Risk factors analysis in humeral condyle fractures in the dog: retrospective study

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INTRODUCTION
In the last twenty years many aspects of the pathogenesis of humeral condyle fractures (HCF) have been cleared. Most probably the elbow anatomic conformation and its biomechanics are some of the causes of this pathology; but some clinical studies pointed out presumable breed, sex, age predispositions.

The purpose of this study is to underline any possible risk factors about this pathology through a retrospective analysis of all 12,220 dogs brought to our section between 1987 and 2003 and a comparison of our data with those reported in literature.

MATERIALS AND METHODS
We examined medical records from all dogs (12,220) who were presented to our attention between January 1987 and December 2003, from them we extrapolated all records of dogs with HCF (98). Signalment, medical history, physical examination findings, diagnosis and treatment data were recorded for each dog. The HCF (104) were divided on the basis of their localization in Lateral (43), Medial (12), Intercondylar (42) and Incomplete (7). The dogs with HCF and the general population were divided on the basis of sex, age, breed and attitude. Dogs with HCF were also divided in immature (younger or of 8 months) and adult (older than 8 months). All dogs were divided in 10 groups of breeds as FCI classification and in hunting and non hunting dogs. The results of this study were object of statistical analysis. In this report we consider only results concerning breed and attitude.

RESULTS
Frequency of condylar fracture was 0.8% (98 on 12,220 dogs), but some groups of breeds had a higher frequency, in fact pointing dogs (group 7) and scenthounds dogs (group 6) had a frequency of fractures of 1.61% (28 on 1741) and 1.62% (16 on 985) respectively, while in the other groups frequency of fractures was between 0 and 0.77%. Differences between different groups were significant ($\chi^2$ test, $p<0.000092$).

Hunting dogs (group 6 and 7) represented 44.90% of all the dogs with HCF, whereas only 22.31% of general population. Non hunting dogs represented 55.10% of dogs with HCF and 77.69% of the general population. Therefore hunting dogs were much more represented in the group of dogs with HCF then in general population. Hunting dogs had a frequency of HCF 1.61%, the others groups of 0.57%. The difference between the two groups of attitude was significant (Fisher’s test, $p<0.000001$). Non hunting dogs were much younger then hunting dogs ($p<0.009$): average age for the formers was 2.54 years, for the latters was 4.29 years. Besides, in the group of immature dogs, 77.27% (34 dogs) were non-hunting dogs and only 22.73% (10 dogs) were hunting dogs, on the contrary in the group of mature dogs, 62.96% (34 dogs) were hunting dogs and only 37.04% (20 dogs) were non hunting dogs. The comparison between hunting dogs and non hunting dogs pointed out a Odds ratio of 2.87, (1.92-4.28) so there is a good association between attitude (hunting) and fracture.

A three years old, male, English Pointer had a scintigrafy that revealed an intense area of $^{99m}$Tc-MDP uptake at the level of the right elbow joint; CT scan revealed an incomplete intercondylar fracture in both humeri; histological sample that consisted of dense cancellus bone, showing a well defined fracture separating the two trabecular bone fronts. At the site of the lesion, a wide fracture gap filled by amorphous and necrotic material was observed. Some osteonecrotic areas were also evident at the trabecular front of the fracture. In very few areas, small group of cells with morphological aspects of mesenchimal activity and proliferation were observed, indicating a limited and incomplete repair process. The adjacent trabecular bone showed an evident increase of density and thickening.

Arthroscopy, performed in elbow joints of the five dogs with incomplete humeral condylar fractures, clearly showed the incomplete condylar fissure fracture and the absence of synovitis.

DISCUSSION
If we consider single types of fractures, we observed that affected breeds were different: in the group of intercondylar fractures, according with same authors, dogs more represented were hunting dogs (42.5%) and also...
Shepherd dogs (17.5%); in the group of lateral fractures we could observe, as saw from Drapè (1990), two
groups of affected dogs: immature small size dogs and mix-breeds; and adult dogs that were almost exclu-
sively hunting dogs (76.92%). We think that the reason of that is in the pathogenesis of those fractures: it
has been looked that the most frequent cause of HCF in puppies is a fall from the arm of the owner or sofa
or chairs or other domestic difference in level. Hunting dogs, contrarily to small size dogs, rarely are on the
arms of people or inside home.
However, adult dogs with HCF were mostly hunting dogs and other medium or big size breeds were more
less affected. It would be possible that some risk factor acts only on hunting dogs and not on other breeds.
We think, as Drapè, that the cause of HCF in hunting mature dogs is related to their physical activity and
to the repetitive mechanical stress that act to lateral humeral condyles during hunting. Besides, in our study
all dogs affected of incomplete HCF were hunting mature dogs (one of theme had in one elbow a complete
HCF and after two months an incomplete HCF in the other elbow). As him, we think that this type of frac-
ture, in hunting dogs, is expression of syndrome of pre-fracture caused by fatigue. Some studies (Marcellin-
Little et al. 1994; Olmstead et al.1988; etc) reported a high frequency of incomplete HFC in Cocker Spaniel
dogs, the authors support the hypothesis of a genetic predisposition to an incomplete ossification of humer-
al condyle, other studies (Rovesti et al. 1998; Robin et al. 2001) reported incomplete HCF also in breed usu-
ally affected by osteochondrotic disease (Labrador retriever and Rottweiler). In the general population of
our study we had 199 Cocker Spaniels and 337 Retrievers (who often had an elbow arthroscopy) but none
of them had an incomplete HCF. Besides, hunting dogs are two groups of dogs constituted by different and
numerous breeds and they don’t have genetic correlations.
The absence of a effective comparison between dogs with HCF and general population in the majority of
past study, might give inaccurate data relatively to the real frequency of this pathology in each breed. Biop-
sies taken from the intercondylar area, either in our or in other studies, didn’t reveal chondrocyte or carti-
lage matrix. The finding of amorphous and necrotic material is a analogy with stress fracture, where in the
last stage (Jones’s Classification) histological report might reveal areas of necrosis. An intense captation of
$^{99m}$Tc-MDP in the affected elbow of our and other studies was a finding similar to stress fractures.

CONCLUSION
In this report humeral condylar fractures had a greater frequency in hunting, adult, male dogs. Hunting
dogs live for a biggest part of the year in small boxes and, during hunting season, after short period of
intense training, work hard and repetitively often in bumpy ground. For this reason, because also to the
analogy that exist in the etiopathology of stress fractures in other species (man and horse), we think that
hunting might be for dog an important risk factor in the etiology of HCF. Besides, the common finding in
hunting dogs of incomplete intercondylar fissure may be the expression of a syndrome of pre-fracture that,
because of continuing and violent stress transmitted through the radius on to the capitulum, might fall in
fatigue fractures.