

OZONE THERAPY IN ORAL DISEASES: A REPLY TO ANTIBIOTIC RESISTANCE

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ABSTRACT

Ozone is an unstable gas as it rapidly releases nascent oxygen molecule resulting in production of oxygen gas. This property of releasing nascent Oxygen, has contributed to its use in human medicine since long time to kill bacteria, fungi and inactivate viruses. The use of ozone in dentistry is gaining popularity and is being used in almost all dental applications. The undisputed disinfection ability of ozone in comparison with other antiseptics contribute to the use of ozone in dentistry as a genuine alternative to contemporary antiseptics. The purpose of this article is to elaborate a review about the clinical applications of ozone in dentistry alongwith highlighting the importance for future research to explore its potentials for more effective clinical application in oral medicine.

KEYWORDS: Ozone, antibiotics, antiseptics.

INTRODUCTION

Atmospheric air is composed of nitrogen (71.0%), oxygen (28.0%) and other gasses (1.0%) including ozone. Its quantity varies according to altitude, temperature and air pollution. Ozone (O₃) has a characteristic, penetrating odour being present in small amounts in atmosphere. Ozone molecules are generally made up of three oxygen atoms. They occur naturally in the upper layer of atmosphere in large amount as long as sun is giving its light. Ozone is responsible for protection of living organisms from the ultra-violet rays by surrounding the earth making a barrier at altitudes of 50,000 to 100,000 feet.^[1]

Ozone gas possess high oxidation potential along with the capacity to increase blood circulation as well as immune response. It acts as a great alternative to conventional therapeutic modalities. Treatment is usually achieved by promoting the fighting ability of the tooth and oral mucosa against the microbial activity. Besides they reduce the amplitude of microbial activity.^[2] Its action against bacteria, virus and fungus are due to its strong oxidation effect involving the generation of free radicals alongwith direct destruction of almost all microorganisms. Medical ozone is prepared from pure medical oxygen. It is being produced commercially through ozone generators in which an electrical discharge is being send through a special condenser containing oxygen.^[3]

It has been found that ozone may provide good results in oral medicine by reducing the microbial activity against the oral mucosa. This potentially beneficial agent has been used in oral mucosal lesion treatment also. Ozone has other varied application in dentistry including treatment of carious lesions, prevention of impairment of wound healing, plaque control, etc.^[4]

MECHANISM OF ACTION

1. Antimicrobial effect

Ozone acts against bacteria, fungi, and viruses. The antimicrobial effect of ozone is due its action on cells by damaging the cytoplasmic membrane mainly by ozonolysis of dual bonds. Besides there is the ozone-induced modification of intracellular contents.^[5]

2. Immunostimulating effect

Ozone promotes cellular and humoral immune system. It causes proliferation of immunocompetent cells as well as synthesis of immunoglobulins. It also stimulates function of macrophages and increases killing of microorganisms by phagocytosis.^[6]

3. Antihypoxic effect

Ozone leads to the rise of pO₂ in tissues and increases transportation of oxygen in blood, resulting in change of cellular metabolism like activation of aerobic processes as well as the use of energetic resources.^[7]

4. Antiinflammatory and analgesic action

Ozone promotes the synthesis of active substances like interleukins, leukotrienes and prostaglandins which as a result lead to reduction of inflammation and pain. Since the infection or inflammation is acidic and ozone is basic, so the varied chemistry of infection and inflammation leads to transportation of ozone to the area.^[8]

ROLE OF OZONE IN DENTISTRY

The use of ozone has been proposed in dentistry attributed to its antimicrobial, disinfectant, biocompatibility and healing properties.

ORAL MEDICINE

Ozone can be used effectively against oral mucosal lesions. Some of the lesions responding quite efficiently are herpes infections like herpes simplex, herpes zoster and herpetic gingivostomatitis. Aphthous stomatitis has been found to respond quite efficiently leading to both decrease in both pain as well as size of lesion. There are reports regarding the effect of ozone on recurrence of these lesions leading to management of recurrent aphthous stomatitis. Other mucosal lesions like candidiasis have been treated quite effectively using ozone. This can be attributed to antifungal action of ozone therapy. Ozone can be effectively used to treat removable denture ulcers and angular cheilitis also. Ozone is believed to have least adverse effects in comparison to conventional used antibiotics for management of oral mucosal lesions encouraging its use. It can be used in the management of oral precancerous lesions like leukoplakia and OSCF due to its antioxidant property.^[6]

OZONE THERAPY IN ORAL AND MAXILLOFACIAL SURGERY

Ozone has a effective influence over bone metabolism as well as process of repair of the bone. In cases with chronic mandibular osteomyelitis, medical ozone application was found to promote rapid control over T-cellular immunity, thus leading to effective clinical cure with reduced incidence of complications. Ozone therapy also leads to better result in the management of the refractory osteomyelitis in the head and neck. Ozone therapy have been proved to be effective in the management of bone necrosis at the extraction sites in patients undergoing bisphosphonate therapy.^[9,10]

OZONE IN PREVENTION OF DENTAL CARIES

Ozone kill bacteria present in carious lesion, painlessly eliminating the use of anaesthetic. Ozone is usually applied over the carious lesion in a controlled manner. Then killing of bacteria responsible for caries take place causing minimal physical intervention in very less time. The prepared tooth can be remineralized with the help of a special remineralization kit, possessing calcium and fluoride in ionic forms.^[11,12]

OZONE IN BLEACHING

In root canal treated teeth, discoloration of crown is a big aesthetic problem. The problem more pronounced when seen in anterior teeth. Conventional walking bleaching usually consume more time and satisfactory results are not obtained. Use of ozone eliminate all these problems. Ozone has been successfully used for brightening of the yellowish tinge in tetracycline-stained incisors. Teeth bleaching by ozone gas carried out due to its strong oxidizing properties.^[13,14]

OZONE IN PERIODONTICS

Dental biofilm is responsible for poor action of antibiotics in killing destructive periodontal pathogens. As a result higher concentrations of antibiotics are being used to kill these organisms leading to toxic adverse effect at the host microbial flora. The introduction of ozone therapy in periodontics has yielded good results. Both gaseous and aqueous ozone can be used as a supplement to mechanical debridement.^[15,16]

OZONE FOR TREATMENT OF PERIIMPLANTITIS

One of the most common reasons for failure of implant is periimplantitis. For preventing this standard plaque control regimen has to be ensured. Ozone can act as a powerful antimicrobial and can kill the microorganisms causing periimplantitis quite efficiently. Further, ozone

exhibit a positive wound healing effect owing to its effect in the increase of tissue circulation. Gaseous ozone or ozonized water cause an increased healing compared to wound healing being taking place without ozone therapy.^[17,18]

CONCLUSION

In the era of antibiotic resistance, there is great need for a naturally occurring substance to treat the infection with least side effects. This requirement can be fulfilled by Ozone with utmost benefit. Oral precancerous lesion as well as oral mucosal lesion can be managed quite efficiently by including ozone in the treatment planning. In comparison with conventional therapeutic modalities like antibiotics and disinfectants, ozone therapy is quite cost effective and easily affordable. Hence, more research should be carried out in near future to enhance the use of ozone at regular basis.

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