The Haryana Veterinarian (March, 2023) **62(SI),** 38-43 ISSN 0033-4359 (P) **Research Article**

COMPARATIVE STUDY OF PHYSIOLOGICAL PARAMETERS IN DOGS UNDERGOING LAPAROSCOPIC AND TRADITIONAL MIDLINE OVARIECTOMY

VISHNU KUMAR SHARMA, SATYAVEER SINGH, Y.P. SINGH and M.C. PARASHAR
Department of Veterinary Surgery and Radiology,
Post Graduate Institute of Veterinary Education and Research, Jaipur-302031, India

Received: 23.04.2022; Accepted: 29.06.2022

ABSTRACT

The present study was designed to evaluate the changes in physiological parameters during laparoscopic and traditional midline ovariectomy surgical procedure and measurement of pain score based on changes in different intraoperative parameters in dogs. All the dogs were fasted for 12 hours and water withheld for 8 hours before induction of anesthesia. Animals of both the group were subjected to same anesthetic protocol and agents; premedicated with atropine sulphate (@ 0.04 mg/kg b.wt. I/M) and xylazine hydrochloride (@ 1 mg/kg b.wt. I/M). After 10 minutes general anesthesia was induced using propofol (@ 5 mg/kg I/V). After administration of anesthesia, animals were positioned on V-top table and maintained on isoflurane@ 1.5 to 2% in full oxygen saturation. All the animals were divided in two groups based on assigned surgical procedure. Heart rate, respiration rate, body temperature and blood pressure were measured at different time intervals and pain score was measured based on changes in these parameters. Based on results it is concluded that heart rate and blood pressure were increased at the time of retrieval of ovaries and pattern of changes in physiological parameters at different stages of study was similar in both the groups but traditional methods showed the more alteration and inflict more intraoperative pain as compare to laparoscopic procedure.

Keywords: Dogs, Laparoscopy, Physiological parameters and pain, Traditional midline ovariectomy

How to cite: Sharma, V.K., Singh, S., Singh, Y.P. and Parashar, M.C. (2023). Comparative study of physiological parameters in dogs undergoing laparoscopic and traditional midline ovariectomy. *The Haryana Veterinarian* **62(SI)**: 38-43.

Ovariectomy is surgical procedure for removal of both ovaries to control the population and to prevent associated diseases of the reproductive such as pyometra and mammary gland tumors in female dogs (Shariati *et al.*, 2014). Ovariectomy is routinely performed as the standard approach for gonadectomy instead of ovariohysterectomy (Van-Goetham *et al.*, 2006) and equally effective technique which can be performed by traditional or laparoscopic methods. Ovariectomy has the advantage of smaller celiotomy incision reduces surgical time, less overall intraoperative trauma, better viewing of the ovarian pedicle, and possibly less risk of complications associated with surgical manipulation of the uterus (DeTora and McCarthy, 2011).

In dogs, laparoscopic procedure is well known and routinely used technique for examining and diagnosis like radiography and ultrasonography (Ninama *et. al.*, 2022). Laparoscopic ovariectomy procedure is becoming increasingly popular and now days as it is routinely used technique in veterinary practice (Mayhew and Brown, 2007). Laparoscopic technique has the advantage of better visualization, minimal postoperative pain, lower postoperative morbidity, faster recovery, and lesser scar formation after healing in comparison to traditional method (Devitt *et. al.*, 2005; Gower and Myhew, 2008; Maja *et. al.*, 2015).

Changes in hemodynamic parameter *viz*. blood pressure and heart rate are related to noxious stimuli during surgical procedure (Otto and Mally 2003). Manipulation, ligation and severing of ovarian pedicle are most stimulation portion of surgical trauma in ovariectomy procedure which results into increased physiological parameter during surgical procedure (Hoglund *et. al.*, 2011; Tallant *et. al.*, 2016). Looking into the importance of physiological parameters to estimate the surgical trauma during surgery, present study was undertaken to estimate these parameters at different stages of ovariectomy and measurement of pain score.

MATERIALS AND METHODS

Twelve healthy non-pregnant female dogs of different breeds of 12 to 24 kg b.wt were presented to department of veterinary surgery and radiology, veterinary clinical complex, PGIVER, Jaipur for elective sterilizations. These dogs were scheduled for an ovariectomy. They were randomly divided into two group of six dogs each *viz*. group-I laparoscopic ovariectomy and group-II traditional midline ovariectomy. All the dogs were fasted for 12 hours and water withheld for 8 hours before induction of anesthesia. Animals of both the group were subjected to same anesthetic protocol and agents; premedicated with atropine sulphate (@ 0.04 mg/kg b.wt. I/M) and xylazine hydrochloride (@ 1mg/kg b.wt. I/M). After 10 minutes general anesthesia was induced using propofol (@ 5 mg/kg I/V). After administration of anesthesia, animals were positioned on V-top table and maintained on isoflurane@ 1.5 to 2% in full oxygen saturation.

*Corresponding author: satyaveersingh4@gmail.com

Group I (Laparoscopic ovariectomy) - dogs were positioned in dorsal recumbency with trendelberg position on V top table and surgical site was prepared aseptically (Fig. 1). A skin incision approximately 0.5 cm long was made 1 to 2 cm caudal to the umbilicus for insertion of veress needle into the peritoneum. Insufflator connected with veress needle and pneumoperitoneum of the abdominal cavity was established with carbon dioxide gas upto the pressure gradient of 12 mmHg. Veress needle was removed and the first 6 mm spiral portal was inserted using little pressure and then insufflators were connected to this portal till the end of surgical procedure. A 5 mm diameter, 30o angle of vision telescope connected to light source, was inserted through this port and a thorough inspection of the abdominal cavity was performed. Two 6 mm portals were inserted at paramedian and caudal site of first portal on either side 5-7 cm of ventral midline for operating instruments under the telescope guidance (Fig. 2). The urinary bladder was identified first by its characteristic tortuous structures of blood vessels. Cord like structure of the uterine body and horns were identified; right and left uterine horns were grasped one by one with traumatic and atraumatic forceps alternatively and followed upto the attached ovary. Characteristic ivory-colored ovarian pedicle was thoroughly visualized. Different ovarian structures; proper ligament, vasculature and suspensory ligament on right and left side were identified and grasped with grasping forceps. These structures were cauterized and sealed using bipolar electrocautery attached to laparoscopic unit (Fig. 3). Cauterized portion was transected using laparoscopic scissor (Fig. 4). Both the ovaries were pulled out one by one through the site of one paramedian portal after stab incision and grasping with laparoscopic forceps under the direct visualization of camera (Fig. 5 and Fig. 6). Single interrupted suture was placed on each portal site.

Group II (Traditional midline ovariectomy): Each dog was positioned in dorsal recumbency, surgical site was aseptically prepared after shaving and scrubbing with 0.5% chlorhexidine solution. A ventral median/midline incision caudal to umbilicus was made after gentle dissection through skin, subcutaneous tissue, muscles and peritoneum, abdominal cavity was exposed. After entering into the abdominal cavity the right and left ovaries were grasped one after another (Fig. 7). Suspensory ligament was ruptured by gentle traction, mesovarium ruptured and encircled sutures were placed around ovarian artery and veins using absorbable sutures. Other encircling sutures were placed around proper ligament. Proper ligament and mesovarium were transected and ovary was removed (Fig. 8). Same procedure was repeated on the opposite side in similar fashion. Peritoneum and muscles were closed in a simple continuous pattern with vicryl suture 2-0 and skin edges were opposed by subcutaneous sutures using continuous pattern.

Recording of operating time, physiological parameters *viz*. body temperature, heart rate, respiration rate, and blood pressure at different time point; preoperative, intubation, withdrawal of left and right ovarian ligament, extubation and recovery of animal for assessing of intraoperative pain and stress. Pain score was measured based on alteration in physiological parameters from the base line values and criteria of measurement of pain score was followed as per the guidelines of Davidson *et. al.* (2004), Devitt *et al.* (2005) and Maja *et. al.* (2015).

Statistical Analysis: Data related to the various parameters in both groups were analyzed by one way ANOVA using SPSS software statistical procedure.

RESULTS AND DISCUSSION

The mean duration of operative time was significantly different between both the groups values recorded in group-I; 88.16±5.38 (range 75-107 minutes) and in group-II; 42.5±3.86 (range 30-54 minutes), respectively. Although in most of the studies operating time using laparoscopic procedures has been found to be more as compare to traditional procedure but this duration in operating time depends on the experience and expertise to handle laparoscopic instruments and these differences may be significant and non-significant (Culp *et. al.*, 2009; Gauthier *et. al.*, 2015; Case *et. al.*, 2011). Comparison of duration of surgery has been observed in dogs but apart from dogs in other species like cats this duration of

Table 1

Pain score criteria in comparison of base value; used for intraoperative pain score measurement

Category	Descriptor	Score
% increase in heart rate	<20%	0
	>20%	1
	>50%	2
	>100%	3
% increase in respiratory rate	<20%	0
	>20%	1
	>50%	2
	>100%	3
% increase in blood pressure	<20%	0
	>20%	1
	>50%	2
	>100%	3
Rectal temperature	Within reference range	0
	Elevated rectal temperature	1

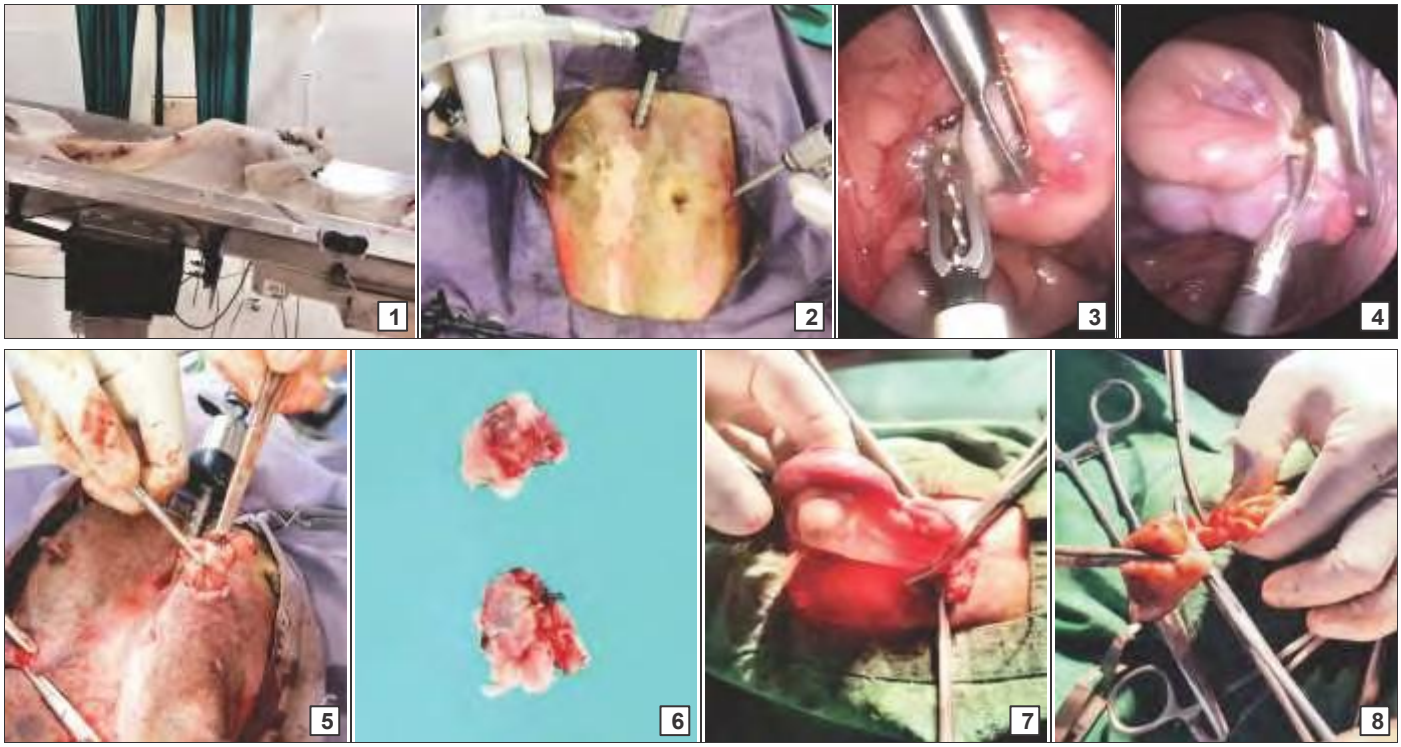

Fig. 1-8. **(1)** Animal in trendelberg position on V top tablein group I; **(2)** Three port in position in a animal of group I; **(3)** Cauterization of ovarian pedicle in a animal of group I; **(4)** Resection of ovarian pedicle in a animal of group I; **(5)** Removal of ovary in the animal of group I; **(6)** Retrieved ovaries in a animal of group I; **(7)** Grasped and exteriorized ovary in a animal of group II; **(8)** Resection of ovary after ligation of ovarian pedicle in animal of group II

Table 2

Mean (± SE) values of physiological parameters *viz*. body temperature (oF), heart rate (beat/minute), respiratory rate (breath/minute) and blood pressure (mm Hg) at different observation stages in group-I.

Parameter (unit)		Preoperative	Intubation	Withdrawal of ovarian ligament		Extubation	Recovery
				Left	Right		
Body temp		101.53±0.21^{c}	100.63±0.50^{bc}	98.52±1.024^{ab}	98.4±0.740^{ab}	96.84±1.04^{a}	97.09±0.75^{a}
HR		116.66±4.09	119.66±8.64	121.33±7.86	127.83±9.32	124.5±2.52	118.66±6.41
RR		22±1.78^{b}	13.66±0.83^{a}	14.33±1.42^{ab}	14.83±0.90^{ab}	23.16±1.37^{b}	22.83±1.10^{b}
BP	SAP	136.33± 4.27	138.33± 2.92	146.83± 3.46	151±6.53	147.83±3.74	139.33±3.20
	MAP	99 ±3.73	101.5 ±2.75	109.33±3.35	114 ±7.34	107.83 ±3.78	100 ±3.74
	DAP	80.66± 3.77	83± 2.72	90.33±4.18	95.5±8.25	85.16±3.94	80.5± 3.94

Values within the group with different superscript differed significantly ($p< 0.05$)

Table 3

Mean (± SE) values of physiological parameters *viz*. body temperature (oF), heart rate (beat/minute), respiratory rate (breath/minute), and blood pressure (mm Hg) at different observation stages in group-II.

Parameter (unit)		Preoperative	Intubation	Withdrawal of ovarian ligament		Extubation	Recovery
				Left	Right		
Body temp		101.75±0.23^{b}	101.55±0.25^{b}	100.58±0.68^{ab}	100.37±0.53^{ab}	98.87±0.71^{a}	99.01±0.75^{a}
HR		114.83±4.62	117.83±1.83	123.66±4.56	119.33±4.51	113.16±4.27	118.5±2.57
RR		21.33±1.97^{abc}	12.83±3.04^{a}	13.83±1.55^{ab}	14.16±1.95^{ab}	25±4.09^{c}	22±1.78^{bc}
BP	SAP	132± 2.58^{a}	143±4.01^{ab}	154.66±5.93^{b}	152±5.22^{b}	148±5.10^{ab}	146.83±2.38^{ab}
	MAP	94.66 ±2.66^{a}	105 ±1.94^{abc}	116.5 ±4.76^{c}	113.16 ±5.82^{bc}	102.33 ±4.12^{ab}	106.33 ±2.06^{abc}
	DAP	76.16±2.90^{a}	86±1.57^{ab}	97.83±4.25^{b}	93.5±6.28^{b}	79.33±3.66^{a}	86.16± 2.13^{ab}

Values within the group with different superscript differed significantly ($p< 0.05$)

laparoscopic procedure also has been found to be more 41±6 minutes (Lap OVE), 24 ± 9 (flank OVE) as compare to midline ovariectomy 35±9 (Gauthier *et. al.*, 2015). Hence duration of operating time may be considered in planning of surgery. However, Freeman *et al.* (2010) observed no significant difference in mean duration of surgery for open and laparoscopic oophorectomy in dogs. Requirement of more surgeons during surgical procedure, handling of more instruments at one time and lack of coordination among surgeons may be the different reasons of having more time in laparoscopic procedure as compared to traditional midline method.

There was no significant difference in values of heart rate, respiration rate and blood pressure between the group I and group II, however significant difference in body temperature between the groups was observed.

Significant decreased pattern in body temperature were observed continuously between and within the groups; however, it was more obvious in group-I as compared to group-II. Comparative decreased body temperature in laparoscopic group might be due to prolonged surgery time and animals under anesthetic effect. Decreased body temperature and similar findings by laparoscopic sterilization and its comparison with open method have been observed in many studies previously (Fukushima *et al.*, 2011; Gauthier *et al.*, 2015). However; Freeman *et al.* (2010) recorded hypothermia at postoperative recovery stage in both laparoscopic and open oophorectomy groups in dogs after recording temperature at different time intervals. In previous study also significant decrease body temperature in both laparoscopic and traditional ovariectomy groups has been observed by Maja *et. al.* (2015).

Heart rate and respiration rate in both the groups did not show any significant changes between the groups which can be suggestive that both parameters may not be good discriminating factor for pain assessment (Gauthier *et. al.*, 2015). There was no significant difference between group I and group II in respiration rate but a significant difference within different observation stages was observed in both the groups. A gradual decrease of respiration rate was observed from preoperative to withdrawal of ovarian ligament then increase at the time of extubation stage then return near to preoperative values in both the groups (Freeman *et al.*, 2010; Laiju *et al.*, 2011).

Heart rate and blood pressure increase at the time of removal of ovaries hence measurement of these parameters appear to be useful for evaluating acute noxious stimuli and surgical stress in dogs (Hoglund *et al.*, 2014). Increased heart rate after the withdrawal of ovarian ligament may be due to a consequence of painful stimulus in dogs (Maja *et al.*, 2015).

A non-significantly increased systolic, mean, and diastolic arterial pressure at withdrawal of ovarian ligament was recorded then these values were decreased till the animals were recovered in both the groups. Recording of blood pressure at different time intervals; group-II had higher values as compare to group-I. Noxious stimulation at the time of retrieval of ovaries after tearing suspensory ligament and traumatic response of the body which is highest at the time of retrieval of ovaries during ovariectomy procedure; increase the blood pressure (Hoglund *et. al.*, 2014; Tallant *et al.*, 2016). Measurement of systolic blood pressure and heart rate can be useful for assessment of intraoperative stress (Hoglund *et al.*, 2016).

Laparoscopic ovariectomy inflicts fewer traumas, less stress and less pain in comparison to open ovariectomy (Vishal *et al.*, 2020). Stress response is influenced by tissue damage and noxious stimuli during surgical procedure and considered as physiological response of trauma which is in proportionate of inflicted trauma during surgery (Giannoudis *et. al.*, 2006; Hoglund *et. al.*, 2016).

There was no significant difference between group I and group II for intraoperative pain score however values obtained in group-II were higher. The mean values of pain score recorded were1.16 ± 0.54 and 2.16 ± 0.47 for group I and group II, respectively. Although these values were non-significantly differ but group-II showed the more pain as compare to group-I. In present study noxious stimulus and surgical trauma seems to be high in traditional method of ovariectomy as compare to laparoscopic procedure which is indicated by the changes in physiological parameters and results into more pain in group-II (Hoglund *et al.*, 2011; Hoglund *et. al.*, 2016).

Associated complications: In laparoscopic procedure, extension of incision length of one port required at the time of removal of ovaries causes mild haemorrhage at portal site and obscuring of the surgical site was observed after mild haemorrhage during manipulation and excision of the ovarian tissues. Difficulty in grasping of ovarian ligaments due to distended intestinal loops and urinary bladder was also observed in laparoscopic procedure. Complications are always associated with ovariectomy procedure either using traditional or laparoscopic method in the form of intraoperative pedicle hemorrhage, splenic puncture, swelling or discharge at surgical wound and dropping of ovaries during their retrieval (Culp *et al.*, 2009; Nylund *et al.*,2017; Swaffiled *et al.*, 2019). Contrary to our observations; Al-Badrany *et al.* (2012) did not observe any complication during laparoscopic ovariohysterectomy by

Pin Score-

Table 4

Intra-operative Pain score in Group-I and II

			Group I						Group II					
Category	Descriptor	Score	1	2	3	4	5	6	1	2	3	4	5	6
% increase in heart rate	<20%	0												
	>20%	1		1			1				1		1	1
	>50%	2												
	>100%	3												
% increase in respiratory rate	<20%	0												
	>20%	1	1				1		1		1	1		
	>50%	2												
	>100%	3											3	
% increase in blood pressure	<20%	0												
	>20%	1	1	1			1		1	1	1		1	1
	>50%	2												
	>100%	3												
Rectal temperature	Within reference range	0												
	Elevated rectal temperature	1												
Total			2	2			3		2	1	3	1	4	2
Mean ± SE			1.16 ± 0.54						2.16 ± 0.47					

All values did not differ significantly between the groups. at (P value > 0.05)

three port technique. Despite having such complications wound healing complications in laparoscopic procedure are less as compare to traditional method of ovariectomy (Charlesworth and Sanchez, 2019).

CONCLUSION

Heart rate and blood pressure are increased at the time of retrieval of ovaries and pattern of changes in physiological parameters at different stages of study is similar in both the groups but traditional methods show the more alteration and inflicts more intraoperative pain as compared to laparoscopic procedure.

REFERENCES

Al-Badrany, M.S., Thanoon, M.G., and Al-Anaaz, M.T. (2012). Laparoscopic ovariohysterectomy in dogs. *Res. Opin. Anim. Vet. Sci.* **2(1)**: 31-34.

Case, J.B., Marvel, S.J., Boscan, P. and Monnet, E.L. (2011). Surgical time and severity of postoperative pain in dogs undergoing laparoscopic ovariectomy with one, two, or three instrument cannulas. *J. Am. Vet. Med. Assoc.* **239(2)**: 203-208.

Charlesworth, T.M. and Sanchez, F.T. (2019). A comparison of the rates of postoperative complications between dogs undergoing laparoscopic and open ovariectomy. *J. Small Anim. Pract.* **60(4)**: 218-222.

Culp, W.T., Mayhew, P.D. and Brown, D.C. (2009). The effect of laparoscopic versus open ovariectomy on postsurgical activity in small dogs. *Vet. Surg.* **38(7)**: 811-817.

Davidson, E.B., David Moll, H. and Payton, M.E. (2004). Comparison of laparoscopic ovariohysterectomy and ovariohysterectomy in dogs. *Vet. Surg.* **33(1)**: 62-69.

DeTora, M. and McCarthy, R.J. (2011). Ovariohysterectomy versus ovariectomy for elective sterilization of female dogs and cats: is removal of the uterus necessary? *J. Am. Vet. Med. Assoc.* **239(11)**: 1409-1412.

Devitt, C.M., Cox, R.E. and Hailey, J.J. (2005). Duration, complications, stress, and pain of open ovariohysterectomy versus a simple method of laparoscopic-assisted ovariohysterectomy in dogs. *J. Am. Vet. Med. Assoc.* **227(6)**: 921-927.

Freeman, L.J., Rahmani, E.Y., Al-Haddad, M., Sherman, S., Chiorean, M.V., Selzer, D.J. and Constable, P.D. (2010). Comparison of pain and postoperative stress in dogs undergoing natural orifice transluminal endoscopic surgery, laparoscopic and open oophorectomy. *Gastroint. Endosc.* **72(2)**: 373-380.

Fukushima, F.B., Malm, C., Andrade, M.E.J., Oliveira, H.P., Melo, E.G., Caldeira, F.M.C., Gheller, V.A., Palhares, M.S., Macedo, S.P., Figueiredo, M.S. and Silva, M.X. (2011). Cardiorespiratory and blood gas alterations during laparoscopic surgery for intra-uterine artificial insemination in dogs. *Canadian Vet. J.* **52(1)**: 77.

Gauthier, O., Holopherne, Doran, D., Gendarme, T., Chebroux, A., Thorin, C., Tainturier, D., and Bencharif, D. (2015). Assessment of postoperative pain in cats after ovariectomy by laparoscopy, median celiotomy, or flank laparotomy. *Vet. Surg.* **44(S1)**: 23-30.

Giannoudis, P.V., Dinopoulos, H., Chalidis, B. and Hall, G.M. (2006). Surgical stress response. *Injury.* **37**: S3-S9.

Gower, S. and Mayhew, P. (2008). Canine laparoscopic and laparoscopic-assisted ovariohysterectomy and ovariectomy.

Compend. Cont. Edu. Vet. **30(8)**: 430-440.

Hoglund, O.V., Olsson, K., Hagman, R., Ohlund, M., Olsson, U. and Lagerstedt, A.S. (2011). Comparison of haemodynamic changes during two surgical methods for neutering female dogs. *Res. Vet. Sci.* **91(1)**: 159-163.

Hoglund, O.V., Hagman, R., Olsson, K., Olsson, U. and Lagerstedt, A.S. (2014). Intraoperative changes in blood pressure, heart rate, plasma vasopressin, and urinary noradrenalin during elective ovariohysterectomy in dogs: repeatability at removal of the 1st and 2nd ovary. *Vet. Surg.* **43(7)**: 852-859.

Hoglund, O.V., Lövebrant, J., Olsson, U. and Hoglund, K. (2016). Blood pressure and heart rate during ovariohysterectomy in pyometra and control dogs: a preliminary investigation. *Acta Vet. Scand.* **58(1)**: 1-7.

Laiju, M.P., Devanand, C.B. and Amma, T.S. (2011). Effect of surgical stress on physiological, haematological and biochemical parameters in elective canine ovariohysterectomy. *J. Indian Vet. Assoc.* **9(1)**: 25-27.

Maja, V., Dragon, R., Milan, J., Darko, D., Ivan, B., Vanja, K. and Zoran, S. (2015). Comparative analysis of parameters of intraoperative and postoperative pain in bitches undergoing laparoscopic or conventional ovariectomy. *Acta Vet. Beog.* **65(4)**: 488-495.

Mayhew, P.D. and Brown, D.C. (2007). Comparison of three techniques for ovarian pedicle hemostasis during laparoscopic assisted ovariohysterectomy. *Vet. Surg.* **36(6)**: 541-547.

Ninama, U.K., Singh, S., Singh, Y.P. and Parashar, M.C. (2022). Computed radiographic measurement of different thoracic parameters in healthy German Shephard dogs. *The Haryana Veterinarian* **61(SI)**: 56-59.

Nylund, A. M., Drury, A., Weir, H. and Monnet, E. (2017). Rates of intraoperative complications and conversion to laparotomy during laparoscopic ovariectomy performed by veterinary students: 161 cases (2010–2014). *J. Am. Vet. Med. Assoc.* **251(1)**: 95-99.

Otto, K. A. and Mally, P. (2003). Noxious stimulation during orthopaedic surgery results in EEG 'arousal'or 'paradoxical arousal' reaction in isoflurane-anaesthetised sheep. *Res. Vet. Sci.* **75(2)**: 103-112.

Shariati, E., Bakhtiari, J., Khalaj, A. and Niasari-Naslaji, A. (2014). Comparison between two portal laparoscopy and open surgery for ovariectomy in dogs. *Vet. Res. For. Intern. Quart. J.* **5(3)**: 219.

Swaffield, M. J., Molloy, S.L. and Lipscomb, V.J. (2019). Prospective comparison of perioperative wound and pain score parameters in cats undergoing flank vs midline ovariectomy. *J. Feline Med. Surg.* **22(2)**: 168-177.

Tallant, A., Ambros, B., Freire, C. and Sakals, S. (2016). Comparison of intraoperative and postoperative pain during canine ovariohysterectomy and ovariectomy. *Canadian Vet. J.* **57(7)**: 741.

Van-Goethem, B., Schaefers, Okkens, A. and Kirpensteijn, J. (2006). Making a rational choice between ovariectomy and ovariohysterectomy in the dog: a discussion of the benefits of either technique. *Vet. Surg.* **35(2)**: 136-143.

Vishal, Saharan, S., Kumar, K. and Kumar, S. (2020). Comparative studies on stress response to laproscopic ovariectomy and open ovariectomy in dogs. *The Haryana Veterinarian* **59(1)**: 67-70.