

## Ovariosalpingohysterectomy Technique Adapted in Bitches (*Canis familiaris*): Advantages and Limitations\*

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### ABSTRACT

**Background:** The ovariosalpingohysterectomy (OSH) is one of the most performed surgeries in bitches often used in population control. Surgical techniques that decrease the chances of operative complications and cause less nociceptive stimulation and acute pain to the patient are highly sought after by veterinarians. We evaluated the inverted OSH technique (IT), which, after celiotomy, begins with the ligature execution, transection of the uterine body and subsequent ligation and ovarian disinsertion. The purpose of this investigation was to analyze aspects of IT execution in bitches, such as visceral manipulation, access to the uterus and ovaries, and surgical time compared to the traditional technique.

**Materials, Methods & Results:** Inverted OSH was compared to the so-called traditional OSH technique, characterized by the initial removal of the ovaries followed by uterine section. The OSH techniques were performed in 24 healthy animals, with a body condition score of up to six (on a nine-point scale) in dogs aged between seven months and five years. All dogs were from the Birth Control Program of Dogs and Cats of the UFRRJ and were distributed into two groups: traditional technique (TT) and inverted technique (IT). Surgeries and anesthesia were carried out by the same veterinarian crew (surgeon, surgical assistant, and anesthesiologist). OSH techniques were evaluated by the surgeon and surgical assistant using semiquantitative analysis (multiple-choice questionnaire with closed questions that pointed scores related to the ease of uterine and ovarian manipulation, as well as to the level of manipulation of the intestinal and urinary vesicle) and qualitative descriptive methods (report of techniques with the opinion of surgeons and an external evaluator-veterinarian surgeon who attended surgeries). Also, the total surgical time and the indication of a positive analgesic response according to changes in the vital parameters observed by the anesthesiologist during specific moments of the operation were evaluated (traction of the ovarian pedicles and the uterine body). There was a greater intraoperative nociceptive stimulation in TT (five analgesic rescues and zero in IT) and greater ease of exposure, access, and manipulation of the ovaries in IT (right ovary  $P = 0.042$  and left ovary  $P = 0.021$ ); no difference in the manipulation of adjacent organs between groups ( $P = 0.944$ ); with no statistical difference in total intraoperative time ( $P = 0.190$ ). In the descriptive qualitative evaluation, inverted OSH revealed advantages concerning the ease of surgical access to the ovaries (especially the right ovary), particularly in heavier dogs.

**Discussion:** The IT was considered easy to perform because the surgical team performed the two techniques at similar times despite having more experience and routine practice with the TT. The anatomy of the bitch challenges the performance of OSH during median celiotomy due to the dorsal location of the reproductive system in the abdominal cavity and, therefore, there is a need to manipulate the intestine and urinary vesicle. Moreover, the ovarian location near the chest wall concavity impairs the manipulation for its disinsertion. In this context, the IT appears useful in this species due to the greater ease of manipulation of the ovaries, highlighted in the semiquantitative and qualitative descriptive analyzes. In general, the OSH technique is impaired in dogs of greater bodyweight because there is a high amount of fat in their ligaments and the increase of the weight is considered a risk factor for the occurrence of complications in this surgery; in these patients, the IT may be advantageous because it allows cranial uterine flexion promoting greater ovarian exposure, thus facilitating its manipulation, hemostasis and pedicle section.

**Keywords:** inverted OSH, pain, surgical technique, animal population control, OSH complications.

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## INTRODUCTION

Ovariosalpingohysterectomy (OSH) is a surgical procedure used to remove the ovaries, fallopian tubes, and uterus [2], and is also one of the most accomplished surgical techniques in veterinary practice [10]. Its most frequent indication is elective sterilization to prevent estrus and thus prevent unwanted puppies [7].

With the evolution of veterinary surgery, the desire for less invasive and traumatic techniques, which cause less pain to the patient and reduce the chance of postoperative complications has intensified [5]. In this context, an adaptation of traditional OSH techniques has been made, in which the surgery ends with the ligation of the ovarian arteriovenous complex and bilateral ovarian disinsertion, which is the inverse of the traditional sequence of techniques cited in the literature [6,7,13] herein called inverted OSH. The traditional surgical technique used as a base was one whose single hemostatic tweezer distal to the ovary was positioned before ligation of the arteriovenous complex [3].

Through personal communication from veterinary surgeon colleagues, it is apparent that the inverted OSH technique has been implemented throughout a variety of practices. However, there are no reports of evaluation of this method of execution, nor its description. Therefore, the objective of this study was to analyze aspects of the inverted OSH technique in the canine species, including visceral mobilization and manipulation, access to the ovaries and ovarian pedicle, surgical time and the production of intraoperative pain stimuli in comparison to the TT. We also provide an assessment of the possible advantages and limitations of inverted OSH.

## MATERIALS AND METHODS

Twenty-four bitches aged seven months to five years with a body condition score up to six (in a nine-point scale, considered clinically healthy) were selected and sent for elective castration in the UFRRJ Birth Control Program of Dogs and Cats. Animals were equally divided into two groups: traditional technique (TT) and inverted technique (IT).

Upon arrival at the Research and Extension Surgical Center at the UFRRJ Veterinary Institute, each animal was allocated in an individual cage for acclimatization for 30 minutes. Preanesthetic medication was then administered intramuscularly-IM (0.5 mg kg<sup>-1</sup> morphine<sup>1</sup> (Dimorf®) associated with 0.05 mg kg<sup>-1</sup> acepromazine<sup>2</sup> (Apromazin®). After 15 min, the trichotomy and ve-

nous access to the cephalic vein followed by anesthesia with propofol 3-5 mg kg<sup>-1</sup> endovenous (EV) propofol<sup>3</sup> (Provive®) and orotracheal intubation were performed. Anesthetic maintenance was given using isoflurane 1.2 to 1.5 of MAC, and the fluid therapy of choice was lactated ringer<sup>4</sup> (Ringer Lactato®) 3 mL/kg/h.

With the animal in the supine position, the surgical field was prepared. Specifically, the distance between the xiphoid cartilage and the pubis (100%) was measured, and a line measuring 33% of this length was marked on the ventral midline with a dermatographic surgical pen, to delimit the incision place and line where lidocaine<sup>1</sup> (Xylestesin®) 7 mg kg<sup>-1</sup> was administered for local anesthesia. 1,200,000 IU of benzathine benzylpenine<sup>5</sup> (Bepeben®) was administered at a dose of 40,000 IU kg<sup>-1</sup> IM.

The traditional OSH technique considered in this study, used in the TT group, was characterized after median-longitudinal celiotomy, by the initial removal of the ovaries followed by uterine resection, with the use of only a hemostatic tweezer positioned distal to the ovary prior to the arteriovenous complex, only to prevent blood from returning after ovarian disinsertion [6]. The IT group was adapted from the previous technique, and the surgery was started from the ligatures in the uterine body and its transection, followed by ligation of the ovarian arteriovenous complex and bilateral ovarian disinsertion.

Ligaments and transfixations, as well as omentalization of the uterine stump, were performed with polyglactin<sup>6</sup> (Poliglactina 910®) yarn size 2.0 or 3.0, depending on the size of the animal. Abdominal wall raffia was made with suture in Sultan pattern and unabsorbable monofilament polyamide<sup>6</sup> (Nylon®) yarn size 2.0, followed by suturing the subcutaneous cellular tissue with polyglactin<sup>6</sup> (Poliglactina 910®) yarn size 3.0 in a mattress pattern. The skin was sutured with unabsorbable monofilament polyamide<sup>6</sup> (Nylon®) yarn size 3.0 in a Sultan suture pattern.

The patient was monitored, and at the time of anesthetic stabilization (M0) and heart rate (HR); respiratory rate (*f*); systolic blood pressure (SBP) and rectal temperature were recorded. EV rescue analgesia with 2 µg kg<sup>-1</sup> of fentanyl<sup>1</sup> (Fentanest®) was instituted during the transoperative process only if two or more values of HR, *f* and SBP presented an increase of more than 20% in relation to M0 [8] and was recorded as a positive analgesic stimulus. Postoperative analgesia consisted of the administration of tramadol hydrochloride<sup>7</sup> (Tramal®) 2 mg kg<sup>-1</sup> IM.

A visual barrier (field cloth) was positioned between the anesthesiologist's area and the surgical field, preventing visual identification of the surgery, enabling an exemption analysis from the anesthetic team of the evaluation of pain stimulus and the need for rescue. The surgeon also did not have access to the physiological parameters of the animal and the interurrences, such as administration of rescue analgesia. Surgeries were performed by the same surgical team using the same anesthesia.

#### *Evaluation of ovariosalpingohysterectomy techniques*

It was considered the presence of pain relief in patients requiring analgesic rescue at the critical moments of surgery, namely during traction of the ovarian pedicles and the uterine body for hemostasis and excision of the mentioned organs. Data were recorded and compared between groups.

The surgeon and his assistant completed a questionnaire adapted from the literature [12] with questions formatted in closed multiple choices, in which they were able to score some characteristics of the transoperative procedure. In this semiquantitative analysis, the ease of manipulation for hemostasis and uterine and ovarian excision was classified as bad (1), good (2) and excellent (3). The level of manipulation was classified as little (1), medium (2) or intense (3). The questionnaire was completed at the end of each surgery.

At the end of the study, surgeons and an external evaluator (veterinarian surgeon who watched the surgeries) were asked to write a short report with their opinion on OSH techniques performed. In all evaluations, the surgeons did not argue with each other. The total surgical time was calculated in seconds from the interval between the entrance to the abdominal cavity and the execution of the last skin stitch.

#### *Statistical analysis*

Statistical analysis was performed using SigmaPlot version 11 (Systat software). The semiquantitative analysis scores were transformed into a logarithm to allow comparison by the Mann Whitney test. The Shapiro-Wilk normality test was used, followed by the Student's t-test, to compare the average of the independent samples; in data considered non-parametric the Mann Whitney test (surgical time analysis) was used. For the detection of significant statistical differences,  $P < 0.05$  (5%) was considered statistically significant.

## RESULTS

During the evaluation of the presence of pain stimulus analgesic rescues were only required in the TT (five rescues) during the right ovarian traction.

In the semiquantitative evaluation (Table 1), the inverted technique demonstrated a greater ease of manipulation of the right (RO) and left (LO) ovaries, with excellent score selection in 87.5% and 100% of cases, respectively, when compared to the TT (62.5% RO and 79.17% LO). In the comparative statistical analysis between the groups, there was a difference of data in both ovaries (RO  $P = 0.042$  and LO  $P = 0.021$ ). In the evaluation of the uterus, the IT revealed an excellent score in all the animals and the traditional one obtained score 2 (good) in one bitch, with no difference between the groups ( $P = 0.338$ ).

The manipulation level of the urinary vesicle and the intestine during OSH was scored by the surgical team with a score of 1 (little) in 75% of the animals and a score of 2 (average) in 25% of the bitches in IT; in TT 79.17% of the animals received score 1 (little), 8.33% score 2 (average) and 12.5% score 3 (intense). There was no difference between the groups ( $P = 0.944$ ).

In the descriptive qualitative analysis, surgeons reported that in IT, once resection of the body of the uterus and section of the broad ligament was performed at the beginning of surgery, there was greater mobility of the set through the possibility of cranial uterine flexion, which provided better exposure of the ovarian pedicles, especially the right one that is more cranial, facilitating the moment of its ligatures and subsequent excision.

The external evaluator observed in IT that it was easier for surgeons to expose the ovaries and to bring them out of the abdominal cavity, especially the right ovary, when compared with TT, due to cranial flexion of the uterus. He also described that in bitches with a greater amount of intra-abdominal fat, the uterine cranial flexion seemed to assist in ovarian exposition. This effect was especially evident in the right ovary because it is more cranial. Thus the surgeons did not perceive extra effort to tract the ovarian pedicles in the execution of the IT, as opposed to the TT.

The total surgical time count started after the incision in the abdominal wall and ceased after the last skin stitch was performed. The average time in IT was  $23' \pm 3.029'$ , and in the TT group, it was  $21' \pm 3.857'$ , with no statistical difference between the groups ( $P = 0.190$ ).

**Table 1.** Semiquantitative evaluation of the ease of manipulation to perform hemostasis and disinsertion of the right ovary, left ovary and uterine section of bitches from the Birth Control Program of Dogs and Cats of the UFRRJ in the execution of OSH by means of two different surgical techniques: traditional (TT) and inverted (IT).

		Right Ovary			Left Ovary			Uterus		
Scores		EXC	GOOD	BAD	EXC	GOOD	BAD	EXC	GOOD	BAD
GROUPS	IT	21	3	0	24	0	0	24	0	0
		87.5%	12.5%		100%			100%		
	TT	15	7	2	19	4	1	23	1	0
		62.5%	29.2%	8.3%	79.2%	16.6%	4.2%	95.8%	4.2%	
		<i>P</i> = 0.042*			<i>P</i> = 0.021*			<i>P</i> = 0.338		

EXC: excellent; \*statistically significant difference at 5% level ( $P < 0.05$ ). Data are expressed as a number of animals classified by the surgeon and auxiliary in each score, percentage of classification and comparison between the groups were made using the non-parametric Mann-Whitney statistical test.

### DISCUSSION

The principal original finding of this investigation was that the observed surgical times of the modified OSH technique were similar to other OSH studies in bitches [4,9]. The inverted OSH technique was quickly executed, similar to the TT, which is favorable since the higher occurrence of complications is related to a longer anesthesia time [11].

The IT can be considered an easy-to-perform surgery because even with training in only one patient (pilot), the surgeon and surgical assistant were able to perform both techniques at similar times. Longer IT surgical time was expected since the TT is routinely performed by the team that participated in this study. Thus, the practical experience of the veterinarians did not generate a shorter execution time of the TT, even though it is a relevant factor since lack of experience can increase OSH time [1].

During the manipulation of the intestine and urinary vesicle, there was no statistical difference between the study groups; however, there were more scores of the intense score (3) in the evaluation of the TT. It is believed that this analysis is independent of the surgical technique used since in the majority of the cases in which the organs were manipulated more intensely it was due to the urinary vesicle repletion of the patients, which may be time-related to the fasting and urination of the animal, not the technique itself.

For many, the high frequency of OSH execution in bitches in the veterinary medical routine [10] trivializes the complexity of the technique. However, the anatomy of the bitch challenges the OSH execution,

since its ovaries and uterus are located dorsally in the abdominal cavity and, therefore, during the median celiotomy, with the patient positioned in the supine position, there is a relative distance between the ventral abdominal wall and the reproductive system, making necessary mobilize the intestine and urinary vesicle to perform the surgery. Also, the ovaries are close to the last pairs of ribs, and this may hinder their exposure due to the chest cavity concavity, especially in bitches with a thoracic-edged thorax, such as German Shepherd, Dobermann, Whippet, and similar breeds.

In this context, the IT is useful in these species due to the greater ease of manipulation of the ovaries, which was evidenced in the semiquantitative analysis with a higher number of excellent scores scored by the surgeon and auxiliary personnel, compared to the TT. The descriptive qualitative analysis of the IT from the surgeon, surgical assistant, and external evaluator also ratifies such information.

In addition, the right ovary is more cranial in the abdomen compared to the left [7], which can be considered as a critical point in the surgery and may negatively impact the outcome, necessitating greater traction to allow the ligaments in the arteriovenous ovarian complex. The greater number of analgesic rescues performed at the moment of the right ovary traction corroborates this observation. In order to facilitate the right ovarian exposure, we suggest that in the IT the removal of the left ovary is done prior to the right ovary because once the body of the uterus has already been sectioned, access to the right ovary is further extended.

In general, the OSH technique is impaired in dogs of greater body weight, as there is a high amount of fat in the ligaments of these animals and the increase of the weight is considered a risk factor for the occurrence of complications in this surgery [11]. In these patients, the IT may be advantageous because it allows cranial uterine flexion, facilitating ovarian manipulation and organ disinsertion. Thus, in an attempt to reduce the chances of surgical complications in these patients, new studies in bitches with a body weight over 18 kg should be developed to evaluate the benefits of the IT in these animals.

#### CONCLUSION

Relative to the traditional OSH technique, inverted OSH promotes cranial uterine flexion, which allows greater ease of manipulation for hemostasis and disinsertion of the ovaries in canine species. Also, there is no difference in the visceral manipulation between the techniques used and the total surgical time is similar, both being considered fast when performed.

The traditional OSH technique can produce greater Algic stimulus in canine species when compared to the inverted OSH technique.

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