



Comparative Efficacy of Chitosan Jelly and Chlorhexidine Mouth Wash for Periodontal Diseases in Dog

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Abstract

The research entitled "Clinical Efficacy of Dental Scaling, Polishing and Chitosan Compound in Periodontal Diseases in Dog" was undertaken to study the same entitled subject. 32 dogs were screened for the presence of periodontal disease. Out of which 12 dogs aged above two years and having dental tartar were included in the present study irrespective of breed, sex and weight. Chlorhexidine mouthwash was given in group I and in group II chitosan jelly was applied with simple massage for the next 14 days after a dental procedure. Dogs with Grade I (33.33%) and Grade II (66.68%) tartar were included in the study. The average age of dogs with grade I and grade II periodontitis ranged between 2-4 and 5-11 years respectively. Findings concluded that dogs fed with cooked food or soft diet has more incidence of dental tartar than a mixed or hard diet. Grade II tartar was seen in dogs fed with soft or mixed diet and Grade I in dogs fed with a hard diet. Regular use of chitosan results in a decreased microbial count with a reduction in infection while regular use of Chlorhexidine results in staining of enamel. Bacterial isolates from the oral cavity identified *E. coli spp.*, *streptococcus spp.*, *staphylococcus spp.* and *Pseudomonas spp.*

Keywords: Dental tartar; Chitosan; Chlorhexidine

Introduction

Being a companion animal dog has gained the capability to survive on a starch-rich diet that would be inadequate for other carnivores. Their natural source of "dental floss" and teeth cleaning- their prey has been in large part removed from their diet. Pets suffering from oral discomfort, illness or inflammation may not be visible but affect their quality of life.

Dental disorders are among the most frequent conditions that occurred in 80% of dogs that have periodontal disease above the

age of 2 years. It could be due to wear and tear of gums and teeth with ageing may results in easy deposition of tartar plaque and lodgement of bacteria over and around the tooth surface or gums resulting in plaques formation whereas periodontal diseases may lead to progressive inflammation and tissue damage, oral discomfort and tooth loss; spread throughout the body affecting the liver, kidneys, and heart. A variety of variables including breed, genetics, age, nutrition, chewing habit, and systemic health cause periodontal diseases [12,24].

Oral health with a good-looking and non-smelling mouth is the product of good dental hygiene signifying cleanliness of teeth, and gums without halitosis. Veterinary dentistry hasn't yet reached its full potential in referral practice so maintaining good oral hygiene at home is needed to keep teeth healthy and strong. Dental health is an underappreciated part of companion animal care so requires proper dental and gum care, both professionally and at home.

Dry foods are the safest as they are abrasive and eliminate plaque from the teeth crown. Ultrasound scaling (Figure 1) under mild anesthesia or sedation [10] using supra and subgingival ultrasonic tips may be done to remove scales and plaques [1].

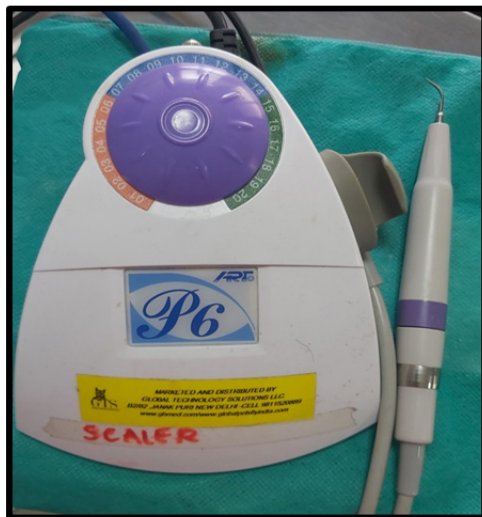


Figure 1: Ultrasonic Scaler.

Scaling causes non-adherence of the bacterial biofilm with smooth teeth to the surface helping reduced plaque deposition and removing residual plaque after scaling by polishing making polishing is an essential component of a thorough dental cleaning as it prevents plaque re-accumulation. The therapeutic process of teeth cleaning in dogs needs anesthesia and intubation in dorsal recumbency.

Chlorhexidine (Figure 2) is the most commonly used antimicrobial for oral infections. Advances in science and biomedicine enabled the development of more efficient and safe novel biomateri-



Figure 2: Chlorhexidine mouth was.

als such as chitin and chitosan which have been studied against a wide variety of target microorganisms viz., algae, bacteria, yeasts and fungus *in-vivo* and *in-vitro* [13].

Chitosan is a water-soluble agent used for mouth rinse having antibacterial and plaque-reducing properties beneficial for both dental health and the overall well-being of the animals.

Material and Methods

The present clinical study was conducted in 32 clinical cases that were presented to the Teaching Veterinary Clinical Complex, Post Graduate Institute of Veterinary and Animal Science, Akola.

Among dogs screened for the presence of periodontal disease if any, 12 dogs above 2 years having dental tartar were included in the study irrespective of breed, sex and weight. These dogs were randomly divided into two equal groups. Depending on the severity of periodontal diseases these cases were categorized into grade I and grade II dental tartar. Under general anesthesia, the dogs were intubated and dental cleaning was carried out with help of a scaler followed by polishing of teeth.

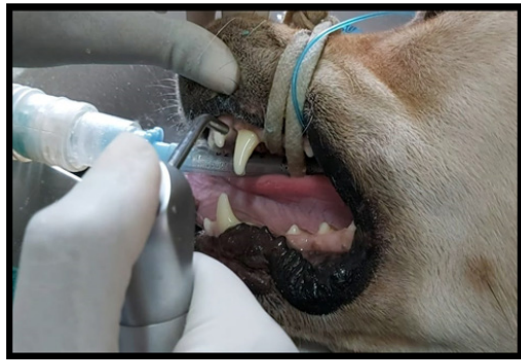


Figure 3: Irrigation with Chlorhexidine after scaling.

After completion of scaling and polishing, gentle irrigation of distilled water was done to remove all the debris from the teeth and mouth. In Group I lavage with 2% Chlorhexidine mouthwash diluted in 100ml of distilled water was performed (Figure 3).

Whereas in Group II Chitosan gel was applied and massage of teeth and gums was undertaken with the help of a polisher brush. Owners were advised to perform mouthwash with diluted Chlorhexidine in group I and chitosan gel application in group II for 14 consecutive days (Figure 4).



Figure 4: Chitosan jelly.

Results and Discussion

Dental diseases are common in dogs [1] with their frequencies as high as 60-80 percent of all canines presenting for treatment. Oral cavity examination of 12 affected dogs revealed Grade I tartar in 4 (33.33%) dogs of 2-4 years and Grade II tartar in 8 (66.67%) dogs of 5-11 years). Aging results in wear and tear of gums and teeth aging may result in easy deposition of tartar plaque and lodgement of bacteria over and around the tooth surface or gums. It was observed that males (59.37%) are more prone to periodontal diseases than females (40.62%).

Diet is the most important predisposing factor and collected history of diet revealed 50% of dogs fed with cooked food or a soft diet including cooked rice, pulses, the boneless chicken had the periodontal disease as compared to 16.67% of dogs fed with hard treats once or twice a week, however, 33.33% dogs fed with hard treats and mixed diet (veg, non-veg and commercial food) had grade I tartar, may be due to hard treat that reduces plaque, stain and calculus building on teeth whereas dogs fed with soft diet had grade II tartar these findings are also confirmed by [11,14,16,18,20,27].

All the clinical and physiological parameters like rectal temperature, heart rate and respiration rate before the dental procedure on 0 days and after the dental procedure on 7 days were found within normal. ECG parameters like P wave duration, P wave amplitude, QRS wave duration, QRS wave amplitude and T wave in affected dogs were also changed non-significantly in both the groups. A tall T wave was found in 4 dogs in group I before the procedure and remained spiked in 3 dogs after the dental procedure on 7 day while in group II tall T wave was found in 4 dogs on 0 day and remained spiked in 2 dogs. (Figure 5) Spiked T wave may be due to acid-base or electrolyte abnormalities such as hyperkalemia.

Hematological parameters like hemoglobin, total erythrocyte count, packed cell volume, basophils, eosinophil, lymphocytes and monocytes recorded on 0, 7th and 14th days were having non-significant changes [3,21,19] while parameters like total leukocyte count and neutrophils decreased significantly decreased in both the groups on 14th day compared to 0th day this might be due to presence of infection [8].

Biochemical parameters like alanine aminotransferase, aspartate aminotransferase, blood urea nitrogen and serum creatinine were found to be non-significant from 0 day to 14 day in both the

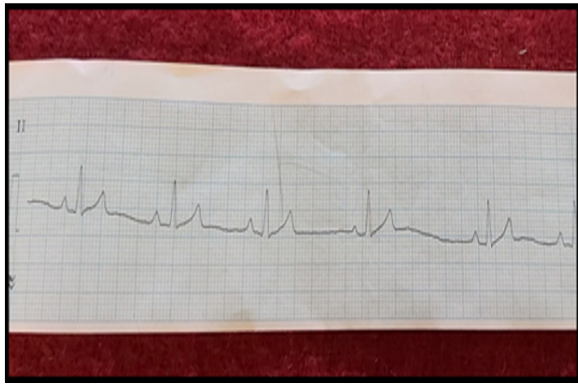


Figure 5: Spiked T wave.

groups as the studied dogs having Grade I and II severity of dental tartar [2,3,6,18,19,22,26,28].

Oral bacteria can cause oral disorders and produce halitosis and plaque formation which turns to tartar. Dehydration can also induce an increase in the bacterial or microbial count and subsequent halitosis, which is the first symptom that alerts dog owners to look after the oral health of the dog. In most cases, grade I tartar does not induce periodontitis; however, if it does, it is most likely owing to infection. Microbial count in both groups decreased significantly on the 14th day compared to the 0th day. It might be due to chitosan jelly and Chlorhexidine mouthwash used in groups II and I respectively. Statistically, microbial count differed significantly ($p < 0.01$) between the groups [8,17,25]. Bacterial isolates identified were *E. coli* (Figure 6), *Pseudomonas aeruginosa* (Figure 7), *Streptococcus spp.* and *staphylococcus spp.* [4,5,7,9,15]. (Figure 8)

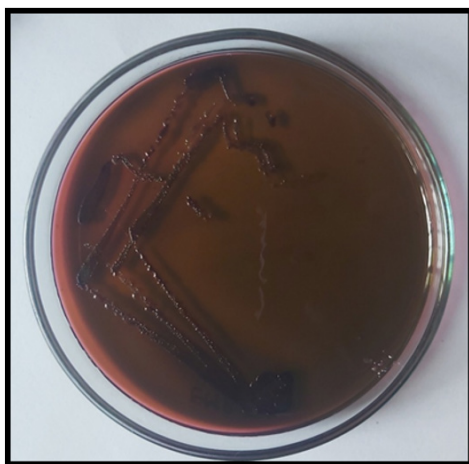


Figure 6: *E. coli* colonies on EMB agar.



Figure 7: *Pseudomonas* colonies on nutrient agar.



Figure 8: *E. coli* colonies on Mackonky's agar.

Conclusions

Oral home care is most important with professional dental cleaning as Grade I and Grade II tartar are reoccurring in nature. Client education with regards to dental diseases for the benefit of their pet's regular oral care is of utmost importance. Untreated periodontal disease may sometime lead to distant organ diseases like renal failure, diabetes mellitus and immunopathies.

The incidence of 33.33% Grade I tartar in dogs of 2-4 years and 66.67% Grade II tartar in 5-11 years dogs were recorded in this

study. It was observed that dogs fed with cooked food or a soft diet had more incidence of Grade II dental tartar and dogs receiving a mixed or hard diet had Grade I tartar. *E. coli* followed by *Pseudomonas aeruginosa*, *Streptococcus* and *Staphylococcus species* were the major isolated pathogens. Chitosan jelly was founded more effective in controlling the infection without any side effects as compared to Chlorhexidine mouthwash which resulted in staining of enamel.

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