Comparative ophthalmoscopic examination of normal retinal fundus in camel and sheep

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Abstract

The eye is a highly complex organ structurally and functionally. The eye is not only the organ of sight but also a window through which one can detect the state of vascular and central nervous system. The retinal fundus of each species is typical and varied among species with little individual variation. The study was conducted on six adult apparently healthy sheep and camels that were brought to Teaching Veterinary Clinical Complex, Tirunelveli. Direct panophthalmascope with iphone attachment was used. Animals restrained and images of retinal fundus was obtained and analysed for morphology of tapetum, non tapetal areas, optic nerve head, Bergmeister’s papilla and retinal vascular pattern. The tapetum in sheep is bluish green in colour. The stars of winslow in sheep was appeared as small, uniform scattering of red or dark pink dots or lines throughout the tapetum. Tapetum was absent in camels. The non tapetal area was homogenous, brown or black with rich visible choroidal vasculature in sheep. The optic nerve head in sheep was kidney shaped and in camel, it was bean or elongated circular in shape. The Optic disc was located in the non tapetal area near the tapetal and non tapetal junction in sheep. The colour of the optic disc varied from pale pink to pink in sheep. In camel the colour of the optic disc was pink to red. Bergmeister’s Papilla was visible in sheep and in camel the Bergmeister’s papilla was large by comparison. Retinal vascular pattern is holangiatic in sheep and camel.

The eye is a highly complex organ structurally and functionally (Kurup et al., 2017) [9]. The eye is not only the organ of sight but also a window through which one can detect the state of vascular and central nervous system (Dukes, 1969) [4]. The most important organs of sense are the eyes because it receives up to 80% of external information by means of sight (Haupt and Huber, 2008) [8]. The ophthalmic examination consisted of assessment of visual acuity, visual field, intraocular pressure examination, slit lamp examination, dilated ophthalmoscopy and photography of the lens and fundus (Taylor et al., 2004) [13]. A posterior segment eye examination includes the examination of the vitreous humour, tapetum lucidum and all the visible parts of retinal fundus. The retinal fundus examination is also useful in the differential diagnosis of systemic infectious diseases, vascular disorders, CNS diseases etc. It is only area where the blood vessels and the central nervous system can be seen directly (Crick and Khaw, 2003) [2]. The normal fundus examination of the animals like deer (Dukes, 1969) [4], dogs (Bereneck et al., 2007) [3], sheep and goats (Galen et al., 2006) [15] were done. The retinal fundus of each species is typical and varied among species with little individual variation. So the present study was done with the aim to characterise the normal ocular fundus image in camel and sheep and to compare among them.

Keywords: Retinal fundus, ophthalmoscopy, fundoscopy, retinal vascular pattern, camel, sheep

Introduction

Materials and Methods

The study was conducted on six adult apparently healthy sheep and camels that were brought to Teaching Veterinary Clinical Complex, Tirunelveli. For Ophthalmoscopic examination, direct panophthalmascope (Welch Allyn make) with camera from iphone attachment was used. Approximately 30 minutes prior to examination, the dilatation of the pupils were done with 0.5% to 1% Tropicamide, a short acting topical mydriatic (Kluss and Constantinescu, 2004) [8]. Animals were examined without anaesthesia, so with proper restraining, manual focus ranging from -20 to +20 diopter was used. The eye was started approaching from 10 cm distance and pupils were identified. The lens of the ophthalmoscope was kept close to the cornea (2-3mm) so as to avoid flash artefact. Once the camera was focussed, the flash level was set to medium. With proper focussing, the image of the posterior segment was taken. Then the image was transferred to the desktop computer and different parameters were analysed.

• Tapetum-Presence or absence of tapetum, tapetal colour, tapetal reflectivity, shape of the tapetal area, homogeneity of the tapetum, junction of tapetal and non tapetal border were
analysed.
- Non tapetal area-Analysed for any elevation, pigmentation
- Optic disc-Examined for location, colour, shape, border and degree of myelination.
- Retinal vascular Pattern-Detailed analysis of retinal arterioles and veins were done and species were classified based on retinal vascular pattern.

Results
The tapetum was absent in camel (Fig. 1). The tapetum in sheep was bluish green in colour (Fig. 2). The tapetal fundus in sheep had a mild uniform stippling on the end of the capillaries called stars of Winslow. The stars of Winslow in sheep was appeared as small, uniform scattering of red or dark pink dots or lines throughout the tapetum (Fig. 3). The non tapetal area was homogenous, brown or black with rich visible choroidal vasculature in sheep. The optic nerve head in sheep was kidney shaped (Fig. 4) and in camel, it was found as bean or elongated circular in shape (Fig. 5). The Optic disc was located in the non tapetal area near the tapetal and non tapetal junction in sheep. But in camel, it was not easily located because of absence of tapetum. The colour of the optic disc varied from pale pink to white in sheep. In camel, the colour of the optic disc was pink to red. Bergmeister’s Papilla is the remnant of hyaloid artery and was visible in sheep and camel but in camel, the Bergmeister’s papilla was large by comparison (Fig. 4 &5).
Retinal vascular pattern was holangiotic in sheep and camel. 3-4 primary retinal vessels were large, straight and dark bluish red in colour. The intertwining of dorsal retinal venule and arteriole was found in 4 sheep in the present study (Fig. 6) and the tributaries of the dorsal vessels appeared like a hanging branches of the tree (Fig. 7). In camels, the vessels emerged dorsally and extended peripherally with the artery and vein spiralling around each other. Two pairs of venules were found leaving the optic disc horizontally (Fig. 8).
The tapetal fundus in sheep was bluish green in colour. Any difference in colour of tapetum reflects its pathology in ruminants (Crispin, 2005) [1]. The stars of Winslow in tapetum of sheep was appeared as small, uniform scattering of red or dark pink dots or lines throughout the tapetum. But they are large and clearly visible in goats (Galen et al, 2006) [3]. The tapetum was absent in camels. But Sini (2014) [11] found a dark brown, red brown or non-pigmented area without tapetal and non tapetal differentiation. The non tapetal area was homogenous, brown or black with rich visible choroidal vasculature in sheep. Similar observations were also recorded in sheep, goat and bovines by Maggs (2013) [10] and Galen et al, (2006) [3].

The optic nerve head in sheep was kidney shaped and in camel, it was found as bean shaped or elongated circular in shape. But it was irregularly circular in goats and horizontally ovoid in cattle (Maggs, 2013) [10]. The optic disc was located in the non tapetal area near the tapetal and non tapetal junction in sheep. But in camel it was easily located in the middle of the retinal fundus because of absence of tapetum. The optic disc location in goat was similar to our study but in cattle it was located at the junction of tapetum and nontapetal areas (Pearce and Moore, 2013) [11]. The colour of the optic disc varied from pale pink to white in sheep. In camel the colour of the optic disc was pink to red. But in ruminants, the colour of the optic disc varied from pale pink to dense white (Maggs, 2013) [10].

Bergmeister’s Papilla is the remnant of hyaloid artery and was found to protrude from the centre of the optic disc into the vitreous humour as grey translucent protuberance (McCormack, 1974). It was visible in sheep and in camel the Bermeister’s papilla was large by comparison. But it was clearly visible in bovines and goats (Maggs, 2013) [10].

Retinal vascular pattern is holangiotic in sheep and camel. 3-4 primary retinal vessels were large and very distinct in ruminant (Crispin, 2005) [11]. Veins were straight and dark bluish red in colour. The dorsal retinal venule and arteriole often intertwined in sheep and the tributaries of the dorsal vessels appeared like a hanging branches of the tree. The intertwining was not found in goat retina (Maggs, 2013) [10]. In camels, the vessels emerged dorsally and extended peripherally with the artery and vein spiralling around each other. Two pairs of venules were found leaving the optic disc horizontally.

The retinal fundus in camel and sheep was different with regard to the tapetal and non tapetal areas as tapetum was absent in camel and bluish green tapetum in sheep. The optic nerve head in sheep was kidney shaped but in camel it was bean shaped. Bergmeister’s papilla was large in camel than sheep. These comparisons would form the basis for the diagnosis of diseases as retinal fundus examination would provide information about the presence and severity of many systemic diseases.

**References**