Developmental Aspects of Follicular Pharyngitis and Laryngeal Hemiplegia in the Foal

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1. Introduction

The pathogenesis of both follicular pharyngitis and laryngeal hemiplegia is not clear. At the moment, pharyngeal folliculitis is thought to be a more or less normal development of the lymphoid tissue in the pharynx. Laryngeal hemiplegia may be a manifestation of a more generalized polyneuropathy, that might be related to vitamin-E and selenium levels during growth. The aim of the study was to evaluate the development of the pharynx and larynx in foals from birth until 11 mo of age, to correlate the endoscopical findings with the postmortem findings, and to correlate laryngeal neuropathy with the selenium and vitamin-E levels in blood.

2. Materials and Methods

Experimental Context

In 1995 a research project on musculoskeletal development and osteochondrosis was started by the Institute for Horse Husbandry at Lelystad and the Veterinary Faculty at Utrecht, The Netherlands. In the following paragraph a short outline of this project is given; the experimental setup and most results of this project are more extensively discussed in a recent Supplement of the Equine Veterinary Journal.1,2,3

All mares of the research herd were sired by stallions known to have osteochondrosis. One week after birth (spring 1996), 43 foals were randomly assigned to 3 groups: a box-rest group (n = 14), a trained group (n = 14), and a pasture group (n = 15).

The box-rest group stayed in their boxes for five months. The trained group stayed in the same barn, but were exercised daily for approximately 45 min. The pasture group stayed in pasture. The box-rest and trained groups were fed grass from the same fields as the pasture group until weaning at 5 months. Then, 24 foals were euthanatized. The remaining 19 foals were housed together in an open barn until the age of 11 months and fed hay and concentrates. These foals were euthanatized at an age of 11 months. The project had been approved by the Utrecht University Ethical Committee. It provided a good opportunity to monitor the development of the upper airways in foals and to assess the possible influences of housing and vitamin E/selenium status.

Experimental Set-Up

Endoscopy

During life the foals were examined endoscopically within one week of birth and at 2–3 and 5 months of age. After euthanasia of 24 foals, the remaining 19 were examined again at 7–8 months and at 11 months of age before euthanasia. The foals were examined at rest, while they were restrained by two helpers. Sometimes a nose twitch was used, but foals were never sedated. The larynx was evaluated while the foal was ‘untouched’, after nasal occlusion, during swallowing, and while performing the slap test. Follicular pharyngitis and laryngeal hemiplegia were scored using a grading system from
0 to 4. For follicular pharyngitis, grade 0 meant a completely smooth pharynx and grade 4 meant many pink edematous follicles packed close together. For laryngeal hemiplegia, grade 0 meant fully symmetrical and normal movement and grade 4 meant marked permanent asymmetry and no or slight movement. Intermediate findings were scored 1, 2, or 3, according to severity.

**Blood Analysis**

Blood samples to determine selenium (flow injection atomic spectroscopy—FIAS) and vitamin E levels (high performance liquid chromatography—HPLC) were taken from the jugular vein at 8 a.m. in the first week after birth and every month until 5 months of age. In the remaining 19 foals samples were taken every other month until 11 months.

**Postmortem Analysis**

In the foals that were euthanatized at 5 months of age, the postmortem examinations were focused on follicular pharyngitis, while 10 of the foals in the 11 months of age group were examined for neuropathy. In the 24 foals euthanatized at five months of age, bacterial culture samples were taken from the pharynx, guttural pouch, trachea, and lung. Samples for histology were collected from the pharynx and the lung.
At 11 months, the laryngeal musculature, peripheral nerves, and central nervous tissues were examined histologically in 10 foals.

3. Results

Figure 1 shows the results of all foals for follicular pharyngitis. The severity increases significantly between birth and 2 months of age. It still increases at five months of age, but then it starts to decrease again after 8 months of age. In Figure 2 the differences between the three management groups are shown. The pasture group developed follicular pharyngitis later and did not reach the severity of the box-rest and training groups.

The histology of pharynx and lungs did not give any additional information. Any alterations were only marginally correlated with the clinical findings. The results of the bacterial cultures showed that the pharynx is almost always positive, as was expected. However, the guttural pouch, trachea, and lung were more frequently positive than expected. Bacteria most commonly found were *Streptococcus zooepidemicus*, *Streptococcus equi* and *Bordetella bronchiseptica*.

The results of the evaluation of the larynx are shown in Figure 3. All alterations (scores 1 to 4) were considered to be ‘neuropathy’. Over 50% of the foals did show some alterations, either left-sided or right-sided. Histology of the laryngeal musculature, peripheral nerves, and central nervous tissues showed in some cases inflammatory infiltrations and/or degenerative lesions, but these changes were not significantly correlated with the endoscopic findings, nor with vitamin E or selenium levels.

The selenium levels increased with age, but did not differ between the foals that were considered normal at 5 months and the foals that showed some grade of hemiplegia (Fig. 4). The same was true for the endoscopic results at 11 months (Fig. 5).

Vitamin E levels decreased with age. There were no significant differences between foals considered normal at 5 months of age (grade 0) and foals with some alterations (grades 1–4) (Fig. 6). The same was true for the endoscopic results at 11 months (Fig. 7). Vitamin E levels are low compared to literature data, but there was no significant correlation with the endoscopic findings, although the foals with some signs of neuropathy at 11 months always had slightly lower values.
4. Conclusion

All foals develop follicular pharyngitis, but in the pasture group the signs were less severe. There is a decrease of severity after 8 months of age. Bacterial cultures of pharynx, gutteral pouch, larynx and lungs were found more often positive than expected. Many foals show some signs of laryngeal asymmetry and abnormal movement. These signs disappear, stay unaltered, or may develop towards ‘real’ laryngeal neuropathy. The case of right-sided hemiplegia occurred without known cause, indicating that this may occur idiopathically. Neither Vitamin E nor selenium concentrations were significantly correlated with the endoscopic findings.

References