Reporting and solving intraoperative complications during mass neutering in canine and feline females carried out on a Mobile Surgery Unit in the south of Santa Fe province.

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INTRODUCTION:

At present, limiting reproduction to control canine and feline population is a strategy adopted by many societies, since from an ethical and humanitarian perspective, it is more acceptable than any euthanasic practice. For Acuña Mercado(2012), the only technique that does definitely abolish fertility is surgical sterilization. Moreover, it has been observed that there is a decrease in the prevalence of uterine diseases and a reduction in the risk of contracting mammary tumors in neutered animals (Olson and Johnson, 1993; Ogilvie and Moore, 2008).

Through the Pro-ownership Program the government of the Argentina carries out free mass neutering of canines and felines throughout the country. In the case of Rosario and area of influence, during the year 2014 and the first quarter of 2015, a Mobile Surgery Unit under the direction and supervision of a surgical team belonging to the Chair of Surgery of the Faculty of Veterinary Sciences in Casilda, National University of Rosario was used to comply with the program. Although the surgeries were carried out by professional teachers of the faculty, non-teaching staff, municipal delegates and protectionist entities also took part in the program, the latter collaborating with the dissemination and organization of activities.

Regarding the surgical technique used by the aforementioned surgical team, it is important to highlight the concepts of Ormrod (1969) who refers to flancotomy as the approach to perform ovariectomies. For this author, flancotomy proves to be a minimally invasive technique with reduced surgical times, with a frequency and distribution of complications similar to those reported by other authors for traditional surgeries. With it, the visualization and exteriorization of the ovaries is easy, which reduces the surgical time. In addition, being of minimal invasion this approach causes small wounds that heal quickly; and in the case of a dehiscence, the probability of an eventration or a evisceration is low, a detail not less important when it is thought that the intervening surgical team cannot participate in the postoperative care. Consequently, it can be inferred that flank ovariectomy is the technique of choice for mass neutering programs, where it is important to work quickly in a large number of patients. However, the flancotomy has a disadvantage that must be emphasized: being of minimal invasion generates a meager operative field, so that when a complication occurs, both the visualization of the intra-abdominal structures and the movements of the hands of the surgeon are limited.

It is known that there may be complications in any surgical procedure. By complications, the adverse health effects of an intervention and the intra and postoperative risks of these interventions are understood (Acuña Mercado, 2012). In the case of massive spaying of canine and feline females using flancotomy as a means of approach, certain intraoperative findings could not only become a complication to be solved by the surgical team, but could also prolong the time of surgery which is very important when evaluating the modality of work applied in population control programs in which a large number of animals are involved.

The aim of this work is to inform both the organizers and the new professionals involved in this type of program about the frequent intraoperative complications in mass neutering of female dogs and cats, specifically when flancotomy is used as the approach, and also about the surgical strategies that can be used to solve them.

MATERIALS AND METHODS:

The study was carried out in the period 2014-2015 on 929 surgeries performed on canine and feline females, out of which 886 were ovariectomies and 43 overiohysterectomies. The approach used in all cases was flancotomy.

The mobile surgery unit where the surgeries were performed is a two-axle trailer seven meters long and two and a half meters wide. It has two stainless steel tables, specific furniture for the tasks, hot and cold water, heating and air conditioning, equipped bathroom, shaving machines, sterilization stove and complete instruments, among other specific supplies for medical attention.

The working protocol began outside the mobile surgery unit, where each animal was identified and clinically checked; then an individual record was completed with relevant data of the pet and owner. Subsequently, the anesthetic was applied intramuscularly according to the pre-established anesthetic protocol, and once the sedation of the animal was achieved the shaving was performed on the dorsal side of both forearms and the operative area (right flank) between the last rib, sub-lumbar muscles, mammary line and flank fold.

In order to perform the venoclysis and maintain a permeable route, intravenous catheters were used. The veins chosen for this purpose were cephalic antebrachial vein or external saphenous vein. After anesthetic induction, three consecutive washes and rinses of the surgical area were performed with 5% povidone-iodine soapy solution.

After anesthetic induction, the patient was admitted to the operating room and placed in the correct position on the stretcher (left lateral decubitus). The fluid maintenance therapy was performed with physiological solution of sodium chloride 0.9% intravenously. Finally, the operative area was covered with 10% povidone-iodine aqueous solution and four sterile field compresses.

The surgical technique began with an oblique skin incision from craniodorsal to dorsoventral, on the bisector of the angle formed by the line of the sublumbar muscles and the caudal border of the last rib, approximately in the center of the area described, with an extension that depended on the size of the animal and the species (between 1.5 and 3.5 centimeters). Once the skin had been cut with Metzembaum scissors, the subcutaneous cell tissue and the muscle planes were divulsed in their fiber direction: external abdominal oblique muscle (from craniodorsal to caudoventral), then the internal abdominal oblique muscle (from caudodorsal to cranioventral) and last, the transverse abdominal muscle (from dorsal to caudal) intimately attached to the peritoneum that was torn in the same maneuver. To ease the approach, an assistant kept the borders of each plane apart with Farabeuf separators. Once the abdominal cavity was approached and the right ovary localized behind the ipsilateral kidney, it was exposed and taken between the thumb and the middle finger of one hand. With a soft but firm movement the pelvic ligament was torn with the index finger of the

other hand to completely exteriorize the gonad. In cats, such a maneuver was not necessary as they have structures of support much more lax. During the ligament tear, special attention was paid to obese bitches with fat infiltration in their muscles, especially if in heat.

A transfixion ligature was then performed, i.e. two threads of nylon 0.26 or 0.30 passed through the same hole in the mesovary, one knotted in cranial (ovarian artery) and the other caudal of the ovary (ovary branch of the uterine artery). Then the assistant held both ligatures to ease the surgeon´s maneuver who, with a Metzembam scissors and a left-hand clamp, extracted the ovary together with the ovary bag. Once hemostasis was checked, the ligature extremes were cut. After that, the surgeon followed the course of the uterine horn caudally to locate the cornual bifurcation, then the left horn and finally the corresponding ovary. The ligatures and left ovary ablation were identical to those for the right ovary. The flancotomy synthesis was carried out with one or two single stitches or x of 0.25mm nylon in each plane as follows:

1) peritoneum- transverse abdominal muscle,
2) internal abdominal oblique muscles,
3) external abdominal oblique muscles,
4) subcutaneous cell tissue, and
5) skin.

Once the surgical intervention was over, the animal was taken to the back of the mobile unit; it was kept warm and with the permeable route. It was under observation until its recovery. The average time from admission into the mobile unit to the beginning of the recovery stage was 8 minutes.

Finally, once outside de mobile surgery unit, the animals were returned to their owners who were given the relevant indications.

RESULTS

Out of the 929 neutered females, the following complications were observed:

a) Ovarian cysts. In 5 bitches ovarian cysts were detected in one or both ovaries but these did not alter the development of the technique. In three cats, accessory ovarian tissue over the ovary's own ligament was found.
b) Surgical accidents. An incision of the wall of an intestinal loop during the maneuver of divulsion was reported in a cat showing distention of the intestinal tract; and a lesion of the splenic parenchyma during a similar maneuver in a bitch with splenomegaly.
c) Intra-abdominal parasites. Dioctophyma *renale* were detected during one canine surgery.
d) Uterine contents.

Out of the 656 spayed female dogs, 631 were ovariectomies and 25 ovariohysterectomies. The causes for which the latter intervention was decided were: intraoperative finding of gestation (15 cases) and uterine collection (10 cases).
In female cats 255 ovariectomies and 18 ovariohysterectomies were performed out of which 13 were for pregnancy and 5 for pyometra

DISCUSSION

The presence of ovarian cysts did not modify the development of the surgeries. Surgical accidents were minimal and proper of a fast technique, essential requirement in this type of programs that contemplate a large number of animals to be intervened a day. The two accidents were solved through sutures. In the case of the intestine, the mucosa was not involved, so only two Lembert´s stitches were made. In the case of the spleen, a splenorrhaphy was performed by means of a continuous pattern of the surgete type.

In the case of the Dioctophyma *renale* detected, the appearance of a bloody exudate in the abdominal cavity alerted the surgeon, who performed a complete scan of the cavity and detected two female adult worms. Parasites were extracted and the cavity was washed with warm physiological solution.

There is no doubt that the most frequent intraoperative complications that influenced the development of the surgical protocol were uterus with content (pyometra, hemometra, mucometra and pregnancy). When the surgeons found a pregnant or collecting uterus they had to change the surgical strategy, that is, perform an ovariohysterectomy with the difficulties that this technique involves when the approach is flancotomy. In order to solve this contingency, the procedure was as follows: first, in order to externalize each of the uterine horns and the body of the organ, the length of the incision had to be extended as necessary to allow a safe extraction that would not generate tears. Then the organs were isolated with second field drapes suitably arranged and in a number appropriate to the circumstances.

The next surgical time consisted of the ligatures corresponding to the ovarian vessels. A ligation was applied by transfixion on the mesovary using a Halsted plier loaded with two nylon threads (0.25 or 0.30). With the first thread, the ligature was done as cranially as possible to the organ, and with the second caudally. With Metzembaum scissors, sectioning was performed between the cranial ligature and the ovary. The same procedure was used with the opposite ovary. After checking hemostasis, the ends of the ligatures of the ovarian arteries were cut.

Once the two ovaries were separated, the broad ligament of the uterus was delicately torn with the fingers, taking special care to ligate the vessels that flow through it, to prevent unnecessary blood loss that could disturb the surgeon's vision. For example, the more vascular adipose broad ligaments required ligation after resection.

The next step consisted of the ablation of the uterus and ovaries of the abdominal cavity and the creation of a uterine stump. In the first place, the right and left uterine vessels that run on the lateral surface of the organ were identified. Three Halsted pliers were placed: one cranial, applied transversally at the border between the neck and the uterine body; an intermediate at 2 to 3 mm cranial to the first, and a cranial at 2 or 3 mm from the intermediate one. Behind the caudal pliers, a

0.30 nylon mass ligation was performed involving the uterine arteries. In this maneuver, the operator measured the strength that was imprinted on the first semi-knot (girdle) so as not to tear friable uterus. The section was performed between the cranial and the intermediate pliers. Then the uterus and ovaries were extracted with extreme care. Finally, the intermediate plier was removed and the efficacy of hemostasis was checked.

In cases where the diameter of the uterine body was significant, a transfixion ligature was chosen: with a straight suture needle threaded with nylon 0.30, a knot was made in eight involving the lateral vessels. If the stump size allowed, a Cushing suture with nylon 0.25 was performed. Then the caudal plier was removed and hemostasis checked. The abdominal cavity was explored to remove clots and observe the rest of organs. In cases where the surgeon thought it pertinent, washings of the abdominal cavity with warm physiological solution were made.

The synthesis of laparotomy was done in a conventional manner with 0.25 nylon as described above. However, to avoid the formation of dead spaces, due to the increase of the opening of the cavity, more points per plane were applied (2 or 3 points in each plane), always involving the anterior plane. In these cases, the advantage offered by the minimal invasion of a flancotomy was lost, therefore, for these animals, a special postoperative follow-up was suggested to the owner.

CONCLUSION

It is concluded that ovariectomy with a flancotomy approach is simple, fast and safe for use in mass neutering campaigns of bitches and cats. However, this technique requires the surgeon competencies highly valued in the surgical field, such as: manual dexterity and physical resistance to perform interventions quickly in a large number of patients and to apply a technique with minimal invasion to promote a postoperative period without complications; and also adequate decision-making to resolve intraoperative complications that tend to be real obstacles.

According to this study, the complications generate changes in the standards of the surgical techniques employed and cause delays in the development of the working protocol.

Although no deaths associated with the surgical interventions were reported in this study, the complications that appeared, if they had not been satisfactorily solved immediately, they could have jeopardized the well-being and even the lives of the patients. Therefore, it is important that both the organizers of this type of programs and the professionals involved, know and consider these findings to be aware, especially when it is known that patients who go to this type of service do not have preoperative tests that could predict them.

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