

Magical healing: The Ozone way¹Dr. Abhay Kulkarni, Reader, P.D.U Dental College, Solapur, Maharashtra²Dr. Supriya Sankpal, Post-graduate student, P.D.U Dental College, Solapur, Maharashtra³Dr. Pratik Parkarwar, Senior Lecturer, P.D.U Dental College, Solapur, Maharashtra⁴Dr. Shruti Wadne, Post-graduate student, P.D.U Dental College, Solapur, Maharashtra⁵Dr. Aditee Karkade, Post-graduate student, P.D.U Dental College, Solapur, Maharashtra⁶Dr. Rashmi Rokade, Post-graduate student, P.D.U Dental College, Solapur, Maharashtra**Corresponding Author:** Dr. Supriya Sankpal, Post-graduate student, P.D.U Dental College, Solapur, Maharashtra**Citation of this Article:** Dr. Abhay Kulkarni, Dr. Supriya Sankpal, Dr. Pratik Parkarwar, Dr. Shruti Wadne, Dr. Aditee Karkade, Dr. Rashmi Rokade, “Magical healing: The Ozone way”, IJDSIR- October - 2020, Vol. – 3, Issue - 5, P. No. 259 – 265.**Copyright:** © 2020, Dr. Supriya Sankpal, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.**Type of Publication:** Original Research Article**Conflicts of Interest:** Nil**Introduction**

Ozone have been benefiting since over 130 years to eliminate diseases and for natural healing. A German scientist “Sir Christian F. Schonbein” (1840) introduced the term “Ozone”.⁽¹⁾ He is known as the Father of ozone therapy.⁽²⁾ Ozone is a molecule containing three atoms of oxygen in a dynamically unstable structure due to the presence of mesomeric states. The first medical application of ozone seems to have been for treating gaseous, post-traumatic gangrene in German soldiers during the 1st world war. Ozone, which is used for medical purposes, is a gas mixture comprising 95 to 99.5% oxygen and 0.05 to 5% pure ozone.⁽³⁾ Sir E. A. Fischbecamethe, a German dentist, was the first person to use ozone for disinfection and to aid healing in his own practice; following his footsteps, Dr. Payr started using ozone routinely during surgeries.⁽⁴⁾ Ozone inhibits cell growth at

certain stages in fungi, it damages the viral capsid and upsets the reproductive cycle by disrupting the virus-to-cell contact with peroxidation in viruses. Ozone acts by stimulating the oxygen metabolism and by activation of immune system.⁽³⁾ Ozone have proven to have many therapeutic benefits, and is an emerging therapeutic agent in field of dentistry and in management of oral lesions and conditions.^(5,6) The advantages of ozone over any other treatment modality is that it is non-invasive or minimal intervention, eco-friendly, easy availability in forms of Ozone gas, Ozone Water and Ozone Oil, improves metabolism of infected tissues by means of its oxidizing effects.⁽³⁾

Mode of Administration of Ozone

Application of ozone is possible in three forms for oral tissue :⁽⁷⁾

1) Ozone Gas

- 2) Ozonated Water
- 3) Ozonated Oil

The administration of direct intravenous injection of ozone gas has a high risk of air embolism, so The European cooperation of medical ozone society has warned about this risk.

Digging deep into literature and past researches, it's been noted that Ozone therapy has good therapeutic benefits in various fields of dentistry when administrated via gas or dissolved in water or oil. It is also observed that most of the literature was in-vitro studies and very few were clinical studies. This motivated us to conduct this study to exhibit the beneficial use of topical Ozonated oil in the most common mucosal lesions. Ozonated oil is produced by fusing ozone through the finest organic cold-pressed Virgin Olive Oil continuously for a long but finite period of time (weeks, sometimes even months of bubbling the oil 24 hours a day). During this procedure, the olive oil changes into an off-white thick paste. The paste formed by this method remains stable and can be stored for up to 17 years.

Aim

The aim of the study was to evaluate the efficacy of Ozonated olive oil in treatment of various oral mucosal lesions.

Materials And Method

A randomized single blind study was conducted on patients attending the outpatient Department of Oral Medicine and Radiology, Pandit Deendayal Upadhyay Dental College, Solapur. The study sample includes total 98 patients with a wide range of age group (20-60 years). A syringe of Type 1 O3 extra virgin olive oil with activated oxygen was used which was 10ml Oil, 0.3 OZ Ozonoid (Fluid ounce) by ADC INC. Dentozoneindia and was applied on the oral mucosal lesions.



The patients with the following lesions were included in the study and followed up for 6 months.

Table 1

Lesions	Number of patients included in the study
Oral Submucous Fibrosis	32
Apthous ulcers	16
Traumatic ulcers	12
Benign migratory glossitis	08
Lichen planus	06
Fissured tongue	06
Radiation mucositis	04
Desquamative gingivitis	02
Candidiasis	04
Gingival polyp	03
Recurrent herpes labialis	03
Parulis	01
Pulp polyp	01

The diagnosis of all the lesions included were based on the clinical signs and symptoms and a few included chairside diagnostic methods such as exfoliative cytology.

All the patients were explained about the condition and were given a basic knowledge of the ozone therapy. After the education of the patients, all those volunteering subjects were included in the study.

The patients with allergy to olive oil or allergy to ozone were excluded from the study.

A total of 98 patients were included in the study and followed up for 6 months. All the clinical records (signs and symptoms, clinical photographs, VAS, etc.) at each visit of the patient were maintained properly. A syringe of ozonated olive oil, mentioned above was used. The patients were asked to rinse with normal water, then the lesion was dried properly and sterile cotton rolls were placed in the vestibule for isolation. The lesion was then dried using the three way syringe. Using sterile cotton plugs the ozone oil was applied over the lesion and was massaged for 1 minute. The patient was asked to keep the mouth open for 10 minutes, in case of salivation during this process, it was suctioned out. Then the patient was instructed not to spit out or eat or drink for one hour. The application was done twice daily, till the improvement in the symptoms were achieved and record were taken on every third day of the patients visit.

Results

Patients with Oral candidiasis, Aphthous ulcers, Traumatic ulcers, and Herpes labialis showed 100% cure with variable duration of treatment interval while patients with Oral submucous fibrosis, Benign migratory glossitis, Fissured tongue, Lichen planus, Radiation mucositis and Desquamative gingivitis showed a considerable reduction in the VAS (as burning sensation to no burning sensation). The mean of VAS taken in the first week before treatment was 9.59 which considerably reduced to a VAS mean of 0.77 within the 4th week of treatment. Whereas there were no changes observed in Gingival polyp, Pulp polyp and Parulis which were treated primarily for their causative factor.

Table 2

Lesion	No. of Patients	Lesion Healed	No. of Days (Mean)
Aphthous ulcers	16	Yes	3
Traumatic ulcers	12	Yes	3.5
Candidiasis	04	Yes	4.2
Herpes Labialis	03	Yes	3.6

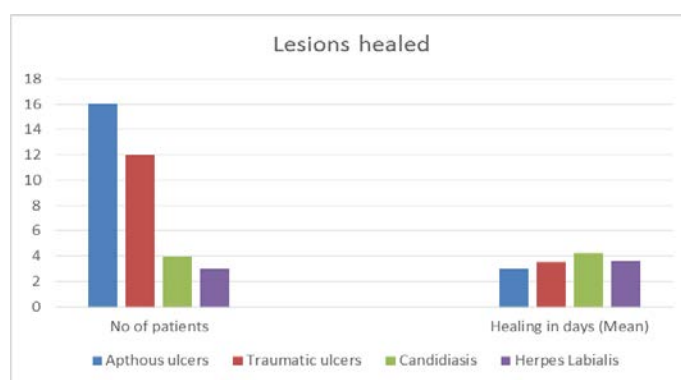


Table 3

Lesion	No. of Patients	Vas Reduction (Mean)	No. of Days (Mean)
Oral submucous fibrosis	32	1.8	9.6
Benign migratory glossitis	08	0.8	6.8
Fissured tongue	06	0.5	5.4
Lichen Planus	06	5.8	12.4
Radiation mucositis	04	4.8	10.5
Desquamative gingivitis	02	1.4	2.4

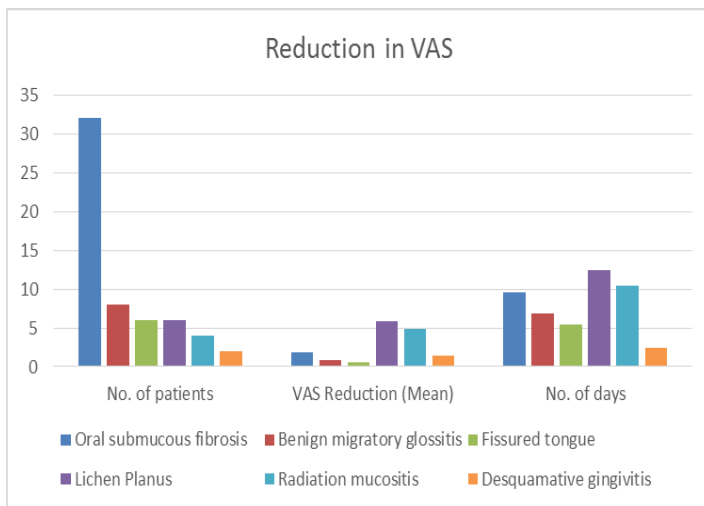


Figure 1: A 28 year old female patient diagnosed for (a) Candidiasis and was treated with the application Ozone oil and the (b) results after the completion of the treatment.

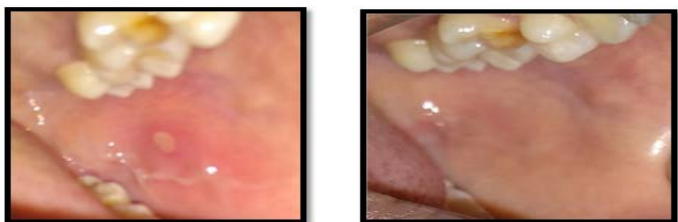


Figure 2: A 30 year old female patient with (a) an aphthous ulcer on the left buccal mucosa and on application of Ozone oil (b) the complete healing of the ulcer can be seen.

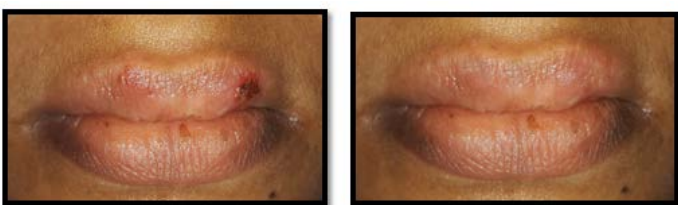


Figure 3: A 28 year female patient with herpes labialis (a) vesicle present on left side of lip also ruptured vesicle and

crusts on right side.(b) complete healing of the lesion on right and left side.

Discussion

Ozone is a triatomic molecule, containing three oxygen atoms. The molecular weight of ozone is 47.98 g/mol and it is a highly unstable compound thermodynamically which depends on system conditions like temperature and pressure, it has a short half-life and decomposes to pure oxygen. Ozone is 10 fold more soluble in water than oxygen and 1.6 fold denser (49.0 mL in 100 mL water at 0°C). Ozone is the third most potent oxidant (E₅ 12.076 V) after fluorine and persulfate, even though it is not a radical molecule. Ozone has a half-life of 40 min at 20°C and also an unstable gas, so it cannot be stored and has to be used at once. It is highly unstable gas. Naturally ozone is formed as a result of photo-dissociation of molecular oxygen into activated oxygen atoms, which further reacting with oxygen molecules. This transient radical anion rapidly becomes protonated, with the generation of hydrogen trioxide, which, in turn, decomposes to an, even more, powerful oxidant, that is the hydroxyl radical. It is the fundamental form of oxygen that occurs naturally by means of ultraviolet energy or lightning, causing an impermanent recombination of oxygen atoms into groups of three.⁽⁵⁾

3 different systems are available for production of ozone synthetically:^(6,7)

- Low concentration of ozone: Produced by Ultraviolet system which is used in esthetics, saunas, air purification
 - Cold plasma system used in air and water purification
 - High concentration of ozone: Corona discharge system
- Currently, there are nine methods of ozone therapy in medical practice:

- Direct intra-arterial and intravenous application
- Intramuscular injections
- Intra-articular injection
- Rectal insufflations
- Major and minor autohemotherapy
- Inhalation of ozone
- Ozone bagging
- Ozonated water
- Ozonated oil

Topical preparations have no adverse effects, so ozonated olive oil was used in the present study.

Table 4: Uses of Ozone in dentistry^(8, 9, 10, 11, 12)

Oral Medicine	Apthous ulcer, Burning sensation in OSMF, Candidiasis, Mucositis, Temporomandibular disorders, Herpetic ulcers
Pediatrics	Root caries, pit and fissure caries, pulpectomy of deciduous teeth
Conservative and endodontics	Caries, hypersensitive dentin, bleaching, root canal irrigant
Prosthodontics	Denture cleansers
Periodontics	Preventing peri-implantitis, promoting osseo-integration and for gingival and periodontal problems
Oral Surgery	Wound healing after surgery and extraction, refractory Osteomyelitis, preventing the development of Osteoradionecrosis

Mode of Ozone administration⁽¹³⁾

To deal with dental infections, ozone therapy a multiplicity of protocols. The three major forms of application of ozone to oral tissue are:

Ozonated water

It is commonly used in root canal therapy.

- Hemostatic effect

- Disinfectant and sterilization effect
- Accelerated wound healing, improved oxygen supply, and support of metabolic process.

Ozonated Olive Oil

They are pure plant extracts, pure oxygen and ozone are passed through olive oil making it more viscous. The final products contain ozides. This is the safest method of external application.

Ozonated Gas

Ozone gas is used to treat apthous ulcer and dental caries. Oxygen is converted to ozone in the ozone-generating equipment. The ozone is then led to a handpiece fitted with a silicon cup over the tooth minimum of 10 seconds in case of dental caries.

Mechanism of Action

Ozone is one of the most potent oxidants in nature, but the mechanism of its therapeutic action is unclear. Some theories suggest that, ozonolysis generates peroxides with unsaturated fatty acids in cell membranes, activation or generation of reactive oxygen species which function as physiological enhancers of various biological processes (including increased production of adenosine triphosphate), and increased expression of intracellular enzymes with antioxidant activity. It has been reported that exposure to ozone results in a change in the level of a variety of biological factors, e.g., cytokines (interferon c, tumor necrosis factors a, transforming growth factor b and interleukin-8), acute phase reactants and adhesion molecules from the integrin family such as CD11b. Other reports suggest increased motility and adhesion of peripheral blood polymorphonuclear cells to epithelial cell lines after exposure to ozone. Similarly, major autohemotherapy-induced leukocytosis and enhanced phagocytic activity of polymorphonuclear cells have been reported.⁽¹⁴⁾

Table 5: Various actions of Ozone^(15,16,7)

Immunomodulatory	<ul style="list-style-type: none"> • Concentration of ozone has effect on immune system. • Higher concentration causes immune-depression. • Lower concentration causes immune stimulation.
Anti-inflammatory	<ul style="list-style-type: none"> • The theory behind this effect is the affinity of negatively charged ozone towards a positively charged inflamed site. • This causes inflammatory mediators production like interleukins, prostaglandins, leukotrienes which are known to reduce inflammation and pain.
Anti-hypoxic effect	<ul style="list-style-type: none"> • Ozone causes increased aerobic cellular metabolism, hence improving the oxygen transport by erythrocytes and due to this property can be used to treat blood coagulopathies.
Bio-synthetic	<ul style="list-style-type: none"> • Protein synthesis is activated hence helping in increasing the amount of mitochondria and ribosome.

The present study showed 100% cure rates in Traumatic ulcer, Recurrent aphthous stomatitis, Candidiasis, Herpes patients, and improvements in the VAS in Oral submucous fibrosis, Benign migratory glossitis, Oral lichen planus, Fissured tongue, Radiation mucositis patients can be due to above said mechanism. No patient

included in the study showed adverse effects or toxicity, showing the safety margins of the topical agent. Within the limitation of the study of a small number of cases, the healing of the lesions showed faster rates compared to the other conventional treatments, depicting the higher efficacy of the topical ozone therapy.

Conclusion

Dentistry is changing as we are now using modern science to practice dentistry. Ozone therapy has been more beneficial than present conventional therapeutic modalities that follow a minimally invasive and conservative application to dental treatment. Ozone is a promising treatment modality for various dental problems in future. But, it has to be kept in mind that presently ozone is an adjunct to other conventional treatment modalities and should be used in combination until more research shows benefits in independent usage.

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