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Conventional ventral midline and right flank approach for ovariohysterectomy in female dogs

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ABSTRACT

The present study was conducted in 12 intact female dogs presented for elective ovariohysterectomy. Animals were randomly divided into two groups of six each. Group I animals were subjected to conventional ventral midline ovariohysterectomy and in Group II animals, right flank ovariohysterectomy was performed. Clinical efficacy of surgical techniques was evaluated on the basis of clinico-physiological and haemato-biochemical parameters. Surgical duration for performing ovariohysterectomy was comparatively less in right flank approach as compared to ventral midline. Physiological parameters like rectal temperature showed non-significant variations in all the animals. Respiratory rate decreased marginally whereas transitory increase in heart rate was observed for short time. Haematological and biochemical observations revealed marginal changes during the period of study in both the groups. The length of surgical incision, duration of procedure and healing were significantly less in Group II as compared to Group I. However, the operative haemorrhage was comparatively more in right flank ovariohysterectomy. The ease of exteriorization and ligation of uterus and ovaries was easy in Group II (right flank approach) as compared to Group I (ventral midline approach). Wound dehiscence was observed in two dogs of Group I whereas Group II animals showed uneventful recovery. Hence, right flank approach is a good alternative over the conventional mid-ventral approach for performing ovariohysterectomy in female dogs.

Keywords: Female dogs, Ovariohysterectomy, Right flank, Ventral midline

In present era, dogs have become an integral part of our modern society. They act as companion for all aged human beings besides acting as guard animals. Dogs often suffer from diseases associated with the reproductive system such as mammary neoplasia, cystic endometrial hyperplasia, ovarian cyst and pyometra. The need of contraception to prevent the uncontrolled breeding and oestrus attraction of male dogs results in inconvenience to the owner (Davidson *et al*. 2004, Howe 2006). Surgical sterilization of dogs and cats is one of the most commonly performed procedures in veterinary practice to minimize the affections, oestrus and associated problems such as bloody vaginal discharge, behavioural change, undesired mating, pseudo and unwanted pregnancy (Slatter 2003, Mayhew and Brown 2007, Kiani *et al*. 2014).

An efficient anaesthetic protocol is mandatory in any surgery to prevent pain, provide immobility and muscle relaxation without jeopardizing the life and safety of the animal (Lemke 2007). Hence, atropine sulphate, xylazine and ketamine hydrochloride combination were used. Traditionally, ovariohysterectomy is performed through ventral midline incision in bitches but considering the post-surgical complications such as evisceration, delayed healing, wound dehiscence, and herniation, a suitable alternative method of flank region came into existence. The main advantage of lateral flank method for ovariohysterectomy include the possibility to observe the surgical wound from a distance without handling of animal and reduced potential for evisceration of abdominal organs.Therefore, the present study was undertaken to compare mid-ventral and right flank approaches for ovariohysterectomy in female dogs, and also to evaluate the effect of two approaches on stress related clinico-physiological, haemato-biochemical parameters and their post-operative complications, if any.

MATERIALS AND METHODS

The present study was conducted from November 2017 to June 2018 in 12 intact female dogs presented for ovariohysterectomy in Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Anjora, Durg. They were divided into two groups each containing six animals. Animals in Group I were subjected to conventional ventral midline ovariohysterectomy while in Group II animals, right flank ovariohysterectomy was performed. The bitches were clinically examined and then subjected to surgical treatment. The surgical site in Group I, i.e. ventral abdominal midline

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(from xiphoid to os pubis) and in Group II i.e. right flank (from last rib to pin bone) was prepared for aseptic surgery as per protocol. Anaesthetic regimen of atropine sulphate (0.04 mg/kg, I/M), xylazine hydrochloride (1 mg/kg b.wt. I/M) and ketamine hydrochloride (5 mg/kg wt, I/V) was given to all the animals of both the group.

Ovariohysterectomy by ventral midline: The animals of Group I were placed on dorsal recumbency following anaesthesia. The surgical site was prepared for aseptic surgery and caudal mid-ventral area was draped. The skin and linea alba was incised layer by layer to reach the abdominal cavity. After elevating the abdominal wall, finger was slided against the abdominal wall, 2-3 cm caudal to the kidney. The finger was turned medially to ensure the uterine horn from a broad ligament and gently elevated from abdomen. The right uterine horn was anatomically confirmed and with caudal and medial traction, the suspensory ligament was identified by palpating as a tight fibrous band at the proximal edge of the ovarian pedicle. The suspensory ligament was broken, which allowed the exteriorization of ovary (Fig. 1). A hole was made in the broad ligament caudal to the ovarian pedicle and triple clamping was done. Transfixation ligature was done on pedicle at the lowest and distant clamp using chromic catgut no. 2 for all the animals. Ovarian clamp was severed between the clamp closure to ovary and the middle one. The pedicle was carefully observed for bleeding and then gradually dropped into the abdomen. The same procedure was repeated for the left ovary. After transecting both ovaries, three clamps were applied on the uterine body just cranial to the cervix. Both the uterine arteries were ligated separately caudal to the most caudal clamp. The uterine body was severed between the proximal and middle clamps. The caudal clamp was removed and transfixation of uterine end was done just cranial to the cervix using chromic catgut no. 2. The pedicle was inspected for bleeding after removing the clamps and gently replaced into the abdomen.

Ovariohysterectomy by right flank: The animals of Group II were placed in left lateral recumbency following anaesthesia. The surgical site was prepared as per the standard procedure and then right flank was draped. Two to three finger width from last rib and ventral to the transverse process of lumbar vertebrae at that angular junction, an oblique incision of 3–3.5 cm was made in downward and backward direction taking care to avoid superficial vessels. The abdominal muscles were separated via a grid approach using a haemostat to reach the abdominal cavity. The right uterine horn and ovary were grasped with fingers and delivered through the incision for ligation and transaction (Fig. 2). Further, same procedure was followed as mentioned in ventral midline ovariohysterectomy approach.

Post-operative care: Postoperatively, dogs were given intravenous fluid therapy (DNS 500 ml I/V), antibiotic (Inj Taxim 500 mg I/M), analgesic (Inj Carodyl 2 ml I/M) and supportive therapy (Inj Tribivet 2 ml I/M) for five days. Antiseptic dressing was done with povidine iodine solution and betadine ointment along with tight abdominal bandaging.

Efficacy of surgical technique: The parameters recorded during surgery were length of incision, operative haemorrhage, ease of exteriorization of uterus and ovaries, ease of ligation of uterus and ovaries, duration of procedure and cost of surgery. After surgery, the incision site was examined for nature of wound (normal/edematous) and nature of discharge (bloody/serosanguinous/foetid/pussy) on 0, 3rd, 7th and 12th post-operative day.

Physiological parameters: The parameters like rectal temperature, heart rate and respiratory rate were recorded before surgery and at 20, 40, 60 and 90 min during surgical procedure and on 3rd, 7th and 12th post-operative day.

Haemato-biochemical parameters: Blood sample (1 ml) was collected from peripheral vein in sterilized glass vials containing EDTA from bitches before surgery and on 7th and 12th day post-surgery for estimation of haemoglobin (gm/dl), packed cell volume (%), total erythrocyte count (millions/mm^3), total leucocyte count (thousand/mm^3) and differential leukocyte count (DLC) (%). For biochemical parameters, 3 ml of peripheral venous blood was collected in plain glass vials and serum was separated for estimation

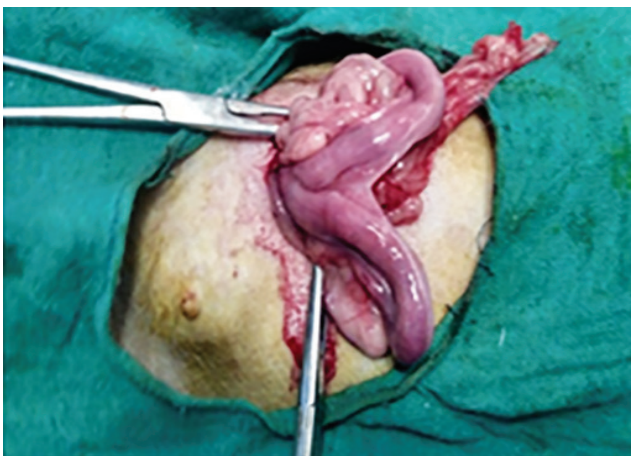

Fig. 1. Exteriorization of uterus and ovary through ventral midline laparotomy.

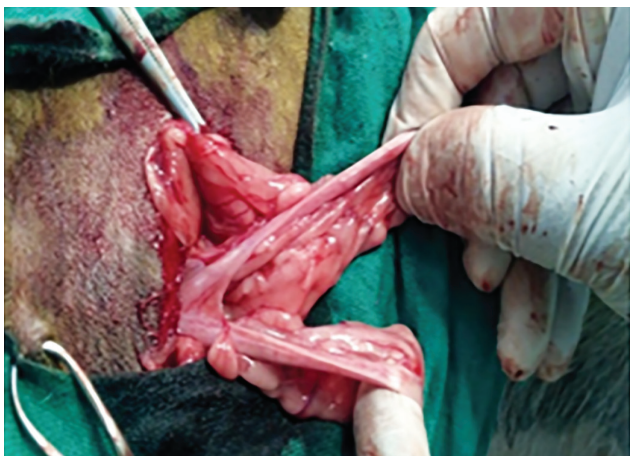

Fig. 2. Exteriorization of uterus and ovary through right flank approach.

of following parameters, viz. serum glucose (mg/dl), creatinine (mg/dl), AST (IU/L) and ALT (IU/L) at 0 day (before surgery) and on 7th and 12th day post-surgery.

Statistical analysis: The data obtained was analysed using Analysis of Variance (one way and two way ANOVA) as per standard procedure by Snedecor and Cochran (1994) using computerized statistical package SPSS 17 and represented in Mean±SE.

RESULTS AND DISCUSSION

The surgical methods, viz. ventral midline and right flank ovariohysterectomy were compared. The anaesthetic regimen used for performing surgery comprised atropine sulphate, xylazine hydrochloride and ketamine hydrochloride.

Efficacy of surgical technique: The incision length was significantly (P<0.05) higher in Group I as compared to Group II (Table 1). Reece *et al.* (2012) recorded surgical incision length for right flank ovariohysterectomy as 2.20 cm. Murthy *et al.* (2012) reported a mean length of surgical incision for ventral midline ovariohysterectomy approach as 2.05±0.22 cm. However, the length of surgical incision for ventral midline and right flank ovariohysterectomy was comparatively more in present study. Less operative haemorrhage during surgery was observed in animals of Group I (++ in two bitches and + in four bitches) as compared to Group II (+++ in two animals and ++ in four animals). In the present study, minimum haemorrhage was observed in Group I, i.e. ventral midline. On the contrary, Murthy *et al*. (2012) reported mild haemorrhage in flank approach. More haemorrhage was seen in right flank approach compared to ventral midline which could be due to muscle trauma and injury to supplying blood vessels. Exteriorization of uterus and ovaries was easy in animals of Group II (right flank) while it took little more time to locate uterus and ovaries in Group I (Ventral midline). Similarly, Devi *et al*. (2016) reported that pus filled enlarged uterus could be exteriorized easily through smaller flank incision as the loose skin and muscle in the flank could be manipulated as per requirement whereas midline incision needed to be longer. Easy exteriorization of uterus and ovaries from right flank might be due to ipsilateral ovary and uterine horn that lie immediately below the flank incision making them easy to locate. The ligation of ovaries and uterus was easy in both the groups. The mean time for duration of procedure in Group I and Group II was 44.25±3.50 and 40.5±2.88 min respectively (Table 1). These findings are in agreement with Vandana (2005) and Pukacz *et al*. (2009) for conventional ovariohysterectomy by flank or ventral midline method. Arunkumar *et al*. (2017) reported duration time of 55.83 min in right flank and 56.0 min in conventional midline ovariohysterectomy. The cost of surgery was calculated on the basis of the suture material used. The mean length of chromic catgut (cm) and petcryl (cm) required in Group I and Group II are shown in Table 1. Cost of surgery was less in Group II as compared to Group I which was due to less suture material required to close a smaller right flank incision as compared to ventral midline. Post-operative swelling was observed on 3rd day in three bitches in Group I and two bitches in Group II. Discharge from the operative site was present in two bitches in both the groups. The discharge from surgical wound may be a result of seroma, bacterial infection or haemorrhage. Wound dehiscence occurred in two bitches and evisceration was seen in single animal of Group I. In the present study, post-operative complication was seen in ventral midline approach (Group I) as compared to right flank (Group II) which simulated with the observations of Arunkumar *et al*. (2017) of no wound dehiscence, self-mutilation or evisceration in animals following right flank ovariohysterectomy. Similarly, Coe *et al*. (2006) also reported significant discharge from the wound after flank ovariohysterectomy. They had the opinion that discharge after a flank approach may be due to the greater thickness of fat and muscle incised during this approach. Evisceration of abdominal organs following ventral midline occur due to breakdown of the abdominal wall because of the gravitational forces, whereas overlapping arrangement of the oblique muscles in the flank helps maintain integrity of body wall if wound complication occur (Arunkumar *et al*. 2017). The animals of right flank incision healed early as compared to ventral midline approach (Table 1) which could be attributed to less tension on suture line and good vascular supply. On the contrary, ventral midline incision frequently undergoes friction with floor while animal takes rest in sternal recumbency and also due to inadequate blood supply in the linea alba.

Table 1. Mean±SE of length of surgical incision, duration of surgery, duration of healing and suture materials used in bitches during ovariohysterectomy

Parameter	Group	Mean±SE
Length of surgical incision (cm)	Group I	8.17^{B}±0.65
	Group II	4.88^{A}±0.44
Duration of procedure (min)	Group I	44.25^{A}±3.50
	Group II	40.50^{A}±2.88
Duration of healing (days)	Group I	14.17^{B}±1.38
	Group II	10.17^{A}±0.31
Catgut (cm)	Group I	24.17^{A}±0.48
	Group II	25.08^{A}±0.24
Petcryl (cm)	Group I	24.5^{A}±1.96
	Group II	29.3^{A}±2.65

^{ABC}Superscript indicates significant (P<0.05) value among different groups.

Physiological parameters: There was non-significant difference in mean rectal temperature at various time intervals (Fig. 3). Marginal decrease in the rectal temperature could be related to sedative effect of anaesthesia. Similar findings were also observed by Arunkumar *et al*. (2017). Lu *et al*. (2013) stated that xylazine decreases metabolic rate, causes muscular relaxation and depression of the central nervous system. There was non-significant difference in mean heart rate at various time intervals. However, heart rate increased significantly (P<0.05) within group at 20 min interval during surgery in both groups (Fig. 4). The increase might have

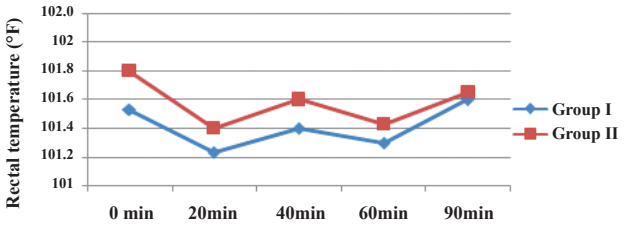

Fig. 3. Effect on rectal temperature (˚F).

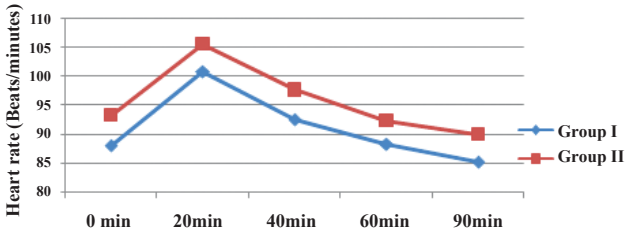

Fig. 4. Effect on heart rate (beats/min).

resulted due to the effect of anaesthesia. Post-operatively, the recorded rectal temperature, heart rate and respiratory rate differed non-significantly. Non-significant differences were recorded in respiration rate among groups and within groups at different time intervals. Similar observations in heart rate and respiration rate had been reported by Murthy (2011) and Holey (2010) following ovariohysterectomy in bitches with ventral midline and flank approach.

Haemato-biochemical parameters: The values (Mean±SE) of haemato-biochemical parameters at various time interval in the bitches of different groups are shown in Table 2. Non-significant difference was recorded in haemoglobin and total erythrocyte count among groups and within groups at different time interval. The marginal decrease in both haematological parameters might be due to surgical stress and operative blood loss. Similar observations were recorded by Arunkumar *et al*. (2017) and Acharya *et al*. (2016) where they have reported significant decrease in haemoglobin and total erythrocyte levels during operation and post-operatively in all the animals that underwent ovariohysterectomy either by ventral midline or right flank approach. A significant (P<0.05) increase in total leukocyte count was seen in both the groups at 7th post-operative day. This might be attributed to defense mechanism of the body following surgery in order to clean dead tissue inside the body which resonates with findings of Faizo *et al*. (2015) and Acharya *et al*. (2016). However, Dharmaceelan *et al.* (2000) reported significant increase in total leucocyte count on first post-operative day because of tissue damage during surgery resulting in the release of cellular proteinases which induce leukocyte mobilization, finally resulting in increased leukocyte. Non-significant variation was observed in different blood leucocyte count. Non-significant decrease in lymphocyte in operative animals of both the groups could be to compensate neutrophilia after surgery which

Table 2. Mean±SE of haemato-biochemical parameters in bitches in different groups

Parameter	Group	0 day	7th day	12th day
Haemoglobin (g/dl)	Group I	13.30^{Aa}±0.71	12.75^{Aa}±0.65	12.83^{Aa}±0.97
	Group II	13.27^{Aa}±0.67	12.70^{Aa}±0.65	12.85^{Aa}±0.32
Total erythrocyte count (10^6/mm^3)	Group I	7.98^{Aa}±0.57	7.65^{Aa}±0.52	7.69^{Aa}±0.73
	Group II	7.96^{Aa}±0.40	7.62^{Aa}±0.39	7.71^{Aa}±0.18
Total leukocyte count (10^3/mm^3)	Group I	9.79^{Aa}±1.00	13.17^{Ab}±1.17	10.28^{Aa}±0.35
	Group II	9.77^{Aa}±1.06	12.22^{Ab}±1.09	10.09^{Aa}±0.75
Packed cell volume (%)	Group I	39.77^{Aa}±2.18	38.25^{Aa}±1.87	38.55^{Aa}±2.90
	Group II	39.80^{Aa}±2.02	38.1^{Aa}±1.92	38.55^{Aa}±1.01
Lymphocyte (%)	Group I	21.92^{Aa}±0.44	21.42^{Aa}±0.42	21.75^{Aa}±0.43
	Group II	21.75^{Aa}±0.43	21.33^{Aa}±0.54	21.67^{Aa}±0.44
Monocyte (%)	Group I	2.80^{Aa}±0.16	2.73^{Aa}±0.14	2.78^{Aa}±0.17
	Group II	2.75^{Aa}±0.18	2.71^{Aa}±0.13	2.73^{Aa}±0.18
Neutrophil (%)	Group I	73.08^{Aa}±0.44	73.75^{Aa}±0.39	73.25^{Aa}±0.43
	Group II	73.33^{Aa}±0.44	74.00^{Aa}±0.52	73.45^{Aa}±0.47
Eosinophil (%)	Group I	2.12^{Aa}±0.15	2.08^{Aa}±0.22	2.11^{Aa}±0.17
	Group II	2.15^{Aa}±0.16	2.13^{Aa}±0.21	2.14^{Aa}±0.16
Basophil (%)	Group I	0.08^{Aa}±0.83	0.08^{Aa}±0.83	0.08^{Aa}±0.83
	Group II	0.00^{Aa}±0.00	0.00^{Aa}±0.00	0.00^{Aa}±0.00
Serum glucose (mg/dl)	Group I	82.31^{Aa}±3.84	89.97^{Aa}±3.16	84.34^{Aa}±3.99
	Group II	81.78^{Aa}±7.44	87.59^{Aa}±7.98	81.90^{Aa}±4.40
Total serum protein (g/dl)	Group I	6.71^{Aa}±0.40	6.62^{Aa}±0.38	6.71^{Aa}±0.18
	Group II	6.30^{Aa}±0.35	6.25^{Aa}±0.33	6.31^{Aa}±0.32
Albumin(g/dl)	Group I	3.73^{Aa}±0.31	3.69^{Aa}±0.25	3.71^{Aa}±0.31
	Group II	3.94^{Aa}±0.29	3.86^{Aa}±0.23	3.90^{Aa}±0.28
Globulin(g/dl)	Group I	2.97^{Aa}±0.22	2.93^{Aa}±0.15	3.00^{Aa}±0.35
	Group II	2.36^{Aa}±0.29	2.39^{Aa}±0.20	2.40^{Aa}±0.22

^{abcd}Superscript indicates significant (P<0.05) value within groups at different time interval from base value. ^{ABC}Superscript indicates significant (P<0.05) value among groups at same time interval from base value.

resonates with the observation made by Arunkumar *et al*. (2017). Non-significant neutrophilia post-operatively in both the groups could be due to cleaning of dead tissue after surgery. Similar findings were also recorded by Acharya *et al*. (2016). Arunkumar *et al*. (2017) also reported neutrophilia immediately during post-operative period due to surgical stress. In the present study, serum glucose increased non-significantly and later on gradually approached the base value. Marginal increase in serum glucose might be attributed to cortisol and catecholamine mediated gluconeogenesis and glycogenolysis as well as decreased peripheral use of glucose. These findings are in appropriation with the observations made by Devitt *et al*. (2005) and Rafee *et al*. (2015) after ovariohysterectomy in dogs. Non-significant differences were recorded in total serum protein among groups and within group at different time interval. Similar observations were noticed by Kumari *et al.* (2018) following laproscopic and open elective ovariectomy in bitches. In the present study, AST and ALT remained within normal range during entire study period. Similar findings were recorded by Kumar (2006), Holey (2010) and Murthy (2011) following ovariohysterectomy in bitches. Non-significant increase in AST level could be attributed to increased metabolic demand and gluconeogenesis after surgery. From this study, it can be concluded that right flank approach can be good alternative for ovariohysterectomy in bitches as compared to the traditional ventral midline approach.

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