

# An Innovative Technique For Treating Severe Caries In Primary Teeth With Ozone: A Retrospective Investigation

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## Abstract

This research was planned to learn more about ozone treatment, a relatively new method for dealing with severe cases of primary tooth caries.

Thirty-five children (sixteen girls and nineteen boys, aged 3 to 6) who had all had fillings from the same dentist were selected. Fifty-two were chosen for the repair process. After 3, 6, and 12 months, we asked a second operator to assess the success or failure of each restoration. The success rate at 12 months was 92.7 percent (n = 48 out of 52 restorations).

In Conclusion, the extent of the carious lesions in the deciduous teeth included in this research meant that pulpotomy would have been necessary if the teeth had been treated traditionally. The suggested approach using ozone was shown to be an effective alternative, with the primary benefit of protecting tooth pulp and tissue against invasion.

**Keywords:** Teeth, ozone, caries, primary.

## Introduction:

One of the chronic infectious childhood illnesses with the greatest global prevalence is caries of the primary teeth, which poses a serious public health issue and has a large economic effect [Anil and Anand, 2017]. The frequency varies greatly across nations, reaching 70–85% in socioeconomically deprived populations [1]; 3- to 4-year-old males are observed to be more impacted than girls [2]; the prevalence varies greatly between countries.

The field of pediatric dentistry has undergone a revolution recently due to the introduction of innovative technology for the prevention and treatment of tooth decay in young children. One of the cutting-edge techniques for the ultra-gentle care of baby teeth involves the use of ozone gas. The use of ozone in dentistry has been studied since the 1930s [3]. Ozone is a substance that is well-known in general medicine for its powerful disinfecting qualities.

Ozone (O<sub>3</sub>), is potent an oxidizing agent that naturally occurs in nature, is a colorless gas with a strong odor. Ozone has a very strong disinfection capacity and may quickly and efficiently destroy spores, viruses, and bacteria. Ozone's toxicity meant it was abandoned after the initial trials were conducted, and no effective means of concentrating the gas without creating waste had yet been identified. In the 1980s, it had been demonstrated that a carious lesion treated with a single application of the gas may re-

mineralize [4]. Thanks to specialized single-patient silicon cups introduced in more recent years, it is now able to administer gas directly to tooth surfaces afflicted by early caries [5].

When children are recalcitrant with typical dental treatments, Caries (tooth decay) may be slowed with the use of ozone treatment, which is non-invasive, painless, quick, as well as very conservative [6].

Ozone (O<sub>3</sub>) may oxidize bacterial cell walls, leading to their lysis, and pyruvic acid generated by bacteria, changing it into acetic acid and carbon dioxide, which can stop or reverse the development of caries. The remineralizing and desensitizing effects of ozone are debatable, despite the fact that its antimicrobial properties are well known [7]. In order to promote remineralization and reduce hypersensitivity, ozone seems to improve the patency of dentinal tubules, allowing more salivary ions to reach the damaged dentin's surface [8].

This investigation was designed for studying the ozone therapy as a novel approach to treating severe primary tooth caries.

## Materials and Methods:

Thirty-five patients (16 girls, 19 boys; ages 3-6 years) who had all had fillings from the same operator were chosen. A written informed consent was obtained from each patient before any procedures were performed. Due to the procedure's low risk and low invasiveness, the Ethics Committee wasn't consulted. All procedures were carried out in accordance with the World Health Organization's Declaration of Helsinki.

Partially removing carious dentin, sterilizing the remaining tissue with ozone, and restoring with composite while isolating the operational area with a rubber dam are the steps that make up the treatment.

The following procedure order was used in all repairs: Working area isolation using a rubber dam (only teeth E–D, with a hook on the furthest tooth). Using a dental pick and water, gently clean the area around the cavity to expose the healthy tooth structure underneath. It was understood that the cervical boundary of the box might be situated inside the dentin in cases with mesial or distal exceedingly deep holes, so long as the dentin was suitably partitioned by a sectional matrix. Carious dentin is removed by utilizing rosette burs to avoid exposing the pulp tissue underneath. In reality, endodontic treatment would have been required to thoroughly clean all of the cavities.

Ozone treatment of diseased dentin using a silicone cup designed for a single patient for 60 seconds. OpalDam™ light curing liquid dam was employed to successfully insulate the mesial and distal cavities, where obtaining a vacuum was more challenging. In order for Healozone to be effective, a total vacuum inside the silicone cup must be achieved, and this can only be done with a proper seal of the cup, which is why vestibular and lingual walls made of this material were developed.

Composite resin filling, polishing, and an examination of the occlusion are all part of the process of restoring a decaying tooth.

Using 4X magnification devices and fiber optic LED illumination, a single operator restored all 52 teeth. About 80% of the time, nitrous oxide conscious sedation was utilized to promote compliance, which is not surprising given the patients' young ages. Since nitrous oxide may be used to provide superficial analgesia, the need for plexus anesthesia has been greatly reduced.

## Results:

A second operator performed follow-up examinations at 3, 6, and 12 months to determine the success or failure of each restoration.

Twelve-month outcomes are shown in Table 1, demonstrating the suggested method's exceptional success rate. A further review of the 4 unsuccessful instances revealed that in 3 of them, the pulp was only briefly exposed during the processes of bonding, not during the carious tissue removal. Possibly, the Healozone cup's vacuum suctioned pulp tissue in areas with very little remaining dentine, explaining this phenomenon.

After achieving tissue hemostasis, we used calcium hydroxide to do a direct pulp capping, and then finished the repair in the manner outlined. As an asymptomatic fistula developed in close proximity to the treated tooth in all four instances between 7 and 15 days after the procedure, endodontic treatment was performed.

**Table 1 Follow up at twelve months**

Treated teeth (52 case)	No.	%
Success	48	92.3
Failure	4	7.7

## Discussion:

Because of its antibacterial, virucidal, disinfecting, as well as biocompatible qualities [9], Ozone's usage in both routine and pediatric dental care has been recommended for some time. As an added bonus, it reduces inflammation, eases pain, boosts the immune system, and encourages tissue regeneration. No anesthetic is required since the germs in the carious lesion are killed without having to remove contaminated tissue, leading to its widespread usage in pediatric dentistry [10].

In early lesions, it may kill bacteria in devitalized tissues and stimulate the deposit of calcium and phosphate ions, both of which are necessary for tissue remineralization and repair. In reality, the calcium as well as fluoride ions deposition in the dentinal tubules is inhibited by a smear layer present on the exposed dentin; ozone is capable of eliminate the smear layer, favoring the tubules opening and the subsequent ions deposition. Ozone's antibacterial qualities have been the subject of several research investigations, which have shown that it is an efficient disinfectant in endodontics [11,12].

Brazzelli et al. [13] did a literature analysis using evidence from 2004 and found that there was insufficient research to evaluate the true efficacy and cost-benefit ratio of the new approach. Although more research has to be done on the subject, the authors felt it was important enough to warrant such attention. However, it has been shown that decontaminating cavitated lesions alone is not a long-term solution. Deciduous carious molars were studied for their response to ozone and fluoride varnishes, and [10] found that neither therapy was effective in halting caries development. Therefore, the therapy should not be limited to the traditional ozone usage as a basic remineralising agent, but should instead focus on restoring damaged tooth tissues.

This finding is consistent with those of other writers [14,15] who also included biodentine among the materials showing success rates on par with the MTA.

Once the ozone was administered, a protective covering of dentin (now referred to as "ex-carious") was able to be kept in place, avoiding pulp exposure and the need for a pulpotomy. When compared to Magne's technique, the usage of this new technology is demonstrably superior at eliminating cariogenic microorganisms. When planning the cavity, it's crucial to have as much enamel as possible on the supragingival and apical edges for a good seal and insulated working area. Since the dentin forms the bottom of the cavity box in mesial and distal cavities, it is crucial to keep the border clean and isolate it properly with a dam. Modern adhesive methods have been tested and found to attach securely to enamel and dentin after being exposed to ozone [16,17,18].

## Conclusion:

The extent of the carious lesions in the deciduous teeth included in this research meant that pulpotomy would have been necessary if the teeth had been treated traditionally. The suggested approach using ozone was shown to be an effective alternative, with the primary benefit of protecting tooth pulp and tissue against invasion.

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