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ORIGINAL RESEARCH

Photodynamic therapy for endodontic treatment of primary teeth

[1]Jasmine Kaur, [2]Gurnoor Singh

[1]Medical Radiation Technologist Assistant, St Joseph Healthcare Centre, Toronto
[2]MBBS, DMC Ludhiana, Punjab, India

Corresponding Author
Jasmine Kaur
Medical Radiation Technologist Assistant, St Joseph Healthcare Centre, Toronto

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ABSTRACT

Background: In primary teeth, pulp inflammation is mostly caused by tooth decay and acute dental accidents. The present study was conducted to assess photodynamic therapy for endodontic treatment of primary teeth. **Materials & Methods:** 60 primary anterior teeth with a diagnosis of pulp necrosis were taken. Group I, patients undergoing conventional root canal therapy (n = 30) and group II, patients undergoing conventional root canal therapy combined with antimicrobial PDT (n = 30). Reduction of bacterial loadwas recorded. **Results:** In group I, there was 94% and in group II 99% reduction of bacterial load. The difference was significant (P< 0.05). **Conclusion:** According to the study's parameters, conventional therapy plus antimicrobial PDT was successful, but it was just as effective as conventional endodontic treatment by itself.

Keywords: endodontic therapy**,** photodynamic therapy, pulp necrosis

INTRODUCTION

In primary teeth, pulp inflammation is mostly caused by tooth decay and acute dental accidents. Radical endodontic therapy is necessary if irreversible pulp inflammation or pulp necrosis has been established. Primary teeth with pulp necrosis can be treated with extraction or endodontic therapy, which tries to eradicate all necrotic cells from the root canal so the tooth can continue to function normally in the oral cavity until normal exfoliation.[1]

Primary teeth endodontic therapy is complicated because to the apical delta's intricacy, the biological cycle of primary teeth, physiological root resorption, lengthy treatment sessions, and occasionally uncooperative children.[2] Early primary tooth loss can have negative effects on a person's social life in addition to impairing the stomatognathic system's development and the permanent dentition's installation. Additionally, keeping primary teeth in the dental arch until physiological exfoliation promotes maxillomandibular growth and aids in the proper eruption of the permanent dentition.[3]

Since microbial agents encourage the emergence and maintenance of pathological processes that harm the pulp and periapical area, the successful decontamination of the root canal systems is essential to the effectiveness of endodontic treatment.[4] The most popular endodontic treatment techniques for primary teeth are handheld files and irrigating solutions that are disinfecting. Nevertheless, germs in the root canal are not entirely eradicated by mechanical equipment and chemical irrigation.[5]The present study was conducted to assess photodynamic therapy for endodontic treatment of primary teeth.

MATERIALS & METHODS

The study was carried out on 60 primary anterior teeth with a diagnosis of pulp necrosis. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Group I, patients undergoing conventional root canal therapy (n = 30) and group II, patients undergoing conventional root canal therapy combined with antimicrobial PDT (n = 30). For PDT, methylene blue, at a concentration of 0.005 %, was used as the photosensitizing agent, which was applied to the interior of the canal with a sterile paper cone for 3 min, followed by the administration of laser light for 40 s (wavelength: 660 nm, energy density: 4 J/cm², power: 100 mW), delivered in direct contact at the entrance to the root canal. Two microbiological samples of the intra-canal content were taken (one before and one immediately after treatment in both groups) using paper cones. Clinical follow-up involved the investigation of fistulas and mobility and was performed 1- and 3 months after treatment.

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Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table: I Distribution of groups

Groups	Group I	Group II
Method	conventional root canal therapy	conventional root canal therapy+ PDT
Number	30	30

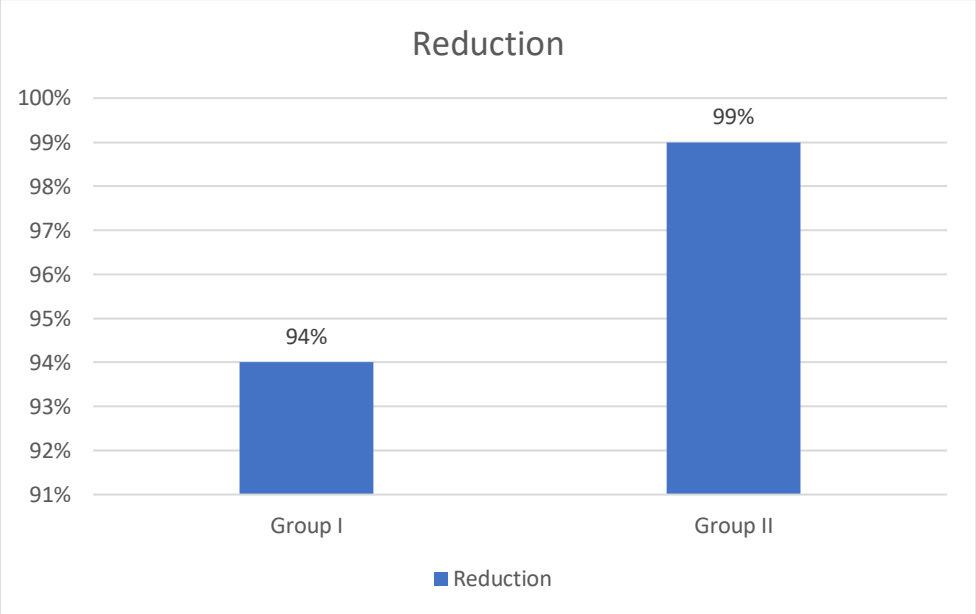
Table I shows distribution of teeth in both groups.

Table: II Reduction in bacterial load in both groups

Groups	Reduction	P value
Group I	94%	0.01
Group II	99%	

Table II, graph I shows that in group I, there was 94% and in group II 99% reduction of bacterial load. The difference was significant (P< 0.05).

Graph I Reduction in bacterial load in both groups



DISCUSSION

A light source at a certain wavelength, a photo-activated dye or photosensitizing chemical, like methylene blue or toluidine blue, and oxygen interact to form the basis of aPDT.[6]

Energy transfer between the light, the photosensitizing agent, and the substrate occurs when the laser irradiates the photosensitizing agent, producing free radicals and singlet oxygen.[7,8]

By influencing lipids, proteins, and nucleic acids, these chemicals change the metabolism of the bacterial cell wall, which causes the bacterial cells to undergo apoptosis and die. The primary factors driving interest in the application of aPDT in endodontic treatment are its demonstrated antibacterial efficacy, the fact that it does not encourage germ resistance, its simplicity and painlessness in administration, and the advantages of laser therapy.[9] Despite the fact that aPDT has been shown to be a successful technique for lowering the bacterial burden in root canals, opinions on the best conditions for its clinical application are divided. Increased use and awareness of the efficacy of this kind of therapy will undoubtedly result from the standardization of irradiation settings and photosensitizing agent concentration.[10]The present study was conducted to assess photodynamic therapy for endodontic treatment of primary teeth.

We found that in group I, there was 94% and in group II 99% reduction of bacterial load. Okamoto CB et al[11] evaluated the reduction in bacterial load following conventional endodontic treatment with and without antimicrobial photodynamic therapy (a-PDT) in primary teeth. Thirty primary anterior teeth with a diagnosis of pulp necrosis were selected. Patients were randomly allocated to two groups as follows: Group I, patients undergoing conventional root canal therapy (n = 15) and Group II, patients undergoing conventional root canal therapy combined with antimicrobial PDT (n = 15). For PDT, methylene blue, at a concentration of 0.005 %, was used as the photosensitizing agent, which was applied to the interior of the canal with a sterile paper cone for 3

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min, followed by the administration of laser light for 40 s (wavelength: 660 nm, energy density: 4 J/cm², power: 100 mW), delivered in direct contact at the entrance to the root canal. Two microbiological samples of the intra-canal content were taken (one before and one immediately after treatment in both groups) using paper cones. Clinical follow-up involved the investigation of fistulas and mobility and was performed 1- and 3 months after treatment. The reduction in bacterial load was 93 % in Group I and 99 % in Group II, with no statistically significant difference.

Pinheiro et al[12] found a 98.37 % reduction in microbiota of the root canals in primary teeth with necrotic pulp after conventional endodontic treatment combined with aPDT (low-level laser at a wavelength of 660 nm and with power density of 4 J/cm² for 40 s) using 0.005 % toluidine blue as the photosensitizing agent. Garcez et al[13] assessed a number of factors in an in vitro investigation, including the photosensitizing chemical concentration, irradiation duration and intensity, and the use of optical fiber in PDT to lower intracanal bacteria. The authors came to the following conclusions: a minimum irradiation energy of 7 J promoted a significant reduction in intra-canal bacteria, the use of optic fiber contributed to the greater formation of reactive oxygen species, and the concentration of photosensitizing agent at which there was a greater efficiency in the formation of reactive oxygen species was between 50 and 100 μm.

The shortcoming of the study is small sample size.

CONCLUSION

According to the study's parameters, conventional therapy plus antimicrobial PDT was successful, but it was just as effective as conventional endodontic treatment by itself.

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