Original Article

Pathological Evaluation of the Testes in the Castrated Dogs in Ahvaz County, Khuzestan Province, Iran

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ABSTRACT

Background: Despite extensive research on the diseases of the reproductive system (testis and epididymis) in dogs, the extent of reproductive complications is unknown.

Objectives: The purpose of the present study was to evaluate the clinical, macroscopic, and histopathological findings of testicular and epididymal tissues in dogs of Ahvaz County, Khuzestan Province, Iran.

Methods: In the present study, 77 castrated testes were evaluated in different animal ages (from 7 months until 12 years). After macroscopic evaluation, the testicle and epididymis tissues were placed in 10% buffered formalin and processed.

Results: Sixty-eight cases of dogs had testicles with normal appearance. Four cases of dogs had cryptorchidism, which was determined during clinical examination. In five cases, the epididymis was swollen with dilated spaces. The microscopic study of the samples showed the presence of various lesions in 45 cases (58.44%). Four (8.89%) of 45 samples with lesions had unilateral cryptorchidism. Testicular degeneration was among the most important cases observed in 14(31.11%). Twenty-two (48.89%) out of 45 samples with lesions had epididymitis. Severe hyperplasia of the mucous membrane covering the epididymis was observed in these samples. Epididymitis and degeneration were observed in 12 cases simultaneously. Two cases of chronic epididymitis were associated with bleeding. Another finding was the observation of intranuclear and intracytoplasmic inclusions (in 29 cases). In 21 cases, epididymitis was also visible simultaneously, determined by the presence of fibrosis around the ducts and mucous hyperplasia. Bleeding was seen in 5 cases (11.11%).

Conclusion: Considering the relatively high prevalence of testicular degeneration, epididymitis, and the presence of inclusions in the studied dogs, castration in males and histopathological evaluations are very important for a definitive diagnosis of complications because they can lead to infertility, especially in purebred dogs that are kept in shelters (because of the chronic course of some infectious diseases).

Keywords: Cryptorchidism, Dog, Epididymis, Histopathology, Testicle

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Introduction

Dogs with cryptorchidism are prone to develop Sertoli cell tumors and seminoma. Dogs older than 6 years with cryptorchidism are more prone to tumor development. Castration is important in controlling the animal population and aggressive behavior in male dogs (Ali et al., 2022). Testicular tumors are caused by the uncontrolled growth of cells inside the testicular tissue. The origin of tumors is not precisely known, but several factors like environment, genetics, and inheritance play a role. Certain breeds of dogs, such as Boxer, German Shepherd, Afghan Hound, Weimaraner, Shetland Sheepdog, Collie, and Maltese, are more prone to developing testicular tumors (Sumner et al., 2021). Most dogs with testicular tumors lack apparent clinical symptoms. Clinical symptoms may be limited to a mass (or masses) inside the affected testicle. Palpation of the scrotum with fingers may reveal nodular enlargement in the testicular tissue. Asymmetry in the size of the testicles and swelling of the scrotum are other signs. Sertoli cell tumors may produce estrogen, and a hyperestrogenism state is formed in the animal. In this situation, the male dog shows the behaviors of the female dog. Also, a series of symptoms, such as enlargement of the mammary glands, hair loss, and increased melanin pigment, are seen in the skin in male dogs (Gould et al., 2007; Kudo et al., 2019).

Excessive secretion of estrogen can suppress the bone marrow, causing anemia (pale color of the mucous membranes) and lethargy in the animal. Behavioral changes have been reported, such as urinating like a female dog and attracting the attention of male dogs. In rare cases of malignant tumors, symptoms may be related to the involved organ where the tumor has metastasized (weight loss, anorexia, lethargy, or vomiting). If the tumor has metastasized to the lymph nodes near the urinary tract or the prostate gland, symptoms include difficulty urinating or defecating. Testicular interstitial cell tumor metastasis to the skin has also been reported. Besides the neoplasias, the topics related to testicular tissue degeneration and epididymitis are critical because if there is no control or treatment, it can lead to the infertility of the affected animal (Grieco et al., 2008; Nascimento et al., 2019).

In addition to the usual clinical findings, examination of the rectal area, blood test, urine test, chest radiography, and, if possible, ultrasound of the abdomen or CT scan are necessary to ensure the involvement of lymph nodes or organs. Sampling is necessary to confirm the diagnosis if the lymph nodes are enlarged and appear abnormal on palpation. Immunohistochemical methods can also be used in the diagnosis of neoplasms. One of the most important definitive diagnosis methods is histopathologic evaluation on biopsy samples, using hematoxylin and eosin staining and, in some cases, immunohistochemistry. Fine needle aspiration has also been reported for sampling (Hohsteter et al., 2014; Sumner et al., 2021; Elahirad et al., 2021). There has not been a comprehensive study on the pathology of testicular and epididymal tissues in dogs in Ahvaz County, Khuzestan Province, Iran. This study aimed to evaluate the clinical, macroscopic, and histopathological findings of testicular and epididymal tissue in dogs in this area. The results of the present study are useful and practical, especially for small animal clinicians.

Materials and Methods

To conduct this study, 77 samples of testicles of male dogs (both testicles from each dog) were taken, which were referred by pet owners to castrate their dogs. Sampling from the population of dogs referred to the Veterinary Hospital of the Shahid Chamran University of Ahvaz (22 cases) and from the cases referred to the Veterinary Clinics of Ahvaz City (32 cases) and shelters (23 cases) in different ages (from 7 months to 12 years with a mean age of 2.6±2.28 years). The breeds of dogs were different (Native, Terrier, Shih Tzu, Spitz, Pomeranian, German Shepherd, American Pit Bull, and Poodle). Small and large breeds were 21 and 56 cases, respectively. This study was conducted over 12 months (from January 1400 to January 1401).

Before castration, a detailed history of the studied dogs was taken, including age, breed, history of scrotal skin infections, and administration of various drugs, including corticosteroids. Clinical findings were taken and recorded by palpation. The condition of the skin and body hair, especially in terms of hyperpigmentation, such as hyperestrogenism syndrome, was checked, as well as the state of urine and feces and, if necessary, examination of the rectal area through finger palpation.

The studied dogs were castrated under complete anesthesia, and the testicles were removed together with the epididymis. Then, the macroscopic evaluation was done from the testicular and epididymal tissue regarding the presence of cysts, their number and sizes, and other abnormal cases; then, they were placed in 10% buffered formalin and stained hematoxylin and eosin (H&E) following tissue processing.

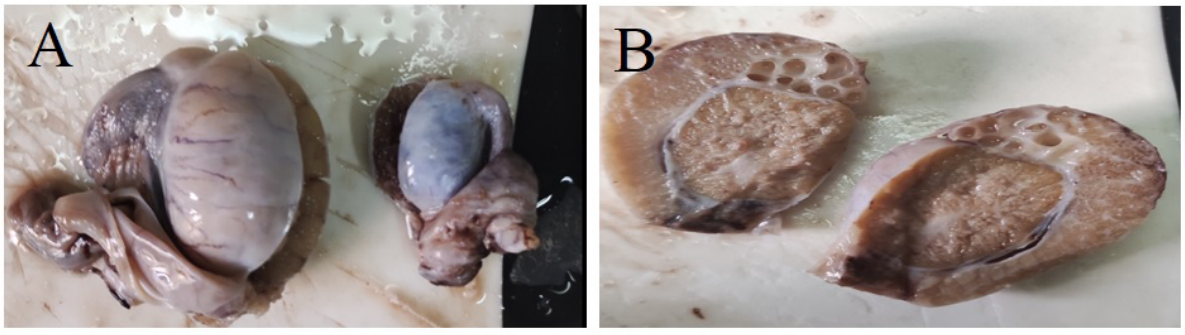

Figure 1. Macroscopic figure of testes

A) Cryptorchidism in the right testicle, B) Testes and epididymis

Notes: There is a visible reduction in the size of the affected testicle compared to the opposite testicle (A) and the presence of multiple cysts inside the epididymis (B).

Statistical analysis

The current research is a descriptive analysis, and the data are expressed as percentages. The statistical analyses were performed using SPSS software, version 22 (SPSS Inc., IL, Chicago, USA).

Results

Macroscopic findings

In the present study, 77 testes and epididymis were examined in the studied dogs. Sixty-eight cases of dogs had testicles with normal appearance. Four cases had unilateral cryptorchidism, which was diagnosed during clinical examination. One of the testicles of the affected dogs was in the abdominal area, and the other testicle was in the scrotum. The affected testicle was smaller and lighter than the testicle on the opposite side. In 5 cases, the epididymis was swollen with dilated spaces (Figure 1).

Microscopic findings

Immature testicles

In the microscopic examination, based on histological characteristics, the testicles were in three stages: Immature, premature (maturing), and mature. In the testicular tissue of two dogs 7 and 8 months old, the seminiferous tubules were covered by a row of cells, which were spermatogonia and nuclei of Sertoli cells. Also, the twisted tubes of the epididymis were visible in a thin and small form (Figure 2).

Premature testicles

The maturing testes were seen in the testicular tissue of 8 dogs. Four cases were 8 months old; the others were 9, 11, 12, and 14 months old. The mucus of the seminiferous tubules was multi-layered in these testicles. In these tubes, the beginning of the process of spermatogenesis was visible, and numerous cells of primary and secondary spermatocytes were visible, but spermatozoa had not formed yet. The ducts of the epididymis were also dilated, and its mucus was visible in a semi-confluent form along with ciliated cells (Figure 3).

Mature testicles

In 67 cases of the testicles, different degrees of spermatogenesis were observed in the seminiferous tubules, indicating puberty. The dogs were 7 months old (two cases), 8 months old (two cases), 9 months old (one case), and the rest were 1 year old or older. In these testicles, the process of spermatogenesis was obvious, and numerous spermatocyte cells and spermatozoa were formed. The mucus of the epididymal ducts was also pseudo-confluent, and spermatozoa were visible inside them.

Pathologic lesions

The microscopic evaluation of the samples showed the presence of various lesions in 45 samples (58.44%) (Table 1).

Cryptorchidism

Of 45 samples with lesions, 4 cases (8.89%) had unilateral cryptorchidism. In the microscopic evaluation of cryptorchidism samples, specific lesions were observed. The covering tissue of the seminiferous tubules

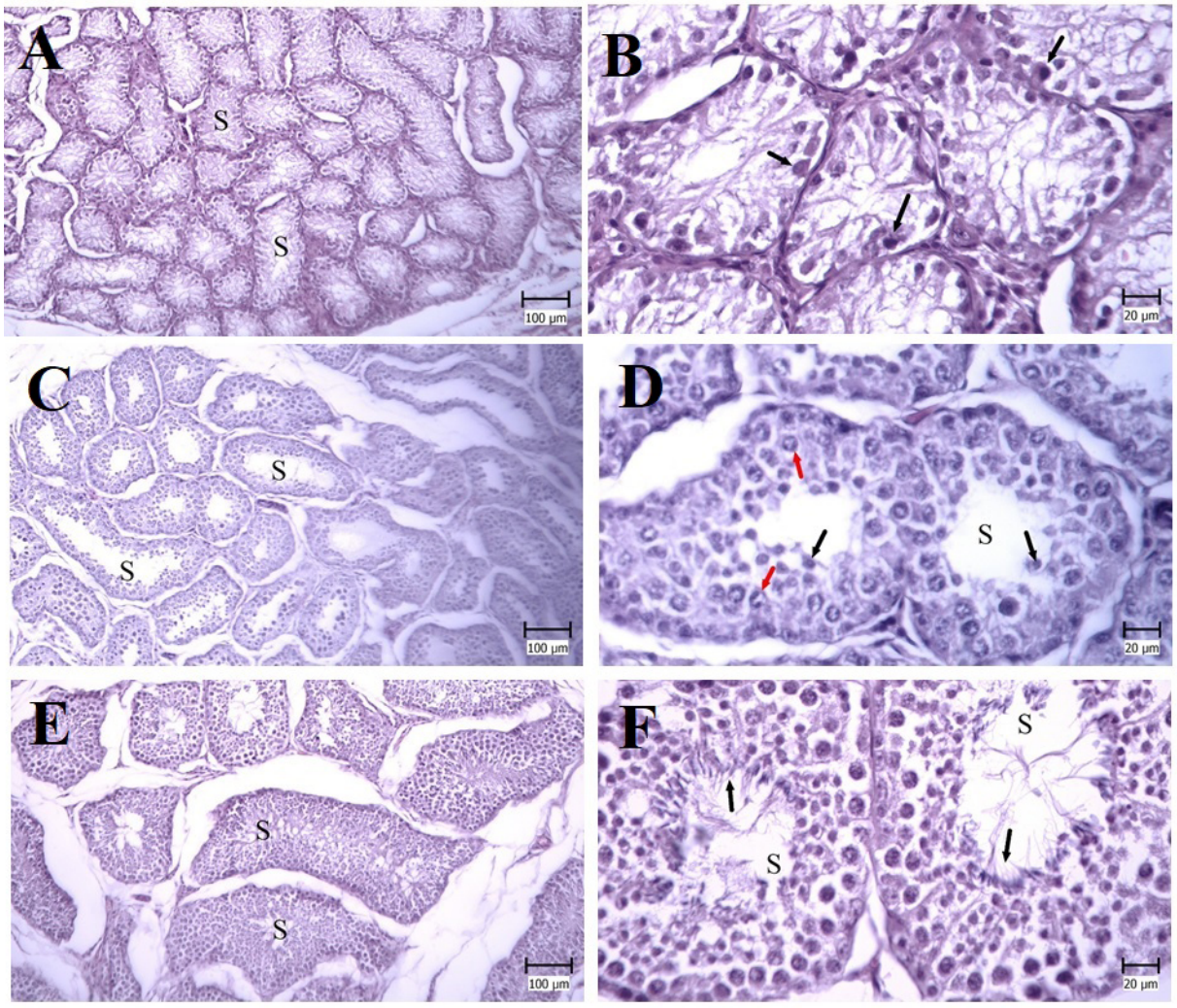

Figure 2. Immature testicle (H&E)

A) Presence of seminiferous tubules (S) covered by a row of cells; B) Part of previuse figure with greater magnification, a single layer of seminiferous tubule mucus, spermatogonial cells (arrow), and Sertoli cells; C) Seminiferous tubules (S) lined by the corresponding epithelium; D) Part of previuse figure with higher magnification. The presence of corresponding epithelial lining of the seminiferous tubules (S) indicates the presence of primary spermatocyte cells (red arrow) and secondary spermatocyte (black arrow); E) Seminiferous tubules (S) lined by the corresponding epithelium; F) Part of previuse figure with greater magnification (corresponding epithelial lining of seminiferous tubules (S) along with spermatozoa [arrow])

in the mentioned testicles consisted only of Sertoli cells, which had a red cytoplasm towards the center of the tube, and the nucleus was present at the base of the cell. The affected dogs were 7 months to 2 years (Mean±SD: 15.25±7.36 months).

In the observations of the testis in front of the seminiferous tubules, complete cessation of spermatogenesis was also observed, and no germinal cells were seen inside the tubules, and the only present cells were Sertoli cells. Epididymal ducts were small and covered by a thin mucus. Germinal cells were not seen inside the tubes. In

Table 1. The number of pathological lesions and their percentage among 45 testicles with lesions in dogs in Ahvaz County

Lesion	No. (%)			
Cryptorchidism	Degeneration	Epididymitis	Inclusion	Hemorrhage
4(8.89)	14(31.11)	22(45.89)	22(45.89)	5(11.11)

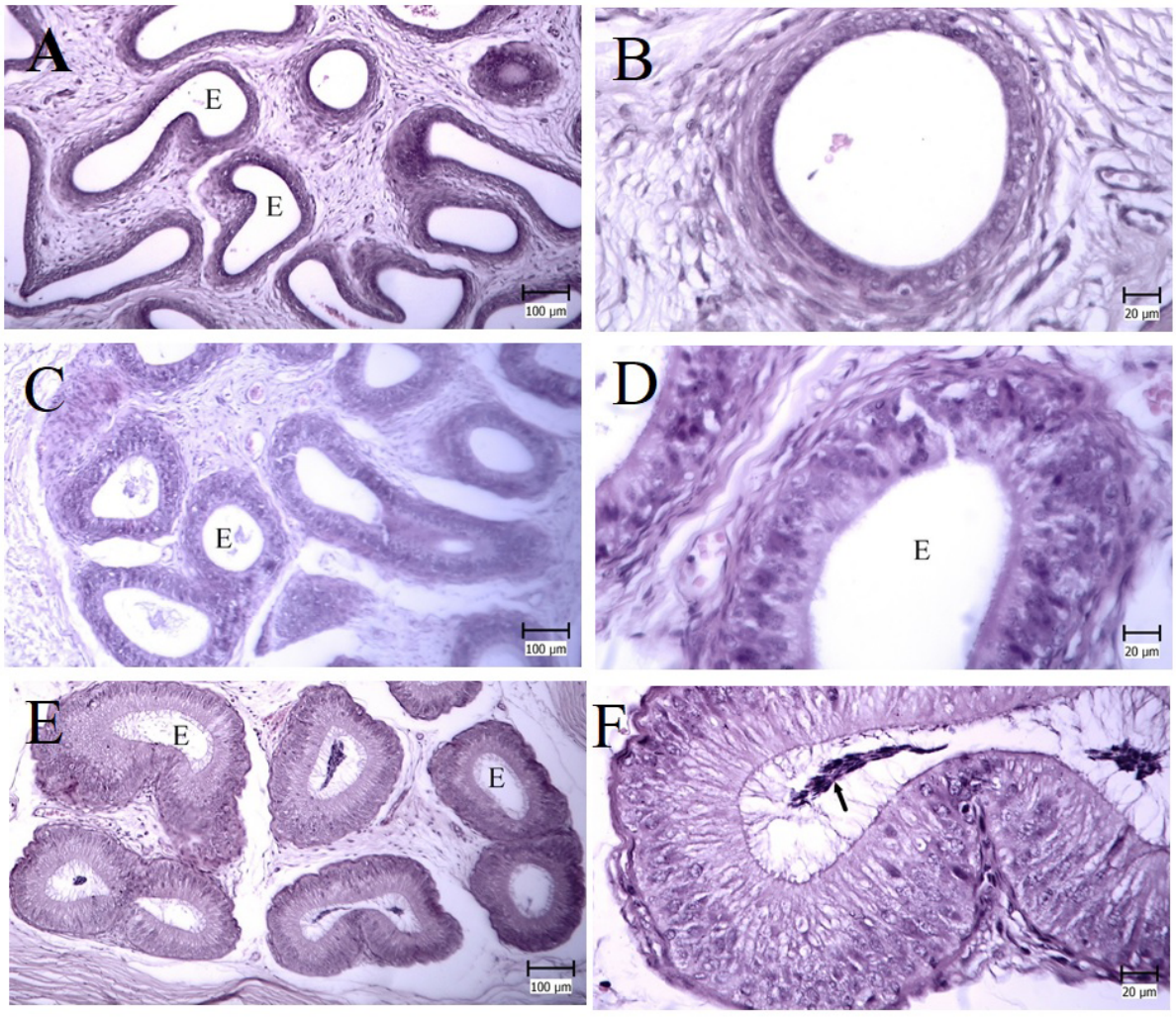

Figure 3. Premature testicle (H&E)

A) In epididymal tubes, the smallness of the tubes and their thin mucus;

B) Part of previuse figure with higher magnification (thin mucus of the epididymal tube;

C) Epididymal ducts, with matching pseudoepithelial tissue (E);

D) Part of previuse figure with greater magnification;

E) Epididymal ducts with pseudo-matched epithelial tissue, accumulations of spermatozoa cells inside them

F) Part of previuse figure ith greater magnification, epididymal ducts have pseudo-matched epithelial tissue and many spermatozoa

one of the cases, numerous erythrocytes were observed in the interstitial tissue. In three dogs, spermatogenesis was observed in the opposite testis, and spermatozoa cells were visible in the epididymal tubes also; however, in one dog, the testicle on the opposite side underwent degeneration, and spermatozoa was not observed in the seminiferous tubules and epididymis (Figure 4).

Testicular degeneration

The frequency of testicular degeneration was 14 testicles out of 77(18.18%) and 31.11% in the examined samples. In these samples, the cessation of spermatogenesis could be seen in the absence of stages of spermatogenesis in the covering tissue of the tubes. Also, the cytoplasm of Sertoli cells was vacuolated, and inside some tubes were visible giant spermatid cells. These cells had many nuclei with a cytoplasm. Local fibrosis of the in-

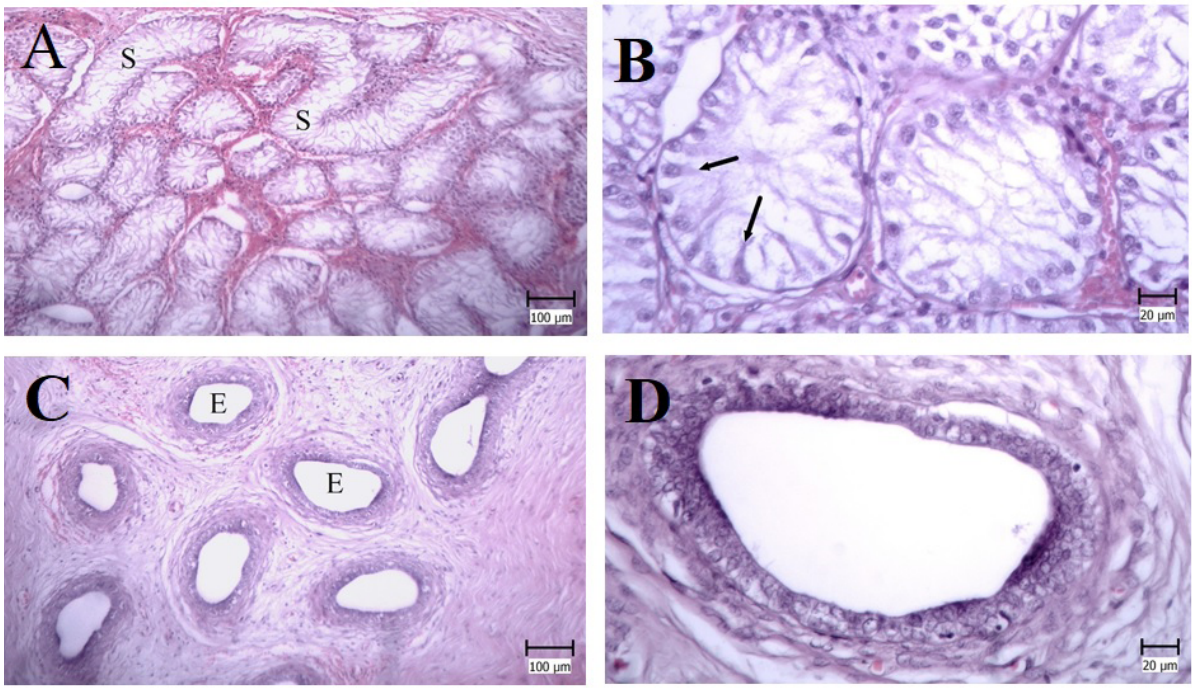

Figure 4. Cryptorchidism (H&E)

A) Note the presence of seminiferous tubules (S) covered by a row of cells

B) Part of previuse figure with greater magnification. Seminiferous tubules can be seen lined with a row of Sertoli cells (arrow) (pay attention to the location of the cells' nuclei and their pink and elongated cytoplasm)

C) In epididymal tubes (E), pay attention to the smallness of the tubes and their thin mucus (epididymis)

D) Epididymal tubes (E). Part of previuse figure with higher magnification (pay attention to the smallness of the tubes and their thin mucus [epididymis])

terstitial tissue was also seen, along with the formation of cysts and thickening of the basal membrane in some sample tubes (Figure 5).

Epididymitis

Of 45 samples with lesions, 22 cases (48.89%) had epididymitis. The frequency of the total lesion was 28.57% in the samples. Dogs with epididymitis were of different ages. Severe hyperplasia of the mucous membrane covering the epididymis was observed in these samples. Proliferated cells could be seen in the form of curtains protruding from the surface of the mucosa, and in some cases, cysts were formed inside the mucosa. Also, mononuclear inflammatory cells and severe fibrosis accumulations were seen around the epididymal tubes.

Regarding fibrosis, there were several layers of connective tissue around the tubes, and in some cases, the thickness of this layer was very high. In twelve cases, epididymitis and degeneration were observed simultaneously. In two cases of chronic epididymitis, it was simultaneously accompanied by bleeding, which was determined by the presence of a large number of erythrocytes inside the epididymal and seminiferous tubes and between the seminiferous tubules unilaterally (Figure 6).

Inclusion bodies

Another finding in this research was the observation of intranuclear and cytoplasmic inclusion bodies. These inclusions were associated with chromatin bordering in the nucleus and vacuole formation in the cytoplasm. They were eosinophilic. This microscopic finding was diagnosed in 29 dogs. In 21 cases, epididymitis was also observed simultaneously, determined by fibrosis around the ducts and mucous hyperplasia. In two cases, less than 1-year-old, chronic epididymitis was observed, in addition to intranuclear and intracytoplasmic inclusions. In 12 cases of testes with degeneration, nuclear and cytoplasmic inclusions were observed also. In one of the 5-year-old dogs, inclusions were very high inside the epididymal cells and the seminiferous tubule cells (primary and secondary spermatocytes). In this sample, the cessation of spermatogenesis was also evident.

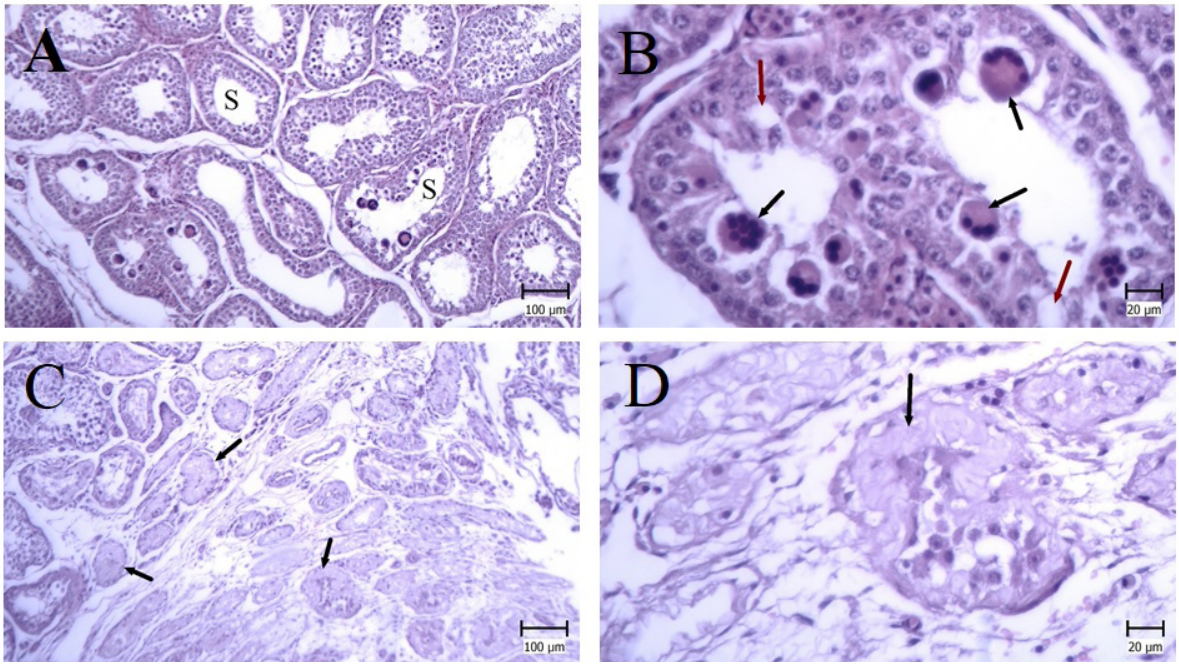

Figure 5. Testicular degeneration (H&E)

A) There is an absence of spermatogenesis in the seminiferous tubules (S) and thinning of the lining of the tubules

B) Absence of spermatogenesis in the seminiferous tubules, thinning of the mucus covering these tubes, numerous vacuoles inside the mucus (red arrow), and giant cells (black arrow)

C) An increase in the thickness of the basal membrane of the seminiferous tubules and hyalinization (arrow)

D) Part of with higher magnification. An increase in the thickness of the basal membrane of the seminiferous tubules and hyalinization (arrow)

In a 4-year-old dog, the presence of inclusion was accompanied by severe destruction of epididymal cells. In this sample, lymphocytic vasculitis was observed, accompanied by many lymphocytes in the arteriole wall and its surroundings. Intranuclear and intracytoplasmic inclusions were also observed in the cells inside the vessel wall (Figure 7).

Hemorrhage

Hemorrhage was seen in 5 cases (11.11%) of 45 testicles with lesions. A large number of erythrocytes were observed between and inside the seminiferous tubules.

Discussion

The present study investigated testicular tissue damage and epididymis in 77 dogs. Testicular tissue degeneration was one of the most important cases, and it was observed in 18.1% of cases. In these samples, the cessation of spermatogenesis was evident in the form of the absence of spermatogenesis stages in the covering tissue of the tubes, as well as the cytoplasm of Sertoli cells was vacuolated and inside some tubes were visible giant spermatid cells.

Various factors can affect testicular hemodynamics in animals, such as environmental (thermal and seasonal effects) and physiological factors (species, breed, age, size, body weight, and maturity) (Samir et al., 2022). Since infectious agents such as Canine Distemper Virus (CDV), mycoplasmas, blastomycosis, *Brucella canis*, *Leishmania infantum,* rickettsial agents, such as Ehrlichiosis and Rocky Mountain spotted fever are involved in creating chronic orchitis and epididymitis, attention should be paid to important factors during examination. The blood-testis barrier is important in the immune response to spermatocide antigens. When this barrier is damaged, orchitis occurs, caused by the invasion of lymphocytes into the testicular tissue, and sometimes causes infertility in animals. It should be noted that in some animals with diseases of the male reproductive system (testicles), no clinical symptoms may be seen by the owner or even the veterinarian, and the only reason for referral is the infertility of the animal (Ettinger & Feldman, 2015; Manna et al., 2012; Egloff et al., 2018; Groch et al., 2020; Jameie et al., 2020; Camargo-Castaneda et al., 2021).

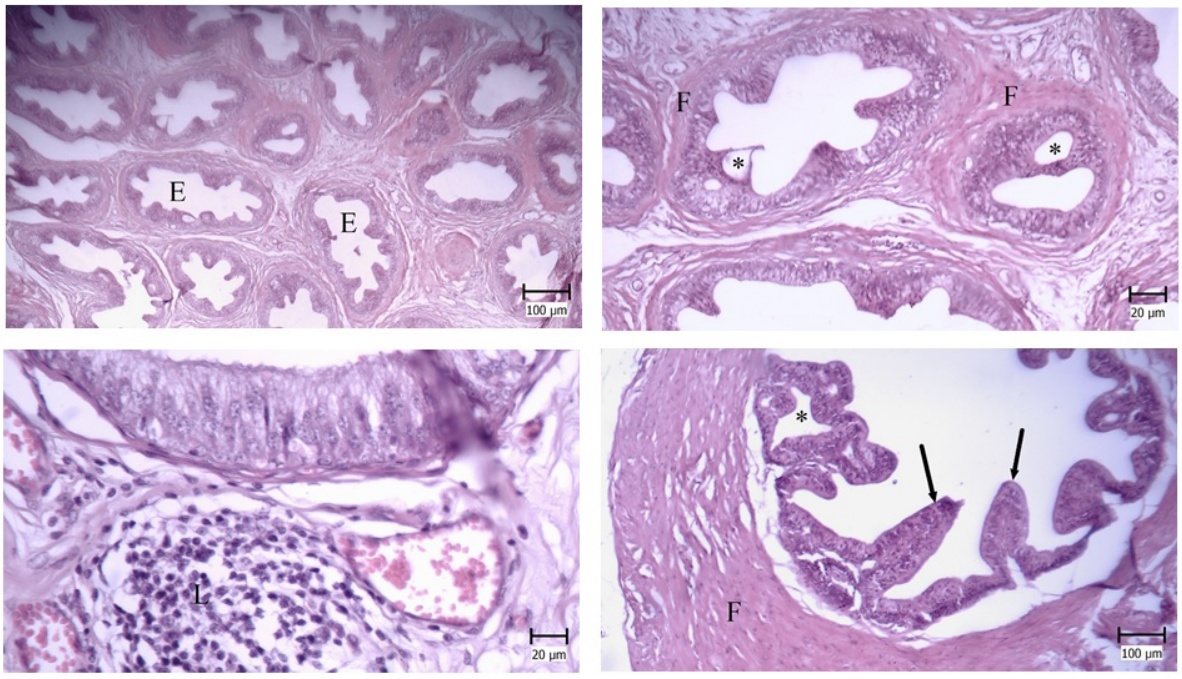

Figure 6. Epididymitis (H&E)

Notes: A) Multiple membranes in the mucus of the epididymal tubes [E]; B) Numerous cysts (asterisks) in the epididymal mucosa, which were caused by the hyperplasia of the cells covering the tubes, Also, several rows of connective tissue (F) could be seen around the epididymal tubes; C) The accumulation of mononuclear inflammatory cells (L) in the interstitial tissue of the epididymal tubes; D) The presence of multiple membranes formed (arrow) in the epididymal mucosa, which was caused by the hyperplasia of the cells covering the tubes. Also, a thick layer of connective tissue (F) could be seen around the epididymal tubes.

Temperature changes and heat stress are other factors that cause testicular degeneration. A study of 138 dogs that lived in tropical areas was sampled, and based on the microscopic results, testicular degeneration was the most common tissue damage (64.8%) (Ortega-Pacheco et al., 2006). Sampling was done from dogs living in the UK, Finland, and Denmark to investigate the effects of geographical regions on testicular morphology. According to their reports, testicular degeneration was significantly higher in dogs living in Finland, which indicates the influence of geography and environmental factors on testicular function. Testicular degeneration may be caused by seasonal performance, light effects, environment, toxins, aging, and infectious agents (Sumner et al., 2021). The present study was conducted in Ahvaz County (southwest of Iran), in a warm and wet climate. The humidity level reaches its peak in the summer season.

Several studies have shown that increasing the temperature of the environment can interfere with the temperature regulation mechanism of the testicles, disturb the evaporative heat loss from the surface of the scrotum, and lead to an increase in the temperature inside the testicle. This condition increases the metabolism of the testicle and the need for oxygen, resulting in hypoxia and the formation of reactive oxygen species, which has a significant effect on the reduction of sperm production and damage to the testicular tissue (Adwell et al., 2018). Various studies have shown that there are chemicals in dog testicle tissue and seminal plasma in concentrations that can inhibit sperm movement in laboratory conditions (Lea et al., 2016; Sumner et al., 2020). In the present study, another important finding was intranuclear and intracytoplasmic inclusions in the mucous cells covering the epididymal tubules. According to the color and type, these inclusions are caused by paramyxovirus infection.

Aging is one of the most common causes of testicular degeneration. In this research, 9 out of 14 dogs with degeneration were over 5 years old. Aging in dogs is associated with a decline in epididymal sperm quality. An age-related increase in the incidence of poor epididymal sperm quality may cause infertility, especially in older dogs (Bhanmeechao et al., 2018a). In a study on 78 dogs affected by mammary gland tumors, intraductal papillary carcinoma and complex carcinoma had the highest incidence. The researchers announced that the risk of malignant tumors increased in intact purebred females

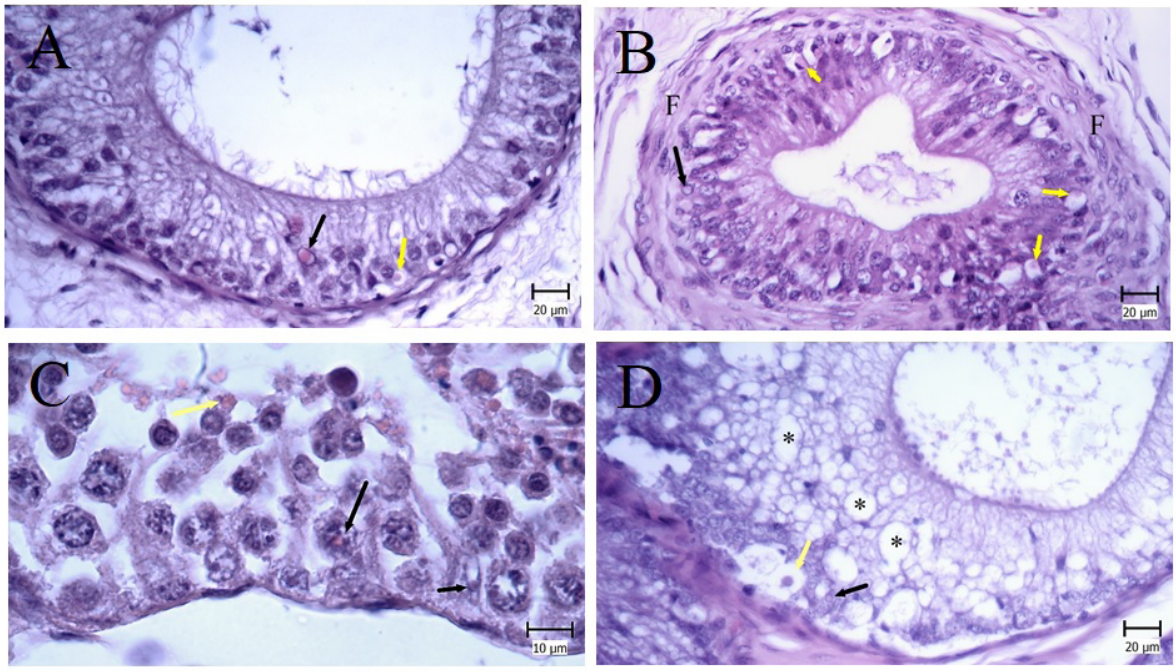

Figure 7. Intranuclear and cytoplasmic inclusion bodies (H&E)

A) Eosinophilic inclusion bodies inside the nucleus (black arrow) and the cytoplasm (yellow arrow) in the cells covering the mucous membrane of the epididymal ducts

B) Part of previuse figure with higher magnification. Intranuclear (black arrow) and intracytoplasmic (yellow arrow) eosinophilic inclusions are seen in the cells lining the epididymal ducts with fibrosis (F) around the epididymal ducts

C) Eosinophilic inclusions are seen in the nucleus (black arrow) and cytoplasm (yellow arrow) in primary and secondary spermatocyte cells

D) Eosinophilic inclusions are seen in the nucleus (black arrow) and the cytoplasm (yellow arrow) in the cells lining the epididymal ducts (pay attention to the presence of numerous large vacuoles in the mucus along with the destruction of the cells covering the epididymal mucus)

as the individual ages (Golchin et al., 2023). Tumors are generally formed in old age. Chondrosarcoma was recognized in a 9-year-old cat (Shokrpoor et al., 2021). In another study, age-related changes with interstitial fibrosis and degeneration of testicular germ cells in 55 dogs show a direct relationship between the degeneration of spermatogenic tubes and the reduction of spermatogenesis and interstitial fibrosis in old dogs (Bhanmeechao et al., 2018b). In another study, testicular degeneration is the most common microscopic injury. According to researchers, testicular degeneration reduces the attention of healthy sperm, which can have a living effect on sperm count and reproductive performance of the animal (Camara et al., 2014). In yet another study on 100 male dogs, the most severe lesions are degeneration of the seminiferous tubules, hyalinization of the basal membrane of these tubules, and fibrosis (Latifi et al., 2021). Other researchers have also reported the existence of viral inclusion within the epididymis (Foster, 2016). In a study on the fishing otter infected with CDV, intranuclear and cytoplasmic inclusions were reported in the epithelium of the bladder and epididymis (Keller et al., 2012).

Considering the many causes of intranuclear and intracytoplasmic inclusions, including CDV, it is emphasized that purebred dogs intended for breeding should not be kept in kennels and shelters. In the present study, 28.57% of the samples had epididymitis. Severe hyperplasia of the mucous membrane covering the epididymis was observed in these samples. Proliferated cells could be seen in the form of curtains protruding from the surface of the mucosa, and in some cases, cysts were formed inside the mucosa. Epididymitis and degeneration were observed simultaneously in 12 of the samples. Two cases of chronic epididymitis were associated with bleeding. Another finding was the observation of intranuclear and intracytoplasmic inclusions, which were seen in 29 cases. In 21 cases, epididymitis was also visible simultaneously, determined by the presence of fibrosis around the ducts and mucous hyperplasia.

Bleeding was seen in 6.4% of the samples. The simultaneous occurrence of epididymitis and intranuclear and intracytoplasmic inclusions in many dogs can indicate that epididymitis occurs due to the damage caused by virus infection and the destruction of duct lining cells. Mucous hyperplasia and fibrosis around the ducts can be a compensatory response against the damage caused by the virus. Another histopathological injury that was diagnosed simultaneously with inclusions was testicular degeneration. This damage may also have occurred due to virus contamination (mainly CDV), and the virus has destroyed spermatocytes or Sertoli cells, which stops spermatogenesis (Ettinger & Feldman, 2015).

In another study to determine the feasibility of laparoscopic cryptorchidism in the treatment of cases of simple cryptorchidism and neoplastic testicles in 15 dogs, unilateral cryptorchidism was found in 12 cases, of which 9 had right-sided cryptorchidism (Lew et al., 2005). In a study that surgically induced cryptorchidism lesions in dog testicles, histopathological data show that the testicular spermatogenic tubes and epididymis contain fewer germ cells and severe atrophy (Jhun et al., 2018).

In the present study, the microscopic evaluation of the samples showed the presence of various lesions in 58.44% of the cases. In 89.8% of the affected dogs, they had unilateral scrotum. The covering tissue of the seminiferous tubules in the affected testes consisted of only Sertoli cells, which had a red cytoplasm towards the center of the tube, and the nucleus was present at the base of the cell. In the present study, 68 cases of dogs had testicles with normal appearance, and 4 cases of dogs were suffering from cryptorchidism. In 5 cases, the epididymis was swollen and with dilated spaces. It investigated the clinical and histopathological aspects of cryptorchidism in dogs and cats. The researchers' results showed that among 98 dogs and cats, 11(11.22%) had cryptorchidism. In their study, most dogs of the Maltese breed, Anatolian Shepherd, Terrier, Persian, Turkish Angora, and domestic short-haired breeds were more affected. The location of hidden testicles varied from the inguinal to the intra-abdominal region, and they were unilateral or bilateral (Othman et al., 2022).

In the present study, in the microscopic examination, based on the histological characteristics, the testes were seen in three stages: immature, maturing, and mature. In the immature stage of the testicular tissue of two dogs, 7 and 8 months old, the seminiferous tubules were covered by a row of cells, spermatogonia, and Sertoli cell nuclei. The maturing testes were seen in the testicular tissue of 8 collared dogs. In the maturation stage, different degrees of spermatogenesis were observed in the seminiferous tubules (in 67 cases), indicating puberty. Another study on 80 beagle dogs showed that hypospermatogenesis inside the seminiferous tubules was observed in 75% of 6-7 months old dogs; this ratio was 10% in dogs older than 11 months. Hypoplasia or atrophy of the seminiferous tubules was seen in 25-40 dogs under 12 months; this ratio decreased to 14% to 17% in dogs between 12- 36 months. The researchers announced that dogs at least 10 months old can be used for microscopic evaluation of the testicles; of course, to minimize random findings, dogs should be over 12 months old (Goedken et al., 2008).

The most common testicular tumors include seminoma, Leydig cell tumor, Sertoli cell tumor, and mixed tumors. The age of dogs with testicular tumors was between 2 and 19 years. Testicular neoplasias are usually observed in old dogs (Manuali et al., 2020). A case of cryptorchidism was described within the left inguinal canal in a collared dog. The testicle affected by cryptorchidism had a Leydig cell tumor, and seminoma was observed in the healthy testicle (Bigham et al., 2009). Some other researchers aimed at investigating testicular precancerous lesions such as immaturity and atrophy and comparing them with immunohistochemistry in the testicles of 26 male dogs of different ages and breeds suffering from cryptorchidism and showed the amount of atrophy and degenerative changes in affected testicles (Pecile et al., 2021).

Cytological evaluation of the testicular tissue plays a role in diagnosing dog infertility. However, there are relatively few reports on the normal cytological features of the testis, which is in contrast to human medicine, where the normal cytology of the testis is fully described. Santos et al. (2010) evaluated the cytology of normal testicular tissue in 6 male dogs aged 3 to 8 years without testicular pathology. The samples showed low blood contamination and a heterogeneous population of isolated or packed cells with high pleomorphism. Their study shows that the obtained cells are similar to men's cells, although there are some characteristics, such as the much larger size of Sertoli cells and the very vacuolated appearance of Leydig cells in dogs.

In conclusion, considering the relatively high prevalence of testicular degeneration, epididymitis, and the presence of inclusions in the studied dogs, castration in males and histopathological evaluations are very important for a definitive diagnosis of complications because they can lead to infertility, especially in purebred dogs that are kept in shelters and are usually exposed to pathogens (including *Canine distemper* and *Brucella canis*).

Considering the relatively high prevalence of testicular degeneration, epididymitis, and the presence of intranuclear and intracytoplasmic inclusions in dogs in Ahvaz County, castration in males and histopathological evaluations are very important for a definitive diagnosis of complications. They can lead to infertility, especially in purebred dogs that are kept in shelters.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations in this research.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

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مقاله پژوهشی

ارزیابی پاتولوژیکی بافت بیضه در سگ‌های اخته شده در شهرستان اهواز، استان خوزستان

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چکیده

زمینه مطالعه: علیرغم تحقیقات زیادی که در زمینه بیماریهای دستگاه تناسلی (بیضه و اپیدیدیم) در سگ‌ها انجام شده است؛ اما هنوز میزان دقیق عوارض تولید مثلی، مشخص نیست.

هدف: هدف از انجام مطالعه حاضر، ارزیابی یافته‌های بالینی، ماکروسکوپی و هیستوپاتولوژی بافت بیضه و اپیدیدیم در سگ‌های منطقه اهواز، استان خوزستان بود.

روش کار: در مطالعه حاضر، ۷۷ نمونه از بیضه سگ‌های نر، در سنین مختلف (از ۷ ماه تا ۱۲ سال)، مورد ارزیابی قرار گرفتند. پس از ارزیابی ماکروسکوپی، بافت‌های بیضه و اپیدیدیم در ظرف حاوی فرمالین بافر ۱۰ درصد قرار گرفتند و مراحل رنگ‌آمیزی دنبال شدند.

نتایج: شصت و هشت مورد از سگ‌ها، دارای بیضه‌هایی با ظاهر طبیعی بودند. ۴ مورد از سگ‌ها مبتلا به کریپتورکیدیسم بودند که در معاینه بالینی مشخص گردید. در ۵ مورد، اپیدیدیم متورم و با وجود فضاهای متسع مشخص گردید. مطالعه میکروسکوپی صورت گرفته بر روی نمونه‌ها، نشاندهنده وجود ضایعات متنوعی در ۴۵ نمونه، معادل ۵۸/۴۴ درصد از نمونه‌ها بود. از ۴۵ نمونه ضایعه‌دار، ۴ مورد (۸/۸۹ درصد)، نهان‌بیضگی یک طرفه داشتند. دژنرسانس بافت بیضه یکی از مهمترین مواردی بود که در ۱۴ مورد (۳۱/۱۱ درصد) مشاهده گردید. از ۴۵ نمونه ضایعه‌دار، ۲۲ مورد (۴۸/۸۹ درصد) مبتلا به اپیدیدیمیت بودند. در این نمونه‌ها، هیپرپلازی شدید مخاط پوشاننده اپیدیدیم مشاهده گردید. در ۱۲ مورد از نمونه‌ها، به شکل همزمان اپیدیدیمیت و دژنرسانس مشاهده گردید. دو مورد از اپیدیدیمیت‌های مزمن همراه با خونریزی بودند. یافته دیگر، مشاهده گنجیدگی‌های درون هسته‌ای و داخل سیتوپلاسمی بود (در ۲۹ مورد). در ۲۱ مورد، به طور همزمان اپیدیمیت نیز قابل مشاهده بود که با وجود فیبروز اطراف مجاری و هیپرپلازی مخاط مشخص گردید. خونریزی در ۵ مورد (۱۱/۱۱ درصد)، دیده شد.

نتیجه‌گیری نهایی: با توجه به شیوع نسبتا بالای دژنرسانس بیضه، اپیدیدیمیت و حضور گنجیدگی‌های داخل هسته‌ای و داخل سیتوپلاسمی، اهمیت اخته‌کردن سگ‌ها در سنین جوانی و ارزیابی‌های هیستوپاتولوژیک بسیار حائز اهمیت است؛ چرا که این عوارض، می‌توانند منجر به ناباروری، بویژه در سگ‌های اصیل که در پناهگاه‌ها نگهداری می‌شوند، گردد (بهدلیل روند مزمن برخی از بیماری‌های عفونی).

کلیدواژه‌ها: کریپتورکیدیسم؛ سگ؛ اپیدیدیم؛ هیستوپاتولوژی؛ بیضه

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