this study was not to demonstrate that, but to show the evolution in time once the surgeon becomes more used to the procedure. The preparation of the laparoscopy equipment requires an average time of 10-15 minutes [Monet, 2003; Pope, 2013]. Here, we are referring to simply starting the equipment, including the optical unit, light source, CO_2 source, ensuring the connection to the CO_2 cylinder, and operating the image processing unit..

In any surgical technique, complications can arise. The rate of complications in these interventions is low, and some authors report it as being zero. Complications are categorized based on their timing, intraoperative and postoperative. One of the most common intraoperative complications is the trauma to abdominal organs due to the placement of ports, and the spleen is most commonly affected. Spleen trauma resulting from port placement is associated with intraabdominal bleeding in 5-19.7% of all cases. The bleeding is directly proportional to the severity of the injuries and can be controlled by inflating and increasing intraabdominal pressure. Any accumulation of blood in the abdominal cavity can make it challenging to identify the ovaries. It's crucial to note that the magnifying effect of the telescope can create the impression of massive bleeding. [Boel and Mayhew, 2015].

Other intraoperative complications include bladder puncture, pedicle hemorrhage, loss of the ovary in the abdominal cavity, and they have been reported in about 10% of cases; peritoneal burning injury (VSD), CO_2 leakage through cannulas into the subcutaneous space in about 5%. Another study suggests that pedicle hemorrhage is more commonly reported when sutures or clips are used (40%) as opposed to VSD (10%). Intraoperative conversion to laparotomy is not a complication in itself and is considered a consequence of other complications explained in this chapter. One situation where conversion should be considered is uncontrollable bleeding of splenic or pedicular origin. Another situation would be the inability to locate a lost ovary in the abdominal cavity. One study supports a conversion rate to laparotomy of 5%, primarily due to splenic laceration when attempting prophylactic gastropexy. Discovering a diaphragmatic hernia is another indication for conversion, regardless of the frequency of operations or experience abundance. Owners must be informed of the potential risk of conversion. [Boel and Mayhew, 2015].

We have not reported these types of complications, but have seen dehiscence in one of the cases.

Other postoperative complications include seromas, hematomas at the site of the trocar entry, incision site infection, intermittent bloody vaginal discharge, omental hernia at the incision site. Statistical calculations suggest that the occurrence of postoperative complications ranges from 3.9% to 31% of reported cases. [Boel and Mayhew, 2015].

CONCLUSIONS

The field of laparoscopy in veterinary surgery continues to evolve, and new techniques and equipment are developed. Surgeons must stay up-to-date with the latest advances and continue to refine their skills. The learning curve for laparoscopic spay can vary from one individual to another. Some surgeons may become proficient more quickly than others, depending on their background, experience, and the amount of training they receive. It's essential for veterinary professionals to seek proper training and mentorship and to continue learning and improving their skills to provide safe and effective laparoscopic spay procedures for their patients.

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