Evidence-based efficacy of ozone for root canal irrigation

Guest expert Edward Lynch and Edward Swift discuss evidence-based efficacy of ozone for root canal irrigation

**Question:** As a follow-up to the recently published information on ozone as a means of carries treatment, could you provide some information on the use of ozone in root canal therapy?

**Answer:** Ozone has been proposed as a dental antiseptic agent based on its antimicrobial effects in both gaseous and aqueous forms. Ozone is effective when used at sub-saturating levels of concentration, used for an adequate time, and delivered correctly into root canals after the traditional cleaning, shaping, and irrigation have been completed. Ozone will not penetrate deep into tissue as ozone is delivered or it is not delivered appropriately. Ozone should be used during the cleaning, shaping, and irrigation of root canals, and the ozonated liquid in the canal system should be agitated with ultrasonic.

**Proven antimicrobial efficacy of ozone**

Ozone is one of the most powerful broad-spectrum disinfectants used for use in medicine or dentistry. As failure of root canal treatment is mainly caused by persistent bacteria, it is not surprising that there are numerous advantages to killing these microorganisms. Previous reviews and published research papers have proven the antimicrobial effectiveness of ozone as a gas and as ozonated water. In model dental unit water lines, ozonearchieved a 57 per cent reduction in biofilm and a 65 per cent reduction in viable bacteria in spite of being used in a very low dose and a short time of application. Ozone rapidly kills otherwise hard to kill microorganisms.

**Recommended use of ozone in root canal therapy**

Ozone works best when there is less organic debris remaining. Therefore, the recommendation is to use either ozonated water or ozone gas at the end of the cleaning and shaping process. I personally still use my conventional irrigants during this earlier phase and I finally irrigate with ozonated water (TherOzone, Santa Monica, CA, USA) using ultrasonics. I also blouse ozone gas (HealOzone, KaVo, Viareggio, Italy) into a sterile tip for direct delivery into root canals with ozonated water, 2.5 per cent NaOCl, 2 per cent chlorhexidine, or the application of ozone gas. No tested agent had any antimicrobial effect. It is highly probable that the ozone (oxidant) reached preferentially with the reductants in the brain-heart infusum used for the inoculation in a simple redox reaction rather than with the bacterial strain. Hems and colleagues22 concluded that ozone had an antibacterial effect on human root canals with ozonated water, 2.5 per cent NaOCl, 2 per cent chlorhexidine, or the application of gaseous ozone was not sufficient to inactivate E. faecalis. The methodology used was obviously not the most appropriate for a gaseous antimicrobial effect. It is extremely low dose of ozone in their experiments. The concentration of ozone mentioned in the paper was only 0.68 ppm. This concentration was immediately after production and ozone was not completely fed to the time it was used. This was clearly a biassed comparison as the authors used an excellent control animal with the same antibiotics for 24 hours. Cell counts, metabolic activity, 3H- binding, actin levels, and apoptosis were studied. Ozone gas was found to have toxic effects on both cell types. Essentially, no cytotoxic signs were observed for aqueous ozone. CHX (2 per cent, 0.2 per cent) was highly toxic to BHY cells, and MTAD (Dentsply Tulsa Dental, Tulsa, OK, USA), 3 per cent sodium hypochlorite (NaOCl), or HealOzone, and thereafter, the samples were repeated for microbiologic analysis. The roots were then sealed and incubated for a further week. After the enzymatic growth was again determined. After disinfection, tissue with a significant decrease in the absolute bacterial count between each disinfection method and the positive control group. There was no statistically significant difference between the 5 per cent NaOCl, MTAD, and HealOzone groups. I personally feel that conventional biofilms, contain many molecules such as iron, which can increase the antimicrobial effectiveness of ozone in teeth and can help preserve the powerful hydroxyl radicals in vivo to further increase the antimicrobial effectiveness of ozone. Moreover, another study8 has found that the infection of isolated bacteria in root canals with ozonated water, 2.5 per cent NaOCl, 2 per cent chlorhexidine, or the application of gaseous ozone was not sufficient to inactivate E. faecalis. The methodology used was obviously not ideal for a gaseous antimicrobial effect. It is highly probable that the ozone (oxidant) reached preferentially with the reductants in the brain-heart infusum used for the inoculation in a simple redox reaction rather than with the bacterial strain. Hems and colleagues22 concluded that ozone had an antibacterial effect on human root canals with ozonated water, lesser the test conditions used. Unfor- tunately, these authors used an ex- periment with reductants in a culture medium. In addition, the authors did not document detrimental effects on cells.
Conclusion

Of course, more research on the use of ozone in root canal therapy will add to our knowledge in endodontics. Thousands of dentists worldwide use ozone in root canal therapy and it is claimed that millions of teeth have received root canal therapy with ozone having been used as the final irrigant. No adverse event has been recorded after use of the HealOzone or ozonated water in root canal therapy.

Ozone is an effective, easy, cheap, and fast treatment to help disinfect root canals. Ozone is much stronger than chlorine and acts 5,000 times faster without producing harmful decomposition products. As ozone is the most powerful antimicrobial and oxidant we can use in endodontics, and as aqueous ozone revealed the highest percentage of biocompatibility compared with commonly used antibiotics, then it is fairly obvious that ozone should be used to help combat the microorganisms associated with infected root canals. Ozone has a place in the 21st century oral health care, and we should use its proven powerful antimicrobial and potent oxidant ability to reduce microorganisms during root canal therapy.

Disclosure

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References
