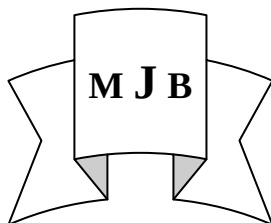


The Effectiveness of the Organic Volatile solvents in Retreatment of Root Canal System(*in vitro* Study)

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Abstract

This study tested the hypothesis that root canal sealer cements insoluble in the volatile solvents chloroform and eucalyptol.

Forty samples were prepared for each material (AH26, Endofil sealers) these were divided into eight groups of five; for immersion in chloroform or eucalyptol for 30 s, 1 min, 5 min, 10 min.

Clear differences were shown in the solubility profile of major classes of root canal sealer cements in two common volatile solvents.

The results of this study shows that the AH 26 was significantly more soluble than the other material in both chloroform and eucalyptol in all immersion times.

Also shows that the chloroform is more soluble than eucalyptol for both sealer cements.

الخلاصة

يتناول هذا البحث مدى فعالية بعض انواع المذيبات العضوية في اذابة انواع مختلفة من مادة الاسمنت الخاتمة لحشوات الجذور لغرض اعادة الحشوة.

اربعون عينة حظرت لكل مادة ثم قسمت الى ثمانى مجاميع لغرض غمسها في المذيب الكلوروفورم مرة وفي المذيب eucalyptol مرة اخرى وللزمن ٣٠ ثانية. ١ دقيقة. ٥ دقيقة. و ١٠ دقيقة.

اظهرت النتائج ان الاسمنت الخاتم نوع الراتنج اعطى اعلى نسبة ذوبان في كلا المذيبات من الاسمنت نوع الايوجينول في جميع اوقات الغمس.

كما توصل البحث الى ان الاسمنت الخاتم بنوعية اكثر ذوبانا في المذيب نوع الكلوروفورم من المذيب نوع ال eucalyptol في جميع حشوات الاسمنت.

Introduction

The complete obturation of the root canal system by using filling material with adequate biological and physicochemical properties is one of the main goals of root canal treatment.[1]

Gutta-percha remains the commonest core root filling material, used in combination with sealer cements to fill voids and canal system ramification.[2]

The major function of a root canal sealer is to fill the spaces between

gutta-percha(GP) and the root canal wall.[3]

A great variety of endodontic sealers are available commercially and they are divided into groups according to their chemical composition. There are sealers based on zinc oxide and eugenol, epoxy resin, calcium hydroxide and glass ionomer.[4]

There are few published data on solubility profiles of endodontic sealers in solvents commonly employed in root canal retreatment.[2]

Whilst methods for gutta-percha removal have been well researched, far

less attention has been focused on the removal of sealer cement from canal walls, and from anatomical ramifications where they may be in accessible to mechanical methods of removal.[5] In these circumstances, solvents become essential if canals are to be thoroughly cleared of residual materials for effective disinfection and resealing. Despite this need, little is known of the solubility profiles of the various classes of commercially available endodontic sealer cements in common organic solvents.[2]

Chloroform has been the most widely used solvent in endodontics, and has been shown to be extremely effective for gutta-percha removal.[6]

Aim of Study

This study tested the hypothesis that root canal sealer cements are insoluble in the volatile solvents chloroform and eucalyptol.

Materials and Methods

Sample preparation:

Forty samples were prepared from each material. These were divided into

eight groups of five, for immersion in chloroform or eucalyptol for 30 s, 1 min, 5 min or 10 min.

Standardized sample moulds were constructed from polished, 2mm sections of 8 mm diameter circular stainless steel rod. Circular sections were milled flat on one surface to allow sample moulds to stand upright, and a 4-mm diameter hole drilled centrally for specimen placement (4 mm diameter x2 mm thick)

Sample mould were cleaned with acetone and weighted in triplicate prior to use. All weight measurements throughout the study were in g. recorded to four decimal places. Moulds were then placed flat on a cellulose acetate strip.

Sealer cements were mixed in accordance with manufacturers instructions.

Freshly mixed materials were carefully flowed to excess into sample moulds, avoiding air entrapment, and left to set at room temperature for 48 h. excess material was then trimmed level with the surface of the mould with a sharp scalpel.

Table 1 shows the root canal sealers and solvents included in this study.

Sealer cement	Manufacturer	Type of material
AH 26	Dentsply-Germany	Epoxy-resin based
Endo-fil	-Switzerland Produits Dentaires	Zinc oxide- eugenol based
Solvents		
chloroform	UK	
eucalyptol	UK	

Results

A T- test were used in order to analyzed and assess the results, for comparisons between the two groups of sealers and two groups of solvents.

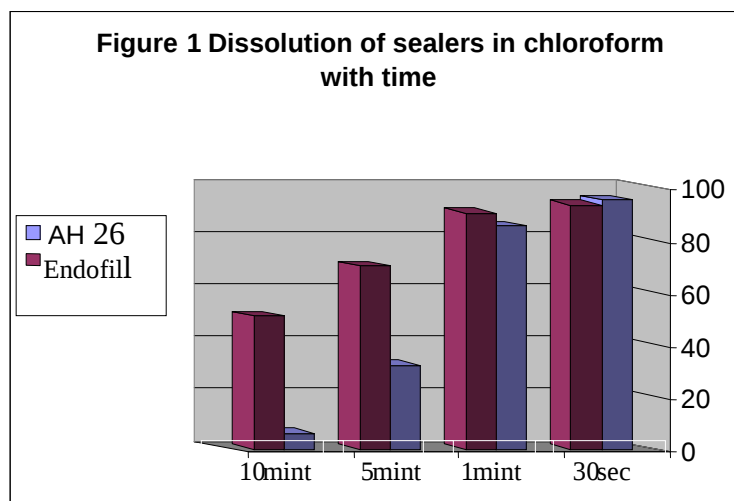
Figure(1) illustrates the solubilities of root canal sealers in chloroform.

Endofil was significantly less soluble than the other sealer at all immersion

time (less than 50% weight loss after 10 min).

AH 26 was the most soluble (94% weight loss after 10 min), significantly more soluble than Endofill at all time intervals.

(more soluble than Endo-fill at all immersion times greater than 30 s ($p < 0.01$)).



Figure(2) illustrates the solubilities of root canal sealers in eucalyptol.

The Endo-fill was significantly less soluble than the AH 26 sealer at all immersion times.

AH 26 was the most soluble (6 % weight loss after 10 min.); significantly more soluble than Endo-fill sealer at all exposure times($p < 0.01$)

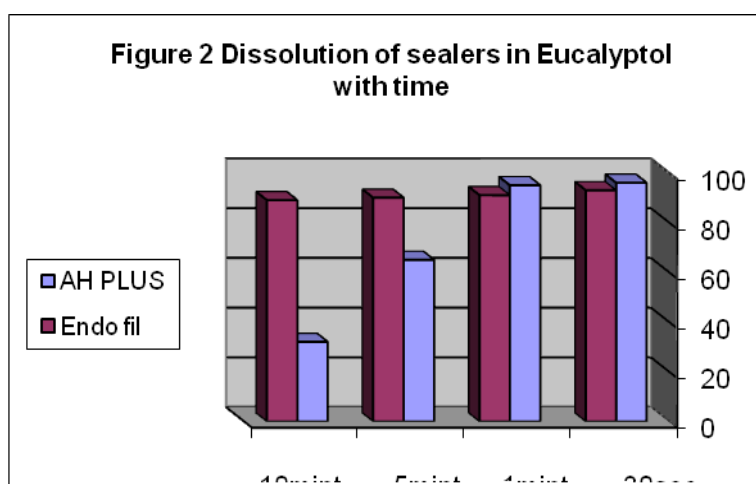


Figure 3 illustrates the comparative solubility of AH 26 in chloroform and eucalyptol. This material was highly soluble in both agents, and particularly

so in chloroform. This difference was significant at exposure time greater than 1 min.

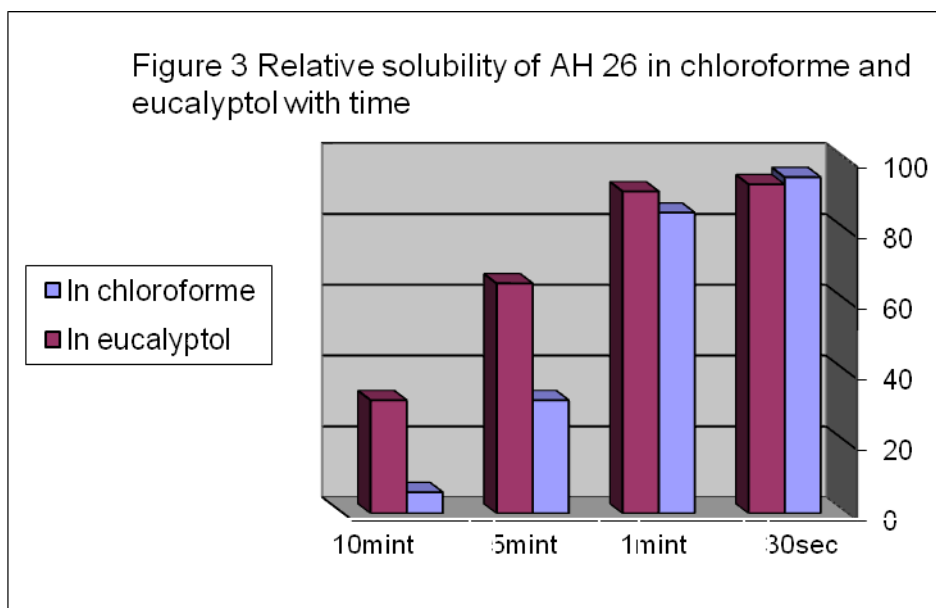
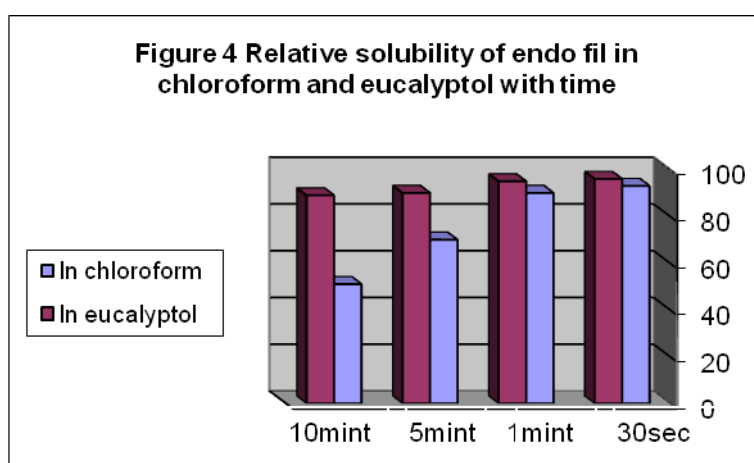


Figure 4 illustrates the relative solubility of Endo fill in chloroform and eucalyptol. This material had lower solubility in eucalyptol than in chloroform (11.3% and 50.99% weight

loss respectively, after 10 min exposure). The difference was significant at exposure times greater than 1min ($p < 0.01$)



There was no change in the weight of empty sample moulds after immersion in either solvent for 10 min.

Discussion

Retreatment is usually indicated in symptomatic endodontically treated teeth or in a symptomatic teeth with improperly done [7]. The method described provided a simple reproducible and cost-effective means of solubility evaluation. [2]

In acknowledge that this study does not take into account clinically imposed parameter, including temperature, access volume of exchange, canal system anatomy, dilution or displacement by biological fluids or irrigants on the action of solvents on root canal sealing cements.

Little has been published on a recently superseded AH 26, a material with an established track record as an effective sealer [8]. And one capable of

effective bulk removal during retreatment[7].

AH26 was highly soluble in both solvents, and particularly in chloroform where specimens had all but disappeared after exposure for 10 min., but it is not known if physical changes in AH26 with time affect its dissolution in organic solvents and therefore its removal from areas inaccessible to mechanical disturbance [9].

While this study has been shown that the Endo-fill has low levels of solubility in eucalyptol, suggesting that this is not the solvent of choice for root canal retreatment's involving a zinc oxide-eugenol cements, a number of researchers have demonstrated bulk removal of this cement with a combination of mechanical and solvent means[9,10].

Our data provide evidence that chloroform is a far more effective solvent for Endo-fill cement than eucalyptole.

Few clinical data are available on the time clinicians typically leave root canals flooded with solvents during endodontic retreatment. The time limits 10 min. employed in this study reflects the mean times of 1.5-10.8 min. reported in laboratory based studies for the retreatment of canals filled with laterally condensed gutta-percha and sealer.[10]

Application of this experimental model with incubation times for standardized samples up to 10 min allowed us to demonstrate clear differences in the solubility profiles of major classes of root canal sealer cements in two common volatile solvents.[11]

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