Effect of Diet on Prophylaxis Scaling Effort

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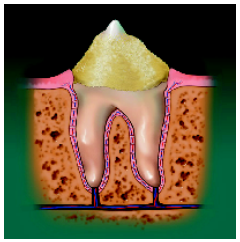
PURPOSE

Professional dental prophylaxis is a key step for maintaining oral health in companion animals. However, few owners routinely schedule cleanings and cite factors such as anesthesia stress as a concern. Recent advances in modern technology have now allowed for better diagnostic tools to understand the impact of the dental prophylaxis on companion animals. In fact, it is now possible to measure the exact degree of calculus severity, and the direct correlation to a professional prophylaxis. The purpose of this investigation was to measure the scaling forces generated during prophylaxis, and to determine if the workload can be reduced by the choice of diet.

INTRODUCTION



Dental calculus, or tartar, is a plaque biofilm that undergoes petrifaction on the tooth surface. In companion animals, it has been reported as the most prevalent disorder among private veterinary practices. The only effective method for complete removal of calculus is through a professional prophylaxis. In veterinary practice, this procedure is accomplished with either an ultrasonic device, or a mechanical scaler. Currently, several marketed pet products claim to reduce calculus accumulation, but few publish technical data to support the claim. Further, when support data is available, the typical focus is on the ability of the product to reduce the area of calculus buildup. While the measurement of area is useful, it does not account for variations in calculus hardness or adhesive tenacity. As a result, the complete benefit of a dental product to the practitioner, or animal has never been fully investigated. One method to examine prophylaxis benefits is through the use of a specially designed Quanticalc (QC) scaling handpiece. This device utilizes a handheld scaler coupled with a force transducer to measure the work effort involved in scaling calculus debris. With the aid of the QC device, a canine study was conducted to measure the prophylaxis benefits related to feeding a diet enhanced with a polyphosphate coating.

METHOD

Twenty-eight adult beagles were recruited for a crossover study. Animals were stratified into two groups that were balanced for calculus, and randomly assigned diet. Test duration included two four-week periods separated by a one-week washout. Test diets included Iams® Chunks (CHNX) and Iams® Chunks enhanced with a polyphosphate (CHNX-PPi). All dogs received a whole mouth (WM) prophylaxis at the initiation of each test period. At period conclusions, visual assessments of calculus area were recorded along with quantitative scaling on the fourth maxillary premolar (P4).

Study Timeline:

Period:	Stratification	Leg 1	Washout	Leg 2
Duration:		4 weeks	1 week	4 weeks

WM Prophy — P4 Prophy WM Grade — WM Prophy — P4 Prophy WM Grade

Calculus area was evaluated on both the maxillary (I3, C, P3, P4, M1) and mandibular (C, P3, P4, M1) teeth by air drying the deposit and scoring under standard room light. For scoring purposes, the tooth was divided vertically into mesial, buccal and distal thirds, with each third assigned a numerical score for both coverage and thickness. Additionally, a probe was used gently to verify the visual impression of cover and thickness. For area, a five point scale (0, 1, 2, 3, and 4) was used for coverage assessment with a "zero" representing the lowest area and a "four" representing the maximum area. For thickness, assessment was limited to a choice of: $\leq$ 1 mm, 2 mm, or $\geq$ 3mm. The tooth score was the sum of the coverage multiplied by the density for each of the three tooth surfaces. Finally, the sum of the teeth scores were averaged to obtain a whole mouth mean tooth calculus score for each animal.

The scaling effort was measured with a modified Quanticalc (QC) hand scaler previously described (Cox et al., JDR 74A: 233 (1774) 1995). QC scaling was conducted on the supragingival deposits located on the fourth maxilla premolars, and was continued until surfaces were free of deposits as assessed by both a visual and tactile inspection. Data collected included the maximum force associated with a scaling stroke, the number of strokes required for the manual debridement of the calculus, and the total work. The total work was determined by multiplying the total force by the total strokes.

RESULTS

Comparative testing (CHNX Vs. CHNX-PPi; $p<0.05$) showed that the polyphosphate enhanced diet:

1. Statistically reduced whole mouth calculus area by 53%.
2. Statistically reduced average P4 calculus scaling force by 39%.
3. Statistically reduced average number of P4 calculus scaling strokes by 30%.
4. Statistically reduced work effort for scaling P4 calculus debris by 56%.

Further, the correlation coefficient between the fourth premolar calculus area and prophylaxis work was rather low (0.0533) implying that traditional scoring methods may not be proper indicators of effort required for cleaning.

DATA

WM Visual Tartar Score

Diet	Mean	SEM
CHNX	3.72	0.38
CHNX-PP1	1.76	0.22

Values differ at $p<0.05$

P4 QC Scaling Force –Kg.

Diet	Mean	SEM
CHNX	8.92	1.32
CHNX-PP1	5.41	0.72

Values differ at $p<0.05$

P4 QC Scaling Strokes

Diet	Mean	SEM
CHNX	55	5.47
CHNX-PP1	39	4.69

Values differ at $p<0.05$

P4 QC Work Effort

Diet	Mean	SEM
CHNX	661.4	161.9
CHNX-PP1	293.9	56.8

Values differ at $p<0.05$

CONCLUSIONS

This data confirms that a diet enhanced with polyphosphates can have a significant effect on both the work effort associated with a dental prophylaxis, and on the accumulation rate of calculus

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Procter&Gamble