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Brief Communication

Serum Concentrations of Procollagen Type III Aminoterminal Peptide in Growing Dogs with Hip Dysplasia

The aim of the present study was to investigate the use of procollagen type III aminoterminal peptide (PIIINP) measurements in serum as an indicator of progress of fibrosis of coxofemoral joint capsules in hip dysplasia in immature dogs. High serum concentrations of PIIINP may indicate ongoing fibrosis with enhanced synthesis and deposition of fibrillar type III collagen, or an alteration in degradation and elimination of circulating PIIINP *(Hørslev-Petersen et al.* 1988a). Therefore, high concentrations of PIIINP in serum was expected in dogs with hip dysplasia, which is a developmental condition with capsular fibrosis and osteoarthritis *(Gay et al.* 1986).

The design of the study included measurements of the concentrations of PIIINP in serum from dogs during their first 6 months of life. Earlier reports have shown high concentrations of PIIINP in serum and synovial fluids in growing *(Trivedi et al.* 1986) and in osteoarthritic animals *(Hørslev-Petersen et al.* 1988b, *Madsen et al.* 1990). These observations support our working hypothesis that increased fibrillogenesis of collagen type III is an early feature of hip dysplasia in dogs.

The present study comprised 23 German shepherd dogs from 6 litters. Serum was obtained from all dogs at the age of 2 weeks, 6 weeks, and 26 weeks. At the age of 6 and 12 months the dogs were examined clinically and radiographically with respect to their hip status. The clinical examination included the Ortolani test for coxofemoral joint laxity *(Chalman & Butter* 1985), and was performed before and after administration of Xylazine (1.3 mg/kg; IM). Dogs were excluded from the study if the clinical examination or the history indicated any disease except hip dysplasia. At the radiographic examination a standardized method for obtaining pelvic radiographs was used *(Rendano & Ryan* 1985). Hip dysplasia was B2 or worse according to the criteria approved by Fédération Cynologique Internationale *(Brass et al.* 1978). Diagnoses were made when the dogs were 12 months old, and dogs with the radiographic evidence of other pelvic diseases were excluded from the study.

The concentrations of intact and high molecular weight PIIINP antigens were determined by an equilibrium type radioimmunoassay[a] *(Risteli et al.* 1988). The methodology, which is well documented in human beings *(Risteli & Risteli* 1990), is based on the fact that PIIINP is liberated into the extracellular fluid during fibrillogenesis of collagen type III. Increased concentrations of PIIINP have been detected in humans with active arthritis *(Hørslev-Petersen et al.* 1988b), in growth *(Trivedi et al.* 1986), and in diseases in which collagen syn-

[a] PIIINP-RIA Kit, Farmos Diagnostica, Oulunsalo, Finland.

Table 1. Results of the measurements of PIIINP in serum from 23 dogs sampled at the age of 2, 6, and 26 weeks.

Dog	Concentrations of PIIINP (μg/l)			Hip dysplasia	
	2 weeks	6 weeks	26 weeks		
1	578	588	ND	NO	
2	1003	582	694	NO	*
3	388	720	205	NO	*
4	236	510	403	NO	
5	814	383	176	NO	
6	1168	508	232	NO	
7	783	473	320	NO	
8	858	695	358	NO	
9	655	423	203	NO	*
10	850	428	365	NO	*
11	832	478	248	NO	*
12	424	915	415	YES	*
13	1280	635	363	YES	
14	2080	990	245	YES	*
15	1136	640	446	YES	*
16	996	468	313	YES	*
17	962	403	330	YES	*
18	768	518	385	YES	*
19	843	682	264	YES	
20	925	620	ND	YES	*
21	330	403	188	YES	*
22	1108	378	255	YES	*
23	940	510	322	YES	*
Median/Range Q1-Q3					
Dysplastic	951/806-1122	569/436-661	322/255-385		
Not dysplastic	814/578-858	508/428-588	284/205-365		
Joint laxity	933/717-1056	514/426-638	322/245-385		
Tight joints	814/578-858	510/473-682	292/232-358		
$p_{normal<>dysplastic}$	0.12	0.54	0.51		
$p_{lax<>tight\ joints}$	0.30	0.95	0.56		

* Dogs showing coxofemoral joint laxity at the age of 6 or 12 months.
ND = Not determined.
Medians and ranges from 25 to 75 percentiles are shown (Q1-Q3) by age group and severity of hip dysplasia.
P show the probability of the Mann Whitney test that there are no differences between affected and normal dogs.

thesis is increased *(Fesslev & Fesslev* 1978) or where the metabolism of the peptide is changed *(Hørslev-Petersen et al.* 1988a, *Bentsen et al.* 1989).

Statistical analyses were performed on computer using the procedures NPAR1WAY ANOVA WILCOXON of the Statistical Analysing System *SAS Institute Inc.* 1988). Non-parametric statistical analysis, the Mann Whitney rank sum test for unpaired observations, was used to establish if there was a statistical difference between the concentrations

of PIIINP in serum from dogs with and without coxofemoral joint laxity or hip dysplasia.

In the present study, the concentrations of serum PIIINP were higher in dogs with hip dysplasia or coxofemoral joint laxity than in normal dogs, but differences were not significant (Table 1). The PIIINP concentration in serum decreased to one third from the age of 2 weeks to the age of 26 weeks (Table 1). It is known that the PIIINP concentration is related to growth velocity *(Trivedi et al.* 1986). Therefore, it is of great importance to know the exact age of the dog from which the PIIINP concentrations in serum are evaluated.

Recent studies in older dogs show that measurements of the concentrations of PIIINP in synovial fluid reflect the progress of capsular fibrosis better than measurements in serum *(Madsen et al.* 1990). Concentrations of the peptide in serum might be low if the progression of fibrosis is very slow or interrupted or if the metabolism of the peptide is increased. Contrary, the PIIINP concentrations should increase with exacerbations of joint disease. These phenomena may explain the great variation in the concentrations of PIIINP seen in this study, and consequently the absence of significant differences between dogs with and without hip dysplasia.

In conclusion, the present study did not support the hypothesis that increased fibrillogenesis of collagen type III is an early feature of hip dysplasia. Still, the latter hypothesis may be correct, and statistically significantly elevated mean concentrations of PIIINP in serum may occur in larger populations. Based on the observation of overlapping ranges between normal and dysplastic dogs, we decided to terminate the study. Still, measurements of PIIINP concentrations of serum may give information about progression of joint diseases of the individual dog, but the measurements are not diagnostic for hip dysplasia in immature dogs.

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