Ask the Experts

USING OZONE TO TREAT DENTAL CARIES

Guest Experts

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Associate Editor

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QUESTION: Is there good clinical evidence supporting the use of ozone in treating dental caries?

ANSWER: Ozone therapy for the management of dental caries has been heralded as a "paradigm shift" in conservative dentistry. Ozone treatment, principally provided by the HealOzone machine (KaVo Dental GmbH, Biberach, Germany), has been marketed by the manufacturer on the basis of supposedly proven scientific fact-"It's a scientific fact, HealOzone works!".1 Ozone has been indicated for the treatment and management of pit and fissure caries and root and cervical caries, although other indications have been listed.

Ozone is theorized to act by:

- 1. killing bacteria at the carious lesion and
- 2. oxidizing organic material within the carious dentin. This reportedly opens up "channels"

within the dentin to allow the penetration of calcium, phosphate, and fluoride ions to allow hypermineralization of the surface. Hypermineralized surfaces are more resistant to subsequent decay.

Ozone has been widely used for its antimicrobial actions (as a powerful oxidant) in the food industry and for water purification. In vitro studies have shown ozone to be effective in reducing the levels of Streptococcus mutans and Streptococcus sobrinus collected from active root caries and Streptococcus mutans in plaque.^{2,3} Interestingly, both of these studies employed ozonated water. Similarly, ozone gas delivered by the HealOzone machine to artificially inoculated cavities has also been shown to reduce levels of Streptococcus mutans.⁴ However, others have suggested that ozone applied by HealOzone is not effective in significantly reducing bacteria in artificial biofilms.



Similarly, although the oxidizing effect of ozone has been shown for root caries biomolecules and salivary biomolecules, no studies have



proved that this has any effect on the permeability of dentin to calcium, phosphate, or fluoride ions.

In the United Kingdom, a Cochrane review and a National Institute of Clinical Excellence (NICE) report have assessed the clinical evidence and found insufficient evidence to support the use of ozone in the management of pit and fissure caries and root caries.^{7,8} Both have questioned aspects of the methodology and statistics carried out in the studies that they included. These reviews considered evidence only from reports exceeding 6 months and that contained both ozone treatment and control groups, up to the year 2004.

Much of the evidence quoted in support of HealOzone is based on abstracts, which do not fit the Cochrane and NICE review criteria. The abstracts are overwhelmingly positive. However, the quality of evidence from abstracts is difficult to assess as they often lack detail about methodology, assessment, or missing data, for example. In contrast to these studies, a prospective published article has shown no overall significant differences for the treatment of noncavitated fissure caries with ozone in children.⁹

Another published article looked at cavitated lesions, and showed sig-

nificant improvement in hardness in the ozone-treated cavitated lesions, and no significant change in the hardness of the control lesions.¹⁰

The results for treatment of root caries appear to be more consistent between abstracts and published articles. In general, over 90% of all root caries lesions treated with ozone appear to show partial or complete reversal. One concern about these studies is the reported lack of response of the control lesions despite the use of 1,100 ppm fluoride toothpaste by the subjects.

Although some of the studies are promising, ozone has not been proven superior to other clinical approaches. Plaque and diet control, chemotherapeutic approaches such as fluoride or chlorhexidine, sealants, and stepwise excavation have all been used quite effectively in caries management and are well supported in the literature. Ozone might prove to work better than these approaches, may work well in combination with these approaches, or may prove to be entirely superfluous; only well-designed, randomized, controlled trials will tell.

In conclusion, there is not yet good clinical evidence supporting the use of ozone in treating dental caries.

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Editor's Note: If you have a question on any aspect of esthetic dentistry, please direct it to the Associate Editor, Dr. Edward J. Swift Jr. We will forward questions to appropriate experts and print the answers in this regular feature.

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