

## Development a new composite for endodontics cones

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**Abstract** – Gutta percha is the most widely used dental material for root canal fillings and has been used for over 100 years. So far a substitute for gutta percha has not yet been found. Since the worldwide supply of natural gutta percha is being reduced, the search for new biocompatible materials for root canal fillings has been under way for a long time. In this study, new composites based on thermoplastic elastomers were developed and their mechanical and thermal properties were evaluated and compared with gutta percha composites. Although the percentage of zinc oxide and rubber had to be changed, in order to obtain the same hardness of gutta percha cones, the developed composites still present a high degree of elasticity being impossible to manufacture the cones out of them.

Gutta percha was introduced as material for root canal fillings in 1847 by Hill and it was modified by Bowman in 1867. Gutta percha is one the most popular materials for root canal fillings<sup>[1]</sup>.

Gutta percha polymer is a trans-1,4-polyisoprene, obtained from the coagulation of latex produced by trees of the Sapotaceae family and mainly derived from *Palaquium*, existing mainly in Sumatra, Filipinas and the Malaio archipelago, even though it can also be found at the Amazon forest<sup>[2-4]</sup>.

Gutta percha is a name derived from two words: getah – wich means gum - and pertja – name of the tree in Malay language. The mainly component is the trans-1,4-polyisoprene but the cis isomer can be found in lower proportion<sup>[5]</sup>. Since worldwide supply of natural gutta percha is being reduced, there is a big interest in finding biocompatible substitutes that could replace gutta percha as root canal fillings.

Gutta percha endodontic filling compositions contain approximately 20% of gutta percha (matrix), 66% zinc oxide (filler), 11% heavy metal sulfate (radiopacifer) and 3% waxes and/or resins (plasticizer).

In this work the mixtures were prepared with thermoplastic rubber percentage varying according to Table 1.

The gutta percha compositions were submitted to mechanical test, Shore D hardness and thermal analysis. However for the three thermoplastic elastomer compositions only the hardness was determined as the materials did not show the required dimensional stability to allow the endodontic cones to be obtained, despite the higher amount of zinc oxide used in these compositions. Nevertheless, it was found that thermoplastic elastomers can be considered as potential substitutes for gutta percha as long the necessary adjustments are made

**Table 1:** Composition of samples

Component (%)	Composite 1	Composite 2	Composite 3
Rubber	18.9	14.5	10.0
ZnO	69.9	74.3	78.8
BaSO <sub>4</sub>	7.86	7.86	7.86
Pigment	1.16	1.16	1.16
Plasticizer	2.18	2.18	2.18

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