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Diagnostic Applications of Ultrasonography to Testes and Accessory Sex Glands in Ongole (*Bos indicus*) Bulls

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Abstract

Ultrasonography was performed on Ongole breeding bulls to evaluate the testes, epididymis, pampiniform plexus, ampulla and seminal vesicles as a part of breeding soundness examination and the findings were recorded. Trans-scrotal ultrasonography of the testis in longitudinal plane showed moderate echogenicity of the testicular parenchyma, while the mediastinum appeared as a high echogenic line in the middle and showed different hyperechogenic testicular tunics. The pampiniform plexus of the testis was revealed as a network of anechoic vascular lumen and hyperechoic vascular coiling giving a spotted appearance. The tail of the epididymis was recorded in the oblique plane near the distal pole of the testis as a less echogenic structure that was differentiated from the testicular parenchyma as a triangular area separated by a non-echogenic line. The prostrate body was a hyperechoic area located dorsal to the neck of the bladder. The ampullae which are located on the neck of the bladder appeared as two dorsal lines with non-echogenic linear lumen, while the glandular lining appeared as moderately echogenic line followed by hyperechogenic muscular wall. Seminal vesicles were examined lateral to the ampulla, above the neck of the bladder which appeared as irregular shaped isoechoic lobes of glandular tissue separated by hypoechoic regions. It is concluded that ultrasonography is a noninvasive technique that does not involve risk to the reproductive potential of the bull and helps to further characterize pathologies of the male reproductive tract by specifying the localization and nature of tissue changes associated with anomalies.

Keywords: Ongole bulls; ultrasonography; testes; accessory sex glands

Introduction

Ongole (synonym: Nellore) by inheritance it is a dual purpose animal and is well known for its thriftiness, hardiness and disease resistance and is the most popular breed in several Latin American countries, exploited to develop new beef breeds. Breeding soundness evaluation of the male offers predictive information on expected performance that may enhance overall herd productivity. Traditionally bulls were assessed for breeding soundness based on clinical examination, observation of libido and mating ability and semen evaluation. Ultrasonography of male reproductive tract and testes facilitates andrological investigation of breeding bulls to eliminate sub-fertile sires and is important to evaluate them for their fertility (Abdel-Razek and Ali 2005). Trans-scrotal ultrasonography helps in diagnosis of sub-fertility in bulls and allows visualization of tissue interfaces within scrotum and accurate measurement of biometry of testes and scrotal circumference. It also allows assessment of both palpable and non-palpable testicular lesions (Chapwanya *et al.*, 2008) and is useful, noninvasive and non harmful method in selecting good breedable bulls (Cook *et al*., 1994) by assessing the testicular echogenecities and measurements. To locate abnormalities the operator must have good knowledge of the ultrasonographic anatomy of the reproductive system. Previous studies on ultrasonography of the male genital tract were carried out in exotic or crossbred cattle but no systematic studies were reported in Ongole bulls. Hence the present study was undertaken to study the ultrasonogram of the reproductive tract of Ongole bulls. Special diagnostic procedures like ultrasonography in conjunction with conventional methods of breeding soundness evaluation are useful in the diagnosis of sub-fertility in Ongole bulls as these bulls are used in the development of beef breeds

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that are reared in free range system and natural service is the method of breeding.

Materials and methods

Eight Ongole bulls aged between 3 to 5 years restrained in a chute were utilized to conduct ultrasonography of testes and accessory sex glands. A light sedation with Xylazine Hydrochloride at 0.02 mg/kg.bwt intramuscularly in aggressive/or anxious bulls was performed for safe examination. A 5/7 MHz linear array transducer connected to B-mode ultrasound scanner (SA-600V; Medison Co Ltd, Seoul, Korea) was utilized for sonography of male reproductive tract and testes. The testes were scanned transcutaneously in transverse and longitudinal planes, while tunica albugenia and mediastinum testes were examined from a longitudinal plane. Contact between the probe and the scrotal skin can be improved by mosioning the skin with warm water and application of high quality ultrasound gel directly on the surface of the scrotum without shaving/clipping of the hairs as the scrotum is covered with short hairs which do not interfere with the sonogram quality (Gnemmi and Lefebvre, 2009). The tail of epididymis was visualized from a diagonal plane near the distal end of testis. A 4 cm thick sonolucent pad or standoff pad was placed between the scrotal skin and the ultrasound transducer in an attempt to view the entire testicle for better image resolution along with a gridline placed between the pad and the scrotal skin for measurement of length and breath of testes as per the procedure described by Bailey *et al*. (1998). Trans-rectal ultrasonography was conducted to record pelvic genitalia including ampullae, bulbourethral gland, pelvic urethra, pars disseminate and body of prostate as well as the seminal vesicles as per the procedure described by Abdel-Razek and Ali (2005).

Results

In the present study trans-scrotal ultrasonography of the testis in longitudinal plane showed homogenous and moderate echogenicity of the testicular parenchyma, while the mediastinum appeared as a high echogenic line in the middle and showed different hyperechogenic testicular tunics (Fig. 1). The transverse image of the testis showed hypoechoic homogenous testicular parenchyma with mediastinum as a hyperechogenic bright spot in the middle (Fig. 2). The transverse and longitudinal projections reveals length and thickness of the testes, quality of parenchyma, characteristics of the testicular tunics and epididymus echogenecity. Ultrasonography of the testis revealed a moderately echogenic homogeneous testicular parenchyma and the mediastinum appeared as a linear more echogenic structure in the center of the testicle. The pampiniform plexus of the testis was revealed as a network of anechoic vascular lumen and hyperechoic vascular coiling giving a spotted appearance (Fig. 3) which is due to intimate coiling of spermatic vein over the artery that controls the thermoregulation of testes. The epididymal head is identifiable on the dorsal pole of the testicle which is less echogenic than the testicular parenchyma. The tail of the epididymis was recorded in the oblique plane near the distal pole of the testis as a less echogenic structure that was differentiated from the testicular parenchyma as a triangular area separated by a non-echogenic line with neumerous sonolucent tubular structures (Fig. 4). The head and tail of the epididymis were readily identified. The epididymis is less echogenic than the testicular parenchyma as it stores spermatozoa for maturation with secretions.

Transrectal ultrasonography of the Ongole breeding bulls revealed the prostrate body as a hyperechoic area located dorsal to the neck of the bladder. The ampullae which are located on the neck of the bladder appeared as two dorsal lines with non-echogenic linear lumen, while the glandular lining appeared as moderately echogenic line followed by hyperechogenic muscular wall (Fig. 5).

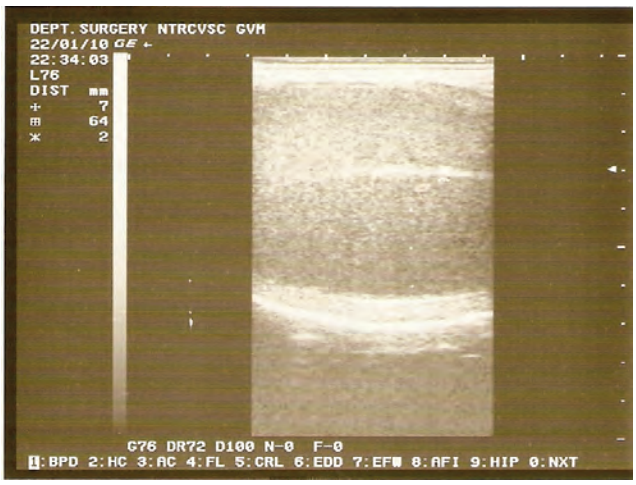

Fig. 1. Ultrasonogram of testis showing the uniform moderate echogenic paryncyma with hyperechoic mediastinum at middle on longitudinal plane

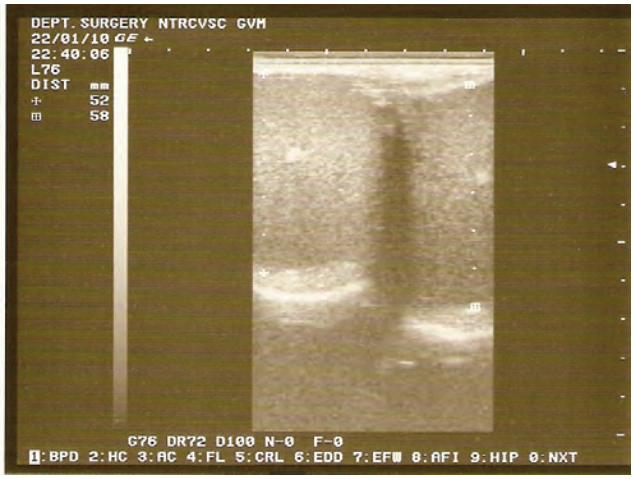

Fig. 2. Ultrasonogram of testis showing mediastinum as a hyperechoic spot at the middle on transverse palne . Note two testicular images together.

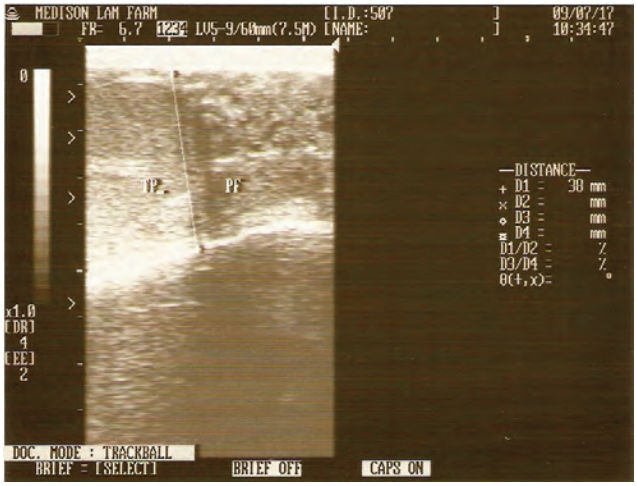

Fig. 3. Ultrasonogram of testis revealing testicular paryunchyma (TP) and pampiniform plexus (PF) as a network of anechoic vascular lumen and hyperechoic vascular coiling giving a spotted appearance.

Fig. 4. Ultrasonogram of testis showing hyperechoic cauda epididymis at its distal pole.

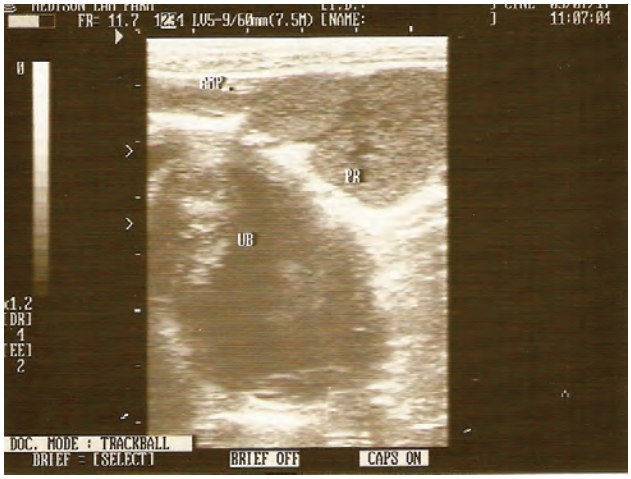

Fig. 5. Trans- rectal ultrasonogram revealing hyperechoic prostrate (PR),non echoic linear lumen of ampulla along with hyperechoic muscular wall (AMP). Note the anechoic urinary bladder (UB) and its relation.

Seminal vesicles which are meaty lobulated glands with central dilatations were examined lateral to the ampulla, above the neck of the bladder which appeared as irregular shaped isoechoic lobes of glandular tissue separated by hypoechoic regions (Fig 6).

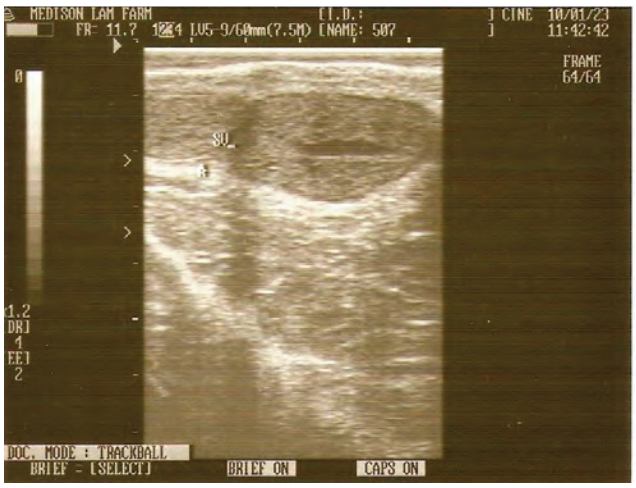

Fig. 6. Trans- rectal ultrasonogram revealing irregular shaped isoechogenic lobes of seminal vesicles (SV). Note the ampulla (A).

Discussion

Trans-scrotal ultrasonography of the testis is the diagnostic modality for identification and localization of intrascrotal lesion and for differentiating testicular from paratesticular lesions. Ultrasonography may assist in differentiating between testicular lesions and disease of the tissues surrounding the testicle. This non-invasive technique readily identifies the thickening of the scrotal skin or vaginal tunics and fluid accumulation in the tissues sur-

rounding the testes as indicated by hypoechoic areas between the tunics or parietal tunic and the scrotal skin (Heath and Purohit, 1998). For transscrotal ultrasonography of the testis a posterior approach is convenient and in this method the transducer is applied directly to the surface of the testis gently and in continuous movement. It was observed that contact between transducer and the skin with sufficient amount of transmission gel by moistening the skin with warm water yielded in good images as reported by Gnemmi and Lefebvre (2009). To conduct trans-scrotal ultrasonography of the testis both transverse and longitudinal projections were performed. The procedure includes while one thumb pushes a testis upwards, out of the transducer path the other hand pushes the testis to be sonate toward the bottom of the scrotum. This stretches the scrotal wall and allows better contact between the probe and the scrotum. The transducer was applied longitudinally on the external face of the testis for a longitudinal view and then the transducer moved transversally on both testes simultaneously to compare the echotexture of both testicles.

The transverse and longitudinal projections reveals length and thickness of the testes, quality of parenchyma, characteristics of the testicular tunics and epididymus echogenecity as reported by Gnemmi and Lefebvre (2009). Ultrasonographic appearance of the testis was in correlation with the testicular histology that the seminiferous tubules constitute the major potion of the testicular parenchyma, which is covered by dense connective tissue the tunica albuginea that radiates to the mediastinum testis. Ultrasonography aids in identification of localized intrascrotal lesions like cysts and differentiates testicular from paratesticular lesions (Heath and Purohit, 1998).

Ultrasonopgraphic appearance of the pampiniform plexus observed in the present study is due to intimate coiling of spermatic vein over the artery that controls the thermoregulation of testes. Varicocele is a condition that causes dilation of pampiniform plexus with edema, which could be revealed by ultrasonography. The head and tail of the epididymis were readily identified as reported by Pechman and Eilts (1987) and Heath and Purohit (1998). Ultrasonography aids in the diagnosis of epididymitis and spermatocele. Epididymitis is characterized by hypoechogenicity caused by the presence of exudates.

Removal of the dung from the rectum before transrectal examination facilitated the introduction of transducer and proper visualization of the internal reproductive organs. Transrectal ultrasonographic appearance of prostrate body is in accordance with the observations of Abdel–Razek and Ali (2005). Seminal vesicles which appeared as meaty lobulated glands with central dilatations were in accordance with the findings of Gnemmi and Lefebvre (2009). Anomalies of the seminal vesicles include inflammation and hypertrophy where the gland appears enlarged with increase in echogenicity resembling the liteinic tissue on sonation (Gnemmi and Lefebvre, 2009).

It is concluded that ultrasonography is a noninvasive technique that does not involve risk to the reproductive potential of the bull and helps to further characterize pathologies of the male reproductive tract by specifying the localization and nature of tissue changes associated with anomalies. Further ultrasonography could assist in differentiating between testicular lesions and disease of the tissues surrounding the testicle, identifying thickening of the scrotal skin or vaginal tunics, fluid/fat in tissues surrounding the testes and pathology of the accessory sex glands. This non invasive method of diagnosis may prove to be a means of identifying the functional testicular capacity of bulls, which could not mount to donate semen for evaluation. Use of this diagnostic aid could be considered before surgery of the male reproductive tract and interpretation of prognosis of sub-fertility in bulls.

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