Ophthalmic Lesions in Non-Human Primates

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Abstract. Over a 2-year period a number of spontaneous ophthalmic lesions were noted in non-human primates. These included lesions in baboons, old world monkeys, and chimpanzees. The lesions were divided into general etiologic categories of congenital, inflammatory, traumatic, degenerative, and undetermined. Specific lesions included colobomas, cataracts, detached retina, iridocyclitis, and morphologic changes due to myopia. Clinical and gross and/or histologic descriptions of the lesions were given, and their relative importance in a colony situation was described.

Few reports of spontaneous morphologic lesions in eyes of non-human primates are available, and most are reports of isolated occurrences. Wilson and Gavan [9] mention one animal with anophthalmia and one with congenital blindness, but do not identify the type of primate. Schmidt [8] described colobomas in 3 species of non-human primates, and glaucoma and cataracts in monkeys were discussed by Baranay [2]. Baranay considered 2 of his cases to be secondary and 1 probably primary glaucoma. Carpenter [3] noted peripheral cystoid degeneration in the retina of a 15-year-old chimpanzee. An owl monkey with idiopathic retinal detachment was reported by Aaberg [1], and contagious conjunctivitis due to SV-15 has been noted in a group of rhesus monkeys [6]. This paper describes the results of a systematic 2-year study of the eyes of non-human primates.
Materials and Methods

From 1 January 1969 to 1 January 1971 the eyes of over 100 non-human primates in the 6571st Aeromedical Laboratory (ARL) colony were examined ophthalmoscopically as part of the colony health program. All lesions were recorded and treated, as were cases of spontaneous disease involving the eyes during this period. During this time 401 non-human primates were necropsied at the ARL. These included 284 monkeys (mostly Macaca mulatta), 82 baboons (Papio sp.), and 35 chimpanzees (Pan troglodytes). As part of the routine necropsy, the eyes from these animals were removed and processed as previously described [8].

Results

Several general etiologic categories of morphologic lesion were noted, including congenital, inflammatory, traumatic, degenerative, and undetermined. The number and specific type of lesion according to species are given in table 1, and clinical and gross and/or histologic features of the various lesions are as follows.

Table 1. Ocular lesions seen in non-human primates over a 2-year period

<table>
<thead>
<tr>
<th>Lesion</th>
<th>M. mulatta</th>
<th>M. arctoides</th>
<th>P. troglodytes</th>
<th>Papio sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjonctivitis and corneal abrasions</td>
<td>6</td>
<td>—</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Iridocyclitis</td>
<td>—</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Colobomas</td>
<td>1</td>
<td>—</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cataracts</td>
<td>1</td>
<td>—</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>Variations in optic disc</td>
<td>—</td>
<td>—</td>
<td>35</td>
<td>4</td>
</tr>
<tr>
<td>BERGMEISTER's papillae</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Myopia</td>
<td>—</td>
<td>—</td>
<td>7</td>
<td>—</td>
</tr>
<tr>
<td>Detached retina</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>Trauma</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>Peripheral cystoid degeneration and retina</td>
<td>1</td>
<td>—</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td>9</td>
<td>1</td>
<td>55</td>
<td>11</td>
</tr>
</tbody>
</table>
Congenital

Colobomas and cataracts were described previously [8]. Colobomas involved the iris and lens in one monkey (M. mulatta) and one baboon, and the retina and choroid in one baboon and one chimpanzee. A cataractous lens was also described in a monkey (M. mulatta). The eyes from the chimpanzee with cataracts have not been available for histologic study.

Variations in optic discs. Clinically, a large number of chimpanzees and several of the baboons had physiologic cupping. Grossly it appeared as a small (0.1 to 0.3 mm) discrete depression in the head of the optic nerve. The depression may occur off-center or may be cone-shaped with the apex at the center of the disc.

Hyaloid remnants. These were not noted clinically or grossly. Histologically they were composed of fibrous and glial elements with little or no recognizable vascular tissue (fig. 1).

Degenerative

Peripheral cystoid degeneration of the retina. The changes occurred circumferentially and extended approximately 3.0 mm posteriorly from the ora serrata. The lesion was most prominent on the temporal aspect of the retina. The smallest cysts affected an area from the inner nuclear to the outer plexiform layer (fig. 2) and were discrete. Towards the ora serrata the cystoid areas became larger and confluent (fig. 3). Varying amounts of light basophilic material occurred within some of the areas. It was positive for acid mucopolysaccharide (AMP) with the colloidal iron stain.

Traumatic

A number of chimpanzees had superficial corneal abrasions. These were usually not severe enough to require treatment.

A severe lesion, apparently a ruptured lens, occurred in the left eye of a baboon. The center of the cornea was cloudy, and there appeared to be an anterior synchia. On gross section, no normal lens was noted (fig. 4). Fragments of what appeared to be lenticular remnants were attached to the posterior ventral surface of the iris, and there were small pieces of white material in the vitreous. Histologically the cornea was slightly thickened and contained a few inflammatory cells. The corneal lamellae were separated, and the endothelium and DESCERET’S membrane were detached. The endothelium was attached to the anterior surface of the iris by a thin strand of tissue. Several globular lenticular fragments (Elschnigs pearls) surrounded by lens epithelium and made up of large degenerated fibers (bladder cells) were
Fig. 1. Hyaloid remnant in a baboon. HE, ×125.

Fig. 2. Peripheral cystoid degeneration of the retina in a baboon. HE, ×125.
Fig. 3. Enlargement and confluence of cystoid spaces in retina. Closer to the ora serrata than figure 2. HE, × 125.

Fig. 4. Remnants of lens (arrow) in a baboon eye, probably post-traumatic.
Fig. 5. Histologic appearance of lens from figure 4. There are large 'bladder cells', and cystoid spaces (arrows). HE, × 30.

Fig. 6. Unilateral conjunctivitis in a rhesus monkey.
attached to lenticular remnants, including the lenticular capsule, immediately posterior to the iris (fig. 5). There were cystoid spaces in several of the globules. There was a chronic inflammatory reaction composed primarily of macrophages and lymphocytes in the sclera and episcleral tissues at the nasal limbus.

**Inflammatory**

One outbreak of *conjunctivitis* was observed among monkeys (*M. mulatta*). It was characterized by sudden onset, a course of 6 to 7 days, and complete recovery. All affected animals were in contiguous cages. The lesion was unilateral in all animals. The conjunctiva was reddened and edematous, and there was a mucopurulent exudate in the conjunctival sac. The cornea appeared slightly cloudy (fig. 6). All attempts to culture bacteria from exudate taken from affected eyes failed.

*Keratitis* occurred in one baboon. Clinically the cornea was cloudy, and there were vascularization and migration of pigment from the limbus towards the center of the cornea. Histologically the corneal epithelium and stroma were infiltrated by mononuclear inflammatory cells, and the former had degenerative changes. There was pigment in basilar epithelial cells. Capillaries were prominent in the corneal lamellae.

*Iridocyclitis*. An arctoides monkey (*M. arctoides*) had ocular involvement as part of a systemic staphylococcal infection. Grossly, there was a small white spot in the ventral portion of the anterior chamber. Histologically, the lesion was characterized by posterior synechia and an accumulation of neutrophils in the iris and ciliary body. Neutrophils also occurred in the anterior chamber and at the filtration angle.

**Undetermined Etiology**

*Myopia*. This condition was diagnosed clinically in several chimpanzees. Histologically the typical myopic eye was elongated and the optic nerve passed obliquely through the scleral canal (fig. 7). On the temporal aspect, the retinal pigment epithelium terminated some distance from the nerve, leaving some choroid uncovered. The choroid also did not reach the disk, and a small area of sclera was exposed. On the nasal side, the various retinal and choroidal structures overlapped the nerve head.

*Detached retina*. This condition occurred in one chimpanzee. Ophthalmoscopically the retina contained many folds which projected into the vitreous. This eye has not been examined histologically.
Fig. 7. Myopic eye, chimpanzee. The optic nerve at the scleral canal runs obliquely, and the retina and choroid end at some distance from the optic nerve on the temporal side (arrows). GOMORI’S Trichrome, × 30.

Discussion

Although not extensively documented, the ophthalmic lesions found in non-human primates should not be surprising. The number of lesions noted in this study was probably limited by 2 factors: the relatively young ages of the animals, and the general state of good health in the colony. The average age of the chimpanzees was 9.5 years, the baboons 9.0 years, and the monkeys 4.5 to 5.0 years. This is close to sexual maturity for chimpanzees and macaques [7], and just a few years over sexual maturity for baboons. Most of the animals that were necropsied were killed to obtain experimental data, and were not clinically sick. The lesions described are morphologically similar to those described in man [4] and domestic animals [5]. The hyaloid remnants and lenticular fragments appear to be analogous to what have been designated BERGMEISTER’S papillae and ELSCHNIG’S pearls, respectively, in man [4].

The conjunctivitis seen in monkeys could be similar or identical to that described as being caused by SV-15 [6]. Although apparently a self-limiting condition, the possibility of an epidemic among monkeys, which could interfere with current research, must be considered.
Although most conditions noted can be diagnosed with minimal equipment and expertise, the accurate clinical diagnosis of myopia requires considerable experience. The techniques used to screen our colony have been described and would undoubtedly be practical for those interested [10].

Despite the relatively young age of many non-human primates in laboratory situations, minimal clinical examination of all primates and gross and histologic examinations of eyes of animals necropsied would probably result in the availability of additional significant data on the prevalence of spontaneous ophthalmic lesions in non-human primates.

Acknowledgements

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References