

Intra Canal Treatments for Clinical Success and Patient Comfort

Yosi Nahmias, DDS, MSc; Gary Glassman, DDS, FRCD(C)

Bacteria have long been linked with the pathogenesis and development of pulp and periapical diseases. The primary aim of endodontic treatment is to eliminate as much bacteria as possible from the root canal system and then to generate an environment in which any residual organisms cannot survive. This can only be achieved through the use of a combination of treatments and procedures, cleaning and shaping of the root canal, antimicrobial irrigating solutions and intracanal treatments. The choice of which intracanal treatment to use, whether to use and when to use, is based on a correct diagnosis of the condition being treated, a knowledge of the type of organisms likely to be involved as well as how they grow and survive. Since the source of the disease is likely the presence of bacteria within the root canal, the use of an antimicrobial treatment is often indicated. Many medica-

ments have been used in an attempt to accomplish these goals, but no single preparation has been found to be entirely predictable or effective.¹

In North America the treatment of choice for an inter-visit root canal dressing is calcium hydroxide, to eliminate or dramati-

ease of delivery with NaviTips or Capillary tips (Ultradent, South Jordan, UT) (Fig. 1).

NEW CLASS OF INTER-VISIT ROOT CANAL TREATMENT IN NORTH AMERICA

Odontopaste (ADM, Brisbane/Clinical Research Dental, London, ON) is a new zinc ox-

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cally reduce microorganisms in the root canal system.² For these uses, Ultracal XS (Ultradent, South Jordan, UT/Clinical Research Dental, London, ON) serves us well with its high Ph, nice paste consistency and its

ide-based endodontic dressing, a non-setting paste which contains an antibiotic, clindamycin hydrochloride 5 percent, and a corticosteroid, triamcinolone acetonide one percent (Fig. 2). Prior to Odontopaste, antibiotic/



FIGURE 1



FIGURE 2

steroid-based endodontic medicaments have been lacking in the North American market, while elsewhere products in use are routinely associated with the staining of teeth, due to the tetracycline antibiotic utilised. It was often suggested that the careful subgingival placement of the dressing was necessary to avoid staining. However this was not only clinically difficult, but it also did not negate the issue of a stained root.³ This became an even greater concern in cases with periodontal/gingival recession where stained roots were exposed beneath teeth, which had been endodontically treated and crowned.

Prior to Odontopaste, internal bleaching of teeth was routinely necessary at the end of treatment. This had mixed results in terms of colour matching and did not deal with the problem of the stained root. Nonetheless,

the use of an antibiotic/steroid-based endodontic medicaments, such as Ledermix, has remained very popular in several countries. The reason for this was its ability to keep the patient out of pain allowing for better patient acceptance of endodontic treatment as a whole, the importance of which can hardly be overstated!

A randomised controlled trial compared the use of calcium hydroxide with an antibiotic/steroid-based endodontic dressing in painful teeth with acute apical periodontitis. The results indicated that the use of the antibiotic/steroid-based endodontic dressing resulted in reduced pain experienced by patients as opposed to those who had a dressing of calcium hydroxide or no dressing at all. The effect of the antibiotic/steroid-based dressing was for a rapid onset of pain relief to the patient.⁴ Odontopaste con-

tains the same steroid at the same percentage and within an equivalent base-paste formulation as the paste tested in the clinical trial. Current clinical feedback indicates that Odontopaste works identically as the tested medicament within the clinical trial.

In terms of staining, a thesis by Adamidou at Leeds University in 2010⁵ compared the level of staining of various different medicaments. Odontopaste was superior to any other antibiotic/steroid-based dressing and equivalent to what is expected from calcium hydroxide pastes. Odontopaste overcame the staining issues whilst providing the benefits of the antibiotic/steroid combination and it is no coincidence that it has therefore proven popular in Australia.⁵

The function of root canal dressings is to maintain the relative sterility of the root canal following alternate irrigation with EDTA and sodium hypochlorite. The bacteria present in the root canal, which typically present the greatest challenge, are not only resistant to antibiotics or alkaline medicaments but their resistance is enhanced further by their presence within a biofilm. *E.faecalis* is the often-quoted bacteria highly resistant to antibacterial irrigants and medications. Sodium hypochlorite and EDTA rinses successfully remove *E.faecalis* within the root canal along with all other bacteria⁶ An endodontic dressing should at the very least maintain this state or, better still, impart a continued antibacterial effect within the root canal.

MECHANISM OF INTRA-CANAL TREATMENTS

Root canal dressings can inhibit

or kill bacteria in two ways. With calcium hydroxide-based root canal dressings the bacteria are killed by the alkalinity of the paste. Calcium hydroxide paste is highly cytotoxic towards bacteria due to the high pH and therefore the hydroxyl ions.⁷ There are, however, some shortcomings. The antibacterial properties of calcium hydroxide rely on a non-specific cytotoxicity as a result of the alkalinity, which is just as effective against host cells as it is against foreign cellular matter. This means that in cases where cellular elements surrounding teeth are compromised, as is the case in traumatised teeth, the use of calcium hydroxide may further compromise the cellular elements of the periodontal ligament vital for the long term survival of a previously avulsed tooth.⁸

The use of a zinc oxide-based antibiotic/steroid endodontic dressing has the advantage of its antibacterial properties being as a result of the antibiotic. The paste is not as cytotoxic to host cells as it is to foreign bacteria. There are issues of resistance to antibiotics by certain bacteria and several authors have pointed this out over many years as a contraindication of antibiotic/steroid endodontic dressings.

These authors fail to take into account the highly different concentration and the unique environment within which the paste is applied. Odontopaste contains clindamycin hydrochloride at five percent. This means that the concentration of clindamycin is 50mg/gram. However, *E.faecalis*' minimum inhibitory concentration (MIC) to clindamycin can vary from 0.12mcg/ml to 100mcg/ml (mcg/ml).^{9,10}

In general the MIC is far larger than the peak serum levels which can be achieved with safe parenteral doses of clindamycin hydrochloride. The peak serum level for 150mg of clindamycin hydrochloride taken orally is 2.5mcg/ml.⁹ In comparison, the concentration of clindamycin hydrochloride within Odontopaste is 62,500 mcg/ml and is applied directly at the point of infection allowing for a high-localised concentration of the antibiotic not possible with parenteral doses. This negates the problem of toxicity with large parenteral doses and penetration of the antibiotic into an avascular root canal.

The main determining factor for the efficacy of the paste against *E.faecalis* is not the resistance to the antibiotic but rather

the smear layer and kill bacteria, are maintained when a paste is used following chemomechanical preparation. There are no studies published that test the pastes under those conditions.

Since calcium hydroxide preparations are more effective against bacteria in biofilm, it had been suggested that in order to improve the antibacterial properties of antibiotic/steroid-based endodontic dressings, but yet retain the superior anti-inflammatory properties, calcium hydroxide be mixed in equal amounts.¹³ Attempts to do so with Odontopaste indicated that the steroid and antibiotic components were inactivated by the calcium hydroxide.¹⁴ Therefore any literature recommending the use of the two medicaments, cal-

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the biofilm form in which the bacteria are present within the root canal.^{11,12} It is this biofilm, which prevents the antibacterial properties of the formulation from exerting a substantial direct effect, delegating the antibiotic to the function of a preservative for the paste. Therefore the major function of the paste is to physically occupy the root canal space with a medium, which is not conducive to bacterial population, within or around its immediate boundary. In essence, the effects of chelating and antibacterial irrigants, which remove

cium hydroxide and antibiotic/steroid dressings mixed together, should be viewed with caution as all of these studies have not performed the basic chemistry validation required for the mixed compound.

Odontopaste contains 0.5 percent calcium hydroxide, which is the highest level permissible without a deleterious effect on the medicinal components. The addition of calcium hydroxide above 0.5 percent to any antibiotic/steroid-based paste is therefore contraindicated.¹⁵

In cases of avulsed teeth, the aim is to reduce the collateral damage caused by inflammation and the immune response particularly towards an already compromised periodontal ligament. The use of an antibacterial paste with low cytotoxicity and with the additional benefits of the anti-inflammatory action

sorption. In terms of pain relief for patients, particularly in cases where the pulp is hypersensitive, the use of an endodontic dressing with a steroid component is ideal. In instances where the preparation and instrumentation of the canal is likely to lead to post operative pain, the use of Odontopaste could also be indicated.

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of a steroid provides a better opportunity for avulsed teeth to recover successfully, to preserve the vitality and intactness of the periodontal ligament and, as a result, to prevent the replacement resorption of the dentine by bone.¹⁶

At the least, a treatment like Odontopaste would be a useful part of the armamentarium for ANY doctor who performs root canal therapy to

- reduce pain associated with apical periodontitis,
- to reduce bacterial contamination of root canals.

In prepared root canals following trauma, to reduce the incidence of inflammatory root resorption and in the reduction of existing inflammatory root re-

The product comes in an 8g tube and can be placed on an inflamed pulp with a cotton pellet. It can be placed into the canal via a spiral filler instrument (lentulo) or a paper point.

Odontopaste may be one smaller tool to help us realize the ultimate goal of endodontics, clinical success and patient comfort.

Dr. Yosef Nahmias graduated from the Universidad Tecnologica de Mexico, School of Dentistry, in 1980 and earned his Master's of Science degree in Endodontics in 1983 from Marquette University in Milwaukee, Wisconsin. Dr. Nahmias has authored numerous publications. He continues to lecture in Canada, Mexico and across South America in addition to teaching at the University of Toronto, Faculty of Dentistry. He maintains a private practice specializing in

endodontics in Oakville, Ontario.

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