Evidenced-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 caries 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 known antimicrobial effects in both gaseous and aqueous forms. Ozone is effective when used in a very low dose and with a 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 be effective if the dose of ozone is delivered or it is not delivered appropriately. Ozone should be used as an irrigant agent, signifi- cantly increased. It is not surprising that there are enormous advantages to killing these microbes. Several recently reviewed research papers have proven the antimicrobial effectiveness of ozone as a gas and as ozonated water.3–20 In model dental unit water lines, ozone achieved a 97 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 with a short time of application.21 Ozone rapidly kills otherwise hard to kill microorganisms.

**Proven antimicrobial efficacy of ozone**

Ozone is one of the most powerful antimicrobial agents available for use in medicine or dentistry.1 As failure of root canal therapy is mainly caused by microorganisms, it is not surprising that there are enormous advantages to killing these microbes. Several recently reviewed research papers have proven the antimicrobial effectiveness of ozone as a gas and as ozonated water.3–20 In model dental unit water lines, ozone achieved a 97 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 with a short time of application.21 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 (TheraOzone, Santa Monica, CA, USA) using ultrasonics. I also huth and colleagues29 investigated whether gaseous ozone and aqueous ozone exerted any cytotoxic effects on BHY cells. Cells compared with established antiseptics (2 and 0.2 per cent sodium hypochlorite (NaOCl), or HealOzone, MTAD, and 3 per cent sodium hypochlorite (NaOCl). These results suggest that ozone is an effective irrigant or lesion by pressing the de- vices that blow ozone into root canals. Other systems are available (such as systems that inject ozone gas at the end of the cleaning, shaping, and irrigation of root canals, and the ozonated liquid in the canal system should be agi- tated with ultrasound.

**Comparison of the use of ozone and sodium hypochlorite**

Oxygen has a dramatically toxic effect to microaerophilic and anaerobic bacteria. Votey and colleagues22 compared the antimicro- bial performance of four systems used as root canal irrigants. Sev- en per cent sodium hypochlorite and infected sterile roots with open access cavi- ties and containing a paper point were cured by one volunteer in the oral cavity for 1 week. After re- moval, the samples were taken for microbiologic analysis. The root canals were then disinfect with the EndoTrish system (Israel) and treated with ozonated water, whereas that of bifidobacteria signifi- cantly decreased. Notably, when the specimen was irrigated with ozone gas at the end of the cleaning, shaping, and irrigation of root canals, and the ozonated liquid in the canal system should be agi- tated with ultrasound.

**Ozone has been proven to be one of the most powerful irrigants we can use in dentistry.**

**Biocompatibility of ozone in root canals**

A high level of biocompatibility of aqueous ozone on human oral epithelial (BHY) cells, gingival fibroblast (HGF-1) cells, and peri- odontal cells has been pub- lished.6–12 Huth and colleagues17 investigated whether gaseous ozone and aqueous ozone exerted any cyto- toxic effects on BHY cells and HGF-1 cells compared with established antiseptics (2 and 0.2 per cent sodium hypochlorite (NaOCl), or HealOzone, MTAD, and 3 per cent sodium hypochlorite (NaOCl). These results suggest that ozone is an effective irrigant or lesion by pressing the devices that blow ozone into root canals. Other systems are available (such as systems that inject ozone gas at the end of the cleaning, shaping, and irrigation of root canals, and the ozonated liquid in the canal system should be agi- tated with ultrasound.

**Enhanced healing associated with ozone use**

Ozone also can play a key part in the healing process,17,6,12–16 which showed equal or even higher cytotoxic potentials than ozone gas. In addition, ozone gas applied into the most root canal, as currently performed with the HealOzone de- vice, dissolves in canal fluids, thus delivering ozone gas to the entire root canal, which then comes into con- tact with tissues.

**Effect of aqueous ozone on the NF-κB system**

The transcription factor NF-κB plays a crucial role in inflamma- tory/immune processes and apoptosis. NF-κB is also thought to be of qualitative importance in the acti- vation of peridontal/periapical inflamma- tory reactions and the pathogenesis of periodontal diseases and apical periodontal processes. Huth and colleagues17 reported that aqueous ozone exerts inhibitory effects on the NF-κB system, suggest- ing that it has anti-inflammatory and immune-modulatory capaci- ties.
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 level of biocompatibility compared with commonly used antimicrobials, 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 efficacy and potent oxidant ability to reduce microorganisms during root canal therapy.

Disclosure

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References
