



Ocular Ultrasonographic Features in Iranian Native Donkey

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Abstract

Objective- The aim of this study was to evaluate ultrasonographic appearance of the normal eye and obtaining reference values of ocular structures in Iranian native donkey.

Design- Experimental study.

Animals- Five Iranian native donkeys.

Procedures- After preparation of the animals, ocular structures were imaged and biometric measurements were recorded.

Results- The cornea, ciliary body, anterior and posterior lens capsule, lens, anterior chamber, vitreous chamber and retrobulbar structures were studied. The ultrasonographic appearance of the donkey's eye was generally similar to other species and especially equine eye with differences in structural measurements.

Conclusion and Clinical Relevance- Ultrasonography is a valuable, non-invasive diagnostic method to evaluate ocular structures. Ultrasonography allows visualization of the intraocular and retrobulbar structures and help in diagnosis of their abnormalities but reference values are needed exclusive for every species or breed. The results of this study could help veterinary practitioners to evaluate the structural changes and pathologic conditions in the eye of Iranian native donkey.

Keywords- Eye, Iranian native donkey, Ultrasonography.

Introduction

The donkey is not just a smaller, inferior type of horse, to those who have taken the time to know him, the donkey is a unique equine of special qualities.¹ Donkeys originate from the relatively dry regions of the world, but are now kept in very different surroundings. They are members of equidae family. There are an estimated 43.5 million donkeys worldwide.² They are an important source of transportation, especially in third world countries, but donkeys have often been given less attention and medical care than other livestock. Working donkeys are in danger for developing different, acute or chronic health disorders. Some of these problems are related to the eyes. The donkey has larger more prominent eyes (similar to a pony or an Arabian horse) which provide wider rear view vision of almost 360°, allowing it to look behind itself with the head facing directly forward, compared to the average horse

with 330° rear view sight arc, or a 30° wedge blind spot above its rump and tail. Donkeys, like horses, can see near and far in the same field of vision as they graze with their heads down and away from the sun.¹ There are imaging techniques like computerized tomography, magnetic resonance imaging and ultrasonography to diagnose and confirm ocular problems in different species including equidae.³⁻⁵ The ultrasonographic assessment of the eye is a valuable method allowing the visualization of intraocular and retrobulbar structures and the diagnosis of several abnormalities both in human and veterinary medicine.⁶ In order to use this technique successfully for confirmation of diseases, the practitioners require knowing the normal ultrasonographic features and characteristics and measurements exclusive for that specie or breed. There are two methods in order to perform ocular ultrasonography including transpalpebral and transcorneal methods. In transcorneal procedure, the transducer is placed on the cornea directly; therefore the quality will increase in comparison to transpalpebral method. In transcorneal technique usually there is a necessity for sedation, chemical restraint or topical anesthesia of the eye and it is better to use sterile coupling gel. In transpalpebral procedure, light sedation

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is enough as the probe is placed on the eyelids and the animals can't see the probe. In spite of transpalpebral method may cause some artifact, but no more damage and probable corneal ulcer is made.⁶⁻⁸ There are only two reports regarding ultrasonography of the eye in donkey but they were done on different breeds.^{9,10} To our best of knowledge there is not any report regarding ocular biometric measurements in the Iranian native donkey. The aim of this study was to evaluate ultrasonographic appearance of the normal eye and obtaining reference values of ocular structures in Iranian native donkey.

Materials and Methods

This study was performed on 5 adult Iranian native donkeys of both genders. These donkeys were found healthy through complete physical examination. A light sedation was made by using 0.5 mg/kg Intravenous Xylazine (Rompun, Bayvet Division, Etobicoke, Ontario). Ultrasonography was performed using an ultrasound machine (SonoScape A6, SonoScape Co. Ltd.) with 5-11 MHz linear probe. The ultrasonographic imaging was performed in horizontal and vertical planes on left and right eyes by transpalpebral technique and applying enough lubricant. In order to avoiding deformation of the globe during ultrasonography, minimal pressure was applied on the probe. Ocular measurements were taken on horizontal plane where anterior chamber, lens and vitreous chamber were included and the globe diameter was maximum. The following parameters were measured by ultrasound machine caliper on the images: Anterior chamber (AC), from the cornea to anterior surface of the lens capsule; Lens (L), the distance between to two surfaces of the lens capsule; Vitreous chamber (VC), from posterior surface of the lens capsule to the beginning of the retrobulbar region; and globe axial length (GAL) from the cornea to the beginning of the retrobulbar region. Each view was imaged 3 times and average of the measurements was included. All of the imaging and measurement was performed by one skilled operator. Descriptive analysis of the obtained data was done.

Results

Ocular ultrasonography in donkeys showed that the cornea, ciliary body, anterior and posterior lens capsule are echogenic while the lens, anterior chamber, and vitreous chamber are rather anechoic. The corneal layers appeared as a thin hypoechoic to echoic curved structure. Even mild pressure of the probe on eye sometimes made cornea to seem flat. The anterior and posterior capsules of the lens looked like curved echogenic lines that mostly could be seen in the central parts because of perpendicular reflection of the ultrasound waves. The iris and ciliary body were echogenic and placed abaxially to the lens (Fig.1).

Similar to the horse the corpora nigra could be imaged in the donkey and it seemed hypoechoic on the anterior surface of the iris (Fig.2).

The optic nerve was seen anechoic and continued after echogenic optic disc. The retrobulbar fat pads were seen echogenic in both sides of the optic nerve. The retrobulbar muscles could not be seen clearly (Fig.3).

The vitreous was uniformly anechoic. The retina, choroid and sclera combined together and couldn't be identified distinctly. The measurements of the normal ocular structures are reported in Table 1.



Figure 1. Different parts of eye and measuring of four ocular diameters. From top to bottom: eyelid (EL), cornea (C), anterior chamber (AC), lens (L), vitreous chamber (VC). The arrow points to the ciliary bodies.



Figure 2. Corpora nigra is seen in the anterior chamber on the iris (arrows).

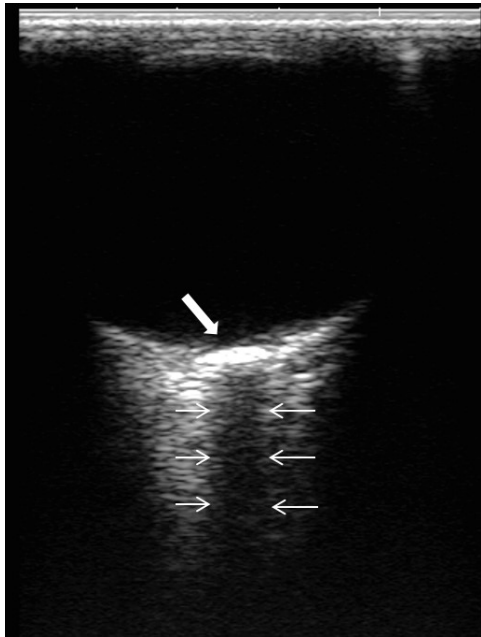


Figure 3. The optic nerve (small arrows) is seen hypoechoic in retrobulbar region and terminates at the optic disc that is hyperechoic (large arrow). On both sides of the optic nerve, hyperechoic fat pad could be seen.

Discussion

Ultrasonographic evaluation of the eye is somewhat a recent addition to usual ophthalmic diagnostic examination in animals. Some parameters for ophthalmic biometry have been established. There are several studies in clinical equine ophthalmology that define normal ultrasonographic images of the eye.^{6,11} In spite of many similarities between the horse and the donkey, use of the mean eye dimension of the horse to

evaluate those of the donkey may not be appropriate. There are only two reports about ocular ultrasonography of the donkey but they were done on different breeds and it is suggested that more studies on specific breeds should be done for establishing a range for measurements. In those studies relations between ocular biometry and gender, weight and age were evaluated.^{9,10} This paper reports ocular ultrasonography of normal Iranian native donkey. Such studies were done in species for different breeds like camel, buffalo, rabbit, parrot, cow, sheep and ferret.¹²⁻¹⁷ General shape of the eye and biometric measurements in our study were similar to those reported in other animals, especially horse, with some differences in shape and dimension. Generally it was fairly clear that the average eye size of horses is significantly larger than that of donkeys.^{10,15,18,19} There was no notable difference between the right and left eye measurements in this study. In parrots and camels also no variation for the left and right eye measurements were reported.^{16,17,20,21} Yadegari, Salehi et al. in their ultrasonographic study of buffalo eye reported that Anteroposterior depth of the lens, vitreous chamber, and axial length of the globe on the left side were greater than the same depths on the right side. The anterior chamber depth and scleroretinal rim wall thickness in the left side also measured less than those in the right side in each buffalo, but this difference was not statistically significant and is unlikely to be of clinical significance.¹⁴ This paper simplifies the use of ultrasonography in the evaluation of ocular disease in Iranian native donkeys, however more studies with larger sample size and considering age, weight and sex are needed before any conclusion.

Table 1. Descriptive analysis of the eye structure in Iranian native donkey.

	GAL	AC	L	VC
Mean(mm)	31.36	3.1	10.96	17.22
Sd (mm)	1.15	0.49	1.08	1
Range (mm)	30.3 to 33.3	2.6 to 3.9	9.6 to 12.4	16.6 to 19

GAL, globe axial length; AC, anterior chamber; L, lens; VC, vitreous chamber, Sd, Standard deviation.

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چکیده

ویژگی های اولتراسونوگرافی چشم در الاغ بومی ایرانی

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هدف- هدف این مطالعه بررسی ظاهر اولتراسونوگرافی و بدست آوردن مقادیر مرجع در چشم نرمال الاغ بومی ایران بود.
طرح- مطالعه تجربی.

حیوانات- تعداد ۵ راس الاغ بومی ایرانی.

روش کار- بعد از آماده سازی حیوانات، ساختارهای چشمی بررسی شدند و اندازه های آنها محاسبه شد.

نتایج- قرنیه، اجسام مژگانی، کیسول قدامی و خلفی لنز، اتافک قدامی، زجاجیه و ساختارهای پشت چشم بررسی شدند. ظاهر اولتراسونوگرافی چشم الاغ به طور کلی شبیه بقیه گونه ها بخصوص اسب بود؛ ولی تفاوت هایی در اندازه های ساختارهای چشمی مشاهده شد.

نتیجه گیری و کاربرد بالینی- اولتراسونوگرافی روش تشخیصی با ارزش و غیرتهاجمی برای بررسی ساختارهای چشمی است. اولتراسونوگرافی اجازه دیدن ساختارهای داخلی چشم و پشت چشم را می دهد و در تشخیص اختلالات آنها کمک می کند اما مقادیر مرجع مخصوص آن گونه یا نژاد لازم است. نتایج این مطالعه می تواند به دامپزشکان در بررسی تغییرات ساختارها و موارد پاتولوژیک در چشم الاغ بومی ایرانی کمک کند.

کلمات کلیدی- چشم، الاغ بومی ایرانی، اولتراسونوگرافی.