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VENTRAL MEDIAN AND LATERAL FLANK APPROACH FOR OVARIOHYSTERECTOMY IN CAT

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ABSTRACT

This study was conducted to compare Ventral Median Approach (OHM) and Lateral Flank Approach (OHF) for feline ovariohysterectomy (OH). Fifteen healthy local female cats *(Felis catus)* with body weights ranged 2-4 kg and aged 1-2 years were divided into two groups, OHM (n= 8) and OHF (n= 7). Prior to OH, the cats were anesthethized using ketamine-xylazine and the sugery was performed by the same operator. The wound scoring showed a significantly higher difference in the OHM group on day 3 and 4 post-surgery. Scores of erythematous, swelling and dehiscence showed no significant differences. The 4Avet pain scale was significantly higher in OHF at the 2, 6, and 12-hours post surgery. The pain response was evaluated using baseline tactile Semmes-Weinstein Monofilaments and was significantly higher in OHF than OHM on day 1 to day 5 post surgery. Blood hematology, blood glucose and wound healing duration did not differ significantly between groups. The OHF approach showed greater post-operative pain than the OHM approach. Wound dehiscence was observed in two cats (25%) in OHM group from day 4 post-operative. The OHM approach showed a greater risk of complications than the OHF group and therefore requires better post-operative care. The OHF group showed a smaller risk of complications but requires better post-operative analgesic therapy.

Key words: cat, flank, laparatomy, medianus, ovariohysterectomy

ABSTRAK

Penelitian ini bertujuan membandingkan ovariohisterektomi (OH) kucing dengan pendekatan ventral medianus (OHM) dan pendekatan lateral flank (OHF). Lima belas ekor kucing betina lokal (Felis catus) sehat dengan berat badan berkisar 2-4 kg dan berumur 1-2 tahun yang dibagi dalam kelompok OHM (n= 8) dan OHF (n= 7). Operasi OH dilakukan oleh operator yang sama dengan anestesi umum ketamine-xylazine. Skor discharge luka menunjukkan perbedaan yang signifikan lebih tinggi pada kelompok OHM di hari ke-3 dan ke-4 pascaoperasi. Skor eritema, bengkak dan dehiscence tidak menunjukkan perbedaan signifikan. Skor rasa sakit 4Avet terdapat perbedaan yang signifikan lebih tinggi pada OHF di 2, 6 dan 12 jam pascaoperasi. Evaluasi respons nyeri dengan Baseline tactile Semmes-Weinstein Monofilaments menunjukkan perbedaan yang signifikan lebih tinggi pada OHF dibandingkan OHM pada hari ke-1 hingga ke-5 pascaoperasi. Hematologi darah, glukosa darah dan interval penyembuhan menunjukkan tidak ada perbedaan yang signifikan antar kelompok. Pendekatan OHF menunjukkan rasa sakit pascaoperasi lebih besar daripada OHM. Dua kucing pada kelompok OHM (25%) mengalami luka terbuka pada hari ke-4 pascaoperasi. Pendekatan OHM menunjukkan risiko komplikasi yang lebih besar dibandingkan OHF sehingga memerlukan perawatan pascaoperasi yang lebih baik. Kelompok OHF menunjukkan risiko komplikasi yang lebih kecil akan tetapi membutuhkan pemberian analgesik pascaoperasi yang lebih baik.

Kata kunci: kucing, flank, laparatomi, medianus, ovariohisterektomi

INTRODUCTION

Cat population management is a global issue that creates problems for the welfare of individual cats (Roberts *et al*. 2015). One of the recommended routine procedures for population control in cats is ovariohisterectomy (Babu *et al*. 2018). Ovariohisterectomy, also known as spaying, is the surgical removal of both ovaries and uterus (Bencharif *et al*. 2010). In addition to control the cat population, this surgical procedure is indicated in cases of pyometra, metritis, dystocia, mammary tumors and other reproductive disorders (Oliveira *et al*. 2014).

Ovariohisterectomy (OH) can be carried out through 2 approaches, namely the Ventral Median Approach (OHM) and the Lateral Flank Approach (OHF) (Kiani *et al*. 2014). These two approaches each have some advantages and disadvantages. The OHM approach is difficult if the operation is performed immediately after delivery because there is enlargement of the mammary glands. In addition, several postoperative complications have been reported such as excessive bleeding from the skin and subcutaneous tissue, inflammation or infection of the wound and leakage from the mammary tissue (McGrath *et al.* 2004). The OHM approach is preferred because the uterus can sometimes not be identifield from a lateral approach, but is difficult to confirm due to technical problems or the cat has been previously spayed. In addition, there are rare congenital abnormalities, such as the unicorn uterus, which may be difficult to identify or treat with the OHF approach (Coe *et al.* 2006).

The OHF technique is preferred by veterinarians, especially in lactating cats, not only that, this approach also allows veterinarians to be able to observe surgical wounds from a distance, especially in wild animals. This OHF approach can reduce the potential for visceral organ expulsion if wound dehiscence occurs (McGrath *et al.* 2004). Another advantage is that it can minimize operating time compared to the OHM approach because the ipsilateral ovary and cornua uteri are located just below the Pelvic Incision, so they are very easy to find (Arunkumar *et al.* 2017). The drawbacks of the OHF approach are difficulty in visualizing the surgical site during surgery and management in case of postoperative complications which would be difficult (Acharya *et al.* 2016).

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Until now in Indonesia, there have been no studies that have been conducted to compare the two surgical approaches to OH, so an effective approach is needed in veterinary practice to enable better surgical recovery with minimal pain and inflammation. This study was conducted to compare surgical stress, postoperative pain, inflammation or wound scores, blood hematology, blood glucose, and healing time in local cats *(Felis catus)* which were operated using OHM and OHF approaches.

MATERIALS AND METHODS

This research was conducted from February to April 2022 at the Surgical Experimental Laboratory, Divison of Surgery and Radiology, Faculty of Veterinary Medicine and Biomedicine, IPB University. Animal acclimatization and maintenance are carried out at Hikari Vet Clinic (Sentul City Veterinary Clinic) Bogor. This study used 15 local female cats aged 1-2 years old and weighed 2-4 kg. The health status of the cat was examined and the cats were adapted for 1 week to adapt to the study cage environment. The research cage used was a folding iron cage measuring 60 × 40 cm covered with plywood with a thickness of 6 mm. Each cage contains 1 cat. During acclimatization, cats were fed 2 times a day, provided with water *ad libitum*, Worming, and given anti-parasitic. Cats were randomly divided into 2 treatment groups, namely the OHM group which consisted of 8 cats, and the OHF group which consisted of 7 cats. All procedures in this study were approved by the IPB University Animal Ethics Commision (Number: 037/KEH/SKE/X/2022).

Surgery Procedure

The cats were prepared for surgery and premedicated subcutaneously with 0.04 mg/kg atropine sulfate and anesthetized with a combination of ketamine 10 mg/kg and xylazine 2 mg/kg intramuscularly. Surgery was performed by the same operator to avoid variations among surgery.

The OHM group cats were positioned dorsally with the OHM procedure performed as described by Fingland (1998), whereas the cats in the OHF group were positioned lying on their left side on the operating table. The fore and hind extremities were secured with straps, and the right hip extremity was pulled slightly caudally. OHF procedure was carried out as described by Shuttleworth and Smythe (2000). Celiotomy closure was routinely performed, and the peritoneal and muscle layers were closed using 3-0 chromic catgut with simple interrupted sutures and the subcutaneous was closed with continuous sutures. The skin suturing was carried out using a 3-0 chromic catgut thread with a subcuticular suture pattern.

Post-Operative Care

The edges of the wound were cleaned with iodine tincture solution, swabbed with gentamicin oinment, then covered with sterile gauze. Meloxicam tablets were given with a single dose of 0.1 mg/kg and amoxicillin tablet were given postoperative at a dose of 20 mg/kg BW 2 times a day. Antibiotics and anti-inflammatories were administered orally for 5 days. The wound was cleaned daily and gentamicin cream was applied twice a day and the operated cat was given soft food until fully recovered.

Wound Healing Process

Wounds were assessed daily using a 0-3 point rating scale for each of the following parameters: discharge, swelling, erythema, and dehiscence. Then the final injury score was summarized from the four parameters for each observation. This wound score system was adopted from Sylvestre *et al.* (2002) (Table 1).

The subjective of wound healing duration was determined by visual observation and recording the number of days from the time of surgery until the cat was declared cured. In this study, cats were declared cured if the surgical wound was dry, the incision scars merged and the wound score only appeared as erythema or swelling (minimum score 1).

Evaluate the Cat's Expression of Pain
4AVet system

Pain scores were assessed a modified 4AVet System (Holopherne-Doran *et al.* 2010). Cats were clinically evaluated at 2, 6, and 12 hours postoperative. Evaluation includes heart rate, respiratory rate, body temperature, and pain score (SN). At each clinical evaluation, postoperative pain intensity was rated from 0-15 using the 4AVet composite pain scale. Three pain levels were defined as: Weak (Grade 1; SN: 1-5), Moderate (Grade 2; SN: 6-10), and Severe (Grade 3; SN: 11-18).

Baseline Tactile Semmes-Weinstein Monofilaments

Cat pain expression was assessed using Baseline Tactile Semmes-Weinstein Monofilaments, Goldberg (AJW Technology Consulting GmbH Koningsallee 106 40215 Dusseldorf (Germany). This tool has several sizes of monofilament that are applied directly on the wound and the skin surface. The monofilament tip is placed against the wound surface and the pressure was gradually applied to the wound until the cat responds

Table 1. Criteria used to assess wound appearance

Results	Score			
	0	1	2	3
Liquid comes out (discharge)	-	Serosanguinous	Purulen	
Swollen	-	0-2 mm	2-5 mm	>5mm
Erythema	-	0-2 mm	2-5 mm	>5mm
Dehiscence	-	0-20%	20-50%	>50%

(tail tugs, kicks, and forward or backward movements). The size of the monofilament consists of 5 sizes, namely force: 0.07 g, force: 0.4 g, force: 2.0 g, force: 4.0 g, and force: 300 gs. Larger values indicated less pain. Evaluation of pain expression was recorded daily until the wound dried or healed.

Hematology Analysis

Blood samples were collected from each animal via the anterior cephalic antebrachial vein. Blood collection was carried out with a 3 mL syringe and transferred into the EDTA tube. Samples were collected before surgery as a baseline and 3 days after surgery. Blood samples were analyzed using a Vet scan HM5 Haemoanalyser (Zooetis, USA).

Blood Glucose Analysis

Analysis of blood glucose was conducted using Nesco Multi check GCU 3 In 1, PT. Djuniar & Djuniar. The strip was first inserted into the Nesco Multi check GCU 3 in 1 before checking blood sugar. One drop of fresh blood was taken then poured into the middle of the test pad on the test strip. Blood glucose checks were carried out at 2, 6, and 12 hours every day until recovered.

Data Analaysis

Data from all parameters (wound score, pain score, blood hematology, and glucose) were analyzed by paired sample t-test analysis.

RESULT AND DISCUSSION

Wound Healing Process

Observation on the 1st and 2nd postoperative day showed that there was more discharge of serosanguineous fluid in OHF (0.71±0.18 and 0.57±0.20) compared to OHM (0.50±0.19 and 0.38 and 0.18). In the OHF approach, serosanguinous discharge was only seen until the 2nd postoperative day, whereas in the OHM group, discharge was still seen after the second day until the 6th day (Figure 1a).

The results of the statistical analysis of the parameters of the wound score as a whole showed significant differences ($P<0.05$) in discharge on the 3rd and 4th post-operative days. While other parameters, such as swelling, erythema, and dehiscence, there were no significant differences between the two groups from day 1 to day 6 postoperative (Figure 1b, Figure 1c, Figure 1d). One cat in the OHM group was found to have dehiscence on day 4 with a score of 1 (dehiscence < 20%) and one additional cat on day 5 with a score of 2 (dehiscence 20-50 %) (Figure 2). The cats was treated immediately by adding simple sutures using 3/0 silk on the dehiscence. This incidence made the healing interval in the OHM group was slightly longer (6.00±0.60 days) compared to the OHF group (5.14±0.26 days) although not significantly different (Figure 5). Based on a statistical analysis, of the overall wound score (Figure 1e), there was no significant difference between the OHM and OHF approaches.

In the OHM group, inflammatory fluid could seep out of the stomach with the help of gravity through the position of the wound below the stomach. It was assumed that the inflammatory process in the inner abdominal tissue continued until the 4th day so that it could seep through the median position of the abdominal wound in the OHM group. In the OHF group, the position of the wound on the side of the abdomen did not allow the inflammatory fluid to escape. Discharge in this wound is a product of the normal wound healing process. Usually, vaginal discharge is clear or yellow, but variations in Color, Consistency, Smell and Amount can indicate an interruption in the normal healing process (Adderley 2010). The fluid mainly consists of water containing nutrients, electrolytes, white blood cells, inflammatory mediators, protein-digesting enzymes and growth factors (Romanelli *et al.* 2010). In this study, no smelly inflammatory fluid was found and the consistency of thick fluid was found in both groups, this indicated the absence of secondary infections and excessive inflammatory complications in both groups.

The incision wound on greater muscle mass in the OHF group did not produce a larger inflammatory fluid over a longer period compared to the OHM approach which only injured the linea alba in the abdomen. New discharge production was seen until the 2nd day in the OHF group and the 6th day in the OHM group. This finding is much shorter than the discharge production reported by Kiani *et al*. (2014) which is until the 10-14th postoperative day and Murugesan *et al*. (2020) which is until the 7th postoperative day. High shedding scores in OHMs could be due to a Seroma, Bacterial Infection, or Bleeding as reported by Coe *et al.* (2006). The production of shorter secretions in this study is thought to be due to the use of aseptic surgical techniques and better postoperative care so that postoperative complications can be minimized.

Wound dehiscence parameters did not show a significant difference between the two OHM and OHF groups. However, two cats in the OHM group (25%) had < 20% dehiscence and 20-50% incision length (Figure 6). This dehiscence condition is thought to occur due to secondary infection or due to a cat licking on the surgical wound or due to friction with the surface of the cage. In addition, it is thought to be due to excessive suture tension due to intra-abdominal pressure on the ventral median which was not found in the pelvic approach (Kiani *et al*. 2014). The dehiscence condition in the two cats resulted in a longer healing time in the OHM group compared to the OHF group although there was no significant difference (Figure 5).

This study also showed that one cat experienced dehiscence on the 4th day and an additional 1 cat on the 5th postoperative day In the OHM group, so the healing interval in the OHM group was slightly longer (6.00±0.60 days) compared to the OHF group (5.14±0.26 days) although not significantly different (Figure 5).

The slight variation in the days of the healing interval may be due to the interfence of the surgical site

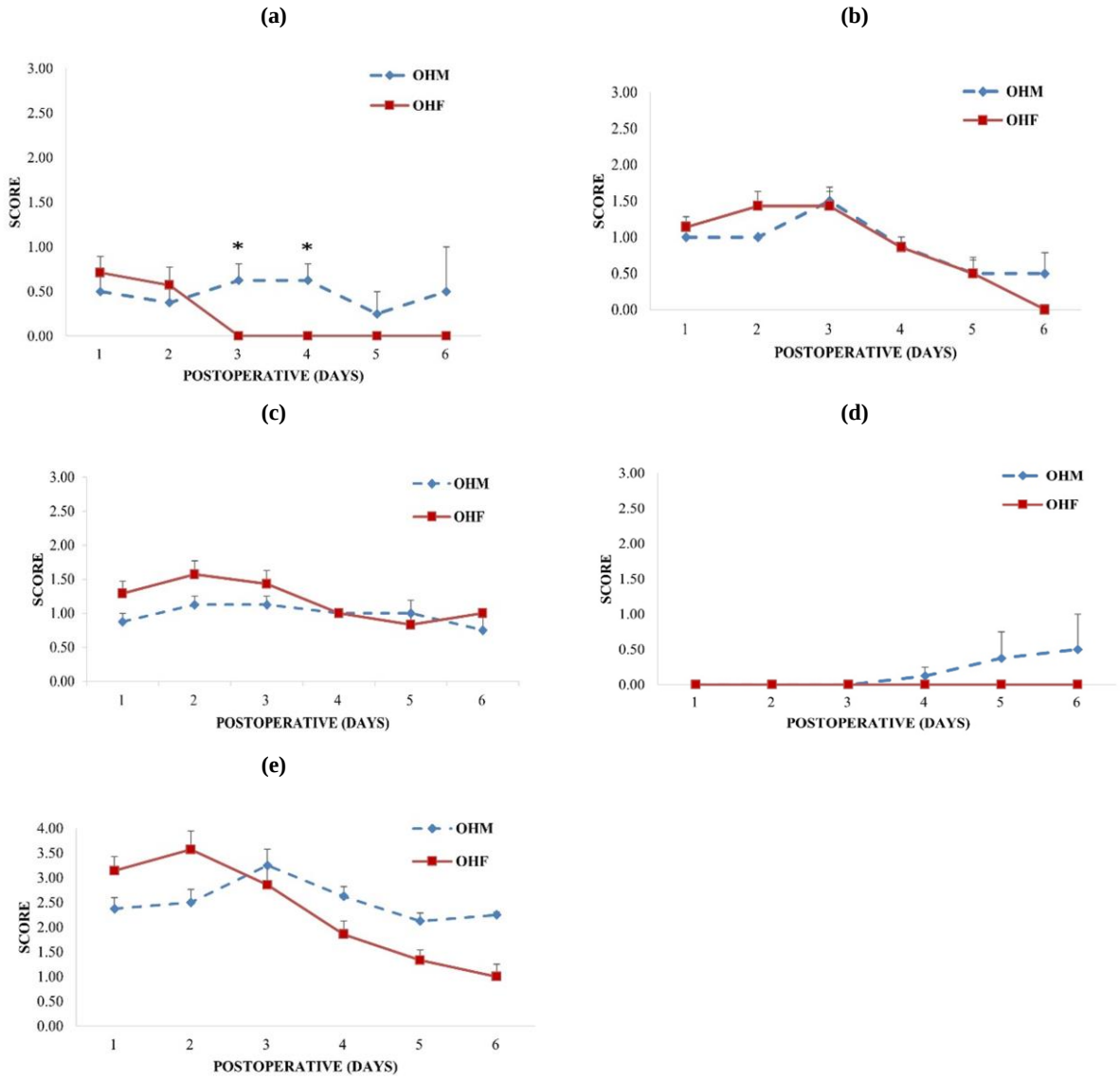

Figure 1. Appearance or score of OHM and OHF wounds from day 1 to day 6 after surgery. (a)= Discharge, (b)= Swelling, (c)= Erythema, (d)= Dehiscence, (e)= Wound overall score. *= Asterisk indicates a significant difference between OHM and OHF on the same day of observation

with objects in contact with the surgical wound as reported by Burns *et al*. (2003) and Guo and Dipietro (2010). The probability of surgical site contact with surrounding objects such as the floor of a cage is higher in the ventral midline than in the pelvis. In addition, the use of a skin suture pattern with a subcuticular pattern has a greater risk of dehiscence in OHMs. This is due to the movement of the cat and the greater gravitational load on the ventral side of the abdomen compared to the lateral side and at that time there was not enough collagen in the wound apposition site. Acharya *et al*. (2016) reported that the absence of Revascularization and Constant Pressure on the ventral midline can slow down the healing process compared to a pelvic incision. In addition, Guo and Dipietro (2010) reported that variations in healing time can be caused by other factors that affect wound healing such as Oxygenation, contact of foreign bodies with surgical wounds, and venous insufficiency. Our study shows that the OHM approach requires more intensive care, especially in protecting surgical scars so that healing can occur more quickly.

Evaluation of Pain Expression in Cat

Based on observations using the 4AVet scoring system, the OHF group showed greater discomfort ($P<0.05$) than OHM (Figure 2f). Observations from 2 to 12 hours postoperative averaged behaviors common to both approaches such as changes in breathing, vocalizations, reluctance or difficulty moving, restlessness or distress, and loss of appetite (Figure 2a). The OHM cat group exhibits a hunched or arched posture. Whereas the OHF cat group showed excessive anxiety and often changed body position. The OHF group showed a greater variation in behavior, namely trying to lick or bite the wound area, whereas the cats in the OHM group only partially closed their eyes. Based on 2 hours of postoperative observation of interactive behavior (response to touch or sound), the OHM cat group achieved a higher maximum score than

the OHF. The OHM group showed less response than the OHF group when the animals were stimulated by the experimenter (Figure 2b). In general, cats are very disinterested in play and respond poorly to calls and petting.

At 6-12 hours postoperative the OHF group seemed more reluctant to move, while the OHM group behaved more spontaneously. The average heart rate in the OHF group was also higher (Score 1) than the OHM group (Figure 2c). In this aspect, the pain level is greater in OHF, the animal can move independently but still moves slightly when stimulated. The OHM group showed lower attitudes than the OHF group, with aggression occurring more frequently in the OHF cats than in the OHM group (Figure 2b). Meanwhile, the surgical wound palpation reaction (Figure 2d). In the OHF group showed more wound palpation reactions than the OHM group. The OHF group also showed maximal palpation response when the wound was touched (Score 3). In the OHM group, although the score was lower than OHF, both groups showed vocalizations and responded when the wound was touched or approached. Assessment of the intensity of the response 2-6 hours postoperative showed that on average the OHF group was more aggressive in responding than the OHMs who responded by running away (Figure 2e).

Observation of pain parameters using the 4AVet system as a whole showed a significant difference between OHM and OHF at 2, 6, and 12 hours post-operative. The OHF group presented significantly more pain ($P<0.05$) than the OHM group (Figure 2f).

Observation of pain scores in the incision area with the Baseline Tactile Semmes-Weinstein Monofilaments tool showed a significantly higher mean score difference ($P<0.05$) on each day of observation in the OHM group compared to OHF (Figure 3). That is, the OHF group has greater pain sensitivity than OHM.

Pain monitoring using the 4AVet system showed significantly higher pain ($P<0.05$) in the OHF group than in the OHM group (Figure 2f). In the OHF group, 2 to 6 hours after surgery, the pain was at an average score of above ten, so it was classified as severe pain. Whereas in the OHM group at 2 to 12 hours postoperative the average score was below ten and belonged to the moderate pain category. According to Burrow *et al*. (2006) and Abubakar *et al*. (2014), the difference in pain between the two approaches is caused by hypersensitivity in the lateral flank area due to a three-layer muscle incision in OHF compared to OHM which only incises the linea alba.

The results of pain research using the Baseline Tactile Semmes-Weinstein Monofilaments tool, there is a significant difference in the average pain score that is higher in OHF than OHM on day 1 to day 5 postoperative. The results of this study are also supported by previous research, Burrow *et al*. (2006) and Grint *et al*. (2006) who showed a higher palpation pain and injury score in OHF cats compared to OHM cats. Different results were shown by Gauthier *et al*. (2015) there was no difference in pain between the OHF and OHM approaches in cat ovariectomize surgery. However, the study by Gauthier *et al*. (2015) used morphine as premedication. The use of morphine was considered as one of the most effective analgesics in reducing pain in the OHF approach. Swaffield *et al*. (2020) reported that there was no statistical difference in postoperative pain and wound scores between OHMs and OHF. Swaffield uses a different method of observing pain, using the Colorado State University Feline Acute Pain Scale (FAPS). Cats are given a FAPS acore of 0-4 by assessing the psychology and behavior, palpation response, and body movements of the cat. Our results show that the OHF approach exhibits a more prominent pain response that is limited to the surgical site but that this pain does not have a systemic impact.

Figure 2. Cats with wound dehiscence are 20-50% of the length of the incision

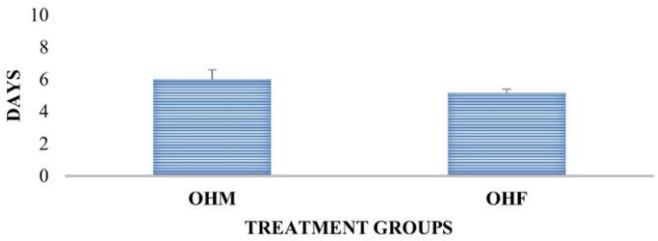

Figure 3. Healing day interval

The administration of meloxicam immediately after surgery did not prevent wound pain for up to 24 hours postoperative. This finding is in line with our study which indirectly showed that meloxicam was considered less effective as a postoperative analgesic. Further research is needed to determine the efficacy of meloxicam as a postoperative analgesic in cats using different doses.

Hematolgy Profile

The mean hematological values in the two groups both before surgery (baseline) and on the 3rd postoperative day did not show a significant difference (P>0.05) and were still within the normal range. However, there were variations in total White Blood Cell (WBC) counts in both groups before surgery and 3 days after surgery (Table 2).

Hematology parameters did not show significant difference between the 2 treatments groups. However, the total WBC in both approaches after 3 days postoperative increased. The increase in WBC might be due to the increase in the hormone cortisol caused by stress after surgery. Stress causes the release of epinephrine which triggers the movement of WBC from the Marginal Granulocyte Pool (MGP) to the Circulating Granulocyte Pool (CGP), which causes an increase in WBC in circulation (Fowler 2006). An increase in the number of WBC after surgery often occurs, because the body tries to phagocytize and eliminate foreign antigens that enter it.

Blood Glucose

Blood glucose examination showed an increase in both groups two hours after surgery with values that were not significantly different between groups. The blood glucose values returned to their initial values 6 hours after surgery in the OHF and OHM groups. Postoperative observations showed no significant differences in blood glucose levels between the two treatments.

Postoperative glucose levels increased 2 hours postoperative but returned to normal values 6 hours postoperative (Figure 4). The rise in glucose levels may be a stress response from surgery that triggers glucagon release and reduces insulin secretion (Desborough 2000). This result was also supported by

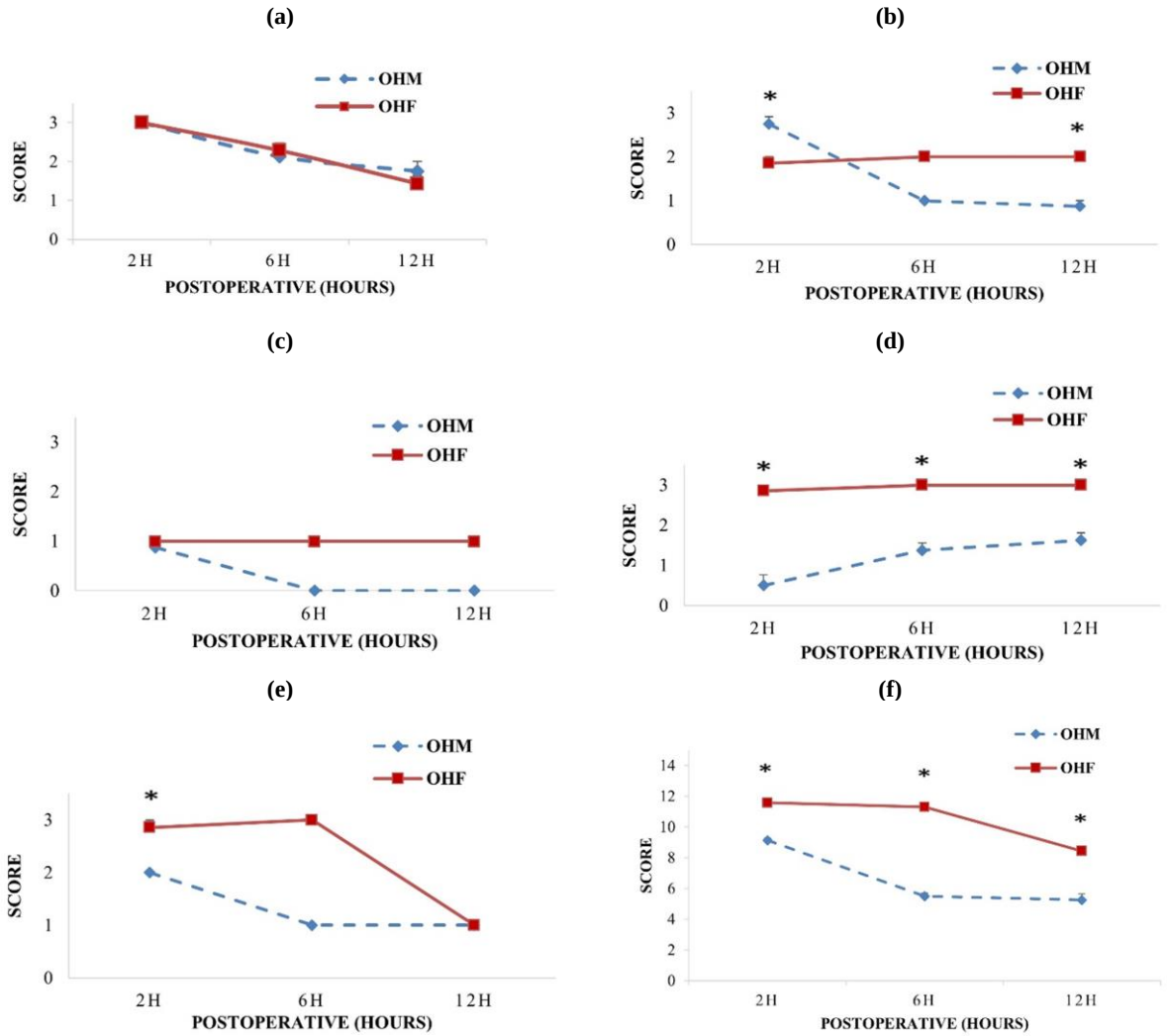

Figure 4. Pain score or postoperative pain in OHM and OHF with the 4AVet system. (a)= General behavior, (b)= Interactive behavior, (c)= Heart rate, (d)= Surgical site palpation reaction, (e)= Response intensity, (f)= Final 4AVet system score. *= Asterisk indicates a significant difference between OHM and OHF on the same day of observation

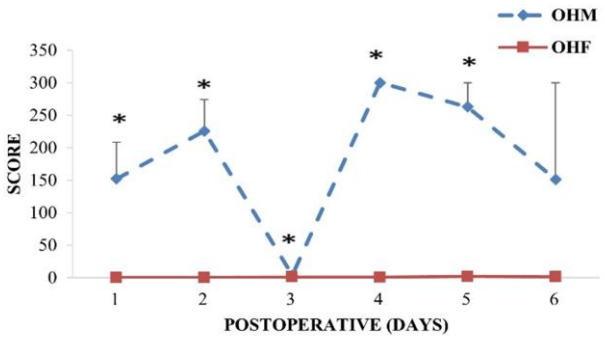

Figure 5. Pain score or postoperative pain in OHM and OHF using the Semmes-Weinstein Monofilaments device. *= Asterisk indicates a significant difference between OHM and OHF on the same day of observation

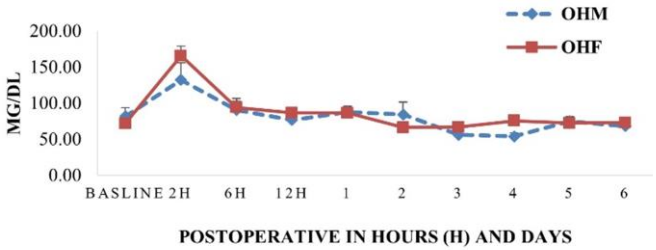

Figure 6. Blood glucose levels before and after surgery. *= Asterisk indicates a significant difference between OHM and OHF on the same day of observation

Table 2. Hematology profile (Mean±SE) of cats in OHM and OHF groups before surgery (baseline) and on the 3rd postoperative

Parameters	Treatments				
	Baseline		Day 3 postoperative		
	OHM	OHF	OHM	OHF	Reference values
WBC	19.05±2.70	21.36±2.92	21.98±4.12	22.29±2.84	4.87-20.10
Limfosit	4.12±0.93	6.29±1.20	6.13±1.15	7.04±1.26	1.50-7.00
Monosit	1.28±0.24	1.57±0.40	1.69±0.33	1.24±0.15	0-0.85
Granulosit	10.58±1.29	13.50±2.05	14.16±3.21	14.00±2.29	-
% Limfosit	24.70±3.01	29.87±5.18	28.76±3.12	31.97±4.19	-
% Monosit	8.10±0.73	6.81±0.94	7.83±0.97	5.70±0.39	-
% Granulosit	67.20±3.28	63.31±5.15	63.41±3.95	62.33±4.11	-
RBC	6.20±0.62	6.41±0.61	8.08±1.18	6.57±0.52	6.12-11.86
HGB	9.49±0.98	11.06±1.19	13.24±1.64	11.23±0.93	9.01-15.59
HCT	29.10±2.93	31.00±2.70	38.09±5.25	31.89±2.28	29.00-50.00
MCV	47.41±2.19	48.93±1.63	47.70±1.13	48.87±1.95	41.90-54.80
MCH	15.26±0.33	17.34±0.94	15.05±2.11	17.11±0.74	12.57-17.56
MCHC	32.69±1.37	35.69±1.83	35.19±1.06	35.09±0.91	31.99-36.01
RDW	14.68±0.59	15.41±0.51	15.55±0.23	16.14±0.23	14.20-17.60
PLT	118.29±47.68	156.43±29.12	70.88±12.56	77.71±16.18	230.00-680.00

Reference values are quoted from Jain (1993) and Tvedten (1999)

the results of Semick *et al*. (2018) which observed that postoperative glucose levels increased from 42 mg/dL to 59 to 163 mg/dl. Hyperglycemia associated with surgery is more common than hypoglycemia because of the hypermetabolic response which increases glucose production and causes insulin resistance (Sharma *et al*. 2011). The blood glucose values of the two groups did not show a significant difference between the two treatments after 6 hours postoperative or during the daily observation until the end of the observation. These findings suggested that postoperative hypermetabolic stress from ovariohysterectomy only occurs 6 hours postoperative.

Although there is no standard OH approach for cats in Indonesia, the use of the OHF method is gaining popularity among practitioners. This trend is starting to be seen in several countries such as in the UK, around 96% of small animal practitioners have performed OHF as well as in the USA (Coe *et al.* 2006). However, some veterinary surgery books still list possible complications in the OHF approach, such as difficulty removing the intact uterine body, detached ovarian pedicle back into the abdomen, which would be difficult to find, and difficulty finding the contralateral ovary and uterine branches (Hedlund 2002; Stone 2003). We did not encounter this complication during

the study, possibly due the use spay hook instrument to locate the uterus in each of the OHF and OHM surgeries. We recommend the use spay hook in performing OH, especially for novice surgeons.

This study showed that ovariohysterectomy in cats, which was performed lege artist with the principle of sepsis, has minor side effects with minimal systemic alteration in a short time. Postoperative healing can be achieved rapidly if postoperative care is carried out properly. The OH operation can be performed by either a flank lateral or vetral median approach depending on the operator's preference. However, the flank lateral approach requires proper analgesics when compared to the ventral median approach. Further research is needed to determine the critical factors affecting the speed of wound healing after OH surgery.

CONCLUSION

The OHF approach shows less risk of complications but greater post-operative pain than OHM, thus this approach required better analgesics administratio until the end of wound healing. Meanwhile, the OHM approach shows a greater risk of complications than OHF, so it needs a careful treatment during the surgery process

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