

Review Article**As in Stratosphere: It is now in Dentalsphere- “Ozone in Paediatric Dentistry”**

Katiyar A, Kohli A, Gupta K, Singh G, Katyayan R, Dwivedi A

Abstract: This review of literature is the attempt to summarize different modalities of ozone application in paediatric dentistry. It has the capacity to stimulate blood circulation, platelets, and immune response. It has been shown to stimulate remineralization of recent caries-affected primary teeth, intra canal irrigants in paediatric endodontic treatment and herpes virus infection treatment. Advantages of ozone therapy are that it is atraumatic without causing anxiety in children and biologically based treatment.

Keywords: Ozone; Dentistry; Pediatric; Ozone Therapy; Remineralization; Ozonated Water.

INTRODUCTION

Ozone, an allotropic form of oxygen is successfully used in the treatment of different diseases for more than a hundred years. Ozone is a triatomic molecule, consisting of three oxygen atoms. Ozone is thermodynamically highly unstable compound.¹ It is used for medical purposes, in the form of gas mixture and comprises of 95 to 99.5% oxygen and 0.05 to 5% pure ozone. Some factors of ozone were responsible for its widespreading, such as simplicity of performance, good tolerance by patients, and absence of side effects or adverse reaction.² Ozone is found in stratospheric layer of atmosphere.

The word ozone was first used by “Schonbein” in 1840 and noted “odour of electric matter”. Its derived from the Greek word “ozein”(odorant).² The field of ozone received a major impulse through the work of the surgeon and ozone therapist “Erwin Payr” who presented his epoch-making publication entitled “ozone treatment in surgery” at the 59th Meeting of German Society in 1935. This can be called the real beginning of ozone therapy in medical practice.²

There are several known actions of ozone on human body such as immunostimulating and analgesic, antihypoxic and detoxicating, antimicrobial (bacteriocidal, viricidal and fungicidal), bioenergetic and biosynthetic (activation of the metabolism of carbohydrates, proteins, lipids etc). it also causes synthesis of biologically active substrate such as interleukins, leukotrienes and

prostaglandins. It influences cellular and humoral immune system.² Ozone in higher concentration is toxic to living systems, causing damage to cell membranes. This toxicity has led ozone to be suggested as an agent for the disinfecting of dental unit water lines.¹ Ozone is toxic to certain bacteria in vitro and it has been suggested that delivering ozone into a carious lesion in patient may reduce the number of cariogenic bacteria. This possibly could arrest the progress of the lesion and may, in the presence of fluoride, perhaps allow remineralization to occur in paediatric patient.¹

Most of people suffer from anxiety and possess a fear towards dentistry. People do fear injections and drills. Incorporation of ozone in dental clinic set-ups would eradicate the feeling of pain during dental treatment and also cut off the treatment time, significantly.³ Lab studies suggest a promising potential of ozone in dentistry, and less number of clinical studies were documented. More number of randomized controlled trials needs to be conducted to determine the precise indications and guidelines to treat various dental pathologies with this promising agent.⁴

SYSTEMS FOR GENERATING OZONE GAS

Three different systems are used for generating ozone gas.

1. They are Ultraviolet System- Producing low concentration of ozone, used in saunas and for air purification.
2. Cold Plasma System- Used in air and water purification.
3. Corona Discharge System- Produces high concentration of ozone. It is the most common system used in medical /dental field. It is easy to handle and it has a controlled ozone production rate.³

CurOzone USA Inc, (Ontario, Canada) developed the HealOzone, which is now distributed by KaVo Dental(KaVo, Biberach, Germany).³ Due to instability of the O₃ molecule, medical grade ozone must be prepared immediately before use.⁵ An ozone application of 10-20 seconds has been reported to eliminate more than 99% of the microorganisms found in the dental caries and associated biofilm.⁵

MODE OF DELIVERY OF OZONE

Three modes of delivery of ozone:

1. Ozone gas application- ozone generating equipment converts oxygen to ozone. The ozone is thereafter led to a hand piece fitted with a silicone cup. Differently shaped silicone cups are available that correspond to the form of various teeth and their surfaces. The requirement time is minimum 10 seconds.
2. Ozone aqueous solution- disinfecting and sterilizing effect, haemostatic effect, accelerated wound healing, improved oxygen supply and support of metabolic processes.
3. Ozone oil- these are pure plant extract through which pure oxygen and ozone is passed.⁴

MECHANISM OF ACTION

Bacteria are destroyed as their cell membrane undergoes an oxidation reaction when come in contact with ozone. Bacteria are killed through

dysfunction of cell wall permeability or through cell lysis.⁶

OZONE: INDICATIONS & CONTRAINDICATIONS

Herpes infection has been studied with topical ozone administration. Ozone oil applied on herpes labialis and mandibular osteomyelitis demonstrated faster healing times than conventional protocols. Ozone is known to encourage wound healing as well as control opportunistic infection. Ozone can also be used in the treatment of alveolitis. Ozonated water inhibited accumulation of experimental dental plaque in vitro. It is found that ozonated water (0.5-4 mg/L) was highly effective in killing of both gram positive and gram negative microorganisms.

Two minutes irrigation of avulsed teeth with non isotonic 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. The application of ozonated water might be useful in reducing the number of C.albicans on denture bases preventing denture stomatitis.

A study evaluated the effects of intracanal medication using ozonated oil compared to a calcium hydroxide paste associated with camphorated paramonochlorophenol and glycerin (HPG) for endodontic treatment of teeth with periapical lesions. Therefore, the recommendation is to use either ozonated water or ozone gas at the end of the cleaning and shaping process. The effects of ozone on pit and fissure caries and primary root caries show a significant reduction in the number of microorganisms after the application of ozone than did larger lesions. The longer the contact time of ozone, the better the microbiological kill rate.⁴

Ozone has been successfully used on the disinfection of water in dental units.⁶ Dental unit water line (DUWL) contamination has become a concern. Ozone has achieved a 57%

reduction in biofilm and a 65% reduction in viable bacteria in spite of being used in a very low dose and with a short time of application.⁴ Ozone reduces the post extraction healing time by forming a pseudo-membrane over the socket. So, protecting it from physical and mechanical insults.⁵ Ozone is used as desensitization of extremely sensitive teeth.⁵ Ozonated water has been used as mouthwash with therapeutic and antimicrobial effects.⁶

Filippi found that ozonated water applied on the daily basis can accelerate the healing rate in oral mucosa. This effect can be seen in two post operative days.² Kronusova used ozone in the prevention of dental caries in fissures of the first permanent molar in children.² The contraindications of ozone uses are pregnancy, Glucose -6-phosphate dehydrogenase deficiency (favism), hyperthyroidism, severe anemia, and severe myasthenia.⁵

CONCLUSION: Dentistry should not be employed as a threat or punishment to a child patient. Management of uncooperative patient can be beneficial with the atraumatic action of ozone. Ozone follows a minimally invasive and conservative application in paediatric dentistry by diminishing the anxiety of a child patient. Its use for preventing pit and fissure caries in primary teeth is promising along with a variety of possible clinical application such as herpes infection in children, re-implantation of avulsed teeth during trauma and prevention of dry socket is the future of paediatric and preventive dentistry by subtracting the need of traditional “Drilling and Filling.”

Author affiliations: 1. Dr Ashish Katiyar, MDS, Reader, 2. Dr Anil Kohli, MDS, Professor & Head, 3. Dr Kirtija Gupta, MDS, Senior Lecturer, 4. Dr Garima Singh, MDS, Senior Lecturer, 5. Dr Rahul Katyayan, PG Student, 6. Dr Amit Kumar Dwivedi, PG Student, Department Of Paediatric And Preventive Dentistry, Rama Dental College, Hospital & Research Centre, Lakhanpur, Kanpur, UP, India.

REFERENCES

- 1 Richard GD, Richardson RJ, Johnson TM, McColl DC, Hooper L. Ozone therapy for the treatment of dental caries. *Cochrane Database Syst Rev.* 2004;(3):CD004153
- 2 Seilder V, Linetskiy I, Hubalkova H, Stankova H, Smucler R, Mazanek J. Ozone and Its Usage in General Medicine and Dentistry A Review Article. *Prague Med Rep.* 2008;109(1):5-13.
- 3 R Garg, S Tandon. *Ozone: A new face of dentistry.* The Internet Journal of Dental Science. 2008 Volume 7 Number 2
- 4 Pattanaik B, Jetwa D, Pattanaik S, Manglekar S, Naitam DN, Dani A. Ozone therapy in dentistry: A literature review. *J Interdiscip Dentistry* 2011;1:87-92
- 5 Celiberati P, Pazera P, Lussi A: The impact of ozone treatment on enamel physical properties. *Am J Dent.* 2006 Feb;19(1):67-72

Corresponding author:

Dr. Rahul Katyayan.
PG student
Dept. of Paediatric & Preventive Dentistry.
Rama Dental College Hospital and Research
Centre, Kanpur. (India)
Email: dr_rahulkatyayan@gmail.com
Contact number-7309646855

How to cite this article: Katiyar A, Kohli A, Gupta K, Singh G, Katyayan R, Dwivedi A. As in Stratosphere: It is now in Dentalsphere- “Ozone in Paediatric Dentistry”. Rama Univ J Dent Sci 2015 Sept.;2(3):32-34.

Sources of support: Nil

Conflict of Interest: None declared