

## EFFECTIVENESS OF NYLON CLAMPS AND WIRES ON DEFERENTECTOMY AND DEFERENS DUCT LIGATION IN ADULT DOGS (COMPARATIVE STUDY)

### EFICÁCIA DA ABRAÇADEIRA E DO FIO DE NYLON NA DEFERENTECTOMIA E LAQUEAÇÃO DOS DUCTUS DEFERENTES EM CÃES ADULTOS (ESTUDO COMPARATIVO)

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#### SUMMARY

The aim of the study was to compare the effectiveness of the nylon clamp and wire in deferentectomy and ligation of the deferens ducts in adult dogs. The comparison included surgery techniques, surgery time and azoospermy time. We used twelve male dogs, aged between one and eight years old, and weighing between eleven and twenty six kilograms. The animals were divided in four groups of three animals, Group 1, deferentectomy was performed using nylon clamp; Group 2, ligation of the deferens ducts using nylon clamp; Group 3, deferentectomy using nylon wire, Group 4, ligation of deferens ducts using nylon wire. The nylon clamp was easy to manipulate, which reduced surgical time and consequently the anesthesia time and the costs involved throughout the process. Azoospermy occurred in the first week after the surgery in all study groups.

**KEY-WORDS:** Dogs. Nylon clamp. Nylon tie. Vasectomy.

#### RESUMO

A pesquisa teve como objetivo comparar a eficiência da abraçadeira de náilon e do fio de náilon na deferentectomia e na laqueação dos ductus deferentes em cães adultos. A comparação incluiu as manobras cirúrgicas, o tempo de cirurgia e tempo decorrido à azoospermia. Foram utilizados doze cães machos, com idade entre um a oito anos, de raça variada pesando entre 11 a 26 kg. Foram divididos em quatro grupos de três animais, Grupo 1 foi submetido à deferentectomia usando a abraçadeira de náilon para ligadura dos ductus deferentes, Grupo 2 foi submetido à laqueação dos ductus deferentes usando a abraçadeira de náilon, Grupo 3 foi submetido à deferentectomia usando o fio de náilon, Grupo 4 foi submetido à laqueação dos ductus deferentes usando o fio de náilon. Constatou-se que a abraçadeira de náilon foi de fácil manipulação o que reduziu o tempo cirúrgico e consequentemente o tempo de anestesia e os custos que envolvem todo o processo. A azoospermia ocorreu na primeira semana após a cirurgia em todos os grupos de estudo.

**PALAVRAS-CHAVE:** Abraçadeira de náilon. Cães. Fio de náilon. Vasectomia.

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## INTRODUCTION

The sterilization method most commonly used in dogs is the orchietomy (COSTA et al. 2009; LIMA, 2010). Another method of sterilization is deferentectomy, which consists of closing the ductus deferens. This method does not change the aesthetics or interrupts testosterone production, since the testes remain intact (ALFONSO, 1990; HOWE, 2006). The testes continue to produce sperm that are reabsorbed by the body (HOWE, 2006; HEALTHWISE, 2008).

Recently, nylon clamps have been introduced in the area of surgery, whether in veterinary or human medicine (SILVA et al., 2004). These devices were originally designed to be used in electro-hydraulic maneuvers, and are, therefore, resistant to traction, have a efficient locking system, low cost and are easy to use, to sterilize and well tolerated by the body (SILVA et al., 2004; SAMPAIO, 2009 e SILVA et al., 2009).

Nylon clamps have been used in many surgical procedures, such as fracture repairs, ovarian hysterectomies, vascular homeostasis, sutures to close abdominal wall, demonstrating its utility in planned laparotomies for peritoneal lavage and the results are described as a success (CHAVEZ et al., 1992; SILVA et al., 2004; MIRANDA et al., 2004 e OLIVEIRA, 2006).

On the other hand, Costa et al. (2008) evaluated tissue site response to the implant of both nylon clamp and wire in muscle of rats by means of macroscopic and histopathological analysis, and reported that there were no tissue changes caused by either method. Höglund et al. (2011) studied the functionality of an absorbable clamp made of polydioxinone to connect the blood vessels and concluded that they were efficient, easy to use and had enough tensile strength.

Since the nylon clamp is still being tested, easy to obtain, inexpensive, safe and well tolerated by the body, and there is little literature on their use, the objective of the research is to compare the efficiency of both nylon clamps and ties to perform deferentectomy and duct deferens ligation of adult male dogs.

## MATERIAL AND METHODS

Were used 12 mixed breed, male dogs, aged between 1 and 8 years old and weighing from 11 to 26 kg. The animals were divided into 4 groups of three animals each; Group 1, underwent deferentectomy using nylon clamps; Group 2, ligation of duct deferens using nylon clamps; Group 3, deferentectomy with nylon tie; and Group 4, ligation of duct deferens using nylon tie. In order to enter the study, the dogs underwent physical examination, complete blood count, biochemical analysis of liver function (alanine aminotransferase – ALT) and renal function (creatinine), urinalysis and examination of the ejaculate. All animals underwent 10 hour fasting before

surgery. Pre-surgery medication used was carprofen<sup>7</sup> (50 mg/mL) (4.4 mg/kg, subcutaneously), followed by acepromazine<sup>8</sup> (0.05 mg/kg, intramuscularly) and morphine<sup>9</sup> (0.3 mg/kg, subcutaneously). Anesthesia was induced with propofol<sup>10</sup> (2.5 mg/kg, intravenously) and maintenance with isoflurane. Before surgery, clamps were sterilized in an autoclave at 121°C, during 15 minutes. We used white nylon clamps 6.6, measuring 14 mm long and 2.5 mm width, with tensile strength 8.1kg.

The surgical technique used was an incision in the left and right inguinal region. To perform deferentectomy using the nylon clamp and nylon tie, we proceeded to palpation of the spermatic cord parallel to the penis and using the scalpel we made an incision between 1 and 2 cm on the skin over the spermatic cord to allow visualization of the common vaginal tunica (Figure 1).

After locating the common vaginal tunica, we isolated the ductus referens of the spermatic cord by means of blunt dissection (Figures 2 and 3).

The ductus deferens was doubly ligated with the nylon clamp in dogs of Group 1 and tied with nylon wire in dogs of Group 3, and subsequently a 1.5-cm section was removed between the ligatures (Figure 4).

At the end of surgery, the tunica and subcutaneous tissue were stitched with poliglátina<sup>11</sup>. The skin was closed up with nylon<sup>12</sup>. The same procedure was repeated in the ductus deferens contralateral. In order to perform the ligation of the ductus deferens using the nylon clamp and wire, the same surgical procedure of the deferentectomy was used up to the localization and isolation of the ductus deferens. Subsequently, a simple ligation of the ductus deferens was performed using the nylon clamp in dogs of Group 3 and the nylon wire in dogs of Group 4 (Figure 6).

The results of the surgical time spent in each procedure and the sperm concentrations before and after surgery were statistically analyzed and compared using the median of the Excel software.

The effectiveness of deferentectomy and ligation of ductus deferentes was analyzed by the sperm concentrations. Semen collection was performed by two people at seven o'clock in the morning. Three semen samples were collected alternately during three days before surgery. After the surgery, three more semen samples were collected, the first, on the day following surgery; the second, three days after surgery; and the last sample, two weeks after surgery. Sperm concentration was determined according to the red

<sup>7</sup>Rimadyl®, Injectable, Pfizer, África do Sul

<sup>8</sup>Aceprom 10® injection, Bayer HealthCare, Africa do Sul

<sup>9</sup>Morphine Sulphate® -Fresenius - Fresenius Kabi, África do Sul

<sup>10</sup>Propofol Fresenius 1%® - Fresenius kabi - África do Sul

<sup>11</sup>CliniSorb® 3-0 CliniSut, R.S.A

<sup>12</sup>Nylon®, 4-0 Medgut, R.S.A



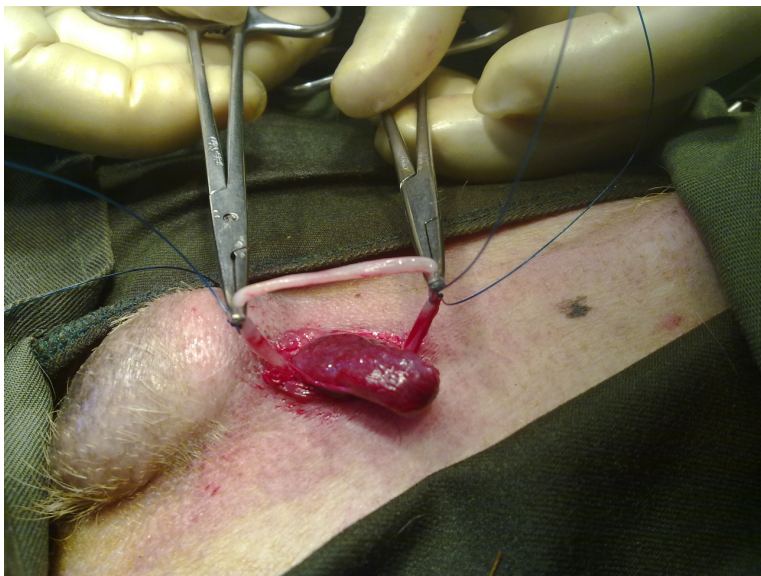
**Figure 1** – Image illustrating the skin incision over the spermatic cord.



**Figure 2** – Image showing the location of the spermatic cord.

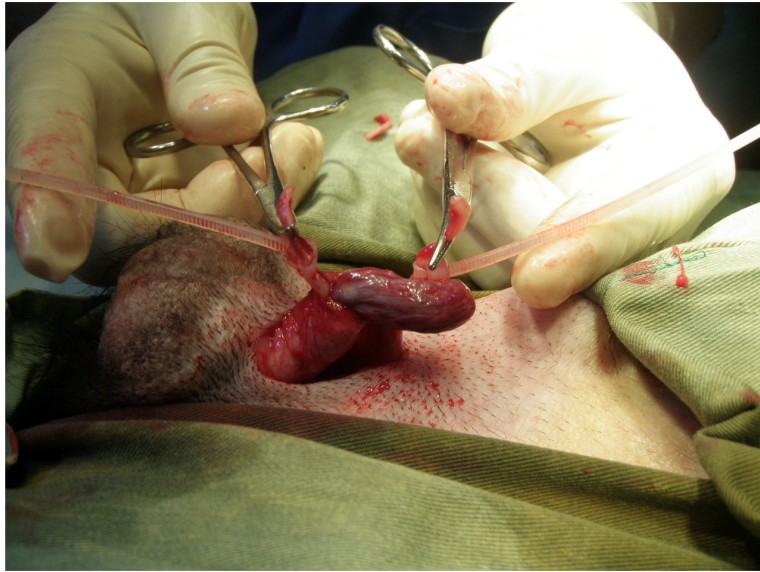


**Figure 3** – Isolation of ductus deferens.



**Figure 4** – Double ligation of the ductus deferens using nylon wire.





**Figure 5** – Double ligation of the ductus deferens using nylon clamp.



**Figure 6** – Ligation of the ductus deferens using the nylon clamp.

blood cell technique as described by Carvalho (1985), using the Newbauer camera for sperm count.

This study was in accordance with the ethical principles of the Brazilian College of Animal Experimentation and approved by the Ethics Committee, under protocol number 205/2011 - CEUA.

## RESULTS AND DISCUSSION

Due to the low number of animals per study group and the high standard deviation of the ligation of ductus deferentes and deferentectomy using the nylon wire, derived from the learning curve, the statistical analysis of the results for the time taken to perform each procedure was done by the median time. The median times taken using the nylon clamp and wire were 14 and 25 minutes, respectively. In addition, the median times taken to perform the ligation of ductus deferentes using nylon clamp and wire were 12 and 17 minutes, respectively (Table 1).

There were no cases of infection or postoperative complication that could compromise the study. The rectal temperatures ranged from 37.3°C and 39.0°C, and the sutures were removed seven days after the surgery. After deferentectomy, due to the size of the nylon clamps it was possible to feel the clamp site and, therefore, to identify the animals with the clamps.

Before and after surgery, the average volume of ejaculate was 1 mL. Median sperm concentration before surgery ranged from 11,000 spermatozoa/mm<sup>3</sup> to 111,000 spermatozoa/mm<sup>3</sup> (Table 2). Azoospermy was verified on the third day after surgery in all dogs (Table 3).

Since the researched material is still in the study phase, we used only three dogs per group according to the proposal from the Ethics Committee of CEUA.

According to Matos (2007), nylon clamps have been used in several surgeries recently, without discarding the nylon wire. Therefore, the nylon wire was selected for comparative analysis of deferentectomy and ligation of ductus deferentes with the nylon clamp. Boothe (1998) stated that when using nylon wire as well as other suture materials in a ligature, care should be taken to perform secure and firm stitches to avoid that ligature will give in to pressure on the site. On the other hand, the nylon clamp had a self-locking device that facilitates surgical maneuvers. This finding is supported by Oliveira (2006), who reported that once the self-locking system acts, its irreversibility provides progressive closure and displaces its lock to the fixation place, thus preventing escape and loosening.

According to the median time of each surgery, it was observed that ligation of ductus deferens with the nylon clamp was quicker compared to the nylon wire. Moreover, deferentectomy with nylon clamp was also faster compared to nylon wire. This difference in surgical time may have been due to the double ligature that was performed in deferentectomy, unlike the simple ligature of the ductus deferens, thereby reducing surgical time.

In this study, the nylon clamp in addition to making easier the surgical maneuvers, it also saved surgery time, thus reducing surgery costs, unlike the nylon wire where the stitches require more time to be carried out. This observation is in agreement with Costa et al. (2009), who reported that the need to perform careful stitches requires a considerable surgical time and hence increased surgery costs.

During the study period, there were no clinical differences between deferentectomy and ligation of ductus deferens; however, it is still not possible to state categorically that one should opt for ligation of ductus deferens over deferentectomy. Further studies are necessary in order to determine the long term efficacy of ligation of ductus deferens. According to Silva (2009), nylon is a non-absorbable material, but the progressive hydrolysis may cause a gradual loss of its tensile strength of up to 20% yearly.

The ability to resist pressure of both materials, in the duct deferens, was considered satisfactory, since the presence of spermatozoa was not observed in the ejaculate after the surgery. This means that both nylon wires and clamps secured a safe ligation of the duct deferentes, thus blocking the sperm flow from the epididim to the urethra, which is in agreement with Boothe (1998), Oliveira (2006) and Silva et al. (2009).

The study was not designed to evaluate the reproductive capacity or semen quality of the studied animals, but it was important to verify the presence and quantity of ejaculated sperm before and after the surgeries, in order to evaluate the effectiveness of both methods. During the study, no washing of the duct deferens was performed as recommended by Hedlund (2005), but in the first week after surgery, sperm concentration was reduced to zero, which is in disagreement with the observations of Hedlund (2005), who reported that after deferentectomy, the sperm remained in the canine ejaculate for three weeks.

## CONCLUSION

The nylon clamp is safer and more practical when used in vasectomy or ligation of the duct deferentes. There was no difference between the nylon clamps and wires with respect to neutering efficacy and both materials were effective in this type of surgery. Moreover, the operating time is shorter with nylon clamp compared to the wire. It is also possible to use the clamp head to identify by palpation the animals that had clamps used in the procedure.

**Table 1** - Time taken to perform (median) deferentectomy and ligation of ductus deferentes using nylon clamps and wires.

Animal	Time (minutes) for deferentectomy using nylon clamps	Time (minutes) for deferentectomy using nylon wire	Time (minutes) for ligation of ductus deferentes using nylon clamps	Time (minutes) for ligation of ductus deferentes using nylon wire
1	16	31	13	20
2	14	25	11	17
3	14	19	12	16
Median	14	25	12	17

**Table 2** - Sperm concentrations (median) before surgery (spermatozoa/mm<sup>3</sup>).

Animal	Group 1				Group 2			Group 3			Group 4	
	1	2	3	4	5	6	7	8	9	10	11	12
Sample 1	59000	125000	74500	52000	40000	20000	46000	37000	27000	124500	60000	45000
Sample 2	54500	83000	66500	54000	42500	11000	60000	37000	34000	109000	55000	47500
Sample 3	60500	109000	68500	78500	42500	10000	55000	42500	40500	111000	57500	47500
Median	59000	109000	68500	54000	42500	11000	55000	37000	34000	111000	57500	47500





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