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The Ozone Therapy in Periodontics

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Abstract

Gingival and periodontal disorders are an important issue in dentistry and medicine. When ozone is fully utilised, the bulk of the factors and causes that contribute to the onset of these diseases are decreased or eliminated (gas, water, oil). Ozone is employed for its antibacterial activity, the oxidation of bio-iota precursors and microbial toxins encapsulated in periodontal contaminations, and its retouching and tissue recovery properties in all stages of gingival and periodontal disorders. The primary purpose of this article is to provide an overview of ozone's clinical applications in periodontics. It is entirely optional to learn about contraindications and how they pertain to other dental professions. If this goal is met, future examiners will be curious about what has been tried and the possible therapeutic application of ozone in Periodontics.

Introduction

Ozone is an oxygen-based gas made up of three atoms. It is a gas that occurs naturally in large quantities in the highest layers of the atmosphere. It plays a key role in absorbing the damaging rays known as UV rays that are found in the light provided by the Sun.

Thus, ozone gas functions as a filter for light in earth's atmosphere, shielding living creatures from UV radiatio.

Roughly 90% of ozone is situated in the stratosphere at a stature of 10 to 17 kilometers and is alluded to as the ozone layer, while the leftover 10% is found in the lower atmosphere. The ozone layer ingests 97 to 99 percent of medium recurrence UV radiations (200 nm to 315 nm). Ozone (O3), like oxygen (O2), is boring, however it has an exceptionally solid smell. It is very scant in contrast with oxygen. It is accepted that around 2 million air atoms are O2 and only three are ozone. Photolysis is the interaction through which ozone is shaped. When the sun's UV rays reach the O2 atoms, they split the gas. When oxygen molecules mix with oxygen atoms in the upper atmosphere, ozone is created. The "Dobson Unit" is used to monitor stratospheric ozone from the ground (D.U). Normal ozone concentrations range from 300 to 350 D.U [1].

Medical grade ozone is made from pure medical oxygen since the amount of oxygen in the environment fluctuates. Climatic air is composed of 71 percent nitrogen (N2), 28 percent oxygen (O2), and 1% other gases such as ozone, all of which are affected by height, temperature, and air pollution processes[2].

Ozone has been demonstrated to have unique qualities and may have practical implications in dentistry and medicine.

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Ozone has various recognised activities, including antibacterial (bactericidal, viricidal, and fungicidal), immunostimulatory, immunological modulatory, antiinflammatory, biosynthetic (stimulation of glucose, protein, and lipid metabolism), bioenergetic, antihypoxic, analgesic, haemostatic, and others. Ozone has therapeutic uses in a variety of dental treatment techniques. When used in conjunction with conventional therapies, ozone therapy has several advantages [3].

Ozonetherapy is becoming increasingly popular in the field of periodontics, a branch of dentistry. Watery ozone has been demonstrated to have a good biocompatibility with fibroblasts, cementoblasts, and epithelial cells, suggesting that it might be used to treat dental illnesses such periodontitis, apical periodontitis, and peri-implantitis. In the treatment of periodontitis, ozone is used as an adjuvant to scaling and root planing (SRP), rather than SRP alone[4].

History

Ozone therapy has been utilized since the 1800s, and in 1896, Nikola Tesla licensed main O3 generator in United States, setting up the "Tesla Ozone Company." During World War I (1914-18), clinicians mindful with O3's antibacterial characteristics directed it topically to contaminated injuries with minimal other clinical assets accessible, and found O3 treated disease, yet in addition had hemodynamic and mitigating effects [5].

Schonbein coined the term "ozone" in 1840. He exposed oxygen to electrical discharges and observed "odour of electrical stuff." Ozone was initially utilised in a health care environment in 1856, barely 16 years after its discovery, to clean the operating area and sterilise surgical tools. Before 1950, ozone treatment was troublesome and restricted attributable to an absence of ozone-safe materials like Nylon, Dacron, and Teflon. Joachim Hänsler, a German researcher and doctor, worked together with Hans Wolff, one more German doctor to make the principal ozone generator for therapeutic utilization. Their design is still used as the foundation for current equipment. The Food and Drug Act of the early twentieth century altered its usage and influence in field of medicine. Dr. E.A. Fisch, a German dental hygienist, pioneered the use of ozonated water for dental operations in 1950[6].

Generators of ozone

Three different systems are there to generate the ozone they are as follows:

- Ultraviolet System: This system produces small amounts of ozone, which is used in cosmetics, saunas, and air purification.
- Cold Plasma System: This system is used to clean air and water.
- Corona Discharge System: This system generates massive amounts of ozone. It is the most commonly utilised framework in clinical and dental settings. It's simple to use and has a controlled ozone ageing rate.

Schedules for ozone organization

Ozone vaporous: In view of its wide range of productivity, vaporous ozone is much of the time employed.Karapetian et al. examined peri -implantitis treatment utilizing traditional, careful, and ozone treatment draws near, and found that the ozone-treated patient gathering had the most noteworthy fruitful microscopic organisms decline. As per the creators, the key issue has all the earmarks of being the purging of the embed surface and encompassing tissue, just as the avoidance of recolonization with periodontal pathogenic bacteria [7].

Water with ozonation: Ozonated water possesses antifungal, antiviral, and antibacterial properties, as well as anti-inflammatory properties, making it more acceptable and effective in the treatment of many ailments.

Ozonatedoil: It is also utilised in dentistry after being ozonized. It is frequently used and quite useful. However, as compared to ozonized oil, gaseous ozone and ozonated water are favoured.

Ozone therapy in periodontics

Oral health has long been recognised as an important component of overall health and well-being. The link between oral health and overall health is well established. Dental diseases are a major public health issue all over the world[8]. Periodontitis is an inflammatory condition of the periodontium. It is complex and multifactorial in nature and is characterized by gingival inflammation and alveolar bone resorption[9]. Periodontal disease is a fiery disease brought about by a mix of periodontal microbes, procured and ecological components, and the host. Inflammation of soft tissues is caused by an increase in inflammatory cells, which generates oedema, which then affects the subgingival ecosystem, causing an anaerobic environment, which causes a change in microflora[10].Alongside the best quality level of scaling and root arranging, ongoing advancements assume a significant part in perceiving the infection at a beginning phase, killing already difficult to reach periodontal microorganisms and causative elements, conveying drug without fundamental difficulties, and further developing home consideration techniques[11].

Periodontal and gingival abnormalities are serious issues in dentistry and medicine. At the start of each of its application techniques, ozone reduces or eliminates the weight of the contributing elements and causes of these disorders (gas, water, oil). Ozone's antibacterial activity, oxidation of bio-particle precursors and microbial toxins implicated in periodontal illnesses, as well as mending and tissue recovery properties, make it a well-established treatment for all stages of gingival and periodontal diseases [12].

Ozone is a good alternative and/or additional disinfectant to standard antiseptics because of its unrivalled disinfection potential. Periodontitis is a multi-factorial illness of mouth in which bacteria and the host's immune system play a role. Periodontal disease is started and progressed by complicated interactions between periodontal bacteria and immune system cells [13].

Because of ozone's unrivalled disinfection capacity over other antiseptics, it is an extremely superb other option as well as supplemental sanitizer to customary sterilizers in treatment of periodontitis, gingivitis, peri-implantitis, surgical wounds, and Prophylaxis. A 60-second ozone spray followed by a mineral wash on the exposed dentine gives immediate relief from root irritation. In situations of peri-implantitis, gaseous or aqueous ozone may be employed. By cutting a sufficient length of PVC or silicone cap, the abutment is completely covered. The gingival margins around the implant must be well sealed. In this case, ozone gas infiltration can also be employed. Irrigation with ozonated water is used during debridement and curettage. A

3–4 times daily application of ozonized oil to the treated regions is also recommended [14].

Bacterial plaque that aggregated on teeth surfaces and made out of local oral verdure is the essential etiological specialist for periodontal sickness and dental caries which might bring about tooth misfortune whenever left untreated [15].

To treat oral infection and germs present in dental plaque and biofilm, ozonated water at a concentration of 4mg/ml is effective in destroying pathogenic gramme positive and gramme negative bacteria in mouth washes.

In 2002, Thanomsub et al. looked into the effects of ozone therapy on bacterial cell growth and ultrastructure. Bacillus subtilis, Escherichia coli, Salmonella sp., Staphylococcus aureus, and Escherichia coli); Bacillus subtilis, Escherichia coli, Salmonella sp., Staphylococcus aureus, and Escherichia coli); Bacillus subtilis, Es Ozone was shown to disinfect water contaminated with up to 105 cfu/ml bacteria in 30 minutes when applied at 0.167 mg/min/l. Bacterial cell membrane breakdown caused intercellular leaking and, as a result, cell death. At doses of 106 and 107 cfu/ml, ozone had no effect on cell viability in bacterial cultures. In 2002, Ebensberger et al. investigated the effects of ozonated water irrigation on the proliferation of periodontal ligament cells adhering to the root surfaces of 23 freshly extracted fully erupted third molars. As a control group, the teeth were irrigated for 2 minutes with a sterile isotonic saline solution or aggressively irrigated with ozonated water. Irrigating an infected tooth with non-isotonic ozonated water mechanically washes and decontaminates the root surface, leaving the periodontal cells on the tooth surface unaffected.

Ramzy et al. flooded the periodontal pockets of 22 patients with severe periodontitis using ozonized water in 2005. A dull headed clean plastic needle was used to flood periodontal pockets with 150 cc of ozonized water for 5-10 minutes once a week during a clinical 4-week research. Pocket depth, plaque list, gingival list, and bacterial include all improved significantly in quadrants treated with scaling and root planing and ozone therapy. They also observed that regions treated with ozonized water had a much lower bacterial count [17].

Gram negative bacteria like Porphyromonasendodontalis and Porphyromonasgingivalis are less susceptible to ozonated water than Gram positive bacteria such oral streptococci and Candida albicans. Furthermore, bacteria in plaque biofilms are sensitive to ozonated water, which has a powerful bactericidal impact. Additionally, ozonated water reduces the formation of plaque on the teeth.When professional teeth cleaning procedures such as scaling and root planing are combined with rinsing or cleaning the mouth with ozone water in cases of gingivitis and periodontitis, the prognosis of gingivitis and periodontitis improves when compared to cases where only scaling and root planing are performed.

The clinical and microbiological data are interpreted from the first to the seventh day. At the point when ozone water system was utilized rather than chlorhexidine, a bigger extent of plaque file (12%), gingival record (29%), and draining list (26%) decline was accounted for. The percentile decrease of Aa (25%) accomplished with ozone was critical when contrasted with no adjustment of Aa event with chlorhexidine. There was no antibacterial effect of O 3 and chlorhexidine on Porphyromonasgingivalis (Pg) and Tannerellaforsythensis. During the exploration time frame, the antifungal effect of ozone was significant from pattern (37%) to seventh day (12.5%), rather than CHX, which had no antifungal effect [18].

Contraindications of ozone therapy

The ozone therapy should not be carried out in the following cases:

1. conditions after hemorrhage and hemorrhagic tendency,
2. convulsions and fits
3. mental diseases in the acute stage,
4. hyperfunction of thyroid,
5. poorly controlled diabetes,
6. myasthenia
7. pregnancy
8. deficiency of Glucose- 6- phoshate dehydrogenase
9. blood-clotting disorders such as haemophilia
10. constant consumption of anticoagulants
11. anemia
12. autoimmune disorders
13. myocardial infarction
14. ozone allergy

Applications of ozone in dentistry

- biofilm purging (pathogen removal from biofilms)
- periodontal pocket cleaning and osseous disinfection
- avoiding dental caries
- endodontic therapy
- tooth removals
- tooth sensitivity
- temporomandibular joint therapy
- gingival recession
- pain management
- infection prevention
- rapid healing
- tissue regeneration
- halitosis management
- tooth surface remineralization
- teeth whitening

Other applications of ozone therapy

1. Cytoplasmic membrane damage
2. Intracellular content oxidation
3. Unique to microbial cells
4. Effective against antibiotic-resistant strains
5. Immunological stimulating • stimulates humoral and cel-

lular immune systems • proliferation of immunocompliment cells • immunoglobulin production • increased phagocytosis activity • activation of biologic antioxidants

6. Analgesic
7. Detoxicating and antihypoxic
8. Stimulation of aerobic processes (glycolysis, fatty acid oxidation, Kreb's cycle)
9. Bioenergetics and biosynthetics • stimulates protein synthesis

- improves cell metabolism (ribosome, mitochondria)
- Synthesis of interlukins, leukotrienes, and other physiologically active compounds

Toxicity of ozone

Harmfulness of Ozone inward breath can be destructive to the lungs and different organs. Epiphora and upper respiratory aggravation, rhinitis, hack, migraine, sickness, and spewing are totally known antagonistic impacts. Confusions with ozone treatment, then again, are very uncommon, happening just once per 0.0007 applications. In case of an ozone inebriation, the patient ought to be laid prostrate, given muggy oxygen, and given ascorbic corrosive, nutrient E, and nacetylcysteine. Due to ozone's gigantic oxidative force, any materials that come into contact with gas, like glass, silicon, and Teflon, should be ozone resistant.

Conclusion

Dentistry is evolving as a result of the fact that we are now practising dentistry using the most up-to-date technology. Ozone treatment is quite reasonable, predictable, and mild when compared to typical medicine methods such as anti-infection agents and sanitizers. Traditional restorative treatments have been shown to be less successful than ozone therapy. We may now treat tooth problems in a less invasive and reasonable manner because to this cutting-edge technology. The description of ozone's subatomic systems adds to the benefits of its application in dentistry. The treatment duration is greatly lowered and the bacterial count is dramatically reduced when patients are treated with ozone. The therapy is quite easy, and it improves the patients' worthiness and consistency while having few side effects. Although additional clinical research is needed to standardise ozone treatment signs and treatment methods, several techniques are so promising, or have already been established, that ozone therapy will ideally become a routine treatment for sanitization of activity localities in dentistry.

References

1. Anwar F, Chaudhry FN, Nazeer S, Zaman N, Azam S. Causes of ozone layer depletion and its effects on human. Atmospheric and Climate Sciences. 2016; 6: 129.
2. Nogales CG, Ferrari PH, Kantorovich EO, Lage-Marques JL. Ozone therapy in medicine and dentistry. J Contemp Dent Pract. 2008; 9: 75-84.
3. Das S. Application of ozone therapy in dentistry. Rev Ind J Dent Adv. 2011; 3: 538-542.
4. Deepthi R, Bilichodmath S. Ozone therapy in periodontics: A meta-analysis. Contemporary Clinical Dentistry. 2020; 11: 108.
5. Elvis AM, Ekta JS. Ozone therapy: A clinical review. Journal of natural science, biology, and medicine. 2011; 2: 66.
6. Mani A, Shukla P, Patel R, Bhople T, Mani S. Ozone therapy in Periodontics-A review. J Med SciClin Res. 2014; 2: 3352-3358.
7. Loncar B, Stipetic MM, Matosevic D, Tarle Z. Ozone application in dentistry. Archives of medical research. 2009; 40: 136-137.
8. Nimbulkar G, Garacha V, Shetty V, Bhor K, Srivastava KC, et al. Microbiological and Clinical evaluation of Neem gel and Chlorhexidine gel on dental plaque and gingivitis in 20-30 years old adults: A Randomized Parallel-Armed, Double-blinded Controlled Trial. Journal of Pharmacy & Bioallied Sciences. 2020; 12: S345.
9. Wankhede AN, Dhadse PV, Jaiswal PG, Baliga VS. Comparative evaluation of interleukin-17 in gingival crevicular fluid of patients with aggressive periodontitis and healthy gingival sites. Journal of Datta Meghe Institute of Medical Sciences University. 2021; 16: 90.
10. Agrawal D, Jaiswal P. Gingival enlargement during orthodontic therapy and its management. Journal of Datta Meghe Institute of Medical Sciences University. 2020; 15: 136.
11. Das S, Mohanty R, Satpathy A, Nayak R, Panda S. Newer Advances in Non-Surgical Periodontal Therapy: An Update. Indian Journal of Public Health Research & Development. 2019; 10.
12. Gupta G, Mansi B. Ozone therapy in periodontics. Journal of Medicine and Life. 2012; 5: 59-67.
13. Wankhede AN, Dhadse PV. Role of Interleukin-17 in immunopathology of chronic and aggressive periodontitis. Journal of the International Clinical Dental Research Organization. 2019; 11: 3.
14. Gulafsha M, Anuroopa P. Miracle of ozone in dentistry: an overview. World Journal of Pharmaceutical Research. 2019; 8: 665-677.
15. Arora N, Hande A. The Effect of Chewing Gum Containing Casein Phosphopeptide–Amorphous Calcium Phosphate on Salivary Streptococcus mutans. Journal of Datta Meghe Institute of Medical Sciences University. 2019; 14: 171.
16. Mani A, Shukla P, Patel R, Bhople T, Mani S. Ozone therapy in Periodontics-A review. J Med SciClin Res. 2014; 2: 3352-3358.
17. MI R, Gomaa HE, MI M, Zaki BM. Management of aggressive periodontitis using ozonized water. Egypt Med JNR C. 2005; 6: 229-245.
18. Kshitish D, Laxman VK. The use of ozonated water and 0.2% chlorhexidine in the treatment of periodontitis patients: A clinical and microbiologic study. Indian Journal of Dental Research. 2010; 21: 341.