

## A LONG TERM HISTOLOGICAL STUDY OF PERIAPICAL TISSUES OF DOG'S TEETH AFTER OVER-FILLING WITH TWO TYPES OF GUTTA-PERCHA POINTS

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*ABSTRACT: Forty roots of dog's teeth were overinstrumented and the canals overfilled with two different types of gutta-percha points. A zinc oxide-eugenol cement was applied only to the part of the point that remained in the root canal. The result were histologically analysed one year after the treatment. One type of point (Odame) showed better results than the other. The material was well tolerated by the periapical tissues, being surrounded by a thin fibrous capsule. A mild chronic inflammatory reaction was observed in the connective tissue nearest to the apical foramen. The periapical tissues in contact with the other type of point (Caulk) were characterized by a moderate to severe chronic inflammatory reaction. The fibrous capsule surrounding the Caulk point was unable to contain the point components, specially a fibrous, birefringent fiber, that reached deeply in the periapical tissues, causing an inflammatory reaction. The results suggest that some components of the gutta-percha points can disturb the periapical healing process after root canal treatment.*

*KEY-WORDS: Root canal filling; gutta-percha points.*

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### INTRODUCTION

Gutta-percha has been considered a nontoxic substance<sup>7,8</sup> and therefore innocuous to vital tissues<sup>5</sup>.

WOLFSON & SELTZER<sup>9</sup> studied the behaviour of rat connective tissue after the implantation of several types of gutta-percha points. They noted minimal inflammation or an absence of inflammation, concluding that some substances that are usually aggregated to the gutta-percha points do not play a major role in influencing its irritant qualities. Nevertheless, Caulk gutta-percha points caused a

more intense inflammatory reaction than other ones, when implanted in rat connective tissue for 60 days, or one year<sup>2,4</sup>.

Root canals of human vital teeth filled with Caulk gutta-percha points and zinc oxide-eugenol cement showed several intensities of chronic inflammatory reactions in the periapical tissues. These inflammatory reactions were related to the diffusion of gutta-percha point components through the periapical tissues, mainly a fibrous substance birefringent to polarized light<sup>3</sup>. However, this experimentation had not a control group who renders doubtful the results interpretation.

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The purpose of this work was to study comparatively the behaviour of the periapical tissues of dog's teeth after root canal overfilling with two different types of gutta-percha points.

## MATERIAL AND METHODS

Forty roots of 3 adult mongrel dogs were used. Under general anesthesia, and with the rubber dam in place, the pulp chamber of each tooth was opened and the pulp extirpated. The root canals were then instrumented with reamers and files and irrigated with sterile saline solution. The apices were purposely perforated and enlarged up to a number 50 instrument. After drying the canals with paper points, they were overfilled approximately 1 mm beyond the Radiographic apex. Twenty root canals were filled with Caulk gutta-percha points (Dentsply S.A.) and twenty others with Odame gutta-percha points (Odontologia Americana Ltda.). A zinc oxide-eugenol cement was applied only to the part of the cone that remained within the root canal. All coronal openings were sealed with amalgam.

One year after the treatment the animals were sacrificed. The specimens were removed and fixed in 10 percent neutral buffered formalin solution, decalcified in formic acid-sodium citrate, and embedded in paraffin. Serial sections at 6 microns were stained with hematoxylin and eosin.

## RESULTS

### *Odame Gutta-Percha point*

The results were similar in all the 20 specimens. This gutta-percha point was well tolerated by the apical connective tissues. A thin fibrous capsule surrounded each point and a mild chronic inflammatory reaction was observed only in the connective tissue nearest to the apical fo-

ramen. Bone tissue was observed close to the filling material and no resorption areas were noted (Figs. 1 to 5).

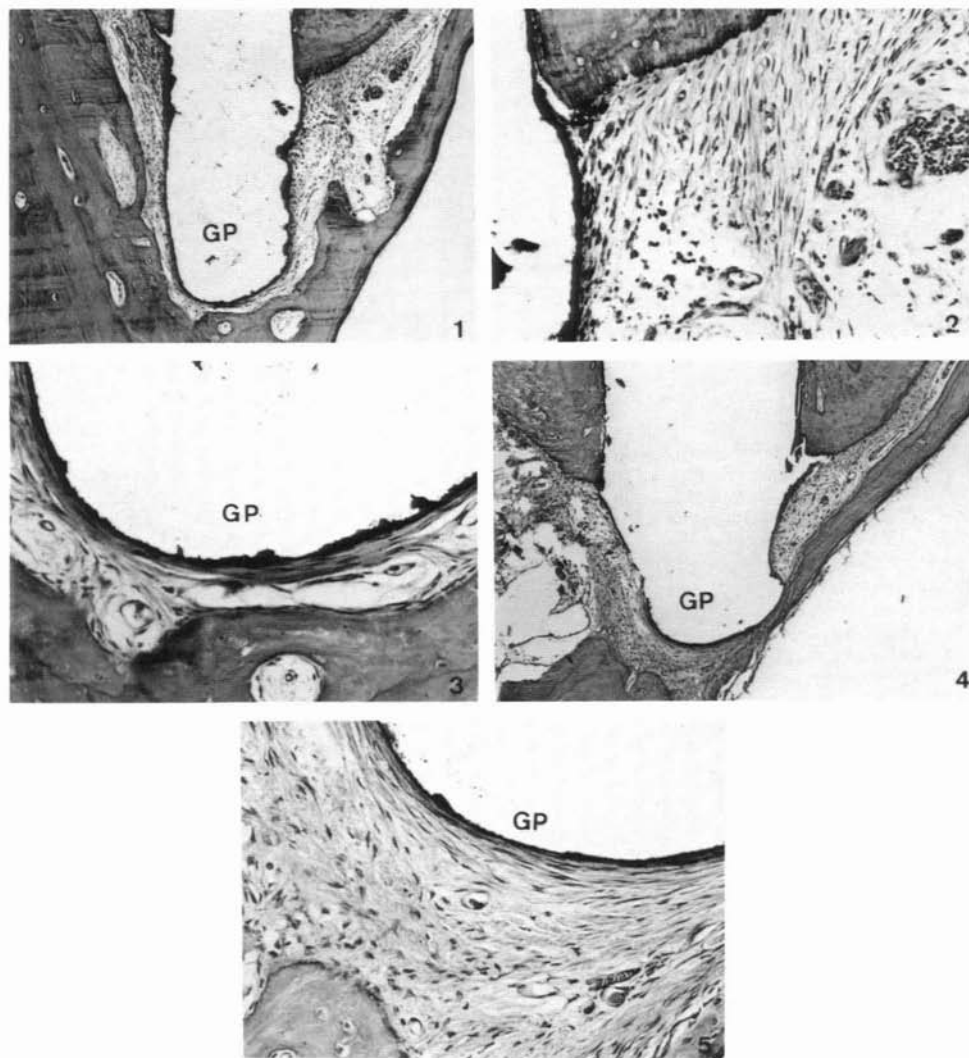
### *Caulk Gutta-Percha point*

The obtained results were very different from the ones observed with the Odame points. The material was surrounded by a fibrous capsule with a moderate or severe chronic inflammatory reaction. This inflammatory reaction was observed in all connective tissues nearest the point. The sections examined showed a birefringent fibrous material and tiny black granulations dispersed through the surrounding connective tissue, that was infiltrated by lymphocytes, plasmocytes, some foreign body cells and a great number of macrophages (Figs. 6 to 10). The bone tissue was distant from the studied material and some areas of resorption or deposition were observed.

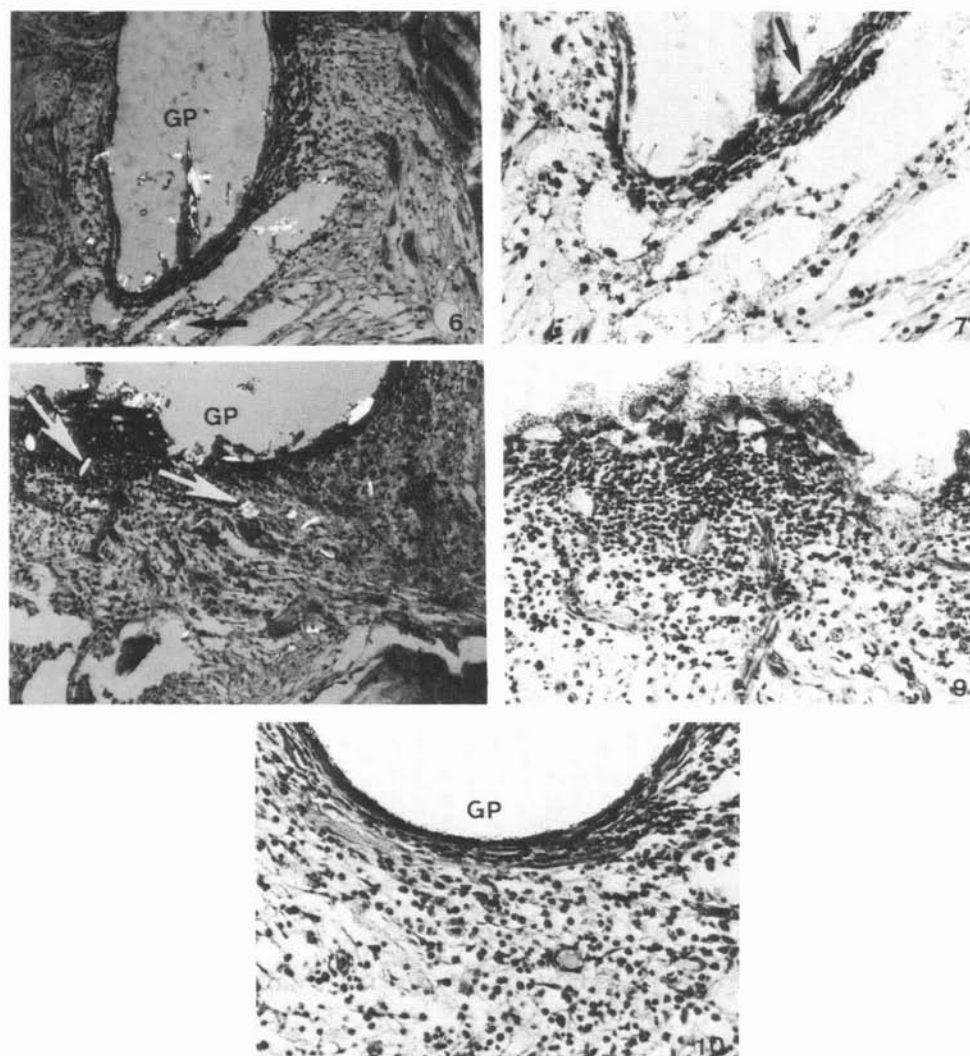
## DISCUSSION

The results obtained with Caulk gutta-percha points agree with the ones observed in previous papers<sup>2,4</sup>. We noted that the fibrous capsule, surrounding the Caulk gutta-percha points, is apparently unable to contain the point components. They pass through it and penetrate deeply into the periapical connective tissues, causing a moderate to severe chronic inflammatory reaction.

With Odame points a mild chronic inflammatory reaction was observed only in the connective tissue nearest to the apical foramen. It is possible that this inflammatory reaction had some relation to the zinc oxide-eugenol cement employed in the root canal filling. The irritating properties of this cement have been observed in previous works<sup>1,6</sup>. The tissue reactions observed next to the Odame points showed that even in overfilling this material was not irritant.



- FIG. 1. — Periapical tissues of dog's tooth, 1 year after overfilling with Odame gutta-percha point (GP). There is a mild chronic inflammatory reaction nearest the apical foramen. H.E. X 40.
- FIG. 2. — Higher magnification of Fig. 1, showing a mild chronic inflammatory reaction nearest the apical foramen. H.E. X 200.
- FIG. 3. — Higher magnification of Fig. 1. The gutta-percha point (GP) is surrounded by a thin noninflamed fibrous capsule. H.E. X 200.
- FIG. 4. — Periapical tissues of dog's tooth, 1 year after overfilling with Odame gutta-percha point (GP). Morphological features similar to the one of Fig. 1. H.E. X 40.
- FIG. 5. — Higher magnification of Fig. 4. A fibrous capsule surrounds the gutta-percha point (GP). There is no inflammatory reaction. H.E. X 200.



- FIG. 6. — Periapical tissues of dog's tooth 1 year after overfilling with Caulk gutta-percha point (GP). All the filling material is surrounded by a chronic inflammatory reaction. Some birefringent material (arrow) to polarized light is seen in the connective. H.E., X 100.
- FIG. 7. — Higher magnification on Fig. 6. There are giant cells (arrow), particles of the filling material and a chronic inflammatory reaction. H.E., X 200.
- FIG. 8. — Periapical tissues of dog's tooth, 1 year after overfilling with Caulk gutta-percha point (GP). There are birefringent materials (arrows) to polarized light and a chronic inflammatory reaction in the connective tissue. H.E., X 100.
- FIG. 9. — Higher magnification of Fig. 8, showing the chronic inflammatory reaction and particles of the filling material. H.E., X 200.
- FIG. 10. — Periapical tissue of dog's tooth, one year after overfilling with Caulk gutta-percha point (GP). There is a chronic inflammatory reaction nearest the filling material. H.E., X 200.

It is evident from the results of this work that at least one gutta-percha point formulation can disturb the periapical healing by irritational qualities of some of its components. We do not know exactly what substance in the point was responsible for the observed inflammatory reactions. It is possible that the birefringent fibers, due to their generally sharp-point form, and also the positive and negative pressure to which the periapical tissues are submitted during chewing, are thrust through the fibrous capsule, carrying out with them some other components of the point. The dispersion of these point components through the tissues can be observed not only in overfilling but also in root

canal fillings at the level of the foramen of even in underfilling cases<sup>3</sup>.

## CONCLUSIONS

The results obtained under the conditions of this experiment suggest the following conclusions: 1. The Odame gutta-percha points were well tolerated by the periapical tissues. 2. The Caulk gutta-percha points elicited a moderate to severe chronic inflammatory reactions of the periapical tissues. 3. New studies must be done in order to better select the points that do not disturb the periapical healing process.

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HOLLAND, R. *et alii* — Estudo histológico, a longo prazo, dos tecidos periapicais de dentes de cães, após sobre-obturação com dois tipos de cones de gutta percha. *Rev. Odont. UNESP, São Paulo*, 14(1/2):13-18, 1985.

*RESUMO: Quarenta raízes de dentes de cães foram sobre-instrumentados e os canais radiculares sobre-obturados com 2 diferentes tipos de cones de gutta percha. Cimento de óxido de zinco e eugenol foi aplicado somente à parte do cone de gutta percha que permaneceu dentro do canal. Os resultados foram histopatologicamente examinados um ano após o tratamento. Um dos tipos de cone de gutta percha (Odame) mostrou melhores resultados que o outro. O material foi bem tolerado pelos tecidos periapicais, tendo sido envolvido por delgada cápsula fibrosa. Os tecidos periapicais, em contato com o outro tipo de cone de gutta percha (Caulk), caracterizou-se por exibir um infiltrado inflamatório do tipo crônico de intensidade moderada a severa. A cápsula fibrosa que envolvia esse tipo de cone de gutta percha mostrou-se incapaz de conter seus componentes, especialmente um, de aspecto fibroso e birrefringente à luz polarizada, que penetrava em profundidade no tecido conjuntivo, causando reação inflamatória do tipo crônico. Os resultados obtidos sugerem que em determinadas circunstâncias, alguns componentes dos cones de gutta percha podem perturbar o processo de reparo após tratamento endodôntico.*

*UNITERMOS: Obturação de canal; cones de gutta percha.*

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