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ORIGINAL ARTICLE

Ultrasonography of vitreous chamber in Iranian Holstein cattle

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ABSTRACT

The aim of recent study was to describe the ultrasonographic appearance and measurements of the normal vitreous chamber in cow eye. In this study, twenty vitreous chamber of eye in cattles (Iranian Holstein) were done scan by ultrasonography and also measured in anterior-posterior axial by B-mode display approach. The ultrasonographic appearance of vitreous chamber is similar to that in other species. Total mean of vitreous chamber depth was 1.443 ± 0.034 cm. The mean of left and right eye vitreous chamber depths measurement were 1.445 ± 0.035 cm and 1.442 ± 0.034 cm respectively. The mean of right eye vitreous chamber depth measurement was not significantly different with mean of left eye vitreous chamber measurement.

Key words: Cattle, Eye, Ultrasonography, Vitreous chamber

Introduction

Evaluation of the Eye is important in animals and has been considered. Structural of eye assessment by different methods has been done including these methods can be cited ultrasonography [4,5,7]. Medical use of diagnostic ultrasonography was reported in 1956s and in veterinary, Koch and Robin have carried out ultrasound eye [9].

Patterns of B-mode ultrasonography is a display pattern and by this way the internal components of the eye such as cornea, anterior chambers, posterior chamber (vitreous) and the lens can be investigated[2,3].

In this study posterior chamber was investigated in cattle eye and details of this structure considered and by using B-mode display measurement of posterior chamber depth.

In ultrasonography, high-frequency sound waves above the audible range are directed posteriorly through the eye from the cornea, and the acoustic echoes are detected, amplified, and displayed on an oscilloscope screen. In B-scan ultrasonography a two dimensional cross section of the eye and orbit is obtained (Figure 1). In this technique the echoes are viewed and permit measurements of posterior chamber distance within the eye (biometry). Ultrasonography is used to examine the contents of eyes in which opacity of one of the usually clear ocular media (cornea, aqueous humor, lens, or vitreous) prevents visualization of the structures caudal to it. It is also useful to assess orbital structures and to guide fine needle aspiration of intraocular and orbital structures [2,3,7].

Ultrasonography is easy to perform, and gives immediate results with excellent definition.

Ultrasound measurements should be repeated exactly without pressure on the eyes mast be done.

To establish good contact between the eye and transducer can use coupling gel on the eyelids and then after each ultrasonography washing it with saline solution [3,7].

In ruminant animals, Vitreous of the eye is transparent environment and has a specific jelly building. This part is set between the lens and posterior internal wall of eye [9,10].

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The animal should be restrained in a standing or sitting position with the head held still. The technique requires sterile coupling gel application to the cornea and then placing the transducer on the gel. This gel must be subsequently rinsed off with sterile saline. Alternatively, the orbit can be examined through the eyelids [3,4,7].

The anterior and posterior vitreous chambers are anechoic, and the curved hyperechoic posterior wall of the globe is seen caudally [2,9].

They are identified as a cone-shaped structure running from the back of the globe caudally. They consist of the moderately echogenic fat tissues with the hypoechoic medial rectus muscle lying medially. The optic nerve is identified as a small hypoechoic depression in the posterior wall. Retrobulbar tissues are poorly defined [7,9].

Direct corneal contact yields slightly superior images. A transcutaneous temporal technique also has been described and is useful for visualization of retrobulbar structures.

The patient is best examined without general anesthesia or sedation. May be a drop of topical anesthetic is applied to the ocular surface, and the ultrasound probe with sterile coupling gel is applied directly to the cornea or eyelids as the patient permits [3,9].

The aim of this study was to describe the ultrasonographic appearance and measurement of the normal vitreous chamber in cow eye. This information should serve as a basis for further clinical investigations of ocular abnormalities.

Materials and methods

Twenty transpalpebral ocular ultrasonographic examinations were performed on 20 adult healthy Iranian Holstein cattles (mean age 45 months). Examinations were performed with the animals restrained in a crush or stocks, without the use of sedation or perineural and/ or topical analgesia. Ultrasonographic examinations were performed with Pie Medical ultrasound machine (Esaote Inc.), using a 6-8 MHz linear transducer and multi-image camera and video recorder were used for this study. To obtain the best possible image, the highest possible transducer frequency should be used.

The transducer's focal point was 2-3 cm with a 5cm focal zone. The globes were examined in a sagittal plane as standard described models in both right and left side of the body. Images were obtained by one operator. Sagittal (longitudinal) plane sections should be obtained and the transducer swept gently in dorsoventral directions. The small groove or mark on transducer indicating the plane of section helps orientation of the ultrasound beam.

Ocular distances were measured from the standard views using calibrated electronic calipers.

Direct measurements were made using a mechanical caliper. Optimal B-scan images along the central optic axis enabled visualization of the cornea, anterior chamber, anterior lens capsule, posterior lens capsule, vitreous chamber, posterior ocular wall and optic nerve (Fig.1).

Intraocular vitreous chamber depth was taken. The axial length of the globe vitreous chamber depth (distance from the lens to the scleroretinal rim) was measured along the central axis of the eye. A stand-off is not required to examine the vitreous chamber. The mean and standard deviation of measurements were calculated and ocular dimensions and data are presented as mean ± standard deviation. B-mode measurements were compared within both sides. A Wilcoxon non-parametric test was used to determine whether differences between measurements. Indicated significant difference was in $P<0.05$.

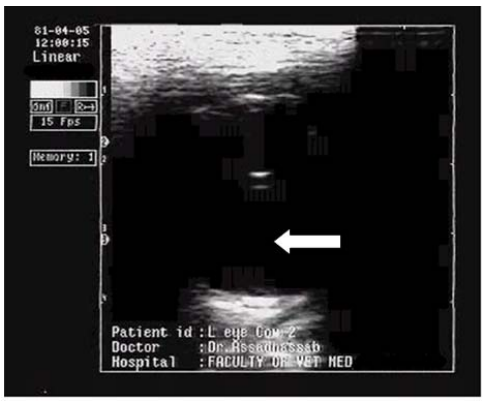

Fig. 1: Sagittal B-mode ultrasonogram of a cow eye. In this scan, the vitreous chamber region (arrow) can be identified.

Results and discussion

Diagnostic quality transpalpebral images were obtained for all orbit examined. On B-scan images, eyes appeared as well defined. In this study, vitreous chamber was anechoic. The vitreous chamber of the aqueous appeared as a single planoconvex, anechoic space.

The vitreous chamber imaged as a homogenous, anechoic region between the posterior lens capsule and ciliary body anteriorly and the posterior ocular wall. The posterior ocular wall had the highest echogenicity encountered.

Obtained data are showed in tables 1.

Ultrasound scanning techniques is used in diagnostic imaging. Ultrasonography has become a very useful diagnostic tool in ophthalmology. The diagnostic ophthalmic ultrasound is based upon ‘pulse-echo’ technique. Two – dimensional ultrasound is an excellent way to evaluate the eye and orbit [2,,6,7].

Table 1: Ultrasonographic Measurements of vitreous chamber depth (Mean ±SD)

Vitreous chamber depth (cm)	Right	left	total Measurement
	1.442 (± 0.034)	1.445 (± 0.035)	1.443(±0.034)

The ultrasonic anatomy and biometry of eye in many animals have been investigated [1,3,9]. Biometric measurements for the vitreous chamber reported by this study were similar to those reported for ultrasonographic examination in other animals [3, 8,9].

Ultrasonography of vitreous chamber eyes revealed many similarities to those described for horses [4,6] and dogs[3,9]with some variations in the shape and dimensions.

In this study, ultrasonographic condition of eye was measured in anterior-posterior axial by B-mode display methods. The mean of right vitreous chamber depth measurement was not significantly different from the left one ($P>0.05$).

We found little differences when comparing measurements in right side of body with left side. The depth of vitreous chamber of the globe in right side were mostly lesser than left one but have not significant statistically deference with them and these are unlikely to be of clinical significance.

A 6-8 MHz transducer has a focal range of approximately 2–4 cm with sufficient depth of penetration can be used in eye ultrasonography that others confirm of this subject [1,8].

In many works take the Biometric measurements from live animals were similar to those reported from cadaveric specimens and may be correct in cattle eye which we must attention to the postmortem changes difference. Structures of eye and many physical measurements of these are reported [1,8]. But in anatomical methods, can be changed in many structures that with used materials or techniques of freezing, there could be a change in the size of eye structures. Ocular measurements were probably affected by freezing to some degree. This may be due to expansion of water during freezing. This change has also been reported for other animals such as the cow, dog and horse [8,10].

In this survey, ultrasonographic eye measurement appear similar to other breeds of cattle or little different from the same measurement [1,8].

Structural review and determine the depth vitreous with posterior echogenicity in distinguishing normal from pathological conditions is necessary.

This study was to characterize the normal ultrasound appearance and ocular biometry of vitreous chamber in the eye of cattle by using a widely available, general purpose scanner and this investigation will provide baseline information for the study of pathologic conditions affecting the eyes with an ultrasound unit commonly available to the veterinarian.

In this study the internal structure of vitreous have seen similar to other animals [2,3,8].

The results show average depth study of the posterior chamber(1.443 cm) near other studies in Holstein Friesian cattle (1.46 cm)[8], and have slightly greater different with Angus bred(1.37 cm)[1] and in comparing with Jersey breed cattle (1.62 cm)[8] have lesser sizes.

It seems that ultrasonography is a valuable diagnostic tool for detecting of eye abnormities, although further studies especially it deferent disease conditions should be carried out.

Ultrasonography can particularly useful for the detection of vitreous chamber disease such as degeneration of it and intraocular hemorrhage causes increased echogenicity in the affected chamber.

Finally, ultrasonography was a comfortable utility in diagnostic imaging of cattle eye and can be used in this way.

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