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Orchiectomy in Medium and Large Dogs - New Surgical Technique

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ABSTRACT

***Background*:** Castration of males is a surgical procedure, most often elective, being performed in an open or closed way. In small dogs and cats, it is possible to ligate the testicular plexus without the use of surgical thread, causing less local inflammation because there is no exogenous material in the animal. In large patients, this technique has limitations, since because of the greater thickness of the vas deferens duct and vessels, the stitch can loosen and cause trans and postoperative bleeding. The aim of this study was to describe a new orchiectomy technique that dispenses with the use of surgical thread in ligating the testicular arteriovenous plexus in medium and large dogs.

***Material, Methods & Results*:** A total of 25 adult dogs, with varied weight (8 a 47 kg), were operated. All animals since study belonged to tutors, coming from clinical consultations in order to perform castration. The entire surgical procedure was properly explained to the owner, as well as all pre-and post-surgical care, for monitoring the animal. All patients were clinically evaluated through anamnesis, physical tests such as palpation and auscultation (cardiac and respiratory) and laboratory tests to discard any animal with systemic changes that made surgery impossible. The breed-wise distribution involved 15 had no defined breed (mixed-breed), followed by 2 Rottweiler, 2 American Bully, 1 Australian Cattle Dog, 1 Labrador, 1 Shih-Tzu, 1 Border Collie, 1 German Shepherd and 1 Pitbull. The average weight was 21.04 kg (ranging between 8 and 47 kg). The beginning of the technique proceeded with the opening of the skin in the pre-scrotal region, with one of the testes positioned below the incision line, to avoid iatrogenic lesions in the urethra. After, the testicular layers were properly incised for exposure of the testicle and posterior ligation of the vessels. Arteriovenous plexus ligation was performed with the aid of a curved hemostatic forceps without the use of surgical thread, using a maneuver similar to making a "surgical knot" with suture thread, followed by a 360º rotation of the forceps and grasping the plexus. Subsequently, the plexus was sectioned and the vessels slid to complete the ligature. The vas deferens was then ligated using the same technique. The 1st surgery performed on dog 1, from skin incision to dermal synthesis, lasted about 15 min, being noticeable its reduction as the surgeon became familiar with the technique, thus obtaining a surgical time of 5 min in the last patient. The average time to perform the technique was 7'48" (ranging between 5 and 15 min).

***Discussion*:** The advantage of the open technique is that in addition to providing greater visualization of the structures present, as well as direct ligation of blood vessels, reducing the risk of release and consequent bleeding, it allows the knot to be made (with the help of hemostatic forceps) duct and pampiniform plexus in an individualized way. On returning for assessment and subsequent removal of the stitches, it was found that the surgical wounds had healed in all animals. There were no dehiscences, fistulations or bleeding. Seroma was only found in the scrotal region of an animal, similar to what often occurs in the conventional technique, being indicated only medical treatment, with application of cold compresses in the region. The animal returned after 3 days, where the presence of seroma was not observed. These results provide significant contributions that the proposed technique, performed in dogs larger than 5 kg, was safe, fast, easy to perform, low cost and free of severe postoperative complications.

Keywords: canids, castration, hemostatic forceps, veterinary surgery.

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INTRODUCTION

Orchiectomy is indicated for control of stray dogs, unwanted reproduction and loss of the habit of urinating frequently to "mark territory". However, this technique is also applied in the treatment of several testicular disorders such as neoplasms, cryptorchidism, trauma and testicular torsion; and prostatic disorders such as benign hyperplasia, cysts and abscesses. Some neoplasms, such as perianal adenomas, have receptors for testosterone, so orchiectomy can also benefit patients with these diseases [6,7,13,18].

The orchiectomy technique can be performed in an open or closed way. In the open technique, the testicular tunics are incised, with the exception of the albuginea. In the closed technique, the vaginal tunic is also preserved [6,7,10,13,19,20].

Whether in the open or closed technique, classically the arteriovenous plexus and the vas deferens are ligated simultaneously. Any sterile surgical thread can be used to ligate the testicular pedicle. However, absorbable threads are preferred because they prevent the maintenance of a foreign body in the animal [13].

In small dogs (less than 5 kg) and cats, it is possible to ligate the testicular plexus without the use of surgical thread. However, they have limited use restricted to small animals, since in large patients, due to the greater thickness of the vas deferens duct and vessels, the stitch can loosen and cause trans and postoperative bleeding [5,14].

Thus, we aimed to describe a new technique of orchiectomy, without surgical thread in ligating the testicular arteriovenous plexus which has the efficiency of the other technics, but can also be used in medium to large animals, with lower risk of bleeding.

MATERIALS AND METHODS

Animals

Twenty-five healthy dogs were used in elective orchiectomies, ranging from medium to large, aged between 1 and 12 years, with weight variations between 8 and 47 kg. All animals were clinically evaluated through anamnesis, physical tests such as palpation and auscultation and laboratory tests such as blood count, alanine aminotransferase (ALT) and creatinine, to discard any animal with systemic changes that would make surgery impossible. Initially, information and standardized antiseptic measures to be performed before surgery were passed to the tutors, such as bathing the animal 24 h before surgery to remove loose hair, undesirable debris and external parasites, followed by food fasting 12 h before anesthetic induction to avoid vomiting and aspiration pneumonia in the transoperative process.

Surgical preparation

The animals were submitted to different anesthetic protocols according to the general conditions and individual characteristics of each one. Abdominal and ventral pelvic trichotomy was performed with shearing machine and blade number 40. After hair removal, the dog was transported to the operating room and positioned in dorsal decubitus. Cutaneous antisepsis of the operative field was carried out with 4% chlorhexidine and 70% alcohol, using sterile forceps and tampons. Circular movements were made from the center of the tricotomized area to the periphery. This process was repeated 3 times by the non-sterile team and 3 times by the sterile surgeon or assistant. The surgical drapes were then put in place for the surgical technique to begin.

Surgical procedure

The orchiectomy began by positioning one of the testicles cranial to the scrotum, in the pre-scrotal region, to avoid iatrogenic injury to the urethra when opening the skin and dividing the tissues. The skin incision was made in the midline and the skin tissue was divulsed for subsequent exteriorization of the testicle. All testicular tunics were incised, with the exception of albuginea, to avoid exposure of the parenchyma and consequent transoperative bleeding. The testicle was exposed after manual rupture of the epididymis tail ligament. The arteriovenous plexus and the vas deferens were isolated (Figure 1A).

The arteriovenous plexus was ligated with a curved hemostatic clamp (“Halsted or Kelly”) without the use of surgical thread, using a maneuver similar to tying a surgical knot (Figure 1B), followed by a 360º rotation of the clamp (Figure 1C) and grasping of the plexus (Figure 1D). Subsequently, the plexus was sectioned and the vessels slid to complete the ligation. Another clamp was used to prevent bleeding from the vascular stump of the testicle to the ligation of the ductus deferens (Figure 1E & F). Then the vas deferens also received the same ligation technique (Figure 2). The plexus and vas deferens were repositioned in the

scrotum and the same procedure was carried out on the contralateral testicle.

The tunics remained open. Subcutaneous suturing was carried out continuously with polyglecaprone 25 thread[1] [PGC25 Atramat®] (2/0 or 3/0 according to the size of the animal) and the skin was sutured with 3/0 nylon thread[2] [Shalon medical®] in an interrupted Wolff pattern. The time and difficulties encountered during each surgery were recorded. All surgeries were performed by same surgeon.

Postoperative treatment

After the end of the surgery, the wound was protected with bandage and the patient was transported to an individual cage where he was monitored until the anesthetic return. It was recommended the rest and use of Elizabethan collar by the patient for 10 days, until the removal of the cutaneous stitches. Postoperative, just analgesia with dipyrone[3] [Dipirona Biovet® - 25 mg/kg, VO, BID, for 5 days], for all patients. Daily cleansing of the surgical wound with physiological potassium chloride solution was recommended. Patients were evaluated clinically every 3 days for the presence of suture dehiscence, fistulations, swelling, bleeding and wound healing.

RESULTS

Study population

Of the 25 animals subjected to the experiment, 60% had no defined breed (mixed-breed), followed by 8% Rottweiler, 8% American Bully, 4% Australian Cattle Dog, 4% Labrador, 4% Shih-Tzu, 4% Border Collie, 4% German Shepherd and 4% Pitbull. The average age of the animals was 5.48 years and the average weight was 21.04 kg. The characteristics of each dog such as weight, breed and age, as well as surgical time, are specified in Table 1.

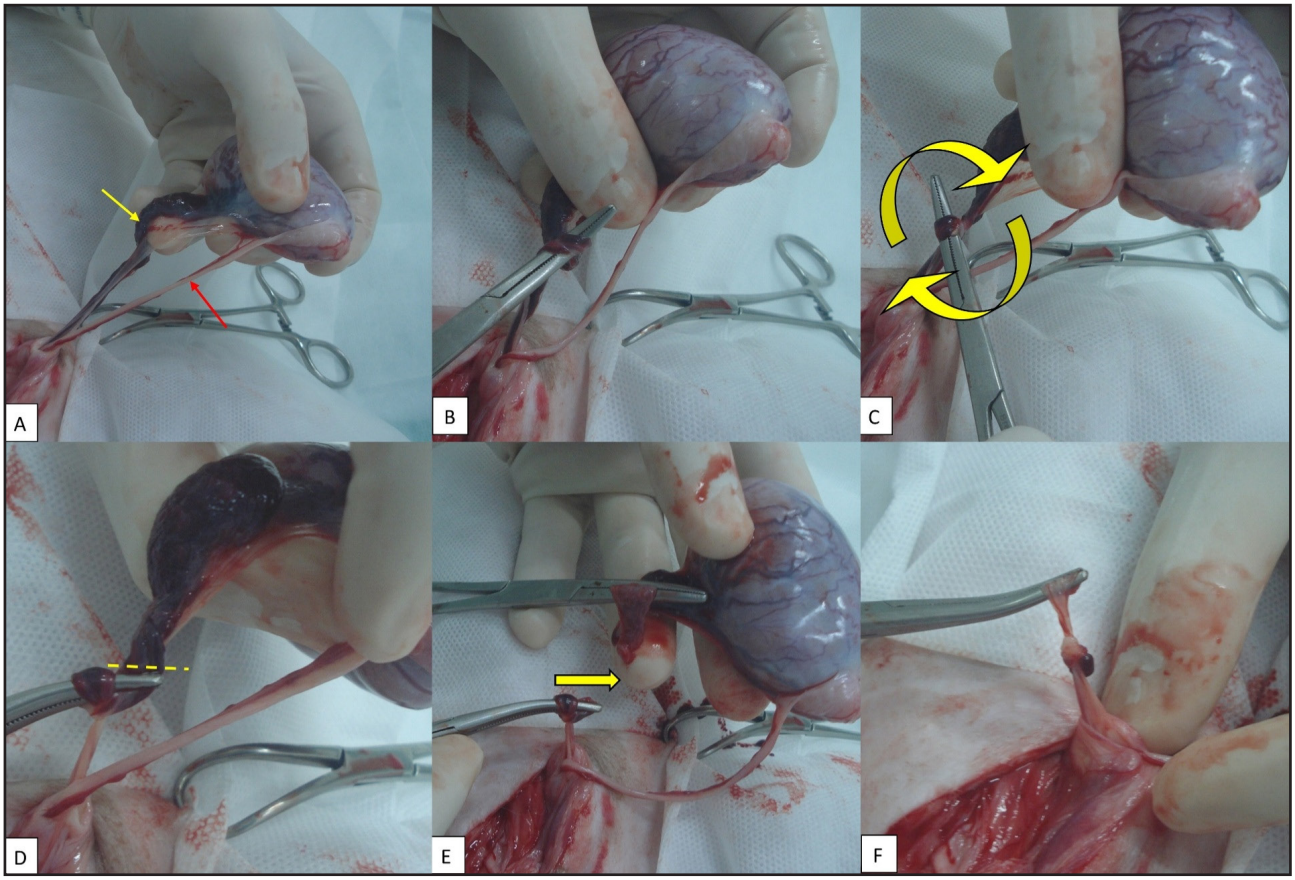

Figure 1. Transoperative photographs of orchiectomy in a dog of mixed breed weighing 17 kg. A- Arteriovenous plexus (yellow arrow) and the vas deferens isolated (red arrow). B- Making the knot with the arteriovenous plexus itself, aided by curved hemostatic forceps ("Kelly"). C & D- Rotation of the "Kelly" clamp by 360° and plexus grasp. The cutting location is marked in yellow. E- Cut the plexus and slide the knot (yellow arrow) to complete the ligature. F- Final appearance of the ligation of the testicular vessels.

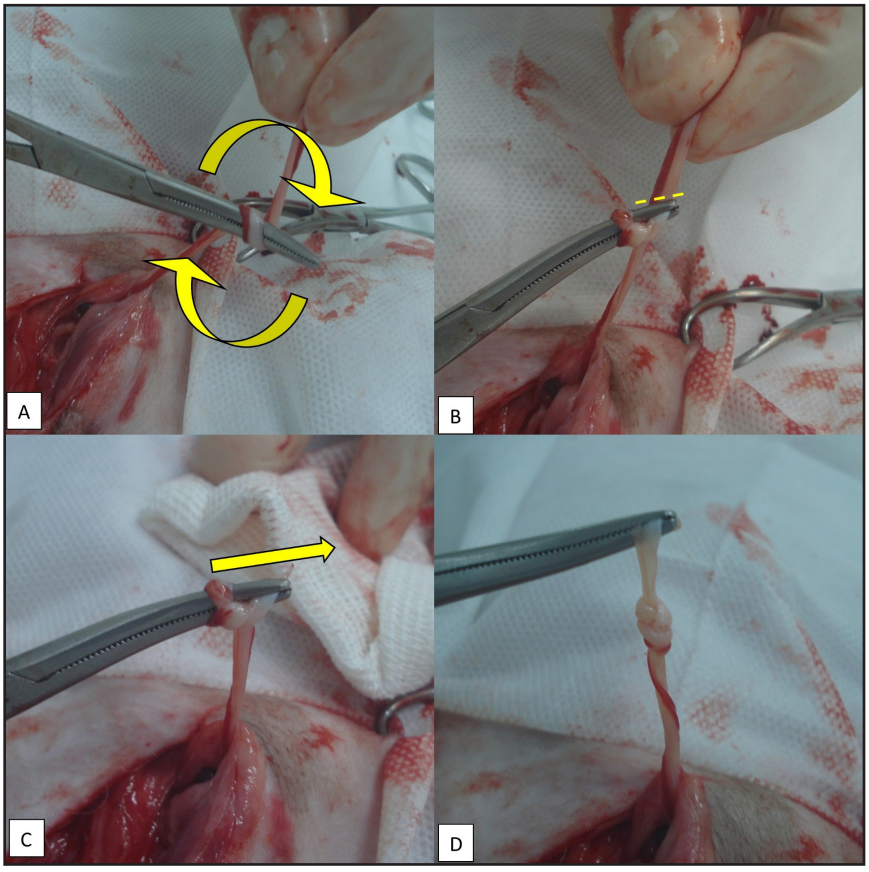

Figure 2. Transoperative photographs of orchiectomy in a dog of mixed breed weighing 17 kg. A- Knot in the vas deferens and 360º rotation of "Kelly's" forceps. B- Grasping the plexus. The cut site is marked in yellow. C- Slide the knot (yellow arrow) to complete the ligature. D- Final appearance of the ligation of the vas deferens.

Table 1. Characteristics of animals submitted to the new technique of orchiectomy.

Animal	Weight (kg)	Breed	Age (Years)	Time
1	45	rottweiler	5	15'47''
2	10	mixed-breed	3	15'22''
3	23	mixed-breed	6	15'32''
4	25	australian cattle	7	14'42''
5	31	labrador	1	15'25''
6	15	mixed-breed	5	12'55''
7	24	mixed-breed	10	12'23''
8	8	mixed-breed	8	10'55''
9	10	shih-tzu	8	8'59''
10	23	border collie	1	7'51''
11	8	mixed-breed	5	7'48''
12	13	mixed-breed	7	7'45''
13	47	rottweiler	8	8'37''
14	20	mixed-breed	3	8'24''
15	17	mixed-breed	3	7'13''
16	11	mixed-breed	2	6'47''
17	9	mixed-breed	5	6'11''
18	26	american bully	7	6'25''
19	34	pitbull	6	6'09''
20	14	mixed-breed	2	5'45''
21	20	mixed-breed	11	5'26''
22	17	mixed-breed	6	5'47''
23	36	german shepherd	12	7'29''
24	15	mixed-breed	1	5'15''
25	25	american bully	5	5'23''

Postoperative evaluation, complications and follow-ups

All dogs had good healing of the surgical wound and their stitches were removed 9 days after surgery. No animal had serious complications. Only patient number 10 had a mild complication from the technique. This animal showed an increase in scrotal volume 3 days after surgery. There was no local pain, suture dehiscence or bruising. Seroma was therefore suggested. No medication was recommended for this complication, just the application of cold compresses to the region. On his next return, 6 days after surgery, the patient had no swelling in the area and the wound was in an advanced stage of healing. The other 24 animals had no complications.

Surgical time

In the 1st animal of the study, the surgical time was 15 min, in the last one was 5 min, demonstrating that after learning, the technique became extremely fast and effective. No complications were observed in the transoperative period.

Difficulties found

Heavier animals, over 15 kg, had a thicker vas deferens, which made the knotting of this structure more laborious. However, this did not prevent the technique from being used. As for knotting the arteriovenous plexus, there were no difficulties related to the weight of the animal, but in dogs over 15 kg, we recommend knotting with larger hemostatic clamps, such as the "Kelly", as they provide greater safety in preventing the clamp from being released. The age and breed of the dogs did not influence the execution of the surgical technique.

DISCUSSION

Numerous cities have been seeking solutions for the high number of wandering animals, one of them is through the realization of campaigns aimed at the reproductive control of canines [12]. The birth rate reduction through the sterilization of dogs is of great value for their population control [15], it is believed that the proposed new orchiectomy technique can act optimizing these sterilization campaigns, even in large dogs, making them more economical, by dispensing the use of threads in the ligation of testicular vessels.

According to Del Carlo & Borges [6], in felines, the spermatic cord can be linked, preferably, with itself, preventing the presence of exogenous materials on the site, which could lead to possible contamination. The use of the thread can interfere with the inflammatory reaction of the organism, acting as a foreign body [9,11,16]. Despite being the best alternative, until this study, there were no known techniques that dispensed with the use of wires for spermatic cord ligation in medium and large dogs.

A study carried out by Oliveira *et al*. [14], showed that the surgical thread ligation technique had no advantages when compared to other techniques that do not require the use of thread. Techniques that use a thread to ligate the testicular cord take longer, have a greater potential for contamination and are more expensive due to the cost of the suture [14]. Despite its benefits in terms of not keeping exogenous material in the patient, this study found that the clamp ligation technique required greater skill on the part of the surgeon when compared to conventional techniques using a thread, but after learning the technique, it could be carried out easily and quickly.

Although orchiectomies are commonly performed procedures, in most cases, as elective procedures, complications are still reported, being them by erroneous surgical techniques or associated anesthetic complications, even in healthy animals like in this study [1,4]. Among the main causes of the risk of death due to anesthesia in dogs are the increase in the degree of physical state in the ASA (American Society of Anesthesiologists) scale, urgent surgeries and longer duration of surgical procedures [3]. In this study, it was observed that the new technique can reduce anesthetic time by being fast and effective after its learning curve and, consequently, reduce the risk of complications. All animals were operated by the same surgeon who had 15 years of experience in performing orchiectomies by conventional techniques using surgical thread. For this surgeon, the 15-min time taken to perform the 1st surgery was similar to the time he uses for conventional techniques. However, the surgical time decreased with the practice of the technique and, in the last animal in the study, the time was 5 min, demonstrating a great advantage over conventional techniques.

Several conditions can impair wound healing, such as infection, hypoproteinemia, changes in collagen synthesis and hyperglycemia [8]. Postoperative complications may occur in the short or long term, such as: scrotal edema, infection, hemorrhage, hematoma, seroma, penile trauma and suture dehiscence [17-19].

Seroma is a common complication in orchiectomies, because due to the manipulation of the tissues and maintenance of the dead space in the scrotum, there is an accumulation of sterile transudate in the region due to the inflammatory process [14], which was observed in animal 10.

If there is an exacerbated amount of fluid in the dead space, healing can be impaired, because the lack of oxygen in the seroma prevents the translocation of repair cells to the wound, as well as increasing the pressure on the skin suture, increasing its tension and favoring dehiscence [2]. In the present study, animal 10 developed swelling suggestive of seroma as an intercurrence, but there was no suture dehiscence or delay in the healing of the surgical wound. It is believed that this seroma formation is related to the agitated behavior of this animal and the difficulty in performing post-operative rest reported by the owner.

There are several studies on orchiectomy techniques in which the spermatic cord is ligated with the cord itself, using figure-of-eight or square knot maneuvers made with hemostatic forceps and the hands, but all of them have been described in cats and small dogs [5,6,14]. In the literature consulted, we did not find descriptions of techniques that do not require the use of threads for medium and large dogs. We believe that ligation without the use of thread in these animals is not indicated due to the great thickness of the vas deferens and vessels, forming a thick and bulky knot, which can slip or come loose, triggering hemorrhages. Therefore, the technique performed in this study aimed to separate the testicular vessels from the vas deferens, providing greater safety and effectiveness of knots, even in large dogs.

CONCLUSION

The study concludes that the new technique of orchiectomy proved to be effective and feasible in medium and large dogs, regardless of breed and age. No significant complications were found in the trans and postoperative periods. The cost and surgical time were minimal, which enables the technique both for projects of castration of wandering animals and for elective orchiectomies in veterinary clinics.

MANUFACTURERS

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***Ethical approval*.** This study complied with the Ethical Principles in Animal Experimentation according to the Brazilian College of Animal Experimentation (COBEA), Federal Law 11794, of October 8, 2008 and State Law 11977, of August 25, 2008, and was approved by the Ethics Committee on the Use of Animals (CEUA) of the Ingá University Center - UNINGA in a meeting on September 20, 2019, under protocol number PM75/2019.

***Declaration of interest*.** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of paper.

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