

RESEARCH ARTICLE

The Effect of Periogen Solution on Dental Calculus *in vitro*: A Pilot Study

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ABSTRACT

Introduction: Calculus can accommodate teeth and prosthetic restorations when the patient's oral hygiene is poor. Hardened calculus cannot be removed by patients, it needs professional cleaning using ultrasonic scaler or hand instrument. Solutions dissolving and preventing accumulation of dental calculus may help to keep dentures clean. The aim of this investigation was to examine the effect of Periogen on dental calculus *in vitro*.

Materials and methods: Calculus was collected via scaling from patients during a routine dental checkup. The samples were stored in carbamide peroxide solution (5%) for 24 hours, then rinsed and stored in distilled water. First, the Ca²⁺ content of the calculus was determined by photometric method after treating with cc. hydrochloric acid solution for 1 hour. The calculus samples were put in Periogen solution, prepared according to manufacturer's instruction for 16 hours, then crushed and put in Periogen solution with the same concentrate for 4.5 hours. The Ca²⁺ dissolved from calculus was measured using same photometric method.

Results: Calculus samples contained 26 mg/100 mg Ca²⁺, which is similar to dentin (27–28 mg/100 mg) and to enamel (36 mg/100 mg). The Ca²⁺ dissolved from calculus after treating with cc. hydrochloric acid for 1 hour was considered 100%. Ca²⁺ dissolution was 1.5% after 16 hours (0.09%/h) and 5.45% (1.21%/h) for the next 4.5 hours after pulverizing the sample. This showed Periogen Ca²⁺ dissolution was 385 µg/100 mg after 16 hours direct contact with the material.

Conclusion: The experiment showed that pulverizing the previously hard calculus was done easily after soaking it in Periogen. The ability of Periogen to soften the calculus needs to be further investigated.

Keywords: Calculus, Oral disease, Periodontal, Periogen.

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INTRODUCTION

Supra- and subgingival calculus is largely responsible for the development and progression of periodontal diseases.¹⁻³ It can accommodate not only on tooth surfaces, but also on various prosthetic restorations (either fixed or removable dentures) when the patient's oral hygiene is poor and the mechanical cleaning of restorations is insufficient.^{4,5}

Patients are not able to remove hardened calculus; it needs professional cleaning using ultrasonic scaler and/or hand instruments by dental professionals, as well as regular checkups if the patients' oral condition makes it necessary.^{1,2}

Dental education is important in the struggle of achieving a good oral hygiene: Dental professionals have to teach their patients of various teeth and denture cleaning methods, appliances, and materials. Besides the mechanical cleaning appliances (e.g., tooth brushes, denture brushes), chemical solutions dissolving and preventing accumulation of dental calculus may help to keep teeth and dentures clean.⁶

Denture wearer patients usually belong to elder population. Their skills to clean their removable dentures can be insufficient, which leads to accommodation of plaque, stains, food particles, and bacteria on their prosthesis.⁷⁻⁹ The presence of bacteria on dentures and thus in the oral cavity may be an important contributing factor for chronic systematic diseases, like chronic obstructive pulmonary disease.¹⁰

The aim of this investigation was to examine the effect of Periogen solution on dental calculus *in vitro*.

MATERIALS AND METHODS

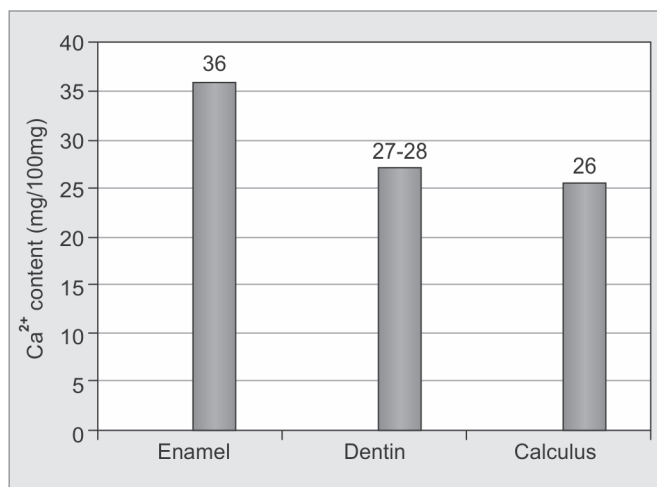
For this pilot study, calculus was collected via scaling from patients during a routine dental checkup at the University of Pécs Medical School dental clinic. Calculus was collected from different teeth (equally from anterior and molar teeth) and from different surfaces of the teeth.

The samples were stored in carbamide peroxide solution (5%) for 24 hours, then rinsed and stored in distilled water until the experiment.

First the Ca²⁺ content of the collected calculus was determined by photometric method¹¹ after treating with cc. hydrochloric acid solution for 1 hour. The calculus

Table 1: Ca²⁺ dissolution in different solutions

Mode of soaking (on room temperature)	Soaking time (h)		Dissolved Ca ²⁺	Speed of dissolution (%/h)
Calculus in one block	16	1.5%	385 µg/100 mg	0.09
Calculus pulverized	4.5	5.45%	1,394 µg/100 mg	1.212
Calculus in one block in cc. HCl	1	100%	25,550 µg/100 mg	10

**Graph 1:** Ca²⁺ content of tooth structures and calculus

samples were placed in Periogen solution, prepared according to manufacturer's instruction for 16 hours, then crushed and placed in Periogen solution with the same concentrate for 4.5 hours.

The Ca²⁺ dissolved from calculus was measured using the same photometric method after the first 16 hours and after another 4.5 hours.

RESULTS

Calculus samples contained Ca²⁺, which was similar to dentin (27–28 mg/100 mg Ca²⁺), and smaller than the Ca²⁺ content of the enamel (36 mg/100 mg Ca²⁺) (Graph 1).

Results of the photometric measurement are shown in Table 1.

The Ca²⁺ dissolved from calculus after treated with cc. hydrochloric acid for 1 hour was considered 100%. Ca²⁺ dissolution was 1.5% after 16 hours (0.09%/h) and 5.45% (1.21%/h) for the next 4.5 hours after pulverizing the sample.

Quantitative Ca²⁺ dissolution from one block calculus was 385 µg/100 mg after 16 hours and 1,394 µg/100 mg after additional 4.5 hours from pulverized calculus with direct contact of Periogen.

CONCLUSION

Ca²⁺ dissolution from hardened calculus was achieved by slow rate, but by pulverizing the calculus samples

helped to induce the rate of dissolution. The experiment also showed that pulverizing the previously hard calculus was done easily after soaking it in Periogen. The ability of Periogen to soften the calculus needs to be further investigated. Therefore, the solution could help patients in cleaning their removable dentures after overnight soaking in Periogen, making the deposits softer, easier removable by mechanical cleaning devices.

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