Collie eye anomaly in the rough collie in Norway

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ABSTRACT

The results of eye examinations of 741 rough collies for collie eye anomaly (CEA) are described. Of the examined dogs, 40.8 per cent had CEA, including, in most cases, chorioretinal dysplasia (CRD). 7.7 per cent had coloboma of the optic disc while 3.5 per cent had complications of CEA, either retinal detachment or intraocular bleeding. There was no sex difference nor was the frequency of the disease influenced by coat colour. After estimating the total frequencies of the different manifestations of the disease, the dogs were divided into two groups according to the age at first examination. In the group of dogs examined between seven weeks and three months old, 48.9 per cent had CEA, compared to a frequency of 25.6 per cent in the group of dogs examined after three months of age.

All the puppies with coloboma also showed signs of CRD, while among the older dogs 11 of the 66 CEA cases reported showed signs of coloboma without CRD.

Twenty-two dogs which had been examined as puppies and given the diagnosis CEA with minor chorioretinal changes were re-examined at an older age. Of these dogs, 15 had ophthalmoscopically normal fundi at re-examination while seven were unchanged from the first examination.

INTRODUCTION

Collie eye anomaly (CEA) is a congenital disease of the posterior parts of the eye affecting the collie breeds. The disease was first described in the 19th century and was rediscovered by Magrane in 1953. Reports of the frequency in USA showed that the disease affected more than 75 per cent of the collies examined (Roberts 1969). Work from England has shown a frequency of 64 per cent (Bedford 1982). More than 50 per cent of collies examined in Sweden were reported to have CEA (Wickström 1986). Until now, there has been no investigation of the frequency of CEA in Norway.

The disease is caused by a defect in the embryonic differentiation of the posterior polar fibrous and vascular tunics of the eye (Bedford 1982). CEA involves the sclera, choroid, retina, retinal vasculature and optic disc. Several defects (microphthalmia, corneal opacity, retinal folds and vessel tortuosity) were included in the first descriptions of CEA (Roberts 1969). The four main ophthalmoscopic changes are, however, chorioretinal dysplasia (CRD), coloboma of the optic disc or adjacent areas, retinal detachment and intraocular haemorrhage (Bedford 1982). The two latter are regarded as complications of coloboma.

According to Bedford (1982), chorioretinal dysplasia (CRD) is seen bilaterally in all dogs affected with CEA but the size of the defect in the two eyes may be dissimilar. In its simplest form, CRD is seen lateral to the optic disc as a small area with reduction or total absence of pigment which uncovers the underlying chorioidal vasculature. The choroidal vessels may be reduced in number and be of abnormal shape, allowing the white sclera to be seen (Fig 1). CRD in its mildest form may have little effect on sight but major defects may cause reduced vision due to degeneration of ganglion cells and thinning of the nerve fibre layer in the retina. CRD may also be accompanied by an absence of photoreceptors (Barrie and others 1981).

The fundus of the puppy eye appears blue on ophthalmoscopy. At about three months of age, the retina changes colour to its adult yellow/green appearance (Barrie and others 1981). Minor chorioretinal changes found on examination before three months of age can therefore be masked by later retinal pigmentation. Such dogs, which then appear normal, have been classified as 'go normals' (Bedford 1982). The number and significance of the 'go normals' compared to the total number of dogs with CRD has, to the author's knowledge, not been investigated and it is possible that their significance has been underestimated.
The second defect included in CEA is the coloboma which appears ophthalmoscopically as an excavation of the optic disc surface (Fig 2) and in some cases the adjacent ocular fundus. The coloboma of the optic disc is actually an indentation of the papilla due to ectasia of the cribriform plate. The defect may originate from defective embryonic closure of the fetal fissure (Barrie and others 1981). Large colobomas may lead to reduced vision while smaller ones have little or no effect.

The complications of CEA are retinal detachment and intraocular haemorrhage. Retinal detachments can be either congenital or occur particularly before two years of age (Barrie and others 1981). They are usually unilateral but may occasionally be bilateral and vary in distribution from bullous to total detachment.

Intraocular haemorrhage may appear as unclotted blood in the anterior eye chamber or as preretinal bleeding and is most likely to result from bleeding from abnormal vessels in the retina. In young puppies, intraocular haemorrhage may also occur from persistent hyaloid blood vessels (Bedford 1982).

Although CEA is variable in its clinical appearance, the disease is thought to be inherited through an autosomal recessive gene (Bedford 1982). No correlation has been reported between the distribution of CEA in the parents' eyes and the degree of involvement of the offspring's eyes (Bedford 1982).

In the present study, the frequency of CEA in the rough collie in Norway is presented. The difference in frequencies between groups of dogs examined before and after three months of age is described and a possible reason for the differing incidence is discussed.

MATERIALS AND METHODS

Seven hundred and forty-one rough collies were examined by 11 members of a panel appointed by the Norwegian Veterinary Association for diagnosing inherited eye diseases. The examined dogs comprised 411 females and 330 males. All coat colours were represented, with 452 sable, 212 tricoloured, 69 blue merle and eight dogs for which the coat colour was not given. Dogs were presented by their breeders or owners for routine eye examination as part of the Collie Club's breeding programme. All the examined dogs were given either a positive or a negative diagnosis. In some cases it could be difficult to establish a diagnosis and some of the dogs were therefore examined by more than one member of the panel.

FIG 1. Sable collie three years old, with CRD (arrow)

FIG 2. Tricoloured collie, seven weeks old. There is CRD and a minor coloboma in the optic disc (arrow)

The dogs were divided into two groups according to the age at first examination. Group A comprised 483 puppies from seven weeks to three months old. Group B comprised 258 dogs between three months and nine years of age. A cut-off age of three months was chosen because at this age the ophthalmoscopic appearance of the fundus changes from blue to yellow/green.

The examinations were carried out in a darkened room following mydriasis with 1 per cent tropicamide (Mydriant; Dispersa). All eyes were examined by focal illumination and by direct or indirect ophthalmoscopy. Slit-lamp biomicroscopy was not used routinely. A standardised form was used to give a detailed description of the ophthalmoscopic findings.

Twenty-two dogs which had been examined as puppies (seven weeks to three months of age)
and given the diagnosis CEA with minimal CRD were re-examined by another member of the eye panel at one year of age.

The statistical significance of the results was calculated with χ² testing.

RESULTS

Frequency of CEA

Of the 741 dogs examined, 302 dogs showed signs of CEA and of these, 283 dogs had CRD. Fifty-seven had coloboma. Unilateral retinal detachment was seen in 13 dogs, five dogs had bilateral retinal detachment and eight dogs had intraocular haemorrhage (Table 1).

Among the female collies, 178 (24-0 per cent) had CEA. The number of males with CEA was 124 (16-7 per cent). The χ² test concerning the difference in the frequency of CEA in males and females, gave a P value of 0-114, which was not statistically significant.

The incidence of CEA related to coat colour was also investigated (Table 2). There was a slight difference in frequency between the coat colours but the result was not statistically significant (χ² test, P value 0-480).

Frequency of CEA related to age

The material was divided into two groups according to the dogs’ age at first examination (Table 3).

In group A (puppies from seven weeks to three months old) there were 236 cases of CEA. All the CEA cases in which the retina could be fully examined (ie, no retinal detachment or intraocular haemorrhage) showed signs of CRD. Group B (more than three months old) included 258 dogs. Of these, 66 dogs had CEA. Eleven of these showed colobomas only with no detectable CRD.

The frequency of CEA in group A was 48-9 per cent compared to 25-6 per cent in group B. The difference in frequencies of CEA between the two groups was statistically significant χ² test, P value 0-000).

Twenty-two dogs which as puppies had been diagnosed as having CEA with mild CRD were re-examined at about one year of age. Of these, 15 showed normal ophthalmoscopic findings while the other seven still showed minor chorioretinal changes.

Cataract was reported in five dogs, four of which had cataract in the anterior cortex and the fifth a bilateral total cataract. Three of the dogs had the same sire, but further genetic studies have not been carried out.

Two dogs had generalised progressive retinal atrophy. These had the same sire, but different dams, which, however, were closely related.

Bilateral hypoplasia of the optic nerve head was reported in one dog and one dog was found to have microphthalmia.

DISCUSSION

The frequency of occurrence of CEA varies from country to country. The incidence in Norway found in the present study (40-6 per cent) is lower than what is reported from many other countries (Roberts 1969, Bedford 1982). However, a report from Switzerland shows a frequency of CEA of 31-6 per cent (Kellner and Leon 1985), while a
study in Austria shows a frequency of 12.6 per cent (Holzhacker 1988). It is difficult to compare these results because the dogs in the referred studies have been examined at different ages and many adults may have been 'go normal' dogs.

Before this investigation, Norwegian breeders have for some years conducted a breeding programme, based partially on ophthalmoscopic examination, which has possibly lowered the frequency of the disease.

The frequencies of coloboma, retinal detachments and intraocular haemorrhages differ only slightly from what has been reported from Sweden (Wickström 1986) but the frequency of coloboma in relation to CEA is lower than in other countries (Stades and Barnett 1981, Bedford 1982). This difference is difficult to explain as the disease is reported to be inherited through a recessive gene (Bedford 1982).

In the present study, there is no statistically significant difference in the occurrence of CEA between males and females, nor is there any relation between coat colour and the presence of CEA. This responds to the results of the study of CEA in the collie in the Netherlands by Stades and Barnett (1981).

The fact that minor chorioretinal changes observed in puppies may be masked by later pigmentation of the retina is well known (Bedford 1982). Dividing the present material into two groups according to the dogs' age at the first examination shows that the frequency of CEA in puppies is much higher than in older dogs. This is most probably caused by a number of 'go normals' among the older dogs. The dogs in group B included both breeding animals and others. They are assumed to make a representative sample from the collie breed, as breeders selecting against CEA usually have their puppies examined, and the dogs in group B were examined for the first time as older dogs.

Chorioretinal dysplasia (CRD) is reported by Bedford (1982) to occur constantly in CEA. CRD was found in all the puppies with CEA in the present study. However, among the 66 older dogs with CEA there were 11 cases with coloboma of the optic disc but no other abnormality in the fundus. These dogs may have shown signs of CRD at an early age which later became masked by retinal pigmentation.

In the study by Stades and Barnett (1981), 18 of 65 dogs affected with CEA showed coloboma of the optic disc as the only sign of the disease. As 91.3 per cent of the dogs in that study were more than three months old, these dogs may therefore have been 'go normal' dogs.

In a Swedish study, Leffler (1986) reported re-examination of 13 Shetland sheepdogs given the diagnosis CRD as puppies. Of these, six were ophthalmoscopically normal at the second examination. This agrees with the findings of the present study, in which re-examination of 22 dogs with minor chorioretinal changes diagnosed at seven to eight weeks of age revealed an ophthalmoscopically normal retina in 15 of the dogs, the other seven still having minimal CRD (Fig 3).

The present study has shown the significance of the 'go normal' in collie eye anomaly and the difficulty in arriving at the correct diagnosis when examining only adult dogs. On the basis of the present study, it is important in a breeding programme to examine puppies in order to diagnose accurately those cases where CRD is the only sign of the disease.

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REFERENCES


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<tr>
<td><strong>Number</strong></td>
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<td>CEA</td>
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<td>CRD</td>
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<td>Coloboma</td>
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<td>Retinal detachment</td>
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<td>Intraocular haemorrhage</td>
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Table 3. Frequency of CEA in collie puppies less than three months old (group A) and in older dogs (group B)

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<thead>
<tr>
<th></th>
<th>Total number of dogs examined</th>
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<tbody>
<tr>
<td>Group A</td>
<td>483</td>
<td>236</td>
<td>48.9</td>
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<td>Group B</td>
<td>258</td>
<td>63</td>
<td>25.6</td>
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