Iranian Veterinary Surgery Association

IRANIAN JOURNAL OF VETERINARY SURGERY

Journal homepage: www.ivsajournals.com

ORIGINAL ARTICLE

Ultrasonographic Features of the Testes of West African Dwarf Bucks

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Received: 6 July 2018
Accepted: 1 October 2018
Available Online: 2 October 2018

Keywords:
Breeding;
Testes;
Ultrasonography;
West African Dwarf bucks.

Abstract

Objective- This study described the ultrasonographic features of the testes in West African Dwarf bucks (WAD).

Design- Experimental study

Procedure- Ultrasonographic images of testes of WAD bucks were acquired in longitudinal, sagittal and transverse planes using a Draminski 5MHz portable ultrasound machine after proper restraint of the bucks and gel application on the scrotum.

Animals- Five WAD bucks age ranging from 1 – 1½ years, weighing an average of 15±0.5 kg were acquired for the study.

Results- The seminiferous tubules showed as a homogenous moderately echogenic region separated by the hypoechoic inter-testicular septum, while the mediastinum testis showed as a thick band of hyperechoic tissue. The epididymis was an anechoic to heterogenously hypoechoic region bounded by the hyperechoic scrotal wall.

Conclusion and clinical relevance- Ultrasonographic images were very useful in ante-mortem clinical assessment of WAD bucks which will aid in proper selection for improved breeding programs.

1. Introduction

The use of biotechnology in livestock production has allowed qualitative and quantitative genetic improvements. Ultrasonography is the use of sound reflection technology and is reportedly safer and more effective in soft tissues. It provides information about size, shape, and location of structures and also provides information about the soft-tissue architecture of the structure or organ being examined. Ultrasonography makes a distinction between solid and fluid-filled structures and provides internal

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DOI: 10.22034/IVSA.2018.135943.1151

details of such structures. It is easily accessible and does not cause deleterious effects. It is based on soft-tissue density and reflection of sound waves where highly reflective structures are termed hyper-echoic and low reflections are referred to as hypo-echoic.[1] Ultrasound imaging has been widely used in reproductive clinical examinations. It is a rapid and non-invasive technique that assists clinicians to complete diagnosis and may lead to early detection of disorders of the testes and related structures,[2] and it has been used to evaluate testicular function in domestic animals.[3] Several authors who have worked on testicular evaluation using ultrasonography are documented in different species of large animals which includes cattle,[4] camel,[5] sheep,[6] Alpine goats[7] and dogs.[8] Although ultrasonography has been utilized to determine the breeding soundness of bucks,[9] proper identification of the parts of the testes have not been done in West African Dwarf (WAD) goats. The WAD buck is a small ruminant endowed with great breeding potential.[9] The aim of this study is to establish the normal anatomy of the testes of WAD bucks using ultrasonography.

2. Materials and Methods

This study was carried out at University of Ibadan Large animal clinic ward 2, Veterinary Teaching Hospital, University of Ibadan, Oyo state, Nigeria. Five matured and clinically healthy West Africa dwarf bucks aged about one and half years with an average weight of 15±0.5Kg were selected for the project. The bucks were acclimatized for a period of two weeks and fed with grasses, commercial concentrates, water and mineral salt *ad libitum*.

Body weight was taken daily during the course of the experiment using a bathroom scale (Camry®) as described.[10]

During selection and prior imaging in this study, animals were subjected to physical examination in order to detect possible diseases that could interfere with their reproductive potential. The examination included a general clinical evaluation (inspection of body condition and presence of hereditary defects and functionality of the nervous, respiratory, circulatory, digestive and musculoskeletal systems) and morphological evaluation of the genitalia (inspection and palpation of the scrotum, testes, epididymides, spermatic cords, prepuce and penis). The animals were declared healthy and free of any clinical manifestation.

Testicular ultrasonography was done by restraining animals by holding the hind limbs spread apart allowing the scrotal sac to dangle free of any encumbrance. The scrotal sac was not shaved because it is covered by a thin layer of hair which did not interfere with the procedure. The scrotal sac was thoroughly cleaned with tissue paper before ultrasound gel was applied generously covering the entire scrotal surface. A Draminski portable 5 MHz ultrasound machine was used. The ultrasound gel was also applied on the probe covering the entire surface and then pressed gently on the surface of the testes held in the scrotal sac. The images were captured from the monitor and stored on an electronic device. Testicular ultrasound protocol for the bucks involved viewing the longitudinal, sagittal and transverse planes for both testes in each of the animals.

3. Results

The ultrasound images showed the skin of the scrotum and sub-scrotal structures, as a single hyperechoic band surrounding the scrotal content. The testicular parenchyma was homogeneous and moderately hypoechoic (Figure 1).

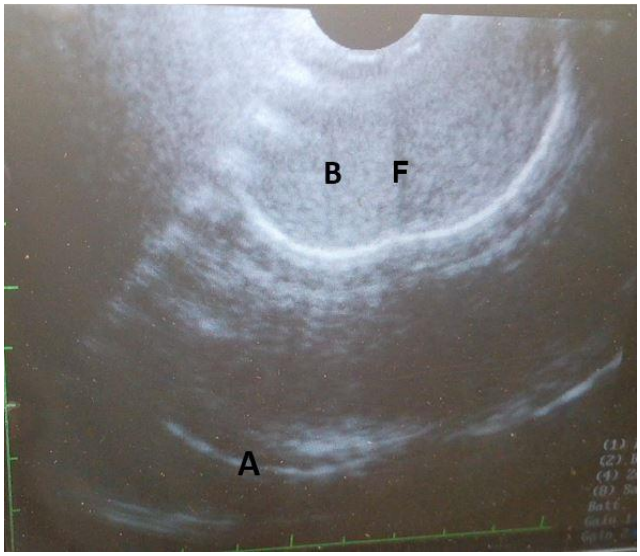

Figure 1. Ultrasonography of WAD buck testes in transverse plane. A shows the scrotal wall and subscrotal structures. B shows the testicular parenchyma made up of seminiferous tubules. F is the hypoechoic intertesticular area.

The mediastinum testis is the highly echogenic (hyperechoic) band within the testes. The whole breadth of the right and left testes was seen on the transverse plane and A shows the hyperechoic area indicating the scrotal wall of the right testis (Figure 2)**.** The hypo-echoic area between the right and left testicle is the inter-testicular septum while the wide linear hyperechoic structure in the central axis of the testes represents the mediastinum testis. The hypoechoic lower border represents the epididymis.

The sagittal plane allowed a view of blood vessels and spermatic cord at the upper border and the hyperechoic mediastinum testis and scrotal wall, as well as the anechoic epididymis (Figures 3-5). All the animals evaluated in this study presented no testicular abnormalities.

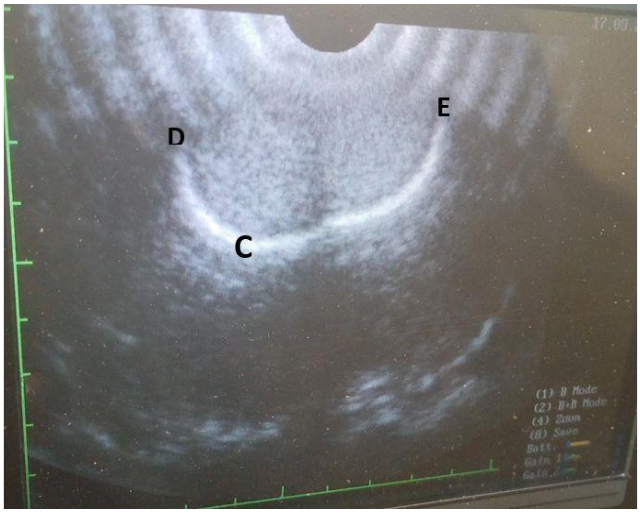

Figure 2. Ultrasonography of WAD buck testes showing the width of the testes (D, E). C shows the hyperechoic mediastinum testis.

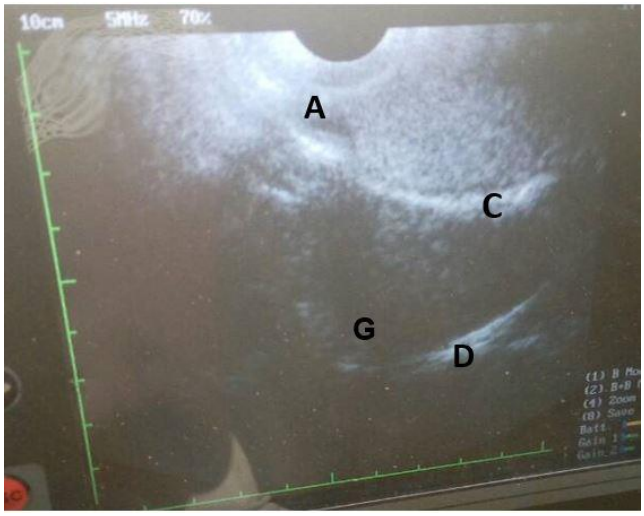

Figure 3. Ultrasonography of WAD buck testes in longitudinal plane showing the blood vessels and spermatic cord (A), hyperechoic mediastinum testis (C), hyperechoic scrotal wall (D) and the anechoic epididymis (G).

4. Discussion

The homogenously hypoechoic testicular parenchyma demonstrated on the transverse plane is asserted[11] to be the testicular echogenicity presentation which is linked to the level of differentiation of Sertoli cells, the high proportion of seminiferous tubules in the parenchyma as well as the increased diameter of the seminiferous tubules at maturity.

Ultrasonography is a non-invasive technique allowing the study of changes in reproductive organs.[12] Pugh et al.[13] described canine testis as having a coarse medium echo pattern whereas the normal testicular ultrasound of WAD bucks in this study revealed a discrete homogenous moderately echogenic pattern. Kealy et al.[14] describes a normal canine testis ultrasound as a dense, homogeneous, fine echotexture comparable to the spleen with a hyperechoic capsule. Their report further describes a central hyperechoic line that represents the mediastinum testis and epididymis is identified as a slightly less echoic, coarse echo-textured structure lying dorsal to the testis. This is very similar to what is observed in this study but is different from what Raji et al. [9] reported. The observation of a homogenous, medium-echoic testicular parenchyma and a hyperechoic mediastinum testis in this study aligns with the observation of Dascanio[15] who reported similar findings in the testis of Llama and alpaca using ultrasonography. The seminiferous tubules were homogenously hypoechoic with a bright hyperechoic mediastinum testis (Figure 2). Testicular echo-texture of the WAD buck goats were similar to those reported in fertile bulls,[16] rams,[12] camels,[5] and Alpine goats.[7] The tail appeared as a moderately hypoechoic to anechoic structure which is similar to descriptions by Pugh et al.[13] who evaluated the testis in dogs.

Ultrasonography has shown high usefulness in its ability to go beyond distinguishing lesions which are extra-testicular and testicular to even determining cystic and solid lesions, it also goes further to identify individual lesions, thereby making diagnosis more definite.[17] Lacasta et al.[18] used ultrasonography to diagnose a unilateral scrotal hernia, varicoele and sperm granuloma in a ram by identifying a hyperechoic covering of the left testis thought to be omental fat within the hernia sac and non-echogenic tortuous areas were diagnosed as varicocele which were confirmed at post-mortem. Carazo et al.[19] using ultrasonography demonstrated changes over time in testicular parenchyma and linked the changes with the photoperiod in goats and allowing its use in predicting of sexual maturity.

Dascanio[15] recommends that a 5 MHz Ultrasound machine will suffice to evaluate the testes while a 7.5 MHz machine will only be required to demonstrate subtle ultrasonographic lesions. A study carried out in Nigeria[9] reports use of a 7.5 MHz machine but this study used a 5 MHz ultrasound machine.

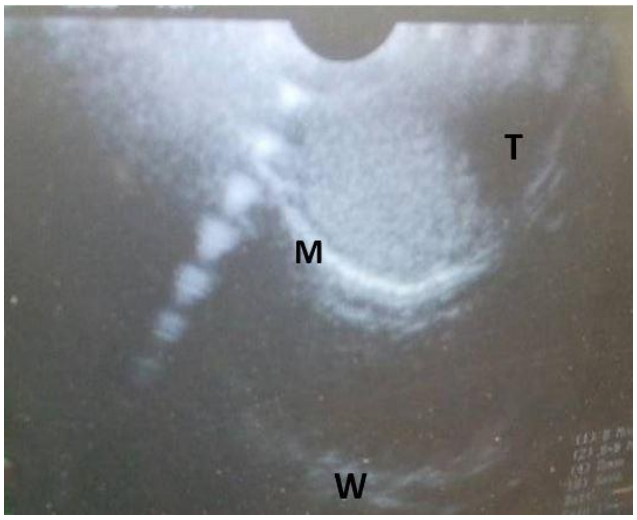

Figure 4. Ultrasonography of left WAD testis. Mediastinum testis (M), tail of the epididymis (T) and scrotal wall (W) are shown.

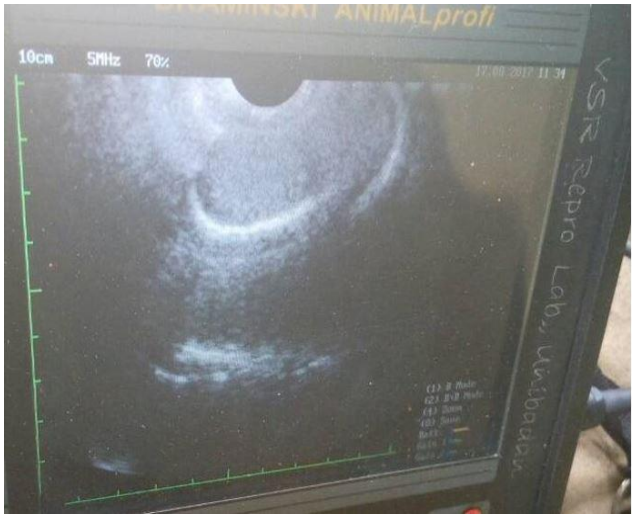

Figure 5. Ultrasonography of WAD testes. The variable echogenicity of the region between the mediastinum testis and the scrotal wall is demonstrated. Compare with figure 4.

The lack of resources to demonstrate normal anatomy also reported by other authors like Carazo et al.[19] Cruz and Freitas[20] has led to difficulty with recognizing some of the ultrasonographic lesions seen in this breed and others breeds and species. The labeled parts of the testes aid in identifying a normal ultrasonographic study. This will enhance clinical assessment of the testes in this highly prolific specie and the value of ultrasonography as a clinical imaging technique in evaluating the testes was demonstrated. In conclusion, ultrasonography is a valuable imaging tool that can be utilized in clinical assessments of reproductive potential of WAD bucks ante mortem in a bid to select fertile animals in a breeding program.

Conflict of interests

None.

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نشریه جراحی دامپزشکی ایران
سال ۲۰۱۸، جلد ۱۳ (شماره ۲)، شماره پیاپی ۲۹

چکیده

ویژگی‌های اولتراسونوگرافیک بیضه‌های بزهای کوتوله آفریقای غربی

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هدف: این مطالعه ویژگی‌های اولتراسونوگرافیک بیضه‌های بزهای کوتوله آفریقای غربی را توصیف می‌کند.
طرح مطالعه: مطالعه تجربی.
حیوانات: پنج بز کوتوله آفریقای غربی سن ۱ تا ۱/۵ ساله، با میانگین وزن ۰/۵±۱۵ کیلوگرم در این مطالعه به کار رفت.
روش کار: با استفاده از دستگاه اولتراسونوگرافی پرتابل درامینسکی ۵ مگاهرتز پس از مقیدسازی مناسب بزها و استعمال ژل بر روی اسکروتوم، تصاویر اولتراسونوگرافیک از بیضه‌های بزهای کوتوله آفریقای غربی در سطوح طولی، ساژیتال، و عرضی گرفته شدند.
نتایج: لوله‌های اسپرم‌ساز به صورت ناحیه‌ای هموژن و نسبتا اکوژن که با سپتوم بین بیضه‌ای هایپو اکوئیک دیده شدند، درحالی‌که مدیاستن بیضه‌ها به صورت نوار ضخیمی از بافت هایپر اکوئیک دیده می‌شد. اپیدیدیم به صورت ناحیه‌ای آن‌اکوئیک تاهایپو اکوئیک هتروژن که توسط دیواره هایپر اکوئیک اسکروتوم پوشیده شده بود، دیده می‌شد.
نتیجه‌گیری و کاربرد بالینی: تصاویر اولتراسونوگرافیک در ارزیابی بالینی پیش از مرگ بزهای کوتوله آفریقای غربی بسیار مفید بود و می‌تواند در انتخاب مناسب بزها برای برنامه‌های بهبودیافته تولیدمثلی کمک کننده باشد.
واژه‌های کلیدی: تولیدمثل، بیضه، اولتراسونوگرافی، بز کوتوله آفریقای غربی.