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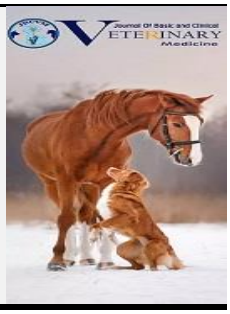

Original Article

Measurement of the internal structures of the healthy eyeball by ultrasonography in Kurdish sheep

Foad Sadi *

Department of veterinary Medicine, Mahabad Branch, Islamic Azad university, Mahabad, Iran.

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ABSTRACT

The purpose of this study was to determine the anatomical parameters of the eyeball in a normal state in the Kurdish sheep using ultrasonographic images in order to find out the clinical aspect of the ocular structures and the normal range of ocular parameters using the ultrasonographic machine. Ocular echo-biometric inspections were carried out on sheep (16-24 months old) from the Kurdish breed. Ultrasonographic images were obtained with an 8-12 MHz linear probe in the sagittal plane. Based on the results of the present study, axial globe length (AGL) (24.3±0.3), anterior chamber depth (ACD) (3.1±0.16), vitreous chamber depth (VCD) (11.30±0.15), sclera retinal rim thickness (SRT) (1.70±0.06), lens thickness (LT) (9.65±0.25) and corneal thickness (CT) (0.875±0.03) were reported. The different dimensions of the natural eyeball components obtained in normal and healthy conditions were presented so that veterinarians in different eye diseases can compare the size of the internal structures of the patient's eyeball with the size of the structures in normal and healthy conditions.

بررسی ساختارهای داخلی کره چشم به وسیله اولتراسونوگرافی در گوسفند سالم نژاد کردی

فواد سعدی

گروه دامپزشکی، دانشگاه آزاداسلامی واحد مهاباد، مهاباد، ایران

چکیده

هدف از انجام این مطالعه بدست آوردن پارامترهای آناتومی کره چشم در حالت طبیعی و سالم درگوسفند نژاد کردی به وسیله دستگاه اولتراسوند دوبعدی می باشد. چون در بیماری های مختلف همانند بیماری چشم صورتی در اثر التهاب حاصل از بیماری پارامترهای کره چشم دستخوش تغییراتی می شود.

در این بررسی کره چشم ۱۲ گوسفند با سن حدود ۲۴-۱۶ ماه از نژاد کردی به وسیله یافته های حاصل از امواج اولتراسوند مورد ارزیابی قرار گرفت. تصاویر حاصل از تحقیق به وسیله پروب خطی ۱۲-۸ مگا هرتزی به صورت طولی انجام گرفت. نتایج حاصله نشان داد که اندازه محور طولی کره چشم۰/۳±۲۴/۳میلیمتر، عمق اتاقک قدامی۰/۱۶±۳/۱میلیمتر، عمق اتاقک زجاجیه۰/۱۵±۱۱/۳۰میلیمتر، ضخامت دیواره شبکیه صلیبه ای۰/۰۶±۱/۷۰میلیمتر، قطر عدسی۰/۲۵±۹/۶۵ و ضخامت قرنیه۰/۰۳±۰/۸۷۵میلیمترمی باشد.

ابعاد مختلف اجزای کره چشم که در حالت طبیعی و سالم بدست آمد در یک جدول قراد داده شده تا دامپزشکان در بیماری های مختلف چشم با مقایسه اندازه ساختارهای داخلی کره چشم بیمار با اندازه ساختارها در حالت طبیعی و سالم بتوانند از آن به عنوان یک مرجع جهت تشخیص بیماری های چشم استفاده کنند.

واژه های کلیدی: اولتراسونوگرافی، گوسفند کردی ،کره چشم

* Corresponding author: foadsadi@yahoo.com

INTRODUCTION

Kurdish sheep is considered as a meat breed among Iranian sheep. Kurdish sheep are of a medium body size with long arms and legs. The color of their body wool is sugar white and their hands, feet and head are brown or black. This breed has a large tail [1]. Ultrasonography is one of the important tools for the assessment of varied ocular abnormalities like phthisis bulbi, microphthalmia, pseudoexophthalmia, scleral ectasia, and congenital glaucoma [2]. Ocular biometry was one of the early uses of ultrasound in human ophthalmology [3]. Chobiometric values are often used for the construction of schematic eyes in optics [4]. It is used in the calculations of intraocular lens dioptric power to be employed in the eyes of animals that have undergone cataract surgery to achieve emmetropia [5]. Most of the ocular diseases produce morphological abnormalities, therefore acquiring knowledge on normal anatomical appearance and dimensions of the eye is valuable in assessing eye health using ultrasound [6, 7]. Loss of corneal opacity occurs due to various reasons like keratitis, corneal ulcers, or various systemic diseases. Documentation of normal ultra-sonographic appearance and ocular dimensions of sheep may facilitate the diagnosis of ocular disease especially when the opaque anterior segment precludes complete ophthalmoscopic examination [8, 9].

Although Kurdish breed is one of the Iranian native sheep, there is no data on intraocular structures. In this study, the structures of the eye ball in Kurdish sheep were examined by ultrasonography in the normal state and different parts were measured. Then, using the information from this study, the eye diseases are diagnosed.

MATERIALS AND METHODS

Ocular echo biometric examinations were performed on 12 healthy male and female Kurdish sheep 16-24 months old with weight range of 48-55 Kg. The estimations were achieved with the animals restrained, without the use of sedation or topical analgesia. Sonographic examinations were carried out with an ultrasound machine (Edan D6, Edan Instrument, Inc, China) using an 8-12 MHz linear transducer. The probe was placed in a sagittal plane and the ocular dimensions were recorded by which cadaster is performed through the upper eyelid by using coupling gel being applied directly to the eyelid and the images were saved. Ocular distances were measured from the standard views using caliber of the ultrasound machine. Optimal B-scan images along the central optic axis enabled to record six intraocular dimensions: Axial globe length (AGL, was measured from the anterior corneal surface to the retina), anterior chamber depth (ACD, was measured as the distance between echoes from the posterior corneal surface and the anterior lens surface), vitreous chamber depth (VCD, was the distance between echoes from the posterior lens surface and the retina), sclera-retinal rim thickness (SRT), lens thickness (LT, was the distance between echoes from the anterior and posterior lens surfaces), corneal thickness (CT, was measured between the echoes from the anterior and posterior corneal surfaces) and optic nerve (ON) (Figure 1). The mean and standard deviation for each set of measurements were calculated and ocular dimensions and data are presented as mean ± standard deviation.

RESULTS

The sonographic images of sheep eye in the present study revealed that the aqueous humor which the fluid filled the vitreous body represented as anechoic region, as well as the internal appearance of the lens (which trapped between anterior and posterior lens capsule) appeared anechoic. The anterior chamber (the area restricted between the hind part of cornea and anterior lens capsule) appeared as a single, anechoic area (Figure 1). As general the study revealed that the cornea, anterior, posterior lens capsule and sclera can be considered as the hyper echoic parts in the sheep eye. The scleroretinal rim appeared as a concave echogenic line at the posterior margin of the eye ball. Moreover, the anterior lens capsule appeared as a convex echogenic line, while the posterior lens capsule appeared as a concave echogenic line. The lens which restricted between it appeared as an anechoic area (Figure 2). The echo biometric measurements on the right and left eyes of the Kurdish sheep have been presented in Table 1. Total average and standard deviation of the right and left eyes measurements have also been given in Table 1. No significant difference (P>0.05) was found between the measurements taken from the right and left eyes of Kurdish sheep. There was also no significant difference was found between male and female Kurdish sheep.

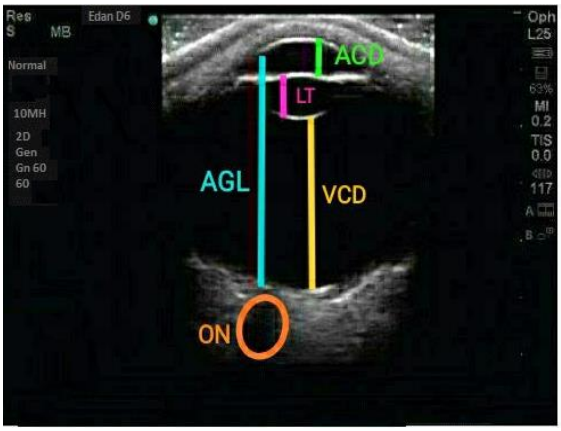

Figure 1: Sagittal B-mode ultra-sonogram of goat eye showed; Axial globe length (AGL), Anterior chamber depth (ACD), Vitreous chamber depth (VCD), Optic nerve region (ON).

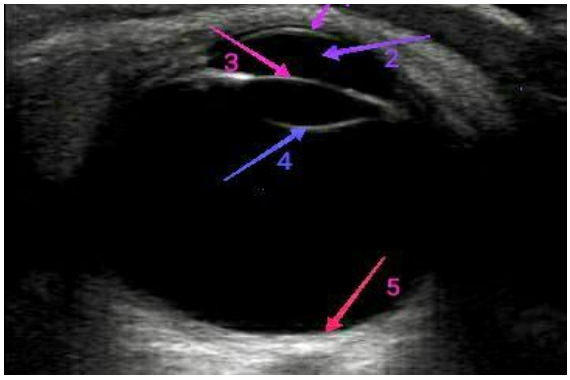

Figure 2: Sagittal B-mode ultra-sonogram of goat eye, showed, 1-Cornea, 2-Anterior chamber, 3- Anterior lens capsule (ALC), 4-Posterior lens capsule (PLC), 5- Scleroretinal rim.

Table 1: Measurement of eye components (Mean ± SD) per mm.

Parameter	Right (mm)	left (mm)	Mean ± SD (mm)
Axial global length (AGL)	24.6±0.2	24.0±0.4	24.3±0.3
Anterior chamber depth (ACD)	3.0±0.14	3.2±0.18	3.1±0.16
Vitreous chamber depth (VCD)	11.40±0.14	11.20±0.16	11.30±0.15
Sclero-retinal rim thickness (SRT)	1.60±0.04	1.80±0.08	1.70±0.06
Lens thickness (LT)	9.60±0.2	9.70±0.3	9.65±0.25
Cornel thickness (CT)	0.85±0.4	0.90±0.2	0.875±0.03

DISCUSSION

Ocular biometry is an important contribution of ultrasound in ophthalmology. It was one of the early uses of ultrasound in human ophthalmology [3]. The axial measurements of the globe are important in evaluating conditions such as glaucoma, micro-ophthalmia, macro-ophthalmia, phthisis bulbi and persistent hyperplastic primary vitreous [10]. In veterinary medicine, ocular biometry can be used in establishing lens implant size, calculating lens power, and estimating prosthetic globe size after enucleation [11]. The structures of the eyeball have also been studied using ultrasonography in Iraqi sheep and the results are similar to those found in the present study [2, 15].

The results of this research indicated that dimensions of anterior chamber, lens, vitreous chamber and axial globe length of adult goats did not differ across the genders. Furthermore, any information on normal ocular dimensions facilitates the use of ultrasonography in the evaluation of ocular disease in adult sheep. Meanwhile, intraocular structures of forty eight adult Poll Dorset Cross, Crossbred Fec B and Corriedale breed sheep were measured by ultrasonography in another study [16]. The results revealed that their eye structures are almost similar to Kurdish sheep breed.

The hyper echoic parts in the present study represented by the cornea, scleroretinal rim and lens capsule (anterior and posterior capsule) were found to be similar to those reported in ovine, buffalo and bovine, but the measurements were different due to the size of animals. This hyper echogenicity resulted from the fact that the hyper echoic organs reflected more echo to transducer and appeared as white dots aggregated in small lines in shape depending on the molecular nature of the tissue [12, 13, 14].

The results of this study are in line with the findings of the study on Barbary sheep [17, 18]. This can be attributed to the physical similarity between Kurdish breed and Barbary breed.

CONCLUSION

The ultrasonogrsphic appearance of the sheep eyes revealed great similarity in comparison with other domestic species. However, there were differences in eyeball dimensions in domestic species which can be attributed to physical differences. It was also found that the

dimensions of right and left eyeball structures in Kurdish sheep were almost the same.

ETHICS

All procedures of the current research have been performed based on the ethical standards.

CONFLICT OF INTEREST

None.

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