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Clinical evaluation of scalpel blade and electrocautery surgical incision techniques for ovariohysterectomy in dogs

Harsh V Bamaniya, JV Vadalia, SH Talekar, RH Bhatt, AA Vagh, DT Fefar, Nitin Kumar and Hardik A Rokad

Abstract
The present clinical study, entitled "clinical evaluation of scalpel blade and electrocautery surgical incision techniques for ovariohysterectomy in dogs" was conducted in 12 clinical cases of dogs presented for ovariohysterectomy at Department of Veterinary Surgery & Radiology, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh, Gujarat. The cases were randomly divided into two equal groups. Group I, dog underwent scalpel blade technique and Group II, dogs underwent electrocautery technique for ovariohysterectomy in dogs. Surgical techniques evaluated for hematobiochemical parameters, blood loss and wound healing. Study reveals there was non-significant difference observed in various haemato-biochemical parameters following ovariohysterectomy with different surgical incisional techniques except haemoglobin and total leucocyte counts value. There was significantly more blood loss was observed with the use of scalpel blade compared to electrocautery incision techniques. However, regarding to wound healing, scalpel blade resulted into significantly early healing of wound compared to electrocautery.

Keywords: Ovariohysterectomy, left flank, electrocautery, blood loss and wound healing

Introduction
In developing countries like India, stray dog overpopulation and control of the threat they pose to humans and domestic animals is a major socioeconomic issue. Many neutering surgical techniques have been tried, updated and many advancements have been made over the years to minimize the surgical morbidity of the ovariectomy animal. The advantages and disadvantages of lateral flank (both sides), mid ventral, and laparoscopic approaches for ovariectomy and ovariohysterectomy have been studied (Vasudev *et al.*, 2019) [36]. One of the most often performed procedure in veterinary medicine is surgical sterilization of dog. It serves as a method of contraception to stop uncontrolled breeding as well as to prevent and treat diseases of the reproductive system, such as mammary neoplasia, benign prostatic hyperplasia, lowering the risk of pyometra, and estrus attraction of male dogs, which causes inconvenience to the owner (Kumar *et al*., 2017) [14]. Several approaches for dog population management are now in use. Surgical techniques, chemical sterilization and hormone treatment are some of them. Despite numerous efforts in recent years to develop acceptable pharmacologic and chemical ways of dog sterilization, surgical intervention has managed to stay the. Female dogs are sterilized using a variety of surgical techniques, including early age gonadectomy, lateral flank ovariohysterectomy, laparoscopic ovariohysterectomy, traditional midline ovariohysterectomy and ovariectomy. Presently, in female dogs, ovariohysterectomy is commonly performed through a midline laparotomy or a flank laparotomy (Howe, 2006) [12]. Scalpel is the oldest instrument which is still in use even today. Stones like flint and jade were used to perform the first circumcisions that have been documented. Their edges were sharpened using a variety of methods. Gradually in 3000 BC, metals such as copper, bronze and iron were used as blades after sharpening their edges. Hippocrates called the first surgical scalpel a "Macairion" around 400 BC, the year it was first used. The Romans gave a similar tool the name "Scallepellus," which was later changed to the word "Scalpel" that we use today (Parepalli, 2020) [24]. The first surgical diathermy procedures were performed around the turn of the 20th century. To obviate the inherent disadvantages of steel scalpels. It is an efficient mode of dissection, being hemostatic and convenient with the advent of modern electrosurgical units (Chalya *et al.*, 2013) [7].

Heat as a hemostatic agent has been thought about for hundreds of years. Devices that utilize electricity to heat tissue and reduce bleeding were developed as technology advanced. These developments eventually led to the development of contemporary electrosurgery. In order to create a specific surgical effect, such as cutting or coagulation, high-frequency electrical current is sent into the tissue during electrosurgery, also known as radiofrequency surgery. Each electrosurgical device consists of a high-frequency electrical generator and 2 electrodes. The patient's body is the conduit via which the electric current travels from the active electrode to the return (dispersive) electrode, where it returns to the electrosurgical generator (Taheri *et al*., 2014) [35]. The three primary types of tissue effects that electrosurgery may produce are cutting, fulguration, and desiccation (Massarweh *et al.*, 2006) [19]. However, diathermy has reportedly been employed in midline laparotomy incisions since studies conducted globally have demonstrated that it has a considerable benefit over conventional knife incisions in terms of in terms of blood loss and post-operative discomfort (Chalya *et al.*, 2013) [7].

Materials and Methods

The present clinical study, entitled "clinical evaluation of scalpel blade and electrocautery surgical incision techniques for ovariohysterectomy in dogs" was conducted in 12 clinical cases of dogs presented for ovariohysterectomy at Department of Veterinary Surgery & Radiology, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh, Gujarat. The cases were randomly divided into two equal groups. Group I, dog underwent scalpel blade technique and Group II, dogs underwent electrocautery technique for ovariohysterectomy in dogs. Surgical techniques evaluated for hematobiochemical parameters, blood loss and wound healing. Blood and serum sample analysis was carried out on day 0 (T0 before surgery), 4 hours (T1), 24 hours (T4) and 48 hours (T3) post-operatively. Anamnesis of each case were recorded regarding the age, breed, body weight of female dogs. The mean age in Group I and Group II before surgery were 2.67 ± 0.76 and 1.33 ± 0.211 years respectively. The mean body weight in Group I and Group II before surgery (T0) were 15.33 ± 2.22 kg and 17 ± 2.24 kg respectively. All the selected animals for ovariohysterectomy were undergone detail clinical examination. Overall health, alertness as well as routine checkup carried out followed by measurement of rectal temperature, pulse rate and respiration rate. All the physiological parameters were within the normal reference range. This indicates normal health status of patient.

Pre-operative preparation of animal

In all animals, pre-operative fasting (off feed and off water for 12 hours and 6 hours respectively) was carried out. Surgical site for flank approach was shaved (Plate 1-A) and scrubbed (Plate 1-B) by diluted (chlorhexidine gluconate and cetrimide solution). Followed by painted with 7.5% povidone iodine. In all animals, inj. ceftriaxone @ 15 mg/kg BW I/M as an antibiotic and inj. meloxicam @ 0.3 mg/kg BW I/M as an analgesic were given in each animal prior to surgery as a prophylactic medication. All dogs were pre-medicated with atropine sulphate @ 0.045 mg/kg BW S/C. After 10 minutes, induction of anaesthesia was carried out by mixture of ketamine hydrochloride @ 10 mg/kg BW I/V and diazepam @ 0.5 mg/kg BW I/V respectively. General anaesthesia was maintained by same mixture as per requirement. All animals were positioned in right lateral recumbency for left flank ovariohysterectomy (Plate1-C). Animals were covered with sterile drape except at the surgical site (Plate 2- A).

Surgical procedure

Group I

Ovariohysterectomy Performed Using Scalpel (N = 6)

A sharp flank (Plate 2-B) incision on the left lateral flank was carried out in horizontal direction, two or three finger width from last rib and ventral to transverse processes of lumbar vertebrae. Following skin, subcutaneous tissue, external oblique muscle, internal muscle layer followed by transverse abdominis muscle and peritoneum were grasped and incised by scalpel blade. After that, left uterine horn was located directly below the incision and it was exteriorized (Plate 2-C) through the incision with the help of spaying hook or index finger. The suspensory ligament was identified after that it was broken by applying pressure on it with the middle or index finger. Ovary was then exteriorized. Two artery forceps were placed below to the ovary. With the use of chromic catgut number 1 trans fixation was carried out followed by circlage ligation (Plate 2-D). After that ovary was severed by scalpel blade. Then after ovarian pedicle was checked for any bleeding. For the right-side ovary same procedure was followed. After that both uterine horns were retroflexed and pulled caudally as much as possible to expose uterine body. The uterine stump was clamped with artery forceps. Then uterine stump was severed (Plate 2-E) by scalpel blade after the trans fixation using chromic catgut number 1 followed by circlage fixation. The uterine pedicle was placed back into peritoneal cavity. Following ovariohysterectomy, the peritoneum and transverse muscle was sutured together in simple interrupted suture pattern with the use of vicryl no 1-0. The internal and external muscle layer was sutured together in continuous lock stich suture pattern with the help of vicryl no 1-0. Subcutaneous suture was taken in continuous pattern with the help of chromic catgut 2-0. Skin suture (Plate 2- F) was taken in horizontal mattress pattern with the use of nylon no. 0 suture material.

Group II

Ovariohysterectomy Performed Using Electrocautery (N = 6)

In a monopolar electrosurgical procedure, a pencil like electrode was used over the flank for skin incision. A sharp flank (Plate 3-B) incision on the left lateral flank was carried out in horizontal direction, two or three finger width from last rib and ventral to transverse processes of lumbar vertebrae. Following skin, subcutaneous tissue were incised. The external oblique muscle, (Plate 3-C) internal muscle layer followed by transverse abdominis muscle and peritoneum were grasped and incised with electrocautery. After that, left uterine horn was found below the incision which was exteriorized through surgical incision with the help of spaying hook or index finger. The suspensory ligament was identified after that it was broken by applying pressure on it with the middle or index finger. Two artery forceps were placed below to the ovary. With the use of chromic catgut number 1 trans fixation was carried out followed by circlage ligation. After that ovary was severed with electrocautery. Ovarian pedicle was checked for any bleeding. For the right-side ovary same procedure was followed. After that both uterine horns were retroflexed and pulled caudally. The uterine stump was clamped with artery forceps. Then uterine stump was severed (Plate 3-D) with electrocautery after trans fixation with

chromic catgut no. 1 followed by circlage fixation. Then uterine stump was checked for any hemorrhage. The uterine pedicle was replaced back into peritoneal cavity. Following ovariohysterectomy, the peritoneum and transverse muscle was sutured together in simple interrupted suture pattern with the use of vicryl no 1-0. The internal and external muscle layer was sutured together in continuous lock stich suture pattern with the help of vicryl no 1-0. Subcutaneous suture was taken in continuous pattern with the help of catgut 2-0. Skin suture (Plate 3-F) was taken in horizontal mattress pattern with the use of nylon no. 0 suture material.

Post-Operative Care

Post-operative analgesia Meloxicam @ 0.3 mg/kg BW I/M and antibiotic Ceftriaxone @ 15 mg/kg BW I/M were continued for 3 & 5 days respectively. Antiseptic dressing of the surgical wound was carried out by using 5% povidone iodine up to the complete healing of wound following ovariohysterectomy.

Statistical Analysis

The data obtained from the study between the three groups were statistically analyzed by using the ANOVA followed by a post hock test. Blood loss and wound healing were analyzed by using student "t" test.

Results and Discussions

A) Haematological parameters

a. Haemoglobin (g/dl)

In the present clinical study, group I mean haemoglobin value significantly ($p< 0.05$) decrease at 24 hrs post operatively. This could be due to because in group I, ovariohysterectomy was carried out with scalpel blade via left flank approach and scalpel blade results into more blood loss compared to electrocautery. Because electrocautery instantly seal the vessels and provide better intra operative haemostasis. However, Laiju *et al*. (2011) [17], Rafee *et al*. (2015) [26], Kumar *et al*. (2017) [14] and Khatal (2019) [13].

A) Shaving of animal

B) Scrubbing of animal

C) Positioning of animal

Plate 1: Preparation of animal

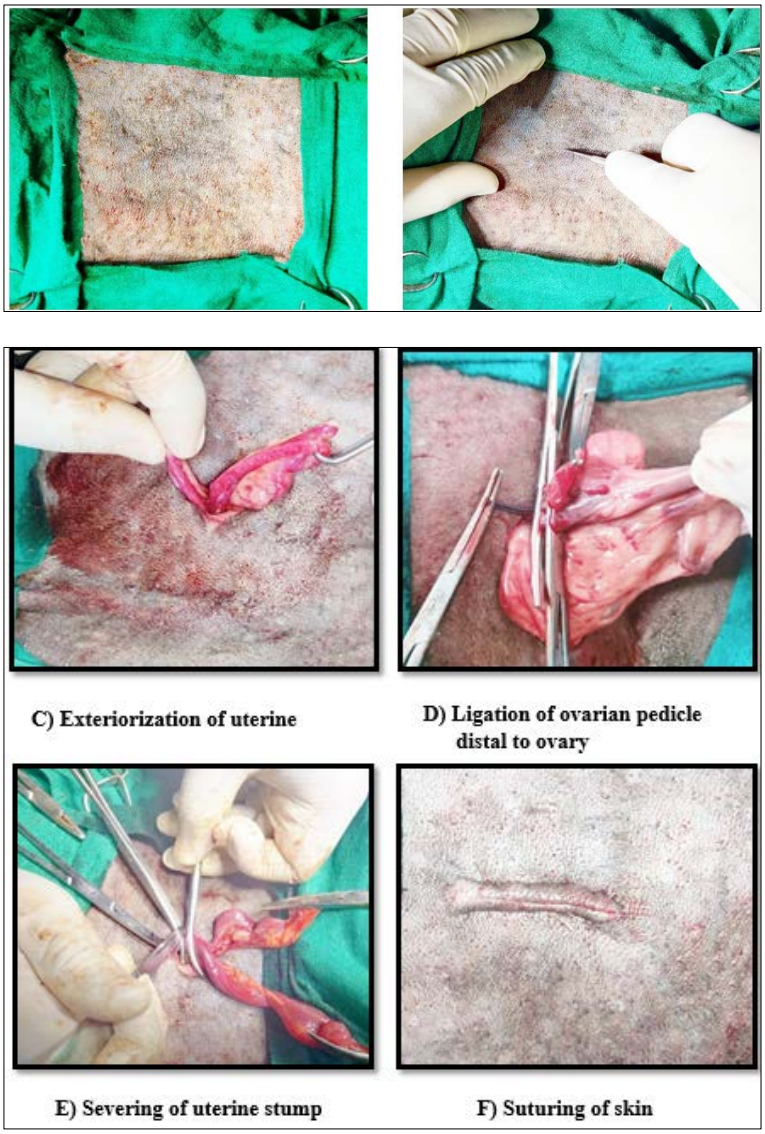
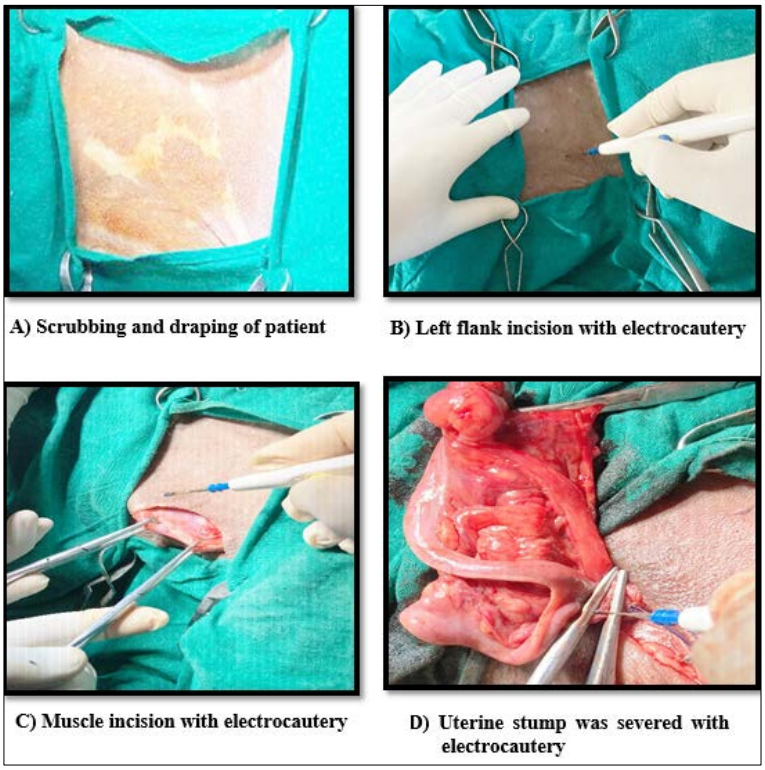


Plate 2: Spaying Using Scalpel Blade



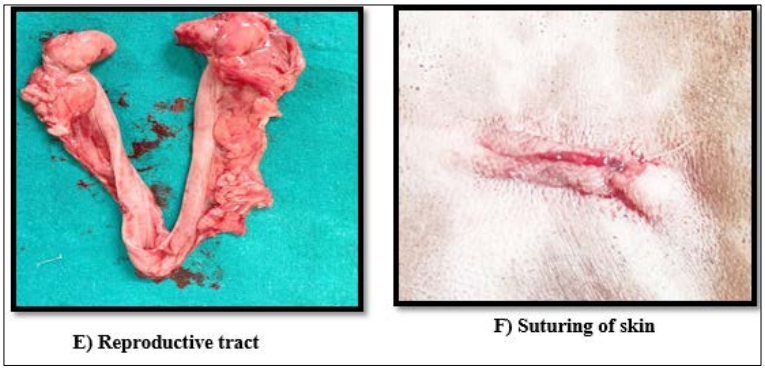


Plate 3: Spaying Using Electrocautery

Also reported that, there was significant reduction in the values of haemoglobin after ovariohysterectomy. It could be due to intra-operative bleeding, surgical stress or haemodilution in response to the fluid therapy. However, in case of group II mean haemoglobin value declines at 24 hours post operatively but the values were statistically non-significant. The mean haemoglobin value did not differ significantly between the groups at different intervals. In the present clinical study, there was a slight variation in haemoglobin levels when comparing groups. Although non-significant, it could be due to minimal blood loss during surgery and surgical stress.

b. Total erythrocyte count (x10^6 /µL)

Statistically non-significant variation in the (Mean ± SE) values of the erythrocyte was recorded within the group and between the groups at different time interval throughout the study period. In present clinical study, there was decline in mean values of total erythrocyte count within all three groups at 24 hr post operatively. Which could be as a result of surgical blood loos, but values were statistically non-significant. It may be due to fluid retention and haemodilution post operatively. Eventually, total erythrocyte count increased non significantly and recovered post operatively. Similar findings were recorded by Shirodkar *et al*. (2008) [31], Rafee *et al*. (2015) [26] after spaying. While, Murthy (2012) [22], Kumar *et al*. (2017) [14], Akshdeep (2018) [2] and Dhaleshwari (2020) [10] reported non-significant variation in the values of erythrocyte count at various intervals following ovariohysterectomy. Whereas, Khatal (2019) [13] and Salvi (2021) [28] reported significantly decrease in the value of total erythrocyte count 24 hours post operatively following ovariohysterectomy.

c. Packed cell volume (%)

In Group I and Group II the mean value of packed cell volume (%) declines at 24 hrs post operatively but the values were statistically non-significant. In group I, more decline in packed cell volume compared to Group II. Which could be due to more blood loss during the ovariohysterectomy with scalpel blade. However, values were increased non significantly and recovered post operatively. Similar findings were recorded by Shirodkar *et al*. (2008) [31], Rafee *et al*. (2015) [26], Fazio *et al*. (2015) [11], Acharya *et al*. (2016) [1], Kumar *et al*. (2017) [14]. While, Laiju *et al*. (2011) [17] and Khatal (2019) [13] found that, there was significant decrease in the value of packed cell volume (%) following ovariohysterectomy. which was returned to the normal range following post-operatively. The mean value of packed cell volume (%) shows non-significant variation between Groups at various time intervals throughout study period. However, in present clinical study, non-significant decline in the value of packed cell volume (%) at 24 hours post-operatively. It could be due to fluids were moving to the intravascular compartment from the extravascular compartment.

d. Total leukocyte count (x10^3 /µL)

In case of Group I, mean values of total leukocyte count were non significantly increase at 24 hours post operatively. However, the values were significantly ($p< 0.05$) decrease at 48 hours post operatively. This might be due to post-surgical stress and haemodilution. Similar findings were recorded by Rafee *et al*. (2015) [26]. In group II mean values of total leukocyte count increases at 24 hours post operatively but values were statistically non-significant and fluctuate non significantly throughout the study period at various time intervals, it might be due to post-operative infection, inflammation following surgery. While, there was a non-significant fluctuation of mean total leukocyte count values between the groups throughout the study periods at various time intervals. Similar findings were recorded by Acharya *et al*. (2016) [1], Kumar *et al*. (2017) [14], Fazio *et al*. (2015) [11] and Khatal (2019) [13]. While in contrary to this Dhaleshwari (2020) [10] reported that there were significantly increase in total leukocyte count post operatively following ovariohysterectomy. This could be explained by the body's natural defence mechanisms, which are important after surgery to remove dead tissue.

B) Differential leukocyte count (%)

In the present clinical study, there were non-significant variation in the values of mean neutrophils (%) within the group and between the groups throughout the study period at various time intervals. Moreover, within Group I, there were statistically non-significant increases in values of neutrophil (%) post operatively following ovariohysterectomy. This might be due to excessive tissue damage using scalpel or might be it was due to presence of infection or inflammation. Lymphocytes value shows non-significant variation within the group and between the groups throughout study period. This might be due to there was not any pathological adverse reaction following ovariohysterectomy. Lymphocytes values fluctuate within normal reference range. There were statistically non-significant variation in the mean values of monocytes (%) within the group and between the groups throughout the study period at various time intervals. Eosinophils (%) value shows non-significant variation within the group and between the groups throughout study period. There were statistically non-significant variation in the mean values of basophils (%) within the group and between the

groups throughout the study period at various time intervals. Basophils (%) values fluctuate within normal reference range. This indicates there was no any allergic reaction occurs following ovariohysterectomy. These observations were in accordance with Murthy (2012) [22], Acharya *et al*. (2016) [1], Kumar *et al*. (2017) [14] and Dhaleshwari (2020) [10] following ovariohysterectomy.

C) Biochemical Parameters

Total protein (g/dl) mean values shows statistically non-significant variation within the group and between the groups throughout the study period at various time intervals. Total protein (g/dl) values fluctuate within normal reference range. Similar findings were recorded by Niranjana *et al*. (2014) [23], Kumari *et al*. (2017) [15], Dhaleshwari (2020) [10] and Rubio *et al*. (2022) following ovariohysterectomy. While, Khatal (2019) [13] recorded significant decrease in the value of total protein at 1st post operatively days following ovariohysterectomy. It might be due to synthesis of new fibroblast and formation of new collagen fibres for bridging the gaping of the wound. However, in present study, in case of group I compared to group II statistically non-significant drops recorded in the value of total protein (g/dl) within the groups and between the groups, but variation was negligible. This might be due to because in group I, ovariohysterectomy carried out with scalpel blade and it result into more tissue trauma compared to two other techniques and it cause the increase total protein extravasation through the endothelium of damaged blood vessels which ultimately cause a drop in total protein level. Albumin (g/dl) mean values shows statistically non-significant variation within the group and between the groups throughout the study period at various time intervals. Albumin (g/dl) values fluctuate within normal reference range. Similar findings were recorded by Niranjana *et al*. (2014) [23], Dhaleshwari (2020) [10] and Rubio *et al*. (2022). While Carriera *et al*. (2016) reported that there was significant decrease in the level of albumin following ovariohysterectomy. However, in present study, in group I compared to group II statistically non-significant drops recorded in the value of albumin(g/dl) within the groups and between the groups, but variation was negligible. This might be due to because in group I, ovariohysterectomy carried out with scalpel blade and it result into more tissue injury followed by inflammation compared to electrocautery techniques which cause the extravasation of albumin from intravascular space and circulation to the liver which ultimately cause the albumin depletion. CRP was measured by using canine specific CRP ELISA test (Wuhan fine biotech Co., LTD) and obtained level of CRP from 4.11 ng/ml to 145 ng/ml in collected serum at different time intervals. It shows non-significant variation among the groups as well as between the groups.

D) Blood loss

In present clinical study, there was significant increase in the mean value of blood loos in group I compared to group II. Because in case of Group II, electrocautery was used and it was associated with quick haemostasis, instantly sealing of minor blood vessels during the surgery compared to scalpel which result into less intra-operative bleeding. However, Mukherjee and Patole (2019) reported that diathermy incision provide efficient and quick haemostasis than traditional scalpel. Whereas, Lail *et al*. (2018) and Lacitignola (2020) recorded quick haemostasis and less blood loss with electrocautery after the various tumour surgery. Moreover, Singh (2014) [32], Meakin *et al*. (2016) [20] and Scott *et al*., 2017) [30] stated that the electrocautery was associated with good haemostasis when compared to scalpel blade following various abdominal surgery in dogs and midline skin incision in dog respectively.

E) Wound healing

Statistically there was significant difference found in the mean value of duration of healing in Group I compared to Group II. There was early wound healing observed in Group I compared to Group II. It may be due to because in Group II, electrocautery was associated with severe thermal damage and charring of tissue which cause the delay in wound healing according to Sinha and Gallagher (2003) [33] and Schoinohoriti *et al*. (2012) [29]. Whereas, Chang *et al*. (2011) [8] revealed that, there was absence of thermal damage in scalpel. While, Schoinohoriti *et al*. (2012) [29] stated that the electrocautery cause necrosis in dermis and epidermis layer which further cause ischemia and result into delayed in wound healing.

F) Post-Operative Complications

In present clinical study, after surgery standard post-operative care was carried out and records were kept for the observations related to the postoperative problems. The post operative complications were seen in three (25%) female dogs out of 12 cases. Among them one case (16.16%) was out of six cases of group I and two cases (33.33%) were out of six cases of group II.

a. Removal of Suture

In one case of group II, on 4th post-operative day removal of suture (Plate 5- G) was noticed. It was due to self-trauma, continuous pawing and licking of surgical site because ease access of left flank surgical site. Suture was taken (Plate 5-H) on next post-operative days and ASD of the wound until it heals was carried out.

b. Abscess

In one case of group I, there was mild swelling beneath the surgical wound at 8th post-operative day (Plate 5-A) and it was increase in size after two days. It might be due to some bacterial infection. Antibiotic inj. enrofloxacin @ 5 mg/kg body weight I/M was given to reduce swelling. Eventually it was rupture (Plate 5-B) itself in next four days. Antiseptic dressing and 3 days course of inj. enrofloxacin @ 5 mg/kg body weight I/M was carried out. However, it was healed following 20th post-operative day. In one case of group II, on 7th post-operative days abscess like swelling (Plate 5-C) was observed beneath the surgical wound, palpation reveal doughy consistency of the swelling. On next day needle aspiration reveals thick dark brown color pus (Plate5-D), it might be due to pseudomonas infection or other bacterial infection. Tincture iodine was administered after aspiration of pus and antibiotic inj. enrofloxacin @ 5 mg/kg body weight I/M was given. Improvement was seen in following days, but it was eventually rupture (Plate 5-E) after 5th days of its occurrence. Antiseptic dressing until the wound heals and 3 days course of antibiotic inj. enrofloxacin @ 5 mg/kg body weight I/M was carried out. It was healed (Plate 5- F) following 20th post operative days. In contrary to this study, Begum and Bhubaneshwari (2018) [10] and Salvi (2021) [28] did not find any complication following ovariohysterectomy. While,

Berzon (1979) [4], Burrow *et al.* (2005) [5] and Peeters *et al.* (2011) [25] observed complications like redness around the surgical site, seroma formation, self-inflected trauma, blood loos, wound dehiscence, erythema, oedama, discharge and sweeling, pain, swelling with or without discharge, wound inflammation with or without discharge following ovariohysterectomy. Whereas, Stone (2003) [34] and Devitt *et al.* (2005) [9] revealed that intra-operative haemorrhage may cause the patient's death. Rupture of ovarian pedicle, uterine pedicle and the broad ligament could be the cause of intra-operative haemorrhage during ovariohysterectomy.

Table 1: Effect on Haemoglobin, Total erythrocyte count, Total leukocyte count and packed cell volume in female dogs of different groups at different time intervals.

Group	Time (hours)	Hb (g/dl)	PCV (%)	TLC (10^3 /mm3)	TEC (10^6 /mm 3)
I	T0	13.5 ± 0.236^{Aa}	44.3 ± 1.55^{Aa}	16.1 ± 2.54^{Aa}	7.34 ± 0.377^{Aa}
	T4	11 ± 0.583^{Aa}	35.5 ± 1.73^{Aa}	31.8 ± 2.92^{Aa}	5.95 ± 0.504^{Aa}
	T24	10.4 ± 0.547^{Ab}	33.8 ± 1.66^{Aa}	27.1 ± 3.08^{Aa}	5.32 ± 0.446^{Aa}
	T48	11.2 ± 0.318^{Aa}	36.8 ± 1.96^{Aa}	20.9 ± 1.84^{Ab}	5.88 ± 0.455^{Aa}
II	T0	13.4 ± 0.658^{Aa}	47.4 ± 2.17^{Aa}	21 ± 2.91^{Aa}	7.4 ± 0.323^{Aa}
	T4	11 ± 0.583^{Aa}	50.7 ± 4.31^{Aa}	26.8 ± 3.5^{Aa}	7.86 ± 0.728^{Aa}
	T24	12.3 ± 0.742^{Aa}	41.5 ± 2.6^{Aa}	29.4 ± 2.97^{Aa}	6.56 ± 0.538^{Aa}
	T48	12.5 ± 0.729^{Aa}	40 ± 2.33^{Aa}	28.9 ± 2.06^{Aa}	6.61 ± 0.428^{Aa}

*Small superscript indicates significant ($p < 0.05$) value within groups at different time intervals. Capital Superscript indicates significant ($p < 0.05$) value between groups at same time intervals

Table 2: Effect on differential leucocytes counts in female dogs of different groups at different time intervals

Group	Time (Hours)	Monocytes (%)	Neutrophils (%)	Lymphocytes (%)	Basophils (%)	Eosinophils (%)
I	T0	6.6 ± 1.28^{Aa}	53.9 ± 6.26^{Aa}	32.6 ± 5.99^{Aa}	1.1 ± 0.241^{Aa}	5.78 ± 0.855^{Aa}
	T4	3.88 ± 1.26^{Aa}	60.5 ± 5.22^{Aa}	32.9 ± 3.75^{Aa}	0.233 ± 0.214^{Aa}	3.63 ± 1.54^{Aa}
	T24	7.43 ± 0.97^{Aa}	58 ± 6.64^{Aa}	30.2 ± 5.54^{Aa}	0.3 ± 0.245^{Aa}	4.1 ± 1.08^{Aa}
	T48	6.52 ± 1.39^{Aa}	59.5 ± 7.73^{Aa}	29 ± 6.19^{Aa}	0.5 ± 0.288^{Aa}	4.5 ± 1.22^{Aa}
II	T0	6.2 ± 1.29^{Aa}	72.6 ± 3.19^{Aa}	17.5 ± 1.96^{Aa}	0.717 ± 0.255^{Aa}	2.98 ± 0.788^{Aa}
	T4	5.17 ± 1.61^{Aa}	78.4 ± 2.93^{Aa}	14.4 ± 3.49^{Aa}	0.217 ± 0.074^{Aa}	0.6 ± 0.157^{Aa}
	T24	6.42 ± 1.34^{Aa}	71.1 ± 4.96^{Aa}	19.5 ± 4.99^{Aa}	0.317 ± 0.14^{Aa}	2.4 ± 0.891^{Aa}
	T48	6.52 ± 1.35^{Aa}	70.1 ± 3.17^{Aa}	17.8 ± 3.1^{Aa}	0.5 ± 0.235^{Aa}	3.25 ± 1.05^{Aa}

*Small superscript indicates significant ($p < 0.05$) value within groups at different time intervals. Capital Superscript indicates significant ($p < 0.05$) value between groups at same time intervals.

Table 3: Effect on total protein and albumin value in female dogs of different groups at different time intervals

Group	Time	Total Protein (g/dl)	Albumin (g/dl)
I	T0	6.71 ± 0.327^{Aa}	3.59 ± 0.222^{Aa}
	T4	6.39 ± 0.346^{Aa}	3.48 ± 0.22^{Aa}
	T24	5.73 ± 0.324^{Aa}	3.2 ± 0.219^{Aa}
	T48	5.83 ± 0.309^{Aa}	3.3 ± 0.217^{Aa}
II	T0	6.75 ± 0.232^{Aa}	3.14 ± 0.231^{Aa}
	T4	6.63 ± 0.226^{Aa}	3.1 ± 0.232^{Aa}
	T24	6.31 ± 0.225^{Aa}	2.99 ± 0.231^{Aa}
	T48	6.24 ± 0.258^{Aa}	3.04 ± 0.231^{Aa}

*Small Superscript indicates significant ($p < 0.05$) value within groups at different time intervals. Capital Superscript indicates significant ($p < 0.05$) value between groups at same time intervals

Table 4: Shows (Mean ± SE) value of blood loss during surgery in different groups

Parameter	Group	(Mean ± SE)
Blood Loss	Group I	2.3 ± 0.493^{A}
	Group II	1.14 ± 0.3^{B}

*Capital superscript shows level of significance ($p < 0.05$) between the groups.

Table 5: Shows (Mean ± SE) value of wound healing in days between different groups

Parameter	Group	(Mean ± SE)
Wound Healing	Group I	11.3 ± 0.333^{B}
	Group II	16.2 ± 0.543^{A}

*Capital superscript shows level of significance ($p < 0.05$) between the groups.

Table 6: Shows post-operative complications in different groups

Percentage (%)	Group I (N=6)	Group II (N=6)
	1/6 (16.16%)	2/6 (33.33%)
Group		Complications
Group I		Abscess (1)
Group II		Abscess (1), removal of suture due to self-trauma (1)

Plate 4: Wound healing (Group I)

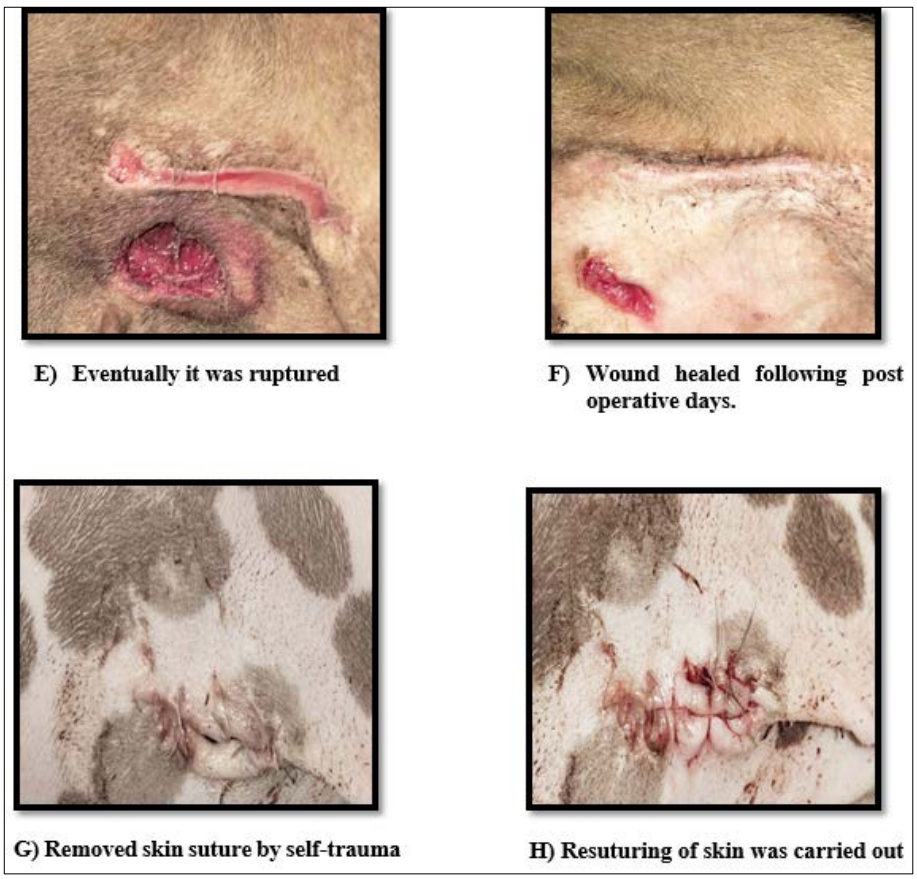


Plate 5: Post-operative complications

Conclusion

In the present clinical study, there was significantly more blood loss was observed with the use of scalpel blade compared to electrocautery incision techniques. However, regarding to wound healing, scalpel blade resulted into significantly early healing of wound compared to electrocautery. Whereas, there was non-significant difference observed in various haemato-biochemical parameters following ovariohysterectomy with different surgical incisional techniques except haemoglobin and total leucocyte counts value.

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