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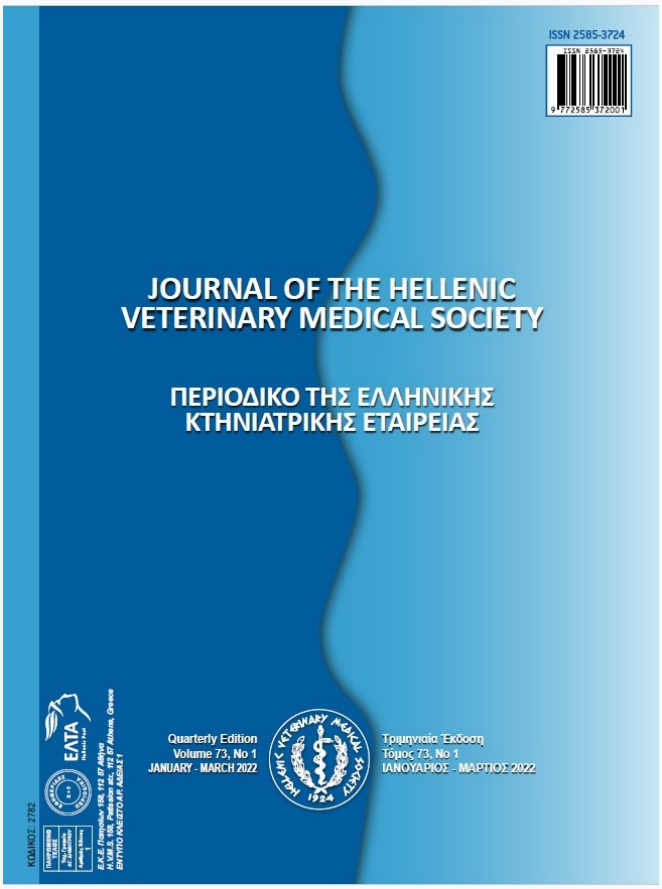

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Review article
Ανασκόπηση

The gynecological controls in the elderly female dogs

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ABSTRACT: In canine geriatric medicine has many different research areas such as cardiology, endocrinology, dentistry. However, diagnosing many related diseases and complications can be late related to thoughts that spayed dog's genital exams are thought of as unneeded approaches. Reproductive infections, mammary/gynecologic tumoural diseases, and their complications decrease their life quality and have a considerable mortality rate in aged intact and spayed bitches. Therefore, an effective gynecologic health check program supported with different imaging techniques is highly needed in small animal clinics. In this review, it is planned an annual gynecologic examination for older/geriatrics dogsand presented the main steps to early diagnose and prevent genital diseases with high mortality and lower their life quality and longevity.

***Keywords*:** Gynecological controls, diagnosis, aging, dogs.

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INTRODUCTION

With the new diagnostic and therapeutic techniques in canine medicine, dogs' life span is getting longer, and they can accompany human beings much more years. According to their breed size, dogs are called senior and geriatric after 7-10 and 10-15-year-old (Fortney, 2004) ; one-third of them have multi-organ endocrinologic diseases such as diabetes mellitus, hypothyroidism, and hyperadrenocorticism. In the patient portfolios of a pet clinic, it can be seen that the older dogs' records take place 30%; also, 20% of the older dogs have genital diseases approximately (Haydardedeoğlu and Kalınbacak, 2015; Hoskins et al., 2004; Willems et al., 2017).

After 7-8-year-old, the female dog's reproductive physiology starts to slow and attenuate each year. Inter-oestrus duration is getting longer; proestrus bleeding and oestrus behaviors' visibility decrease (Feldman et al., 2015), so some cases cannot be noticed on time. However, early diagnosis of uterine infections or genital tumors is essential for appropriate surgical and therapeutic approaches, especially in elderly ages (Balducci et al., 1986; Waldron and Budsberg, 1989). For example, considering two cystic endometrial hyperplasias (CEH) -pyometra or mammary carcinoma cases in a young daughter and aged mother, the treatment protocols, prognosis, and complication rates would differeven though they have similar genetic, breed, and size features. Although these changes and high risks of genital diseases, the owners can be reluctant to refer their pets to veterinary clinics, especially spayed bitches. Fortunately, setting a well-designed collaboration between owners and veterinarians is possible because many of them have a strong relationship with the dogs as time passes andare more alert to their pets' behavior and health status. Although the female dogs consistof many spayed and senile individuals, genital system checkedup should be performed with clinical examinations and scans during their lifetime at least once a year. Scanning helps detect uterine infectious or hormone-dependent tumoural masses in intact females for early diagnosis and avoiding many late post-spaying complications after the four weeks of proestrus bleeding. It is suitable for the spayed bitches that the gynecologic evaluations once a year at the vaccination visits.

In this review, the main steps of a genital check-up program for older/geriatric female dogs are presented to use at the early diagnosis of different genital diseases with high mortality and lowering their life quality.

THE MAIN STEPS OF THE GYNECOLOGICAL CHECK-UPS

There are five main areas in a gynecological control program that must be evaluated by recording the clinical, radiological findings presented below:

1. Behavioral changes
2. Urinary incontinence
3. Perineal examinations
4. Gynaecological ultrasonography
5. Mammary glands' evaluations

1. Behavioral changes

With aging, various and irreversible changes are seen on many organ systems that affect their daily behavioral patterns. These effects may originate from neurological, endocrinologic, or orthopedical disorders. For example, catecholamine neurotransmitter levels are decreased (Milgram et al., 1993), but free radicals' levels rise in brain tissue (Mecocci et al., 1993). Diabetes mellitus can result in hypoxia by anemia and high blood pressure (Ivy et al., 1994). Loss of appetite and disorders in thermoregulation and orientation functions are remarkable, making the dogs more sedentary during the day (Landsbaerg and Head, 2011).

Moreover, by occurring the neurocognitive deficits, the owners define their pets as unhappy, lethargic, and unresponsive (Fortney, 2004). However, on the other side, anxiety can be seen in some individuals, representing much more physical activity and aggressive reactions to other animals and humans (Vite and Head, 2014). Furthermore, anxiety and protest acts can result in intermittent home soiling issues. Therefore, the differential diagnosis of organic disorders than neurocognitive impairment or protesting is crucial for appropriate evaluation by askingabout the duration of this condition and questions about life changes such as (moving to a new house, death of the owner, participating in a new pet, or any family member) (Landsbaerg and Head, 2011). When considering gynecologic diseases, lethargic and unresponsive dogs are the first group that must be evaluated for infectious and tumoural diseases and post-spaying complications. Suffering from defecation and urination can be originated from the perineal mass related to neoplasms orhernias.

The other behavioral changes can be increased sex-

ual activity and hyper-estrus symptoms.Long-lasting proestrus bleeding and copulation days would point to ovarian cysts or tumors such as granulosa cell tumors (GCT). Therefore, all remarkablebehavioral changes should be recorded for the subsequent clinical examination, even if they seem unrelated to the gynecologic disorders. Effective interventions and perioperative/chemotherapy protocols can be standardized for better health management based on recordings of these changes, especially irreversible ones.

2. Urinary incontinence

The spayed bitches weighing 20 kilograms above are at risk for home soiling problems (Veronesi et al., 2009). Following the surgery, by the irreversible decrease of the oestradiol level, contractility on the muscles of the orificium urethra externa disappears gradually, and urinary incontinence occurs.Studies show that ovariohysterectomised dogs have difficulty holding urine in the bladder as between %5-20 (Okkens et al., 1997; Veronesi et al., 2009). Home soiling caused by estrogenic deficiency is observed in resting/sleeping time, and it should be differentiated from euphoric emotions, protests act, or other neurocognitive deficits (Hoskins et al., 2004).

In differential diagnosis, thoracic and lumbar vertebrae radiographies should be evaluated for spondylitis cases; urine sample tests should be done to eliminate the cystitis case. Ultrasonographically, when the bladder is observed in average dimensions and with homogenous wall echotexture, without any stone or inflammatory signs, it should be suspected of the estrogen deficiency resulting fromspaying operation (Hoskins et al., 2004). Researchers have pointed to this issue that can be seen very long after the ovariohysterectomy until ten years (Okkens et al., 1997).

3. Perineal examinations

The perineal examination consists of three main steps: perineal skin inspection, searching perineal/perivulvar masses, and investigating the vaginal discharges. After recording anamnesis data, inspection and the perineal area's palpation reveal many genital malformations related to aging in bitches. Obesity risk increases with aging, and it causes excessive perivulvar skin folds. In addition, the vulvar atrophy and position change are seen more evidently in ovariohysterectomised females because of basal estrogen level (Graham, 2014). In these cases, owners should keep hygienic their pet's perivulvar area after the daily routines. If not, the poor ventilation and moisture from urine cause the impairment of local bacterial flora; specific and nonspecific agents can quickly contaminate and infect the skin. Intermittent, serous, seromucous vaginal discharge, odor, and itching are common symptoms of the infection that have a high risk of cystitis and pyometra in immunosuppressive individuals (Lightner et al., 2001).

At the perineal area's examination, clinicians should investigate any painless swellings that can push back into the pelvis and possible mass formation, especially the dogs showing urination or defecation changes such as constipation, pain symptoms, etc. Aging is a predisposing factor for weakening the pelvic muscles that support the perineal wall (Hayashi et al., 2016). Ultrasonographic imaging of the mass is a helpful tool as an additional diagnostic procedure. Before deciding the surgical treatment, transdermal usg may reveal the entrapped pelvic organs such as the bladder, uterine horns, intestinal loops (de la Porta Machado et al., 2020).

The other possible gynecologic disorder is the genital tract neoplasms in female dogs. Vaginal, vestibular, and vulvar tumors are the most common tumors in female dogs, excluding mammary gland neoplasia (White and Brearley, 2018). Leiomyomas, fibromas, and the malign forms of the mesenchymal tumors are common gynecologicaltumors in the canine practice. The owners cannot see hidden swelling under the furry tail in the long hairy dogs until showing clinical symptoms. Detailed palpation reveals the small-sized mass formation in the perineal area.

After detecting a mass, B-mode and Doppler usg help define its shape, capsule formation, and imaging vascular map that simulates the mass and proper preparation for a better outcome. According to the tumor's solid or multilobular shape and vascular intensity, performing the appropriate operative approaches are possible. At the exams of genital tract tumors, a possible estrogenic effect caused by the follicular cysts or the functional ovarian tumorsshould be investigated via abdominal usg and vaginal cytology because these tumors are associated with the high level of ovarian estrogen secretion (White and Brearley, 2018).Measuring and monitoring the total ovarian dimensions at the periodical visits play an essential role in gynecological scans of senior/geriatric dogs. Ovarian diameters more than 25 millimeters, cystic anechoic areas are typical findings to perform spaying operations. In the suspected ovarian images, cornified and nonnuclear superficial epithelial cells

at vaginal cytological samples reflect the high serum estrogen levels (Root Kustritz et al., 2010). In these cases, myelosuppressive signs on the hematological tests should be investigatedfor the medical/surgical precautions before surgery.

All vaginal dischargesreflect differentgenital disorders and have clinical importance in spayed and intact dogs of any age. Therefore, even if there is a little spot with various characters (serous, mucous, hemorrhagic, purulent) on the vulvar area that thought the vaginal discharge, detailed evaluations consist vaginal touché, cytology, and abdominal usg should be done a too early diagnosis of genital diseases (Perivulvar dermatitis, vaginitis, transmissible venereal tumor, CEH-pyometra complex, ovarian remnant syndrome, ovarian-uterine-vaginal tumors, etc.).

4. Gynecological ultrasonography

In this check-up program, gynecological usg is one of the most effective steps to diagnosing genital infections, neoplasms, and spaying complications. However, most cases are referred to the veterinary clinics quite late, so they have many complications at the perioperative and chemotherapy stages. In addition, there are many differences in the anesthesia/operation durations and the response to surgery and medical administrations between the infections and tumoural cases diagnosed early and lately for geriatric dogs. Therefore, annual scans of the genital organs help the vets for more detailed and proper genital evaluation.

Few and small cysts (1-2 mm) in the uterine wall, increased uterine horn diameter (>0.9 mm), and anechoic uterine content is the main signs for cystic endometrial hyperplasia cases (Bigliardi et al., 2004; Hagman, 2018; Veiga et al., 2017). In addition, according to researchers, low resistance in the uterine artery reflects uterine infections (Veiga et al., 2017). Therefore, early diagnosing cystic endometrial hyperplasias would avoid surgical complications and help the less drug usage because there is not disturbing in the kidney and liver functions yet, in the early stages of the disease.Regarding the many complication risks of uterine infections in senior and geriatric females, annual uterine scans play an essential role in avoiding septicemia and toxemia. The main target for this control program is the other aseptic forms of uterine disorders, such as hematometra, mucometra, and hydrometra. As time passed following vaginal flora contamination, cystic endometrial hyperplasia results inthe open or closed cervix pyometra formation. The observing vaginal discharge results in an earlier treatment possibility than in closed cervix pyometra cases. However, closed cervix pyometra cases do not show any specific symptoms until disturbingthe kidney and liver functions. In these cases, the higher uterine diameter and the thinner uterine wall cause high intrauterine tension, intraabdominal fluid accumulation with various echogenicity is detected (Hagman 2018). Until showing general symptoms, these patients will well tolerate surgical treatment and respond without complication.Closed-cervix pyometra is a latent and progressive disorder; the owner cannot notice general symptoms such as loss of appetite, polydipsia, polyuria, lethargy, etc. When these signs are remarkable, hepatic and renal function are damaged and need intense medical therapy.

New members of the pyometra risk group are considered that the ehrlichiosis and leishmaniosis positive dogs are having an additional risk for uterine infections (Behera, 2010; Silva et al., 2009). Therefore, clinicians should be much more alert in these dogs'periodic genital checks.

Vaginal cytology for differential diagnosisof uterine infectionsis not the right choice in healthy dogs at the diestrus stage due to similar microscopic results (intermediary cells, neutrophilia, fibrin debris, etc.) in both cases. Nevertheless, only taking the vaginal samples can be helpful in spayed females with Stumph pyometra.Stumph pyometra occurs in the ovariohysterectomised females caused by the hormonal active remnant ovarian tissue (Ball et al., 2010). Both the sagittal and transversal pelvic sections should be performed to detect the infected corpus uteri. Acoustic enhancement resulting from a full bladder may hide the corpus uteri, so; a secondary usg evaluation should be performed after urination. In those cases, ovarian pedicles should be investigated to virtually surgical treatment consisting of ovarian remnant treatment.

Besides uterine infections, abscesses and granuloma formation are the latent issues in spayed females. Early and late spaying operation complications are responsible for many gastrointestinal or urinary disorders in older female dogs. Nonabsorbable suture materials, the lack of aseptic approaches, retained sponges resulting in a granuloma formation can adhere to the abdominal wall and organs (Erdoğan and Yaygıngül, 2020; Goethem et al., 2006). For this reason, all surgical ligation areas should be investigated ultrasonographically for any suspected mass and its connection with the other abdominal organs.

Genital tumors are recorded as %1-2 for ovarian and uterine origins of all neoplasms. Their incidence is higher in intact females not allowed to mate and parturition (White and Brearley, 2018). If they do not produce estrogen, such as non-functional granulosa cell tumors, it is late to diagnose these latent and progressive tumors (Erdoğan et al., 2015). Metastasis to the other tissues and capsule formation, including kidney, bladder, and other vital organs, decreases surgical outcomes. At the ultrasonographic examination of the big-sized tumors, there is a challenge in detecting tumor origin and differentiation. Nevertheless, seeing anechoic cystic areas and vessels and blood flow evaluation with Doppler usg can guide the surgeons for additional medical and instrumental preparation in the preoperative stage.

5. Mammary gland evaluation

Mammary tumors are detected in approximately half of the intact canine female population, and malignity rates are recorded at 50% in dogs older than 10-year-old. The cumulative effect of progesterone triggers mammary neoplasia (Momont and Barber, 2003; Moulton et al., 1970). Informing owners about the risks, the protective effects of spaying on mammary tumors, and reasonable mammary controls at home aresignificant during visits. Because the home checks' findings help monitor the patients and make higher the success of treating the mammary tumors. Owners detect external masses in the simple regular palpations quickly. Every month, simple mammary palpations should be done to catch any suspected swelling. The primary purpose of these checks is to detect all-palpable or nonpalpable masses in the first grade (T1N0M0) and to start surgical and medical procedures immediately.

In literature, the intact or spayed females after 2.5-year-old, having relatives with the mammary tumor, affected with steroid administrations, and obese ones feeding with home-waste foods are in the risk group (Momont and Barber, 2003; Egenvall et al., 2005; Munson and Moresco, 2007). Following monthly checks by owners, inspection and palpation are performed on all five couple mammary lobes. In history, coughing and decreased exercise performance should be recorded for distant organ metastasis. In addition, every asymmetrical swelling should be evaluated for hernia formation, commonly seen in the inguinal mammary lobe areas. Inguinal hernia seen in dogs commonly due to the high diameter of canalis vaginalis is also confused with the tumoural masses (Parkinson et al., 2019; Waters and Stone, 1993). Differential diagnosis by usg reveals additive findings and appropriate surgery (Munro and Stead, 1993).

In small mammary masses (<2 cm), several physical features such as mobility, ulceration-inflammation signs should be recorded. Additionally, palpating of the regional lymph nodes and their usg find out the possible lymphatic metastasis condition. Finally, cytological samples are used for differentiation among other tumoural masses originating from different tissues and prediagnostic approaches between benign and malign neoplasms (Egenvall et al., 2005; Alonso-Diez et al., 2019).

Non-invasive imaging systems are pretty helpful in the monitoring of canine mammary tumors. Areas with more than five millimeters of opacity are suspicious for lung metastasis (Gobello and Corrada, 2001; Momont and Barber, 2003) ; magnetic resonance or computerized tomographical scans are needed. By using more comprehensive imaging, many detailed results can be used to appropriate management. B-contract, contrast-enhanced, and Doppler usg show the morphological changes, dimensions, echogenicity, hemodynamic features of the masses, and regional and abdominal lymph nodes (Wehrend et al., 2001; Marquardt et al., 2003; Momont and Barber, 2003; Nyman et al., 2006a; 2006b). Also, computerized assistant analysis programs can perform quantitative evaluation of the images (Feliciano et al., 2017; Mülazimoğlu et al., 2016). For more certain differentiation of the benign and malign masses, elastography is recommended to measure the changing elasticity and increased hardness of the malign tumor (Kutschker et al., 2008; Feliciano et al., 2017). Besides, infrared thermography may be used in the mass diagnosis and thermal changes due to the intravenous thrombus in the dogs (Kim and Park, 2012; Redaelli et al., 2014).

CONFLICT OF INTEREST

Author declares that there are no conflicts of interest associated with this publication.

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