Risk for a dog to have simultaneous phenotypic expression of both hip and elbow dysplasia. A study based on 1411 radiographic examinations of both joints sent for official scoring

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INTRODUCTION
Hip dysplasia (HD) and elbow dysplasia (ED) are among the most common orthopaedic diseases of medium to large breed dogs, that are associated with osteoarthrosis in adulthood. As they are encountered in similar breeds, many dogs are simultaneously affected by HD and ED.

The purpose of this study based on 1411 official radiographic screening for both elbow and hip dysplasia is to look, in this population, for the phenotypic correlation between hip and elbow dysplasia and to the risk ratio linked with the two conditions.

MATERIALS AND METHODS
Animals:
From 1999 to 2007, based on radiographs which were submitted for authoritative grading, 1411 dogs simultaneously screened for HD and ED were included in the study. Radiographic screening was performed by a unique skilled official panellist. For each dog, breed, age at time radiographs were performed, HD and ED score were noted.

Radiographic examination:
HD radiographic screening was based on a conventional ventrodorsal hip extended view. The animals were graded according to the FCI 5 class grading scale protocol (A = no sign of HD; B = near normal; C = mild HD; D = moderate HD; E = severe HD).

ED radiographic screening was based on three radiographic projections of each elbow joint: true mediolateral with the joint flexed approximately 45° (ML flexed), true mediolateral with the joint extended (ML extended), and cranio-lateral-caudomedial oblique (Crl5L-CdMO). ED gradation was based on official ED french grading system, which is a 5 class modified IEWG (International Elbow Working Group) grading scale (ED 0 = No sign of ED; SL = near normal; ED 1 = Mild ED; ED 2 = Moderate ED; ED 3 = Severe ED).

In this grading scale, every dog showing a primary lesion on the radiograph is classified as ED 3.

As they belong to an «intermediate» class, dogs scored as «near normal», either for HD or ED, were excluded from the study.

Data analysis:
Statistical analysis was performed with a statistical computer software package. A chi2-squared test and a Spearman's rank correlation test were performed in order to look for correlation between elbow and hip dysplasia. Risk ratio and the corresponding 95% CI was then calculated to look for the risk factor for the animal to be both HD and ED affected. Risk ratio was also calculated for each class of dysplasia.

RESULTS
1411 dogs were included in this study. Most of them belong to four breeds: Bernese mountain dog (726), Rottweiler (341), Australian sheepdog (165) and White Swiss sheep dog (139). 41 dogs from 13 other breeds are also included in the study. There are 894 females and 517 males. Median age was 16 months. Results of HD and ED score were resumed in table 1. HD prevalence was 7.5% and of ED prevalence 18.4%.

Chi2-squared test showed a significant correlation (p-value < 0.001) between HD and ED. Spearman’s rank correlation test value was 0.1 (p-value = 0.0005).

Risk ratio for an animal to be simultaneously affected by HD and ED was 1.67 (1.21-2.30) (p-value = 0.004).

For a dog with ED, risk ratio to be affected by HD increases with the grade of ED. Indeed, risk ratio, for a dog with grade 1 ED, to be affected by HD was 1.19 (0.67-2.09). Whereas for a dog with grade 3 ED risk ratio to be affected by HD was 3.60 (2.20-5.90). Similarly, for a dog affected by HD, risk ratio for ED increases with the grade of HD. A dog with a grade C HD get a risk ratio to be affected by ED of 1.30 (0.82-2.06) whereas risk ratio, for a dog with grade D HD, to be affected by ED was 2.29 (1.53-3.40).
CONCLUSION

We found a statistically, though low, significant correlation between HD and ED. To the authors knowledge, phenotypic correlation between HD and ED was so far reported in three study. A Pearson correlation coefficient of 0.16 between phenotypic traits of HD and ED was found in labrador retriever in Switzerland. Another result from an explorative screening program for elbow dysplasia in some breeds of dogs in Italy show that HD diagnosis was significantly associated with the risk of outbreak of ED, and that dogs affected by hip dysplasia showed a 41% increased risk on being affected by ED. In Finland, a phenotypic correlation between HD and ED was also reported to be 0,24 for the Rottweiler.

On a clinical (or individual) point of view when HD or ED is diagnosed in an animal, the clinician should look for the second condition. This is particularly pertinent in case of severe ED or HD as the risk ratio for an animal with severe HD to be also affected of ED is almost 2,3. Similarly, the risk ratio for an animal with severe ED to present with HD is 3,6. Such correlation between orthopedic conditions has been described for other orthopedic problems.

On a breeding point of view, finding a positive correlation between HD and ED could bring the hope that a simultaneous selection for both traits is possible. Unfortunately, at least in our study and in the studies of Mäki, the correlation is in a low range. Therefore selection against only one trait will not effect the other trait sufficiently. As a consequence, selection has to be conducted at reduction of HD as well as reduction of ED.

REFERENCES


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