Biological Forum – An International Journal **16(1): 107-111(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Evaluation of Laparoscopic Sterilization Techniques in Dogs

Mohan Lal Sharma[1*], S.K. Jhirwal[2], Mahendra Tanwar[2] and Meena Puniya[3]
[1]Ph.D. Scholar, Department of Veterinary Surgery and Radiology,
CVAS Bikaner, RAJUVAS, Bikaner (Rajasthan), India.
[2]Assistant Professor, Department of Veterinary Surgery and Radiology,
CVAS Bikaner, RAJUVAS, Bikaner (Rajasthan), India.
[3]M.V.Sc. Scholar, Department of Veterinary Surgery and Radiology,
CVAS Bikaner, RAJUVAS, Bikaner (Rajasthan), India.

(Corresponding author: Mohan Lal Sharma)*
(Received: 22 November 2023; Revised: 30 November 2023; Accepted: 25 December 2023; Published: 15 January 2024)
(Published by Research Trend)

ABSTRACT: Two techniques of laparoscopic spaying in female dogs were evaluated in two groups each containing 7 apparently healthy non-pregnant bitches. Group I (LapOVE) comprised of animals undergoing laparoscopic ovariectomy with three port technique and Group II (LapOVH) comprised of animals undergoing laparoscopic ovariohysterectomy with three port technique. All the animals gone through the same anaesthetic protocol comprised of induction with xylazine, ketamine and maintenance by isofluraneanaesthesia. The total surgical time in Group LapOVH was significantly ($p<0.05$) more than that of Group LapOVE. Intra-operative complications like mild thermal injury to spleen, bladder was observed in one case from both groups. Post-operative surgical wound infection including erythema and seroma were reported as post-operative complications whereas in long term follow up urine incontinence was observed in two cases irrespective of the procedure followed. LapOVE had advantages like shorter surgical times. In our study both LapOVH and LapOVE appeared to be safe and effective methods of surgical sterilization.

Keywords: Laparoscopic, laparoscopic ovariohysterectomy, laparoscopic ovariectomy.

INTRODUCTION

Sterilization of female dogs is the most common surgical procedure performed in veterinary surgery (Van goethem, 2006). Spaying can be done by either OVH (ovariohysterectomy) or OVE (ovariectomy), where OVH is the most preferred method of spaying used worldwide. Many surgical techniques have been described for spaying such as laparoscopic procedures (Case, 2011) open midline laparotomy, and lateral flank laparotomy amongst which Laparoscopic procedure is considered as most efficient method. Many studies have been published so far comparing laparoscopic procedures and open surgical techniques for spaying (Janssens, 1991). Laparoscopic surgery is growing in popularity in the veterinary sector due to its benefits, including reduced surgical trauma, less discomfort following surgery, shorter hospital stays, and a quicker return to regular activities (Mayhew, 2011). Laparoscopic surgery presents a promising method for sterilizing a large number of dogs, allowing the dogs to be released in three days without experiencing complications such as wound dehiscence, hemorrhage, infection, or maggot infestation (Mahalingam *et al*., 2009). Laparoscopy provides good view of surgical field by magnification and illumination, which may decrease intra-operative and post-operative complications. Literature cited stated that LapOVH is advantageous because of less post-operative pain and surgical stress as happens in open OVH (Davidson 2004; Devitt, 2005; Hancock, 2005) whereas LapOVE is better technique because of shorter recovery time compared to open OVE when post-operative recovery is compared (Van goethem, 2006). The current study was conducted to assess two distinct laparoscopic sterilization methods in a canine birth control program.

MATERIALS AND METHODS

This study was conducted on fourteen healthy bitches presented to Department of Surgery and Radiology, College of veterinary and animal science, Bikaner, RAJUVAS for elective sterilisation. All selected animal underwent ultrasonographic examination prior to surgery to rule out pregnancy, they were also tested for hemato-biochemical parameters to determine anaesthetic risks regarding health. The chosen animals were randomly divided into two groups, Group I and Group II, each consisting of seven animals.

All the bitches were preanesthetised with Atropine sulphate @ 0.04 mg/kg body weight IM (intramuscular) and Xylazine hydrochloride @ 1 mg/kg body weight IM and after 10 minutes Ketamine hydrochloride @ 5 mg/kg body weight IM was used as induction agent. Maintenance of anaesthesia in the dogs was performed by inhalation anaesthesia with Isoflurane USP.

Site over abdomenarea was aseptically prepared for the surgery after clipping the hairs from xiphoid region to pelvis. After application of surgical drape around the surgical site a small nick was applied near the umbilicus to facilitate the insertion of Veress pneumoperitoneum needle (Karl Storz GmbH & Co. KG, Germany). The abdominal cavity was inflated using carbon dioxide gas via veress needle at a rate of 2 L/min and a pressure gradient of 10-12 mmHg was maintained, using an electronic carbon dioxide endoflator and silicone tubing from Karl Storz GmbH & Co. KG, Germany. The veress needle was replaced with a 6 mm safety trocar and cannula unit (Karl Storz GmbH & Co. KG, Germany). Through the cannula, a digital camera (TELECAM 1-chip camera, Karl Storz GmbH & Co. KG, Germany) and a light source (KARL STORZ Xenon cold light source LED NOVA) were connected to a rigid-type telescope (Hopkins II straight forward 30-degree telescope, Karl Storz GmbH & Co. KG, Germany). The abdominal cavity was examined for any trauma by veress needle to trocar, the organs like urinary bladder was identified because of its architecture of twisted blood vessels and ovary and uterus are identified by their characteristic colour and cord like structure.

Under telescopic guidance, two other ports of 5mm each were created 4-6 cm para median and distal to the laparoscope insertion site for insertion of operating instruments and thus, the three ports were placed (Fig. 1).

In animals of Group I, Kelly grasping forceps were introduced by one side port (left) and the uterine horn bifurcation was identified by its characteristic "Y" shape adjacent to urinary bladder, it acts as landmark for both the ovaries. Now the ovary of other side (right) was approached following uterine horn bifurcation and it was pushed caudally to make the ovary, ovarian bursa, suspensory ligament and associated blood vessels visible. Then using Karl Storz bipolar electro cautery forceps through the right side port, the suspensory ligament, including the arteries, was grabbed and cauterized (Fig. 2). Then, the remaining mesovarium structure was electro cauterized using electro cautery forceps, and all of the cauterized structures were cut using Click line scissors (Fig. 3) (Karl Storz GmbH & Co. KG, Germany). The uterine horn was grasped near the ovarian bursa and was cauterized using bipolar electro cautery forceps (Fig. 4). Through a side port, the entire ovarian bursa was removed after being dislodged (Fig. 5). The same procedure was followed for the left side ovary. Finally the carbon dioxide from the abdomen was released following removal of all cannula. The incisions were sutured using silk no. 1 in simple interrupted fashion.

In animals of Group II, Right ovary was hold caudally in the similar way as was done in Group I, the suspensory ligament and associate arteries to ovarian pedicle were cauterised and cut using Karl Storz bipolar electro cautery forceps. Then the left ovary was also separated from suspensory ligament and associated vasculature in similar way. Lastly, by using bipolar electro cautery forceps, the uterine body, artery, and vein proximal to the cervix were grabbed and cauterized (Fig. 6). Ultimately, a side port was used to remove the entire uterine horns and body along with the ovaries (utero-ovarian complex) (Fig. 7 and 8). The skin incisions were sutured with simple interrupted sutures using silk no. 1 (Fig. 9). Surgical wounds were dressed using betadine on alternate days till suture removal on 12th day. Intraoperative and postoperative observations were recorded.

Pain assessment—Post operative observations of pain was made at 2, 8, and 24 hours after surgery based on University of Melbourne Pain Scale (Appendix 1)

The data were subjected to 2-way analysis of variance (ANOVA) and the paired t-test, as per Standard statistical methods.

RESULTS AND DISCUSSION

Ovariohysterectomy was considered procedure of choice for female sterilization, complications such as pyometra, urinary sphincter mechanism incontinence, and weight gain are not seen more commonly with ovariectomy (OVE) versus ovariohysterectomy (OVH) (Okkens *et al*., 1997; Van Goethem, 2006). Furthermore, some have promoted potential benefits of OVE over OVH including smaller incisions and decreased abdominal trauma, decreased surgery and anaesthesia times (Janssens, 1991; Okkens *et al*., 1997), smaller celiotomy, and less manipulation of the female genital tract. (Van Goethem, 2006; Van Goethem, 2003; Van Nimwegen, 2005), urinary incontinence was the common complication reported by Okkens *et al*., (1997), hence it was proved that there was no indication for removing the uterus during routine neutering of healthy bitches, and suggested that ovariectomy should be considered the procedure of choice for neutering and can be a good alternative of OVH.

The study was conducted on 14 apparently healthy non pregnant animals which were randomly divided into two groups i.e. Group I and Group II. Their body weights ranged from 10.5 to 26 kg (mean-18kg) in Group I and 12kg to 29 kg (mean-19.5kg) in Group II. Age ranged from 12 months to 48 months (mean-28 months) in Group I and 12 months to 42 months (mean-26.5 months) in Group II. There was no significant difference in the age and body weight between the groups. All the selected animals were nulliparous except the two animals from each group were pluriparous. All the animals were sexually mature in both the groups. All animals of study groups were operated with the same anaesthetic protocol, premedication was done with atropine sulphate and xylazine hydrochloride, induction of anaesthesia was done using ketamine hydrochloride and was maintained using isoflurane gaseous anaesthesia. All the animals had smooth recovery from anaesthesia after surgery.

Total surgical time (mean ± SE) (defined as the time from umbilical incision to skin sutures) was 25.24 ± 1.53 minutes in Group I while it was 36.21 ± 1.56 minutes in Group II. The total surgical time in Group II was significantly ($p<0.05$) more than that of Group I, similar to the findings reported by Corriveau *et al.* (2017); which was 67 minutes for LapOVH and 50 minutes for LapOVE. Previous reports depicted that

mean surgical time for LapOVH recorded by Devitt *et al.* (2005); Davidson *et al.* (2004); Mayhew *et al.* (2007); Austin *et al.* (2003) were higher than mean surgical time reported for LapOVE by Manassero *et al.* (2012); Runge *et al.* (2012); Case *et al.* (2011); Dupre *et al.* (2009). Tapia-Araya *et al.* (2015); Arntz (2019); Culp (2009) also reported average total surgical time for lap OVE by bipolar electro-cautery i.e. 32.0±3.0 minutes, 22.5 minutes and 30 minutes, respectively. The difference in time is attributed to extra instrument position and handling the tissue at new site at uterine body; extraction of large portion of ovaro-uterine complex instead of only ovaries required extra efforts and time too in lapOVH rather than lap OVE.

Intra-operative complications like mild thermal injury to spleen, bladder was observed in one case of both groups. Spleen puncture occurred during introduction of trocar and veress needle in one case of each Group. Intra-operative haemorrhage occurred during electrocauterization and manipulation of the soft tissue evidenced in one case of Group I and two cases of II. These were also reported by in laparoscopic procedures by Manassero *et al.* (2012); Dupré *et al.* (2009); Mayhew *et al.* (2007); McClaran *et al.* (2009). Corriveau *et al.* (2017) reported splenic lacerations in 1.4% cases of their laparoscopic procedures (lap-aroscopic OVH (1 dog) and OVE (3 dogs)). Malm *et al.* (2004) reported mild thermal injury and splenic puncture in some of his cases terectomy. Davidson *et al.*, (2004) also reported intra-operative complications like splenic puncture and vaginal discharge. Intra-operative hemorrhage is a common complication in open sterilization surgeries, but it lowered upto 1% as reported by Corriveau *et al.* (2017). Berzon *et al.* (1979), reported intraoperative hemorrhage in 20% of dogs in his study on open sterilization technique whereas Burrow *et al.* (2005), evidenced 6.3% intra-operative hemorrhages in elective OVH. In the present study, the low rate of hemorrhage could support the theory that laparoscopic sterilization reduces the risk for pedicle haemorrhage. Hence, no specific complication was related to one technique so it was proposed that lapOVE is also equally acceptable compared to lapOVH.

Post-operative surgical wound infection including ery-thema and seroma was reported in aniamls of both Groups, Corriveau *et al.* (2017), also reported surgical wound infection in 6.7% cases whereas Mayhew *et al.* (2012) reported wound infection in 1.3% of his cases. Similar findings were reported by Vasseur *et al.* (1988); Eugster *et al.* (2004); Beal *et al.* (2000); Brown *et al.* (1997).

The mean ± SE values of score (University of melbourne pain scale (UMPS) (Afshar *et al.*, 2017) for post-operative pain at 2nd, 8th and 24th post-operative hours in Group I animals were 2.63±0.83, 2.26±0.29 and 1.43±0.93, respectively, while those in Group II animals were 3.11±0.47, 2.27±0.52 and 1±0.83, respectively. Binder *et al.* (2018) also studied subjective pain measurements included the recording of behavioural changes and use of different pain scales (simple descriptive scale, four point categorical scale, numeric rating scale, visual analogue scale or several composite pain scales, such as the Glasgow Composite Measure Pain Scale or the University of Melbourne Pain Scale). There was significant difference in pain scores between the Groups at 2 hours. However, there was non-significant difference in pain score between two Groups at 8 and 24 hours. The difference in pain scores could be attributed to the longer time duration in procedure of lapOVH, longer duration of capnoperitoneum which also attributes to pain. Culp (2009); Hancock (2005) also reported that the there was no significant difference in pain score at 24 hours.

LapOVE had advantages like shorter surgical times, and also urinary incontinence recorded was long term post- operative outcome was a common complication, and had no significance with either procedure (LapOVEvsLapOVH).

The present study depicts that both techniques presented same outcomes regardless of animal characteristics. Both LapOVH and LapOVE appeared to be safe and effective methods of surgical sterilization when performed with a multiport or single-port technique (Corriveau, 2017).

Appendix 1- University of melbourne pain scale (UMPS) (Afshar *et al.*, 2017).

Category	Descriptor	Score
Physiological Data		
	Dilated pupil	2
	Percentage increase in heart rate relative to preprocedural rate >20% >50% >100%	 1 2 3
	Percentage increase in respiratory rate relative to preprocedural rate >20% >50% >100%	 1 2 3
	Dilated pupils	2
	Salivation	2
Response to palpation	No change from preprocedural behaviour Guards/reacts when touched Guards/reacts before touched	0 2 3
Activity	At rest, sleeping Semiconscious Awake Eating Restless (pacing continuously, getting up and down) Rolling, thrashing	0 0 1 0 2 3
Mental status	Submissive Overtly friendly Wary Aggressive	0 1 2 3
Posture	Guarding or protecting affected area Lateral recumbency Sternal recumbency Sitting or standing, head up Standing, head hanging down Moving Abnormal posture (e.g., prayer position, hunched back)	2 0 1 1 2 1 2
Vocalization	Not vocalizing Vocalizing when touched Intermittent vocalization Continues vocalization	0 2 2 3

Fig. 1. Picture showing Placement of the three port.

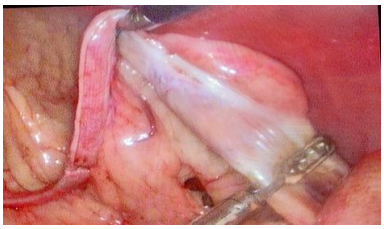

Fig. 2. Application of electrocautery forceps at ovarian pedicle and associated blood vessels.

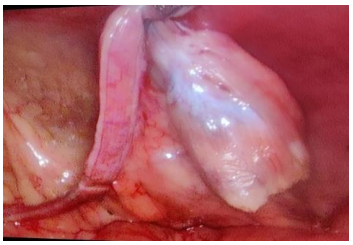

Fig. 3. Resected ovarian pedicle end.

Fig. 4. Electro-cauterisation of uterine horn near ovary in animals of Group I.

Fig. 5. Exteriorised ovaries in animals of Group I.

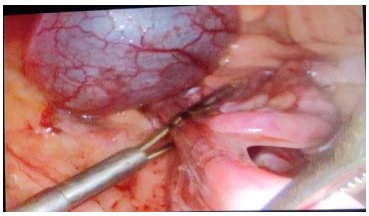

Fig. 6. Elecrocauterization of uterine body in animals of Group II.

Fig. 7. Exteriorising the uterine horn with ovaries in animals of Group II.

Fig. 8. Exteriorised uterine horn with ovaries in animals of Group II.

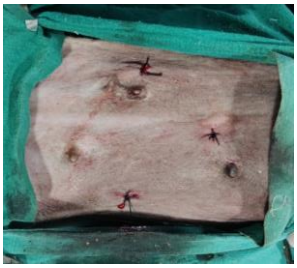

Fig. 9. Port site were sutured using silk no. 1 in simple interrupted manner.

CONCLUSIONS

Both the technique of laparoscopy are safe and effective methods of sterilization. We did not find any major reason for removal of uterine horn along with ovaries. Ovariectomy is a method that is equally effective and has no known drawbacks for the elective sterilization of female dogs. A smaller incision, improved visibility of the ovarian pedicle, and perhaps a lower risk of problems from uterine manipulation surgery are some potential benefits of laparoscopic ovariectomy. So laparoscopic ovariectomy is equally effective technique and can be method of choice for sterilisation.

FUTURE SCOPE

Laparoscopic surgery is the new trend introduced in veterinary science, where the regular procedures like sterilisation can be performed with a lot of benefits but still the best technique amongst all techniques is to be declared after the lot of clinical study and data.

Acknowledgement: The authors are thankful to the Principal Investigator, All India Network Programme on Diagnostic Imaging and Management of Surgical Conditions in Animals (AINP-DIMSCA), a project of ICAR for providing help in the form of equipment and facilities during the study.
Conflict of interest. None.

REFERENCES

Arntz, G. J. H. (2019). Transvaginal laparoscopic ovariectomy in 60 dogs: Description of the technique and comparison with 2-portal-access laparoscopic ovariectomy. *Veterinary Surgery*, *48*(5), 726-734.

Austin, B., Lanz, O. I., Hamilton, S. M., Broadstone, R. V., & Martin, R. A. (2003). Laparoscopic ovariohysterectomy in nine dogs. *Journal of the American Animal Hospital Association*, *39*(4), 391-396.

Beal, M. W., Brown, D. C., & Shofer, F. S. (2000). The effects of perioperative hypothermia and the duration of anesthesia on postoperative wound infection rate in clean wounds: a retrospective study. *Veterinary surgery*, *29*(2), 123-127.

Berzon, J. L. (1979). Complications of elective ovariohysterectomies in the dog and cat at a teaching

institution: clinical review of 853 cases. *Veterinary Surgery*, *8*(3), 89-91.

Binder, C., Katić, N., Aurich, J. E., & Dupré, G. (2018). Postoperative complications and owner assessment of single portal laparoscopic ovariectomy in dogs. *Veterinary Record*, *183*(24), 745-745.

Brown, D. C., Conzemius, M. G., Shofer, F., & Swann, H. (1997). Epidemiologic evaluation of postoperative wound infections in dogs and cats. *Journal of the American Veterinary Medical Association*, *210*(9), 1302-1306.

Burrow, R., Batchelor, D., & Cripps, P. (2005). Complications observed during and after ovariohysterectomy of 142 bitches at a veterinary teaching hospital. *Veterinary Record*, *157*(26), 829-833.

Case, J. B., Marvel, S. J., Boscan, P., & Monnet, E. L. (2011). Surgical time and severity of postoperative pain in dogs undergoing laparoscopic ovariectomy with one, two, or three instrument cannulas. *Journal of the American Veterinary Medical Association*, *239*(2), 203-208.

Corriveau, K. M., Giuffrida, M. A., Mayhew, P. D., & Runge, J. J. (2017). Outcome of laparoscopic ovariectomy and laparoscopic-assisted ovariohysterectomy in dogs: 278 cases (2003–2013). *Journal of the American Veterinary Medical Association*, *251*(4), 443-450.

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

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

Devitt C. M., Cox R.E., Hailey J. J. (2005). Duration, complications, stress, and pain of open ovariohysterectomy versus a simple method of laparoscopic-assisted ovariohysterectomy in dogs. *Journal of American Veterinary Medical Association, 227*, 921–927.

Duprè, G., Fiorbianco, V., Skalicky, M., Gueltiken, N., Ay, S. S., & Findik, M. (2009). Laparoscopic ovariectomy in dogs: comparison between single portal and two- portal access. *Veterinary Surgery*, *38*(7), 818-824.

Eugster, S., Schawalder, P., Gaschen, F., & Boerlin, P. (2004). A prospective study of postoperative surgical site infections in dogs and cats. *Veterinary surgery*, *33*(5), 542-550.

Hancock, R. B., Lanz, O. I., Waldron, D. R., Duncan, R. B., Broadstone, R. V., & Hendrix, P. K. (2005). Comparison of postoperative pain after ovariohysterectomy by harmonic scalpel-assisted laparoscopy compared with median celiotomy and ligation in dogs. *Veterinary Surgery*, *34*(3), 273-282.

Janssens, L. A. A., & Janssens, G. H. R. R. (1991). Bilateral flank ovariectomy in the dog-surgical technique and sequelae in 72 animals. *Journal of Small Animal Practice*, *32*(5), 249-252.

Mahalingam, A., Kumar, N., Maiti, S. K., Sharma, A. K., Dimri, U., & Kataria, M. (2009). Laparoscopic sterilization vs. open method sterilization in dogs: a comparison of two techniques. *Turkish Journal of Veterinary & Animal Sciences*, *33*(5), 427-436.

Malm, C., Savassi-Rocha, P. R., Gheller, V. A., Oliveira, H. P., Lamounier, A. R., & Foltyneck, V. (2004). Ovariohysterectomy: experimental and comparative study between laparoscopic and conventional approaches. Intra-operative phase. *Arquivo Brasileiro de Medicina Veterinária e Zootecnia*, *56*, 457-466.

Manassero, M., Leperlier, D., Vallefuoco, R., & Viateau, V. (2012). Laparoscopic ovariectomy in dogs using a single-port multiple-access device. *Veterinary Record*, *171*(3), 69-69.

Mayhew, P. (2011). Developing minimally invasive surgery in companion animals. *The Veterinary Record*, *169*(7), 177.

Mayhew, P. D., & Brown, D. C. (2007). Comparison of three techniques for ovarian pedicle hemostasis during laparoscopic-assisted ovariohysterectomy. Veterinary Surgery, 36(6), 541-547.

McClaran, J. K., Buote, N. J. (2009). Complications and need for conversion to laparotomy in small animals. *Veterinary Clinics of North America - Small Animal Practice*, *39*, 941–951.

Minami, S., Okamoto, Y., Eguchi, H., Kato, K. (1997). Successful laparoscopy assisted ovariohysterectomy in two dogs with pyometra. *Journal of Veterinary Medical Science*, *59*, 845-847.

Okkens, A. C., Kooistra, H. S., Nickel, R. F. (1997) Comparison of long-term effects of ovariectomy versus ovariohysterectomy in bitches. *Journal of Reproduction and Fertility Suppl*, *51*, 227–31.

Runge, J. J., Curcillo, P. G., King, S. A., Podolsky, E. R., Holt, D. E., Davidson, J., & Agnello, K. A. (2012). Initial application of reduced port surgery using the single port access technique for laparoscopic canine ovariectomy. *Veterinary Surgery*, *41*(7), 803-806.

Saberi Afshar, F., Shekarian, M., Baniadam, A., Avizeh, R., Najafzadeh, H., and Pourmehdi, M. (2017). Comparison of different tools for pain assessment following ovariohysterectomy in bitches. *Iranian Journal of Veterinary Medicine*, *11*(3), 255-265.

Tapia-Araya, A. E., Martin-Portugués, I. D. G., Bermejo, L. F. and Sánchez-Margallo, F. M. (2015). Laparoscopic ovariectomy in dogs: comparison between laparoendoscopic single-site and three-portal access. *Journal of veterinary science*, *16*(4), 525-530.

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

Van Goethem, B.E., Rosenveldt, K.W., Kirpensteijn, J. (2003). Monopolar versus bipolar electrocoagulation in canine laparoscopic ovariectomy: a nonrandomized, prospective, clinical trial. *Veterinary Surgery*, *32*, 464–470.

Van Nimwegen, S. A., Van Swol, C. F. P., Kirpensteijn, J. (2005). Neodymium: Yttrium aluminum garnet surgical laser versus bipolar electrocoagulation for laparoscopic ovariectomy in dogs. *Veterinary Surgery*, *34*, 353–357.

Vasseur, P. B., Levy, J., Dowd, E., & Eliot, J. (1988). Surgical wound infection rates in dogs and cats data from a teaching hospital. *Veterinary surgery*, *17*(2), 60-64.

How to cite this article: Mohan Lal Sharma, S.K. Jhirwal, Mahendra Tanwar and Meena Puniya (2024). Evaluation of Laparoscopic Sterilization Techniques in Dogs. *Biological Forum – An International Journal*, *16*(1): 107-111.