INTRODUCTION:
Every day morning thousands of dentists around the world do not stop to think as they turn on their compressors pick up dental drill or turbine and proceed to amputate parts of their patients' teeth. All in certainty that some time in the future, the fillings they are about to place will need to be replaced. Rather than follow principles of drill and fill to dental care would not it be better to have a system that allows infection control, tissue preservation and natural remineralization. This new system is called ozone.¹

What is Ozone?
Ozone is triatomic oxygen (also known as trioxygen) with molecular weight of 47.98g/mol is a naturally occurring compound consisting three oxygen atoms. It is found in nature, in the form of a gas in the stratosphere in a concentration of 1-1Oppm being continually created and destroyed into molecular O₂.Both these chemical reactions are catalyzed by very high frequency ultraviolet light from sunlight. Its stability depends upon system conditions like temperature and pressure that decomposes to pure oxygen with a short-life. The decomposition produces apart from molecular oxygen; atomic oxygen which is highly reactive.

Dissolved in water, ozone is relatively instable. Its decomposition rate, which may range from seconds to hours is essentially dependent on the quality of water, temperature. During decomposition in water, hydroxyl (OH) is formed as a second oxidant accelerating the decomposition process.²

At room temperature, ozone is a blue gas with a characteristic smell that can still be noticed in air at a concentration of 2 ppm.³

History of Ozone:
1785-Van marum noticed that air near electrostatic machine acquired characteristic odour when electric sparks were passed.
1840- Shonbein named the substance ozone from Greek word Ozein—to smell
1857- Werner Von Siemans designed an ozone generator
1870- First report of ozone being used therapeutically to purify blood by Lender in Germany.
1896-Nikola Telsa patented his first ozone generator & in 1900 he formed first Ozone Company.
1902-Ozonated water was successfully used in treating anemia, diabetes, influenza, morphine poisoning and gangrene.
1933- Ozone was first introduced in dentistry by Zurich dentist Firsch for the treatment of infected wound cavities and chronic periodontal infections.³
1979-Dr George Freibott began treating his first AIDS patient with ozone.
1980- Dr Horst Kief also reported success treating AIDS with ozone.
1992-Russians revealed their techniques of using ozone bubbled into brine to treat burn victims with astounding results.
1998-US Environmental protection agency in conjunction with the safe drinking water act of 1991 confirmed that ozone was effective in riding water of hazardous pathogens.

Ozone Generators:
Ozone delivery system (Heal ozone) is a portable apparatus with an ozone generator, delivers ozone at concentration of 2100 ppm for 40 - 60 seconds through a special hand piece. The disposable removable silicone cup attached to the hand piece is provided for receiving gas. The tightly fitting cup seals the selected area on the tooth to prevent escape of ozone. The ozone drawn out of sealing cup through in ozone neutralizer converts the ozone to oxygen.¹

Actions of ozone:
Acts as bactericide by disrupting the integrity of the bacterial cell envelope, fungicide by inhibiting cell growth and virucide by damaging viral capsid.
Enhances circulation by increasing the oxygen carrying ability of tissues.
Increases cell proliferation and synthesis of extracellular matrix.
It stimulates oxygen metabolism by stimulating 2,3-diphosphoglycerate (2,3, DPG) which leads to an increase in the amount of oxygen release to the tissues.

Causes dissolution of malignant tumors by inhibiting the release of interferons.

Oxidizes toxins allowing their excretion.\textsuperscript{1,4}

General Uses of Ozone:

In general ozone is used commercially to: Disinfect water before it is bottled.

Kill bacteria, yeast and protozoa on food contact surfaces such as fresh fruits, vegetables, grains, seeds, nuts, legumes and all animal meats.

Kill yeast and mold spores (oxidize) impurities in water, such as iron, arsenic, hydrogen sulfide, nitrites & organic clumps.

Oxidize and degrade many organic pollutants including pesticides, herbicides and other persistent environmental chemicals.\textsuperscript{1}

Medical Uses:

Ozone has been used to treat: Acne, Alzheimer disease, Amebiasis, Aphthous stomatitis, Atherosclerosis, Bacterial pneumonia, Bells palsy, Bronchospasm, Brucellosis, Bullous pemphigus, Burkitt’s lymphoma, Cancer of all types, Candidiasis, Cavernous sinus thrombosis, Chicken pox, Cirrhosis of liver, Contact dermatitis, Diabetes, Eczema, Endocarditis, Epidermoid Carcinoma, Erythema migrans, Food poisoning, Furuncle, Gangrene, Glomerulonephritis, Gout, Hairlyeukoplakia, Hemorrhage, Histoplasmosis, Ichthyosis, Influenza, Leukemia. Leucopenia, Lupus erythematosus, mumps, measles, pemphigus, pernicious anemia, rhinitis, sinusitis, scleroderma, shingles, shock, stomatitis, syphilis, tendinitis, thrombophlebitis, thrombocytopenic purpura, tuberculosis, ulcers, urticaria, warts.\textsuperscript{1}

Uses of Ozone in Dentistry:

1. Caries management:
2. Tooth Whitening:
3. Root Canal Therapy:
4. Fractured Teeth:
5. Dentinal Hypersensitivity:
6. Post operative Pain:
7. Soft Tissue Lesions:
8. Oral Surgery- against infections after osteotomies, osteomyelitis
9. Head & Neck Tumors:
10. Dental water lines:
11. Prevention of demineralization surrounding orthodontic Brackets:
12. In prosthodontics for cleaning the surfaces of dentures: Ozone can be applied for Study of Arita et al has shown that application of ozonated water reduces the number of Candida albicans on denture plates. There is also evidence on the effectiveness of aqueous ozone application for decontamination of the implant surface.

Adverse Effect of Ozone:

Gaseous pure ozone passes the mucous membrane of the upper respiratory tracts without absorption and therefore reaches unprotected bronchioli & alveoli. This causes destruction of surfactant. Such exposure for long time causes acute collapse of alveoli & bronchioli.\textsuperscript{2}

Contraindications:

- Glucose-6-phosphate Dehydrogenase deficiency
- Hyperthyroidism.
- Thrombocytopenia
- Individual intolerance to ozone
- Acute & chronic tendency to bleed.\textsuperscript{1}

Conclusion:

Despite the positive properties of ozone gas or ozonated water, intraoral use of ozone must be performed by preventing ozone from getting into the respiratory air of the patient. Initial data indicates promising potential of ozone usage for the treatment of certain carious lesions. Additional clinical trials are needed to validate the feasibility and safety of routine usage of ozone in dentistry.
REFERENCES:
5. Holmes J. Uses of ozone in the general dental practice; Integration into general dental practice, part 2. www.the-o-zone.cc