



Early Ultrasonographic Findings After Ovariohysterectomy Operation in Bitches

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ABSTRACT

Background /Aim: In this study, early ultrasonographic (USG) findings of the abdominal/pelvic cavity and incision line following ovariohysterectomy (OHE) in dogs has been evaluated.

Material and Methods: Twenty female dogs, ages between 1 to 5 years old were selected in anestrus or diestrus stage which determined by vaginal cytology findings. They were taken into anesthesia using xylazine/ketamine combination and the operation was performed on the median line. Intraoperative body temperature (T), respiration (R), pulsation (P) values and the duration of the operation were recorded. During the first week of operation, daily examinations (T, R, P, mucosal pigmentation, lymph nodes, appetite, urination, defecation and pain symptoms) were carried out. On the 1, 4 and 7th days postoperatively, ligation areas and the incision line were assessed based on the visualization levels, morphological characteristic and possible complications by using B-Mode ultrasonography with 6.6 MHz intervals micro convex probe.

Results: Results showed that intraoperative pulsation values were between 66-170 beats per minute /min, which were increased by 90% (18/20) when comparing to preoperative values. Ligation areas were visualized 25% (5/20) and 50% (10/20) for the left and right ovary, respectively. All ovarian ligations could be monitored by 30% (6/20) on the 1st-day, 45% (9/20) on the 4th-day, and 35% (7/20) on the 7th-day postoperatively. The highest rate of the cervical ligation visualization was 60% (12/20), which was recorded on the 7th-day postoperatively. No differences were detected in ligation areas, which were more significant on the 4th and 7th day postoperatively. It is recorded that the visualization of right ovary having higher risk of complication was easier than the left one. The complications rate of the incision line was 60% (12/20), which can be more visualized on the 4th and 7th days.

Conclusion: It is concluded that transabdominal/transdermal ultrasonography during first week can be used for postoperative monitoring of spayed dogs.

Key Words: Ovariohysterectomy, complication, ultrasonography, dog

Köpeklerde Ovaryohistektomi Operasyonu Sonrası Erken Dönem Ultrasonografi Bulguları

ÖZET

Öz bilgi/Amaç: Bu çalışmada, anöstrus veya diöstrus döneminde olan köpeklerde yapılan ovariohistektomi operasyonu sonrası erken dönem abdominal/pelvik kavite ve ensizyon hattının ultrasonografi (usg) bulguları değerlendirilmiştir.

Materyal ve Metod: Bu amaçla, seksüel siklus dönemi anamnez ve vaginal sitoloji bulgularına göre belirlenmiş 1-5 yaşları arasında, 20 adet dişi köpek seçilmiştir. Köpekler ksilazin/ketamin kombinasyonu kullanılarak anestezi altına alındı ve operasyon medyan hattında gerçekleştirildi. İntraoperatif vücut ısısı (T), solunum (R), pulzasyon (P) değerleri ve operasyon süresi kaydedildi. Yedi gün boyunca günlük postoperatif muayeneler (T, R, P, mukozalarda pigmentasyon ve lenf düğümleri, iştah, ürinsiyon, defekasyon ve ağrı düzeyi) gerçekleştirildi. Postoperatif 1-4 ve 7. günlerde B-Modu, 5,0-6,6-8 MHz aralığında mikrokonveks problu usg cihazı ile ligasyon bölgelerinin ve ensizyon hattının konumu, görüntülenme düzeyi, karakteristik özellikleri ve olası komplikasyonların varlığı araştırıldı.

Bulgular: Çalışma sonucunda intraoperatif pulzasyon değerlerinin 66-170 atım/dk aralığında olduğu; bu değerlerin preoperatif ölçümlere göre %90 (18/20) oranında artış gösterdiği kaydedildi. Ligasyon alanları sol over için %25 (5/20), sağ over için ise %50 (10/20) oranında görüntüldü. Tüm over ligasyonları postoperatif 1. gün %30 (6/20); 4. gün %45 (9/20) ve 7. gün %35 (7/20) oranında görüntüldü. Servikal ligasyonların en yüksek görüntülenme oranı ise %60 (12/20) olup, postoperatif 7. Günde kaydedildi. Ayrıca, postoperatif 4. ve 7. günde bulgularının daha belirgin olduğu ligasyon bölgelerinin lokalizasyonu bakımından herhangi bir fark gözlenemedi. Komplikasyon riski yüksek olan sağ over ligasyonunun daha kolay görüntüldüğü kaydedildi. 4. ve 7. günde daha belirgin olarak görüntülenebilen ensizyon hattında %60 (12/20) oranında komplikasyonla karşılaşıldı.

Sonuç: Ovaryohistektomi operasyonu geçiren köpeklerin postoperatif gözleminde ilk hafta süresince transabdominal/transdermal ultrasonografinin kullanılabileceği sonucuna varıldı.

Anahtar Sözcükler: Ovaryohistektomi, komplikasyon, ultrasonografi, köpek

Introduction

Ovariohysterectomy (OHE) is the most widely performed in canine practice for sterilization (Concannon et al., 1991). This surgical approach in female dogs consists major abdominal surgery under general anesthesia and can cause various complications between 23-52 of patients (Dorn and Swist, 1977; Pollari and Bonnet, 1996; Bowlt et al, 2011). Among different intraoperative and early post-operative complications, it is reported that the hemorrhage, wound infection, gossypiboma, incisional hernia, stump abscess formation, torn stitches, organ prolapse, ureteral injury and peritonitis (Pearson, 1973; Dorn and Swist, 1977; Kyles et al., 1996; Campbell, 2004; Frank and Stanley, 2009; Adin, 2011). The complications seen more often that in smaller size breeds than middle size and larger size breeds (Johnston et al., 2001). Moreover, authors reported that the increasing patient weight and duration of anaesthesia time are risk factors for the incidence of OHE complications (Muraro and White 2014).

Abdominal ultrasonographical findings in dogs undergone OHE are commonly reported after detecting complication cases. In these complications' visual data, images from incidental observations are more than post-operative monitorization studies, because many intraabdominal lesions do not cause clinical symptoms until the terminal stage needed a second surgery. Moreover, there are limited reports consists post-operative incisional complications after OHE. Authors reported that the incidence of incisional issues were more than intra/post-operative hemorrhage (Adin, 2011). Although the rate of wound infection after elective spaying operations is similar to that of ordinary surgery (% 2.2 – 5.7), it was reported that the delayed wound healing and subcutaneous swelling are higher by increasing of the durations of the anesthesia and operation (Burrow et al, 2005; Adin, 2011). In addition to palpation of the mass, usg usage are useful to differentiation of the falciform lipid tissue and/or bowel hernias following by abdominal wall rupture (Adin, 2011).

The purpose of the present study is to describe the early USG findings after the elective OHE operations performed at the low-risk stage (diestrus or anestrus periods) in dogs and to investigate their possible effects on post-operative follow-up.

Material and Methods

Twenty healthy female dogs aged between 1 to 5 years were brought to Adnan Menderes University Veterinary Faculty, Animal Hospital Obstetrics and Gynecology Clinic with the spaying request. It was looked out that the dogs were healthy based on the detailed anamnesis, general clinical examination findings, and reproductive scanning results. All dogs were hospitalized in pre-prepared shelters in order to determine the cycle stage, to be in common care and feeding conditions and to ensure the objectivity of postoperative evaluation. All approaches were carried out by the ruling of Adnan Menderes University Animal Experiments Local Ethics Committee numbered (64583101/2015/023) and with the consent of the animal owners informed about the study.

Vaginal smear samples were taken from all dogs to determine the stage of the estrus cycle. The samples were stained according to the Papanicolaou staining technique and evaluated microscopically. The dogs described in the stage of diestrus or anestrus that are considered to be low-risk periods for OHE, were included in the study group. Preoperative body temperature (T), respiratory rate / minute (R), heart rate / minute (P) values were recorded and they were anaesthetized with 2 mg/

kg xylazine HCL im (Alfazyne 2% - Ege Vet® İstanbul-Turkey) and 11 mg/kg ketamine HCL im (Alfamime 10%-Ege Vet® İstanbul-Turkey) combination. All surgeries were performed on the median line using routine procedure (Stone et al, 1993). In all peri-ovarian sutura ligaments, ligamentum lata uteri and cervical ligation number 0 absorbable threads (Surgiquick-Sutures LTD UK®) were used. After the removing of the uterus and ovary, the peritoneum and muscles were closed again with a simple continuous locking suture using 0 absorbable threads. In the subcutaneous and skin sutures, simple continuous and horizontal mattress sutures were applied with 2/0 absorbable threads respectively. Enrofloxacin (Baytil-K 5%-Bayer® 50 mg of active substance in 1 ml) was given subcutaneously at a dose of 5 mg/kg for 5 days postoperatively to all dogs.

The operation and anesthesia awakening times (min) of each dog were also added to the operation findings. During 7 days postoperatively, signs of general health (appetite, urination, defecation, pain, mucosa/conjunctiva, lymph nodes) were monitored daily; and body temperature (T), respiration/minute (R), pulsation (P) were measured. Additionally, consecutive USG examinations were performed (operation area, abdominal and pelvic cavities) to monitorize the early stage of post-operative period.

For this reason, USG was performed over all ligation regions especially periovarian and pericervical regions (right and left ovarian pedicles, ligamentum latum uteri, cervical ligation point) and incision line. By using the color Doppler USG device (Esaote® MyLab 30 Vet-Italy) and the 6.6 MHz microconvex probes of this device that have a multifrequency feature, serosity accumulation, hemorrhage, hematoma, mass and other pathological findings were investigated in the related regions. During the ultrasonographic examinations, technical standardization was achieved, with 85% of Gain settings and one focus point at the 6cm depth.

Results

According to the anamnesis and clinical examinations, the average age of 20 dogs of different breeds was 2.9±1.31 years and the average body weight was 20.1±7.18 kg. According to the results of vaginal cytological examination, it was detected that 15 dogs (75%) (Cases 1-7, 12-16, 18-20) were at anestrus period, 5 dogs (25%) (Cases 8, 9, 10, 11, 17) were at diestrus stage.

Body Temperature, P / min and R / min were measured and recorded before and during the operation. According to the data, while body temperature decreased 0.1 °C-0.3 °C in 13 patients, it increased 0.2 °C-0.3 °C in 5 patients, and remained constant in 2 patients. There was a significant rise in the pulsation values of 18 dogs during the operation while only 2 dogs showed a fall. Additionally, a decrease in respiratory frequency was determined in 19 patients, while one remained stable. The average operation time (between the first incision and the last skin suture) was 48.25 min (30-70 min).

According to the post-operative general examination findings; 17 patients (85%) on the first day, 3 patients (15%) on the second day were in normal appetite, urination was observed on the first day in all patients except 1 patient (5%). However, defecation started on the first day in 18 patients (90%). In 2 patients, urination and defecation occurred on the second day post-op.

Manual palpation was used to investigate the presence of pain findings and as a result of the procedure 7 patients (35%) were exposed to abdominal pain for 7 days due to contact. Of the

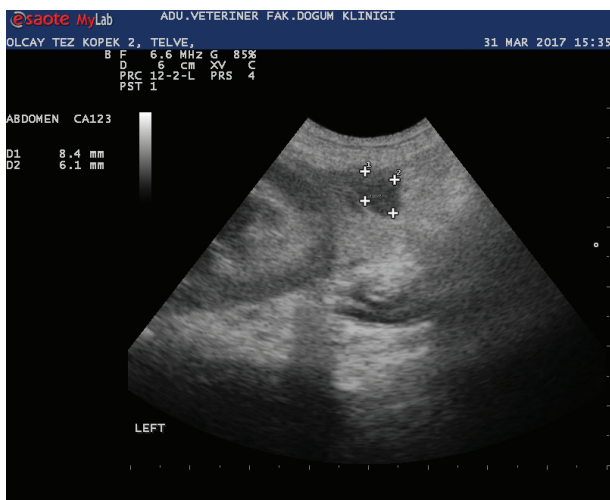


Figure 1: Case 2, Left ovarian ligation area, 1st day

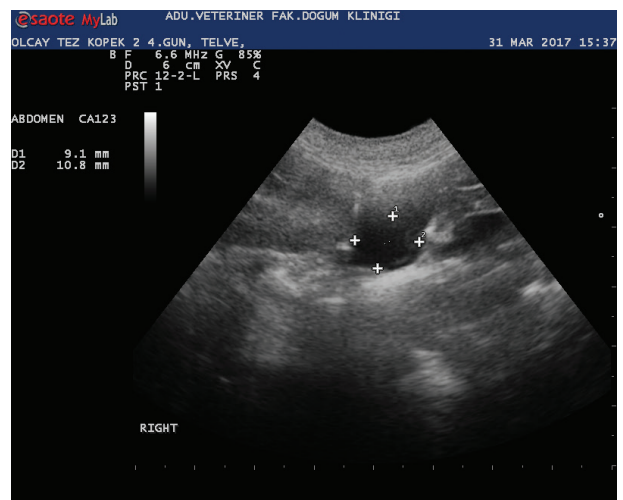


Figure 2: Case 2, Left ovarian ligation area, 4th day



Figure 3: Case 4, Cervical ligation area, 1st day

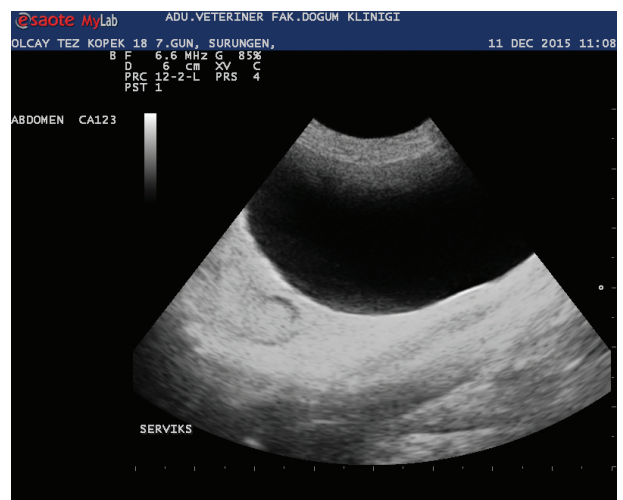


Figure 4: Case 18, Cervical ligation area, 7th day

other 13 patients (65%) it was for 2 days. It was determined that they did not react to palpation starting from the 4th day. Mucosa/conjunctival pigmentation was normal in all dogs for 7 days. Growth in lymph nodes (submandibular, prescapular and popliteal) persisted in 3 patients (15%) for one week and post-operative secondary infection were observed in these patients. In 5 of the dogs (25%) lymph node growth was observed up to the 5th and 6th days, besides in 12 patients (60%) no abnormal lymph node was detected. Cough, nasal flow and tracheal sensitivity were observed in the dogs who had secondary infection in post-op. It was detected that 11 patients (55%) who had edema in the wound area also had fluid accumulation in the incision line. Additionally, the skin sutures were opened in two patients (10%) due to infection at the wound area and hematoma was observed in these areas in 3 patients (15%).

In the USG examinations applied on 1st, 4th and 7th day after the OHE peri-ovarian regions, periservical region and incision line were examined respectively. In peri-ovarian views, images were obtained in the left region in 5 patients (25%), and in the right region in 10 patients (50%). In accordance with these scans, in 4 patients (20%) on the 1st day post-op and in 7 patients (35%) on the 4th day post-op, in 5 patients (25%) on the 7th day post-op, pieces attached to suspensor ligament and ovarian ligation area were inspected. On the scans of the left kidney caudal, images were only possible in 2 patients (10%) on day 1 (Figure 1), 2 patients (10%) on day 4, and 2 patients (10%) (Figure 2)

on day 7. The remaining cervix fragment and ligation area were tried to be observed in the examinations of the cervix region, 3 patients (15%) on day 1 (Figure 3), 3 patients (15%) on day 4 (and 12 patients (60%) on day 7 (Figure 4) were monitored. In the incision line examinations, in 11 patients (55%) on the first day (Figure 5), in 14 patients (70%) on the 4th day, in 15 patients (75%) on the 7th day (Figure 6), pathological formations (edema, hematoma, infection) were seen.

Pericervical examination of the cervix / ligation region was performed in terms of fluid accumulation and cervix localization. Cervical image was obtained in 14 patients (70%). While the importance of full bladder is emphasized in usg examinations of genital organs in some current literature data, in this study, flares occurred around the sac due to the increase in echogenicity and no clear images were obtained in the peri-cervical region (Figure 7). Cervical images were obtained in 12 patients (60%) mostly on the seventh day post-op. Cervix could only be displayed in 3 Cases (15%) on the first day of the USG examinations and again in 3 Cases (15%) on the fourth day of the examination. While images could be obtained in 12 dogs (60%) with underfilled bladder, cervix could be viewed in 3 patients with full bladder (15%) (Case 1/4th day post-op, 11/4th day post-op, 18/7th day post-op).

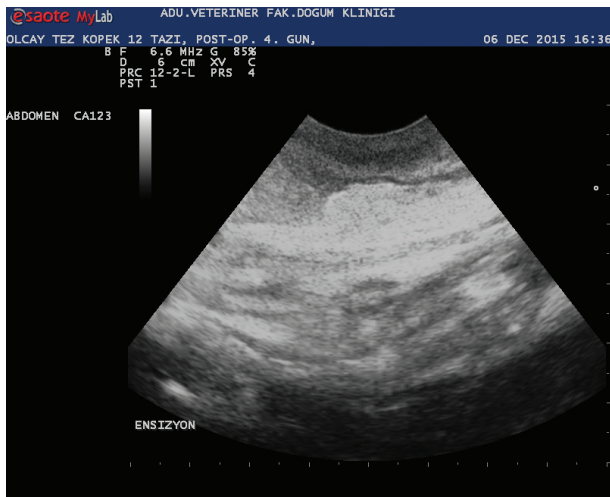


Figure 5: Case 12, Incisional area, 1st day

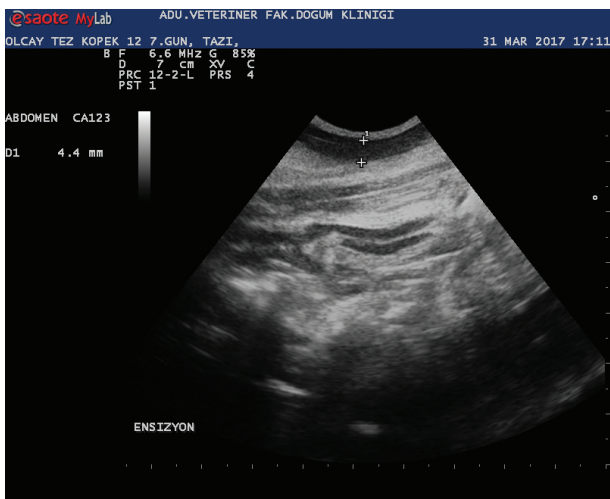


Figure 6: Case 12, Incisional area, 7th day

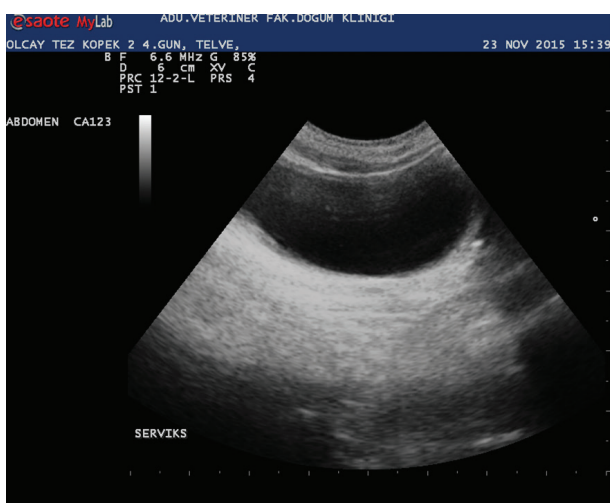


Figure 7: Increased echogenicity due to full bladder

Discussion

Ovariohysterectomy is one of the most common surgical procedures performed in veterinary clinics (Burrow et al., 2005). Intra/post-op complications usually occur as a result of performing the operations during the periods of high serum estrogen levels (proestrus, estrus), incorrect manipulation and inappropriate material usage (Howe, 2006). USG, which forms the basis of this study, is a real-time, practical, safe device that can be used in the diagnosis of these and postoperative complications without requiring special preparation and with no side effects. Examinations being non-invasive, being reproducible when necessary and obtaining real-time images are the main features that increase the importance (Davidson & Baker, 2009; Andrews et al., 2015).

In the literature information research, it is possible to reach general characteristics of short / long term complications through age, applied anesthesia and operation methods (Burrow et al., 2005; Sontaş, 2005; Goethem et al., 2006; Howe, 2006; Bencharif et al., 2010; Adin, 2011; Kustritz, 2012; Sreenu et al., 2015). In these studies, the morphological changes seen in the ligation sites and residual reproductive tissue residues are mostly presented through complications. However, the lack of usg findings in healthy or minimally problematic cases is remarkable. In order to eliminate the gap in this area, the usability of this study in the post-op follow-up was evaluated by analyzing the usg findings belonging to the early stage following the OHE.

Hemorrhage and infection development are in the first rank in early stage complications after abdominal surgery in dogs (Burrow et al., 2005; Adin, 2011). İlhan et al. (2004) reported that the role of usg in the diagnosis of intraabdominal abscess and peritonitis was between 52-90%. In our study, the absence of intraoperative / postoperative hemorrhage due to controlled ligations and the elimination of infection risk due to obeying the rules of asepsis / antisepsis have been effective in controlling this risk.

Regarding the topic of the study, no research findings have been encountered on imaging of postoperative ligation sites on a daily basis. When the ligation sites on both sides were evaluated simultaneously, the images obtained in the study were 30% (6/20) on the 1st day post-op; 45% (9/20) on the 4th day and 35% (7/20) on the 7th day. In addition, although there would be an increase in the cranial tension, there was no change in the anatomical localization of the ligated tissues that were unattached caudally after the removal of the ovaries, and it was observed that the ipsilateral kidney was seen right in its caudal just as in healthy ovaries. In our study, the fact that the ligation sites can be visualized more intensely on the 4th day can be related to the visibility of the cicatrix tissue at the internal connecting points of the removed tissues (Parsak et al., 2007). Additionally, decrease in abdominal sensitivity and unresistance to usg examination in 4 days may have an effect on the increase in the quality of images. In addition, the reduction of meteorismus with the transition to routine food from day 4 will have an effect on the reduction of artifacts and image quality.

In the images obtained from the study, cervical ligations with a diameter close to the healthy uterine diameter range (0.3–0.8 cm) (Barr, 2010) were observed (0.44–1.59 cm). However, local edema due to ischemia in the early post-op is thought to be the main reason for these measurements to be higher in some cases. The highest visualization rate of cervical ligations was 60% (12/20) and was recorded on the 7th day. It is also

Table 1. Rates of ultrasonographic visualization of ligation areas and incision line

Left Ovarian Ligation Area (n=5; 25%)	Day 1 (n=2; 10%)
	Day 4 (n=2; 10%)
	Day 7 (n=2; 10%)
Right Ovarian Ligation Area (n=10; 50%)	Day 1 (n=4; 20%)
	Day 4 (n=7; 35%)
	Day 7 (n=5; 25%)
Cervical Ligation Area (n=14; 70%)	Day 1 (n=3; 15%)
	Day 4 (n=3; 15%)
	Day 7 (n=12; 60%)
Incision Line (n=20 100%)	Day 1 (n=11; 55%)
	Day 4 (n=14; 70%)
	Day 7 (n=15; 75%)

noteworthy that the bladder is not full in 10 of these 12 cases. It is convenient that the bladder, the guide organ in the usg examination of the uterus, is full for the examination. It is very likely that the urine in the full pouch serves as an acoustic window and that the surrounding tissues can be easily visualized (England and Yeager, 1993; Fontbonne and Malandain, 2006; Davidson and Baker, 2009). However, in our study, contrary to this data, hyperechogenicity caused by full bladder was found to cause difficulty to visualize cervical ligation regions. The fact that the cervical ligation site being located just below the bladder makes it negatively affected by the acoustic rise.

None of the patients had intrapelvic/vaginal bleeding and vaginal discharge associated with the risk of bleeding/infection during and after the opening of the cervical ligatures. The reason for this is thought to be that the operations are performed from the median line and the related tissues are easily reached and removed. These examinations were performed on 1-2 cm caudally of the end of the incision line. In all usg exams, cervical ligation can be easily performed on the caudal of the incision line.

Burrow et al. (2005) and Adin (2011) reported that the rate of wound infection after elective OHE was close to each other (2.2-5.7%); likewise, in elective OHE applications, they both reported that prolongation of anesthesia and operation periods are determinants of wound healing and subcutaneous serosity collection. Pope and Knowles (2014), reported that they encountered 14% (87/618) of incisional inflammation/infection, 0.8% (5/618) of incisional seroma, and 0.6% (4/618) of incisional hernia. In our study, 60% (12/20) of the dogs, who reacted and felt pain during manual palpation of the abdominal region for 7 days, incision line edema, hematoma formation or opening of skin sutures were observed. In the examination of the incision line on the 4th and 7th days, more pathological conditions were encountered compared to the first day. The intense inhibitory effect of antibacterial applications taken during the first 72 hours is thought to be related to traumatizing the wounds of dogs with itchy skin due to wound healing around the 4th day. In addition, the lack of use of Elizabethan collar despite application of regular dressing in the study may be effective in the development of these complications. For this reason, the necessity of wearing an Elizabeth collar is evident in animals that cannot be dressed regularly.

Ovarian and stump granulomas may occur as a result of the use

of nonabsorbable material during OHE, elimination of ligations under aseptic conditions, or forgetting of intraoperative tamponade in the abdominal cavity (Werner et al., 1992; Mai et al., 2001; Miller et al., 2006; Frank and Stanley, 2009; Kanazono et al, 2009; Putwain and Archer, 2009; Rayner et al, 2010). Wan et al. (1992) reported that usg images of postoperative ovarian granulomas generally appear as hypoechogenic – anecogenic fluid-filled abscesses surrounded by a hyperechogenic fibrinous capsule, and in the granulomas that occur as a result of forgotten tamponade, the artifact formation and calcification areas are observed due to the accumulation of gas in the irregular-edged mass. In our study, compliance with the rules of asepsis / antiseptis, the absorbability of the threads used are thought to prevent such complications thanks to the correct examination of intraoperative bleeding. It was reported that intestinal obstruction due to stump uterine abscess was observed in the first 7 days, postoperatively (Adin, 2011). The absence of any defecation problem in this study, the lack of intestinal obstruction or suspicious foreign body images in the usg, confirm that such a situation did not occur.

In the light of the data obtained in this study, early effects of elective OHE operation performed even in diestrus and anestrus periods, which are considered as low-risk, were observed in abdominal / pelvic scans and transdermal usg of the wound site. The data, which may form the basis for detailed usg evaluation of the abdominal / pelvic / wound region, may be useful for early diagnosis of possible complications. Although the usg examinations have not yet become widespread in the routine control procedure of patients after neutering operations, it is likely that B-mode usg applications will be included in the postoperative control systematics with the help of new data obtained from similar future studies and the developing technology in imaging systems.

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