



Ozone Therapy : A New Revolution In Periodontics

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Post Graduate Student***Abstract:***

Ozone therapy has successfully being used in the medical field for treatment of various diseases. The versatility of ozone therapy, its unique properties, noninvasive nature, absence of side effects or adverse reactions are responsible for its wide spread use. Ozone gas has a high oxidation potential and has the capacity to stimulate blood circulation and the immune response. It can be used for the treatment of periodontitis, as a mouthwash for reducing the oral micro flora, as well as in the cases of periimplantitis. This paper gives a brief review on the potential of ozone therapy in periodontics.

Key words: *Ozone therapy, noninvasive, periodontics*

1.Introduction

Ozone is a natural gaseous molecule made up of three oxygen atoms. Ozone therapy can be defined as a versatile bio-oxidative therapy in which oxygen/ozone is administered via gas or dissolved in water or oil base to obtain therapeutic benefits (Bayson A et al., 2004). The word ozone originates from the Greek word ozein, which means odor and was first used by German chemist Christian Friedrich Schonbein, father of ozone therapy (1799-1868) in 1840. The first application of ozone in medical field seems to have been for treating gaseous, post-traumatic gangrene in German soldiers during the 1st world war (Bocci V 2004). However a big step forward was the invention of a reliable ozoniser for medical use by the physicist Joachim Hansler (1908-1981). The idea to use ozone in medicine developed slowly during the last century and it was stimulated by the lack of antibiotics and the disinfectant properties of ozone. Ozone, which is used for medical purposes, is a gas mixture comprised of 95 to 99.95% oxygen and 0.05 to 5% pure ozone. Due to proven therapeutic advantages of ozone, many fields in dentistry could benefit from ozone therapy. The first dentist who used ozone was Edward Fisch in 1950 for treating Austrian surgeon Ernst Payr for a gangrenous pulpitis and thereby inspired him to begin a line of investigations dedicated to ozone use in health care.

2.Ozone Generation

Joachim Hänsler and Hans Wolff, German physicians, developed the first ozone generator for medical use. Their design continues to be the basis for modern equipment. Medical grade ozone is a mixture of pure oxygen and pure ozone in the ratio of 0.05% to 5% of O₃ and 95% to 99.95% of O₂. Due to the instability of the O₃ molecule, medical grade ozone must be prepared immediately before use. Within less than an hour after preparation only half of the mixture is still ozone while the other half is transformed into oxygen. As a result, it is impossible to store ozone over long periods of time. In order to control the decomposition of O₃ into oxygen it can be associated with a vehicle with aqueous properties to promote the conversion more quickly or with a vehicle with more viscous properties to retard the conversion.

There are three different systems for generating ozone gas:

- Ultraviolet System: produces low concentrations of ozone, used in esthetics, saunas, and for air purification.
- Cold Plasma System: used in air and water purification.

- Corona Discharge System: produces high concentrations of ozone. It is the most common system used in the medical/ dental field. It is easy to handle and it has a controlled ozone production rate.

2.1. Mode Of Delivery

The route of ozone administration is topical or in gaseous or aqueous form or as ozonated olive or sunflower oil.



Figure 2: Dispenser for ozone administration

3. Mechanism Of Action

Ozone has been shown to possess unique properties and has potential applications to the clinical practice of dentistry and medicine. There are several known actions of ozone, such as antimicrobial (bactericidal, viricidal, and fungicidal), immunostimulating, immune modulatory, anti-inflammatory, biosynthetic (activation of the metabolism of carbohydrates, proteins, lipids), bioenergetic, antihypoxic, analgesic, haemostatic, etc. Ozone oxidizes biomolecules, disrupts microbial cell structures and metabolism. Ozone disrupts microbial cell walls in seconds, leading to immediate cell lysis. An ozone application of 10 – 20 second has been reported to eliminate more than 99% of the microorganisms found in the dental caries and associated biofilms – and a 40 second treatment time covers all eventualities (Lynch and Baysan, 2001.). It was reported that ozone at low concentration of 0.1 ppm, is sufficient to inactivate bacterial cells including their spores. (Broadwater WT et al., 1973).

4.Applications Of Ozone In Dentistry

The use of ozone has been proposed in dentistry because of its antimicrobial, disinfectant, biocompatibility and healing properties. Ozone has been applied for treatment of early carious lesions, sterilization of cavities, root canals, periodontal pockets, enhancing epithelial wound healing such as ulcerations and herpetic lesions, Bleaching of discolored root canal treated teeth, Desensitization of extremely sensitive teeth, treatment of periimplantitis, and as a rinse for the avulsed teeth or as a denture cleaner and decontamination of used tooth brush.

5.Application Of Ozone Therapy In Periodontics

- Ozonated water in decontamination of avulsed teeth before replantation

A high level of biocompatibility of aqueous ozone on human oral epithelial cells, gingival fibroblast cells, and periodontal cells has been found. (Huth KC et al., 2006, Ebensberger U et al., 2002). Two-minute irrigation of the avulsed teeth with nonisotonic ozonated water not only provides mechanical cleansing, but also decontaminates the root surface, with no negative effect on periodontal cells remaining on the tooth surface before replantation. (Ebensberger U et al., 2002).

- Antibacterial Effect of Ozone on Plaque biofilm

Both caries and periodontal disease are caused primarily by plaque biofilm. Ozone might be useful to control oral infectious microorganisms in dental plaque. Ozonated water strongly inhibited the accumulation of dental plaque. Ozonated oil is used as a safe therapeutic alternative in patients with Acute Necrotizing Ulcerative Gingivitis. Healing and bactericidal properties makes it useful as a subgingival irrigant. The antimicrobial property of ozone is not only effective in reducing the number of cariogenic bacteria, but also causes significant reduction in the microorganisms present in the root canal. However it was not successful in completely eliminating these bacteria embedded in the biofilm. (Polydorou O et al., 2011, Knight GM et al., 2008, Nagayoshi M et al., 2004, Bezrukova IV et al., 2005, Johanson E et al., 2009) Ozonated water is effective in killing gram positive, gram-negative bacteria and oral *Candida albicans* causing periodontal disease. Ozonated water had nearly the same antimicrobial activity as 2.5% sodium hypochlorite and also the metabolic activity of fibroblasts was high when the cells were treated with ozonated water. The aqueous form of ozone, as a

potential antiseptic agent, showed less cytotoxicity than gaseous ozone or established antimicrobials like chlorhexidine digluconate, sodium hypochlorite or hydrogen peroxide undermost conditions. Therefore, aqueous ozone fulfills optimal cell biological characteristics in terms of biocompatibility for oral application. (Fukuizumi T et al., 2004, Kshitish Detal., 2010) Ozone may be considered as an adjunctive to conventional treatment strategy due to its powerful abilityto inactivate microorganisms.



Figure 1: Application of ozone therapy in gingivitis

- Ozone for treatment of periimplantitis

For the prevention of periimplantitis an adequate and steady plaque control regimen must be ensured. Ozone, a powerful antimicrobial kills the microorganisms causing periimplantitis. In addition ozone shows a positive wound healing effect due to the increase of tissue circulation. Gasiform ozone or ozonized water shows an increased healing compared to wound healing without ozone therapy. (Karapetian VE et al., 2007).

5.Contraindications of ozone

The following are contraindications of ozone therapy-

- Pregnancy
- Glucose- 6- phosphate dehydrogenase deficiency
- Hyperthyroidism
- Severe anemia
- Severe myasthenia
- Active hemorrhage

6.Ozone Toxicity

Therapeutic administration of Ozone did not cause any deleterious effects. European cooperation of medical Ozone societies prohibited the intravenous injections of Ozone gas due to risk of air embolism. But the inconsistent use of Ozone was reported to cause certain side effects like rhinitis, occasional nausea, vomiting, blood vessel swelling, poor circulation, heart problems respiratory tract irritation, at times stroke. In case of Ozone intoxication the patient must be placed in the supine position, inhale humid oxygen and take ascorbic acid, vitamin E and N acetyl cysteine.

7.Conclusion

In the era of advancement in the methodologies of treatment Ozone therapy has evolved with success. This is one of the most minimally invasive treatment methods. The treatment time is reduced and according to some studies bacterial count is reduced precisely. It is absolutely painless procedure which increases patient acceptability and compliance with minimal adverse effects. Scientific support demonstrated by various studies shows Ozone therapy as a potential therapy in field of medicine and dentistry. According to Cochrane database there is lack of consistency between different outcome measures and absence of reliable evidence that application of Ozone gas reverses the decay. Nevertheless in vivo randomized and well controlled clinical trials are the requirement of the day to establish it as a standard therapy.

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