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Comparative and Pathological Study of the Testis and Epididymis in Rams, Bucks and Bulls of Algeria

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ABSTRACT

The objective of present study was to determine the prevalence of testicular pathology in three important domestic species in Algeria and thus show their relationship to infertility in our farms. The study describes the incidence of testicular pathology in apparently healthy young and adult slaughtered rams, bucks and bulls. Out of 886 animals examined (450 rams, 285 bucks and 151 bulls), 59 (13,11%) had testicular lesions. 596 were aged less than one year old and 290 were aged more than one year old. The incidence of testicular lesions in rams and bucks was respectively 8.44 and 5.26%. It was about 3.97% in bulls. Testicular hypoplasia was the most common lesion occurring in rams (3.33%) and bucks (2.10%). The testis was disproportionately smaller than the epididymis. The second most common lesion found was cryptorchidism, 3.11% in rams and 2.10% in bucks. The other lesions detected in rams were orchitis and epididymitis (1.33%), varicocele (0.44%) and epididymal aplasia (0.22%). The inflammatory changes (orchitis and epididymitis) were observed in bulls as first common testicular lesion (3.31%) and the second one was hypoplasia (0.66%). The prevalence of testicular pathology identified in our study seems important in rams compared to goats and bulls.

Key words: Testis, epididymis, pathology, ram, buck, bull

INTRODUCTION

Testicular pathology is an important factor of infertility in sheep, goats and cattle (McEntee 1990). Many studies were performed on the genital organs disorders in all the world. In some studies about investigations of testicular pathology in rams, bucks and bulls, congenital abnormalities such as hypoplasia and cryptorchidism have been reported by many authors (Watt, 1978; Gimbo *et al.*, 1987; Tarigan *et al.*, 1990; Galloway *et al.*, 1992; Regassa *et al.*, 2003; Kafi *et al.*, 2007; Boucif *et al.*, 2008).

Inflammatory changes (orchitis and epididymitis) in the testes and the epididymis may all so cause infertility. The most common and important lesions registered was orchitis and epididymitis. These conditions have been reported by Hibret *et al.* (2001), Siddiqui *et al.* (2005) and Boucif *et al.* (2011) in rams.

The aim of the present study was to describe testicular and epididymal pathology in rams, bucks and bulls under Algerian conditions and learn more about functional and pathomorphological changes especially in the testis.

MATERIALS AND METHODS

Testes and epididymis of slaughtered 450 rams, 285 bucks and 151 bulls from local Algerian breeds and different ages were examined during November 2010 to June 2011 for detecting pathological changes. Samples were collected from Tiaret abattoir and post-mortem examination of the testes and epididymis was carried out immediately after slaughter. The scrotal wall was incised and the testes were removed and examined. The scrotal circumference was not considered in this study. The organs from each animal were identified, labelled and transported to the laboratory. Pathological examination was performed macroscopically to determine the presence of lesions. Dissections into the parenchyma of the testes were done for detecting gross pathological changes. The findings for each animal were recorded. Tissue of affected organs were fixed in 10% formalin, routinely processed and embedded in paraffin wax. Section cut at 5 µm thickness were stained with Hematoxylin and Eosin (HE) for microscopic examination.

RESULTS AND DISCUSSION

Testes and epididymis of 886 rams bucks and bulls from different ages bred under the local environmental condition of Algeria and slaughtered at Tiaret abattoir were subjected to morphopathological investigation and microscopical examination in order to detect testicular lesions, Table 1. Out of 886 animals examined, 59 (13.11%) had testicular lesions. 596 were aged less than one year old and 290 were aged more than one year old.

In rams and bucks: The incidence of testicular lesions in rams and bucks was 8.44 and 5.26%, respectively.

The different lesions observed in the testes and epididymis of slaughtered rams and bucks were illustrated in Table 2 and 3, respectively.

Table 1: Incidence of testicular lesions in rams, bucks and bulls

Age (year)	Animals	Lesions (%)
<1	596	35 (20.46)
>1	290	24 (8.60)
Total	886	59 (13.11)

Table 2: Incidence of testicular lesions in rams

Lesions	Unilateral	Bilateral	Total	Incidence (%) (N = 450)
Hypoplasia	13	2	15	3.33
Cryptorchidism	8	6	14	3.11
Orchitis/Epididymitis	5	1	6	1.33
Varicocele	1	1	2	0.44
Epididymal aplasia	1	-	1	0.22
Total	28	10	38	8.44

Table 3: Incidence of testicular lesions in bucks

Lesions	Unilateral	Bilateral	Total	Incidence (%) (N = 285)
Hypoplasia	4	2	6	2.10
Cryptorchidism	6	-	6	2.10
Epididymitis	1	2	3	1.05
Total	11	4	15	5.26



Fig. 1: Left unilateral hypoplasia



Fig. 2: Bilateral hypoplasia in ram and buck

Hypoplasia: Testicular hypoplasia dominated other genital disorders in rams and bucks. The 15 (3.33%) cases of hypoplasia were detected in rams and 6 (2.10%) in bucks. Thirteen were unilateral and only two cases were bilateral in rams (Fig. 1). In bucks, four cases were unilateral and two were bilateral (Fig. 2).

Hypoplasia can be associated to a specific chromosomal abnormality in rams and intersex condition in bucks. Heat and cold stress can be the other causes.

Histologically, no tubules have germinal cells but they contained sertoli cells. The tubules were small in diameter, they have a thin basement membrane and there was hyperplasia of Leydig cells (Fig. 3).

Cryptorchidism: Retained, undescended or 'hidden' testis was the second most common testicular abnormality detected. Out of 450 rams and 285 bucks examined, 14 (3.11%) and 6 (2.10%) had cryptorchidism, respectively. Eight cryptorchid testes were unilateral, 6 were bilateral in rams and 6 were unilateral in bucks (Fig. 4, 5).

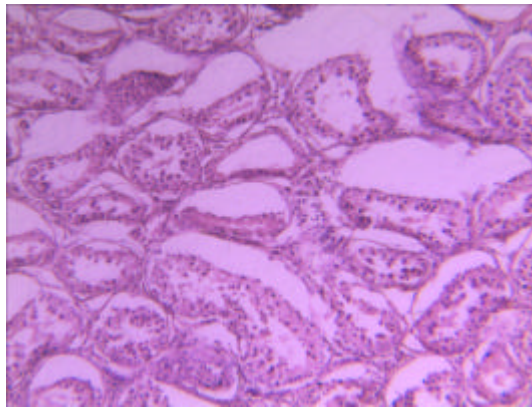


Fig. 3: Testicular hypoplasia in ram, seminiferous tubules presenting no spermatogenic activity
HE, obj.10x



Fig. 4: Retained testes in ram



Fig. 5: Right retained testis in buck

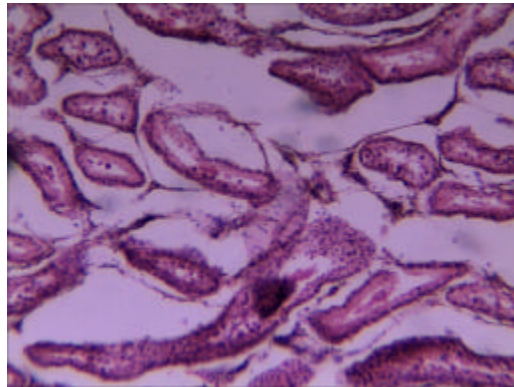


Fig. 6: Orchitis in ram, presence of lymphocytes, plasma diffuse infiltrate lymphocytes and cells and necrosis between plasma cells

Grossly, the retained cryptorchid testes were smaller in size. They were located in the abdominal cavity in 12 cases (8 unilateral and 4 bilateral) in rams and in 5 cases in bucks. They were subcutaneously located in the ventral perineum after the inguinal outlet in 2 cases (bilateral) in rams and in one case in bucks.

Histologically, the seminiferous tubules of the cryptorchid testis were hypoplastic with poorly differentiated germinal epithelium, with or without central hollow and in some testes, the tubules were separated by expanded areas of connective tissue.

Orchitis/Epididymitis: Inflammatory changes in testes and epididymis were observed in six cases with an incidence of 1.33% in rams. The lesions were unilateral in five cases and bilateral in only one.

Histologically, inflammatory reaction in orchitis was characterized by the presence of lymphocytes, plasma cells and fibrosis between seminiferous tubules in the type one and besides the infiltration of inflammatory cells, there was coagulation necrosis in the seminiferous tubules in the second type (Fig. 6).

Epididymitis was observed in the body of the epididymis in three cases in rams. The incidence in bucks was 1.05% (1 case unilateral and 2 cases bilateral).

Histologically, the lesion was focal and characterized by the presence of lymphocytes and proliferation of interstitial connective tissue (Fig. 7).

Varicocele: A dilation (enlargement) of the internal spermatic veins that drain the testicle was visible macroscopically. Varicocele was observed in two cases (0.44%), one case was unilateral (right side) and one case was bilateral.

Epididymal aplasia: It was unilateral and was observed in only one case (0.22%). In bulls the incidence of testicular lesions in bulls was 3.97%. Inflammatory changes were the first common testicular lesions in bulls (Table 4).

Orchitis and epididymitis: These inflammatory changes were detected in 05 (3.31%) cases. Orchitis was observed in 2 cases, epididymitis in one case and epididymo-orchitis in 2 cases and was bilateral (Fig. 8). Orchitis and epididymitis were probably of infectious origin in bulls.

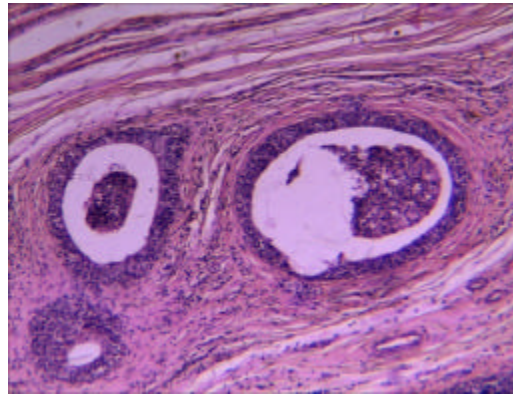


Fig. 7: Epididymitis in ram, polymorphonuclear seminiferous tubules HE, obj.10x cells surrounding tubal structures and occupying their lumen HE, obj.10x



Fig. 8: Epididymo-orchitis in bull

Table 4: Incidence of testicular lesions in bulls

Lesions	Unilateral	Bilateral	Total	Incidence (%) (N= 151)
Orchitis/ Epididymitis	01	04	05	3.31
Hypoplasia	01	-	01	0.66
Total	02	04	06	3.97

Orchitis was most probably as consequence of an ascending infection. Macroscopically, the lesion was visible as solitary or multiple white-yellow foci of up to 1 cm in diameter. Histologically, the tubular outline was intact in the affected areas but the seminiferous epithelium was obliterated. Numerous macrophages and multinucleated giant cells that surround attendant neutrophils and debris were seen.

Hypoplasia: One case of testicular hypoplasia was observed in bulls and it was unilateral.

The hypoplastic animal presented flaccid testicular consistency and small size of testes.

The incidence of the pathological genital changes was determined as 8.44% in rams, 5.26% in bucks and 3.97% in bulls.

The incidence of hypoplasia was 3.33% in rams, 2.10% in bucks and 0.66% in bulls.

Testicular degeneration and testicular hypoplasia are difficult to differentiate during an initial examination (Pugh, 2002).

In rams and bucks out of season, testicular size and palpation characteristics may be difficult to differentiate from subtle cases of testicular atrophy. More extreme differences are encountered in rams than in goats, but in general the testis in the non-breeding season is smaller and lacks normal resiliency (Pugh, 2002).

The difference in size is theoretically because of a reduction in either the number of tubules, the length of tubules, the diameter of the tubules, or one or more combinations of these. Germ cells may be absent or present but fail to produce enough spermatozoa. Germ cells may have failed to migrate to the genital ridge en utero, failed to migrate in sufficient numbers, failed to survive, have arrested development, undergo (Foster, 2010).

Watt (1978) reported an incidence of 40% of gross lesions in testes of 2281 Merino rams of wide age range examined at 3 abattoirs in Perth, Western Australia and when testicular hypoplasia/atrophy represented 14 cases while Regassa *et al.* (2003) reported an incidence of 28.1% in rams and 17.8% in bucks. Testicular atrophy represented 9.7% on 404 bucks and 12.6% in rams.

The incidence of hypoplasia reported in this present study, 15 (3.33%) in rams is roughly similar to the incidence reported by Watt (1978) and lower than the incidence reported by Regassa *et al.* (2003).

True hypoplasia can be associated with the intersex condition in bucks and a specific chromosomal abnormality in rams. Other causes of testicular atrophy include zinc deficiency, hypothyroidism, starvation diets, systemic disease and heat and cold stress (Pugh, 2002).

In bulls, testicular hypoplasia represented only an incidence of 0.66%. Oliveira *et al.* (2011) reported a high incidence (11.8%) of testicular hypoplasia in bulls aged between 36 and 48 months. The incidence reported in the present study is much lower than the incidence reported by the author mentioned above.

Testicular hypoplasia can affect one or both testes. The condition has been associated with cryptorchidism and a variety of hereditary diseases such as XXY chromosome disorder (Klinefelter's syndrome). A tendency towards high carriage of the scrotal contents in certain breeds or family lines predispose to some degree of testicular hypoplasia and subfertility (Sargison, 2008).

The incidence of cryptorchidism was 3.11% in rams, 2.10% in bucks. It was the second testicular anomaly observed in rams and bucks only.

Eight cryptorchid testes were unilateral, 6 were bilateral in rams and 6 were unilateral in bucks.

Grossly, the retained cryptorchid testes were smaller in size. They were located in the abdominal cavity in 12 cases (8 unilateral and 6 bilateral) in rams and in 5 cases in bucks. They were subcutaneously located in the ventral perineum after the inguinal outlet in 2 cases in rams and in one case in bucks. Six cryptorchid testes were unilateral in bucks.

Boucif *et al.* (2008) reported a high incidence (64%) of cryptorchidism in rams. All cases of cryptorchidism identified were found in the testes located in the abdominal region. Bilateral cryptorchidism (64%) was significantly more frequent compared to unilateral (36%).

Kafi *et al.* (2007) reported an incidence of 2.9% of cryptorchidism in native bucks reared in Southern Iran and Smith *et al.* (2007) reported an incidence of 7.4% (ranging from 2.4 to 18.2% in different years) in ram lambs of the North Ronaldsay breed.

Igbokwe *et al.* (2009) reported an incidence of 0.6% in Nigerian Sahel male goats (bucks).

The incidence of cryptorchidism reported by this study is lower than the incidence reported by Boucif *et al.* (2008) and Smith *et al.* (2007). Unilateral cryptorchidism was frequent than bilateral in rams Boucif *et al.* (2008). While, the incidence in bucks 2.10% was not far from the incidence reported by Kafi *et al.* (2007) but higher than the incidence reported by Igbokwe *et al.* (2009).

Partial or total cryptorchidism is a common problem in rams. Most unilaterally cryptorchid rams remain fertile and cryptorchid animals of particular phenotypic merit are often used in pedigree breeding flocks. However, poor pregnancy rates may follow when cryptorchis rams are introduced to large numbers of ewes. Furthermore, the high incidence of cryptorchidism of 0.5% in some ram breeds suggests that there might be a hereditary basis for the problem and that is unwise to retain affected animals (Sargison, 2008).

Orchitis and epididymitis were detected in 5 (3.31%) cases in first, 2 cases of orchitis, 2 cases of epididymo-orchitis and 1 case of epididymitis were detected in bulls. Orchitis and epididymitis were observed in 6 (1.33%) cases in rams as third testicular lesion and epididymitis in 3 (1.05%) cases in bucks. Costa *et al.* (2007) reported a high incidence (7.5%) of orchitis and 9.4% of epididymitis in rams. The incidence of orchitis and epididymitis in rams (1.33%) reported by our study is lower.

Orchitis is a common occurrence in the ram and is occasionally seen in the buck (Pugh, 2002). It can be of infectious origin in rams (McEntee, 1990).

Orchitis may be accompanied by periorchitis and epididymitis. Bacterial invasion may develop hematogenously, through retrograde migration from the ductus deferens and epididymis, or directly through wounds of the scrotal skin. The swollen scrotum of affected bulls is hot and doughy and may become filled with a fibrinopurulent exudate (Barth, 2006).

Epididymitis in the present study was observed in the body of the epididymis in 03 cases in rams. The incidence in bucks was 1.05% (1 case unilateral and 2 cases bilateral).

Epididymitis is a rare condition in the buck but a clinically important disease in rams (Randall, 2002). It should be considered to be caused by *Brucella ovis* until proven otherwise.

Epididymitis due to *Brucella ovis* is a common cause of ram infertility, especially in rams in the western United States. The disease usually affects the tail of the epididymis (the bump at the bottom of the testicle) which becomes hardened and swollen (Van Camp, 1997).

In younger rams and less commonly in bucks, epididymitis can be caused by a number of organisms such as *histophilus*, *actinobacillus* and *haemophilus* species, as well as *corynebacterium pseudotuberculosis* (Pugh, 2002).

Some animals are initially fertile but lose fertility after the efferent ducts become completely occluded. Granulomas are firm swellings found in the head of the epididymis (Pugh, 2002).

The disease in rams can also cause orchitis (infection of the testicle), sperm granuloma secondary to obstruction of epididymal ducts and decreased fertility (Randall, 2002).

Varicocele was found in two cases (0.44%) in rams. Watt (1978) reported a similar prevalence of varicocele in merino rams of wide age range examined at abattoirs in Western Australia. Janett and Thun (1995) reported a case of varicocele in an old ram when spermatologic examination revealed an oligozoospermia. Varicocele is a disease that particularly affects old rams. It can be a cause of subfertility because of a lack of thermoregulation (Foster, 2010).

Varicoceles are more common in rams than in bucks. It is localized dilatation and thrombosis of the internal spermatic vein and is recognized as fluctuant to hard swelling in the spermatic cord (Cabannes and Bonenfant, 1980).

Abnormalities such as decreased total sperm count, reduced sperm motility and morphologic abnormalities of the sperm are often associated with varicoceles (Pugh, 2002).

The exact etiology of the condition is not known but a genetic predisposition is suspected (Pugh, 2002).

One unilateral case (0.22%) of epididymal aplasia was observed in rams. Segmental aplasia of the epididymis was reported by Tarigan *et al.* (1990) in feral male goats (in one buck, 0.1%).

Epididymal aplasia is a defect in mesonephric development in which part of the epididymis is missing. A cause of infertility in male dogs manifested by azoospermia. Usually unilateral in bulls and rams; probably inherited (Pugh, 2002).

CONCLUSION

The study showed important frequency of testicular lesions in the ram compared to the buck and the bull. Cryptorchidism and hypoplasia were observed in the ram and the buck while hypoplasia was encountered in all three species. Animals affected should be removed from our farms because of subfertility.

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