
REVIEW ARTICLE

OZONE THERAPY- A holistic approach in dental practice during Covid era and beyond

Pooja Kabra¹, Fiza Alam²

¹Associate Professor, Department of Conservative dentistry and endodontics, SDS, Sharda University, Greater Noida

²BDS Intern, SDS, Sharda University, Greater Noida

Corresponding Author's Email id: pooja.kabra@sharda.ac.in

ABSTRACT

The oral cavity represents an open ecosystem which constantly fights to a balance the microbial entry, colonization patterns, and host defenses aimed at eliminating pathogens. Multiple modes of management depend upon the level of pathogenicity along with the timeline when patient reports to the practitioner. With a relative ongoing scare of treatment in the Covid era and constant threat to the practitioner there has been a bend of opting more conservative and less invasive options if available. Ozone therapy is more effective than the minimally invasive and effective traditional treatments used in dentistry today. Ozone dentistry falls into the category of new treatments in dentistry, but ozone is not new. Ozone therapy already has a role in the root canal in endodontics. Ozone gas can penetrate and kill bacteria in the root canal, effectively eliminating bacteria and improving the success of endodontic surgery. Ozone therapy for endodontics represents a revolution in dental treatment, especially in root canal surgery. As the dental community continues to explore and perfect the use of ozone in endodontic surgery, the root canal treatment landscape is expected to change, providing patients with better outcomes and minimal intervention in the treatment of dental disease.

Key words: ozone, dental, microbes, bacteria.

Received 01.01.2024

Revised 21.01.2024

Accepted 25.2.2024

How to cite this article:

Pooja K, Fiza A. OZONE THERAPY- A holistic approach in dental practice during Covid era and beyond · Adv. Biores. Vol 15 [2] March 2024. 279-283.

INTRODUCTION

Many dental procedures produce droplets and aerosols that are contaminated with blood and microorganisms which can spread easily throughout the dental operator. This can hereby contaminate the atmosphere and cause a great threat to the patient as well as dentists. The alternative approach to reduce such infections is ozone therapy. Ozone (O₃) is an allotropic form of oxygen that is it is a triatomic molecule and is the third most potent oxidant (higher energetic form of oxygen), has the capacity to stimulate blood circulation and immune response. Ozone therapy has many uses in dentistry. An important part of ozone therapy is the treatment of tooth decay. Ozone selectively targets and eliminates disease-causing cavities without affecting healthy tissue. This non-invasive method offers a promising alternative to caries removal. Additionally, ozone therapy has an important place in dental care. Its antibacterial properties help heal gums by helping reduce diseases associated with periodontitis. Ozone can be used in pockets over time to disrupt bacterial biofilms and improve oral health. Ozone therapy already has a role in the root canal in endodontics. Ozone gas can penetrate and kill bacteria in the root canal, effectively eliminating bacteria and improving the success of endodontic surgery. This approach reduces the need for additional reagents and improves the overall disinfection process. Ozone's ability to support healthy tissue has implications for oral surgery and tissue management. It improves blood circulation, accelerates wound healing and reduces back discomfort and complications. In addition, the anti-inflammatory effect of ozone helps patients who have undergone many dental operations to have a better recovery process. Despite its benefits, continued research is essential to validate and refine ozone dental treatments. Although promising, its integration into general dentistry requires careful evaluation of safety, effectiveness, and application criteria. As dentists continue to explore and understand the full

spectrum of ozone therapy, it promises to change some aspects of dentistry. Ozone therapy for endodontics represents a revolution in dental treatment, especially in root canal surgery. Ozone has emerged as a promising treatment in this field due to its powerful anti-inflammatory properties. One of the main uses of ozone in endodontics is to disinfect the root canal. Ozone gas entering the root canal can penetrate the body and reach areas that are difficult to reach with traditional methods. This ensures greater destruction of bacteria, viruses and fungi that cause root diseases. It effectively targets and eliminates disease while preserving healthy tissue. This option will help preserve tooth structure, which is important to preserve the integrity of the treated teeth. Inflammation is a part of dental diseases, and ozone's ability to modulate the inflammatory response helps provide patients with a better post-operative experience. Reducing pain can speed healing and reduce post-operative discomfort. Although ozone therapy has great potential in endodontics, its integration into mainstream practice requires further research to establish a protocol and ensure safety.

PRODUCTION OF OZONE

The atmosphere is made up of several layers and one of which is stratosphere (rich in ozone). Ozone in the stratosphere is produced by striking the high energy ultraviolet radiation on the oxygen molecule and allow it to split into two free oxygen atoms. The free oxygen atoms collide with molecules of oxygen to form ozone molecules. For medical use highly specific gazettes known as Ozone Generators are used for production of ozone [1].

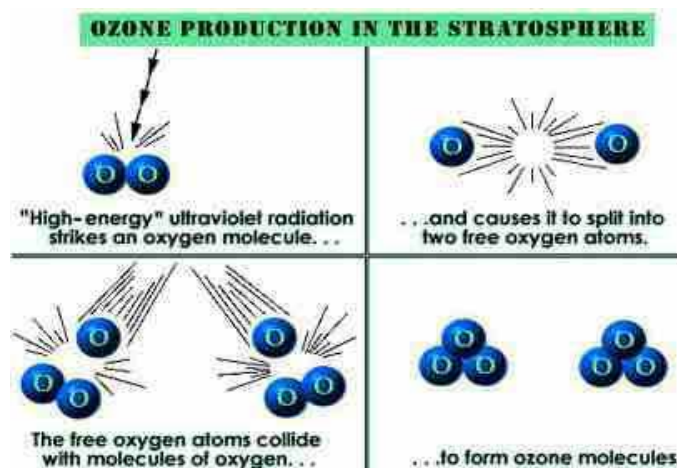


Fig 1. depicting production of ozone

PROPERTIES OF OZONE-

Ozone is atraumatic, non-invasive analgesics and has antimicrobial properties with ant hypnotic actions. These properties have excelled its application in wider range and can be used in almost every field in dentistry. Ozone occurs as a colorless gas with a pungent odor at room temperature and is detectable even at concentrations as low as 0.02–0.05 ppm. [2]

FORMS OF OZONE AVAILABLE FOR DENTAL APPLICATION -

There are various forms of ozone used in dentistry like in Gaseous form, in ozonates water form and in ozonized oil form. The gaseous form can be administered topically either by an open system or by a sealing suction system to avoid inhalation and adverse effects. The ozonated water had shown to be efficacious again gram- positive and gram-negative oral microorganisms as well as bacteria in plaque biofilm. Last being the ozonized oil which is one of the competitive antimicrobial agents.

OZONE GENERATING SYSTEMS USED IN DENTISTRY-

"Healozone" an airbase system which is known to deliver higher ozone concentration. Prozone is easier to use and safe to apply to reduce bacteria through oxidant. Ozotop is a compact and free flow ozone delivering system. Ozony tron being used on the principle of high frequency and can be applied to inaccessible areas such as gingiva. Out of these, in dentistry, two widely used ozone units are the heal ozone15 and ozotop. [3]

AREAS WHERE OZONE TREATMENT CAN REPLACE AEROSOLS IN DENTISTRY-

a. Treating dental caries and restoration: - Dental caries being a prime concern and caused by S.Mutans. Ozone oxidizes the pyruvic acid produced by the cariogenic bacteria to acetate and carbon dioxide. Ozone has the power to restrict extremely deep caries. Not only does ozone kill all the bad bacteria, fungi, viruses and protozoans, it also removes their breakdown products as well as other necrotic debris. [5] Ozone application can be used in pit and fissure caries by removing smear layer. To provide adequate access for the ozone to the caries, the pits and fissures should be cleaned properly. Huth et al. concluded that ozone application significantly improved non-cavitated initial fissure caries in patients at high caries risk over a 3- month period. [6] After using ozone, the dentist can ask the patient to use many additional products (fluoride, xylitol, probiotics, etc.) to promote regeneration. It was reported that by applying ozone for 40 seconds and using the remineralization device, the development of non-cariogenic diseases can be stopped without the need to remove caries. Ozone equipment should also be used appropriately; The ozone nozzle should be applied directly to the carious lesion to ensure ozone penetration into the caries and biofilm. In a 4 mm deep root caries gums, within ozone treatment alone will not be sufficient.

b. Endodontic treatment:- Often bacteria from the caries process enter the tooth and penetrate deep into the skin or "veins" of the tooth. Enterococcus faecalis is considered an important cause of endodontic infections and is particularly resistant to sodium hypochlorite, the agent most used while rendering endodontic care. Ozone has been shown to be effective against this resistant anaerobe and all other pathogens, including bacteria and fungi found in root canals of the tooth. Ozone is effective when applied to the root canal and provides satisfaction and time during cleaning, treatment and post-treatment. Ozonated water can be used as a root canal, and in necrotizing root canal disease, ozonated oil can be used as a root dressing to reduce the distinctive anaerobic odor emitted by the tooth. Moreover, when ozonated water is used for ultrasonic disinfection in the root canal, the disinfection is equal to 2.5% NaOCl. [7]

c. Treating tooth hypersensitivity:- Tooth loss resulting from many factors (e.g. wear, abrasion, erosion, occlusal trauma) can cause enamel and dentin wear, leading to sensitivity. Studies have shown that ozone application not only reduces enamel and dentin sensitivity, but also reduces root sensitivity.

d. Treatment of Periodontitis:- Periodontitis is a destructive inflammatory disease of the supporting tissues of the teeth and is caused either by specific microorganisms or by a group of specific microorganisms, resulting in progressive destruction of periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession, or both. [8] As an alternative treatment to antibiotics, ozone therapy is a better and promising step to avoid biofilm resistance. Periodontal disease is usually associated with halitosis. Dentists are getting better at managing and preventing gum disease. One can use ozone water to irrigate deep roots during decomposition, then use a fine cannula to inject ozone into the deep root system, and then release ozone oil for long-term disinfection. Patients can also be given ozone oil to themselves by placing it every day. The effect of irrigation with ozonated water on the proliferation of cells in the periodontal ligament adhering to the root surfaces of avulsed teeth. [9] They confirmed that ozonated water was highly effective in killing both gram positive and gram-negative microorganisms. Use of 150 ml of ozonized water to irrigate the periodontal pockets for a duration of 5-10 min once weekly for four weeks in patients suffering from aggressive periodontitis. [10]

e. Promotes healing and reduces post operative pain :- Ozone therapy has many uses in oral surgery; Whether it is a simple tooth extraction, a painful jawbone or osteotomy. Ozone promotes wound healing, increases the number of red blood cells and promotes tissue drainage. This causes vasodilation, which increases blood flow to the ischemic area. Therefore, it can be successfully used in cases of wound healing impairments following surgical interventions like tooth extractions or implant dentistry. [11] The effect of ozone therapy on pain, swelling and trismus following third molar surgery and concluded that ozone application effectively reduced postoperative pain; however it had no effect on swelling and trismus evaluated by Kazancioglu et al. [12] Ozone has also been recommended as a therapeutic treatment in cases of bisphosphonate related osteonecrosis of jaw.

f. Disinfecting dentures: - Dentures are often colonized by various bacteria, especially Candida albicans. Dental stomatitis is encountered routinely and is a reason of accumulation of plaque. [13] A successful method is to use ozone to clean the dentures. It is effective against various microbes adhering on the denture surface including C. albicans. [14]

g. Effective treatment in apprehensive patients:- Because of quick, easily applied and effectiveness, ozone therapy is considered one of the appreciated therapy in children which also help managing the child's behaviour and their cooperation. Dahnhardt et al. treated open carious lesions with ozone in anxious children in which near total reduction (93%) of dental anxiety is observed. [15]

h. Ozone in remineralization after fixed mechanotherapy:- Teeth bonded with bonding material are reported to have been affected by some form of enamel opacity after orthodontic treatment; diffuse opacity being the most common type identified. Ghobashy et al. evaluate the effects of ozonized olive oil gel in reducing enamel demineralization around orthodontic bracket during orthodontic treatment. [16]

i. Treatment of oral ulcers:- Several soft tissue lesions i.e. aphthous ulcers, herpes labialis have been reported to be effectively treated using ozone therapy. [17] This necessity is attributed to the healing power of ozone..

j. Ozone in sterilization and disinfection:- In addition to disinfectants, ozone water can also be used as a cold disinfectant in medical and dental care. Ozone water is also used in hand sanitizers, fiber optic caps, contact lenses, surgical glasses, etc.

CONTRAINDICATIONS

There are two sides of same coin. Likewise, Ozone therapy too has some limitations and contraindications. Those are conditions like Myasthenia Gravis, Pregnancy, Hyperthyroidism, Myocardial infarction, Anemia, Hemorrhage to name a few.

OZONE TOXICITY

Although ozone has some benefits, inhaling it can sometimes damage the lungs and other organs. The European cooperation of Medical Ozone Societies prohibited the intravenous injections of ozone gas due to the risk of air embolism. [18]

CONCLUSION –

Ozone therapy has been widely used in medical professions since more than a century. Currently its usage is well known in almost every field of dentistry. This powerful oxidant accounts for its ability to kill harmful microorganisms present in the oral cavity and holds the future promises to explore more for treating different medical conditions all over the world since covid times and beyond with its widespread use.

REFERENCES

1. Tiwari,S, Avinash,A, Katiyar,S, Iyer,A, Jain.S. (2017). Dental applications of ozone therapy: A review of literature,The Saudi Journal for Dental Research. 8 (1-2), pp105-111.
2. Iliadis D, Brian J, Millar. (2013). Ozone and its use in periodontal treatment. Open J. Stomatology. 3(2):197-202.
3. Holland Alan.(2010). Ozone in endodontics. Endod Pract. 6-10.
4. Kumar A, Bhagwati S, Tyagi P, Kumar P. (2014). Current interpretation and rationale of the ozone usage in dentistry: a systemic review of literature. Eur J Gen Dent. 3(3):175-80.
5. Domb WC. (2014). Ozone therapy in dentistry. A brief review for physicians. Interv Neuroradiol. 20(5):632-6. doi: 10.15274/INR-2014-10083. Epub 2014 Oct 17. PMID: 25363268; PMCID: PMC4243235.
6. Huth KC, Paschos E, Brand K, Hickel R. (2005). Effect of ozone on non-cavitated fissure carious lesions in permanent molars -a controlled prospective clinical study. Am J Dent. 18:223-8.
7. Reddy SA, Reddy N, Dinapadu S, Reddy M, Pasari S. (2013). Role of ozone therapy in minimal intervention dentistry and endodontics – a review. J Int Oral HealthJun. 5(3):102-8.
8. Saini R, Saini S, Sharma S. (2010). Periodontal disease linked to cardiovascular disease. J Cardiovasc Dis Res. 1:161-2.
9. Ebersberger U, Pohl Y, Filippi A. (2002). PCNA-expression of cementoblasts and fibroblasts on the root surface after extraoral rinsing for decontamination. Dent Traumatol. 18:262.
10. Ramzy MI, Gomaa HE, Mostafa MI. (2005). Management of aggressive periodontitis using ozonized water. Egypt Med J N R C. 6 (1):229-45.
11. Das S. (2011). Application of ozone therapy in dentistry. Indian J Dent Adv. 3(2):538-42.
12. Kazancioglu HO, Kurklu E, Ezirganli S. (2014). Effects of ozone therapy on pain, swelling, and trismus following third molar surgery. Int J Oral Maxillofac Surg. 43(5):644.
13. Agrillo A, Petrucci MT, Tedaldi M, Mustazza MC, Marino SM, Gallucci C, et al. (2006). New therapeutic protocol in the treatment of avascular necrosis of the jaws. J Craniofac Surg. 17:1080-3.
14. Arita M, Nagayoshi M, Fukuizumi T, Okinaga T, Masumi S, Morikawa M, et al. (2005). Microbicidal efficacy of ozonated water against *Candida albicans* adhering to acrylic denture plates. Oral Microbiol Immunol. 20:206.
15. Dahnhardt JE, Jaeggi T, Lussi A. (2006). Treating open carious lesions in anxious children with ozone. A prospective controlled clinical study. Am J Dent. 19:267-70.
16. Ghobashy Safaa Ali, El-Tokhey Heba Mohamed. (2012). In vivo study of the effectiveness of ozonized olive oil gel on inhibiting enamel demineralization during orthodontic treatment. J Am Sci. 8 (10):657-66.
17. Nagarakanti S, Athuluru D. (2011). Ozone: a new revolution in dentistry. Webmed Cent Dent. 2(12), WMC002685.

18. Hubert Chang, et al. (2012). Oxidative consumption of oral biomolecules by therapeutically-relevant doses of ozone *Adv Chem Eng Sci.* 2, pp. 238-245
Andreeva, L.I., Kozhemyakin, L.A., Kishkun, A.A. (1998). Modification of the Method for Determination of Lipid Peroxides Using Thiobarbituric Acid Test. *Laboratory Work, Moscow.* 11, pp. 41-43.

Copyright: © 2024 Author. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.