



## Efficiency of Bioceramic Cement and Photodynamic Therapy Used During Apicoectomy for Perforated Root Canal

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### KEYWORDS

Bioceramic,  
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### ABSTRACT:

**Background:** This study was conducted to assess the efficiency of bioceramic cement and photodynamic therapy used during apicoectomy for perforated root canal.

**Material and methods:** This study comprised of 10 patients who reported for root canal treatment. It was found that out of 10 patients, 5 had perforated root canal. So, apicoectomy was decided to be the choice of procedure for treatment using bioceramic cement and photodynamic therapy. The procedure was explained to the subjects and the subjects were asked for consent. The subjects who gave consent had been included in the study. The mean age of the subjects was 26.8 years. The root canal was first disinfected followed by instrumentation with RECIPROC system R40/0.06 file and irrigated by sodium hypochlorite 2.5% and ethylenediaminetetraacetic acid with detergent (EDTA-T). The canal was thereafter rinsed with 10 mL of sterile saline solution to eliminate any chemical residue and dried using paper points #40. The aPDT procedure involved introducing methylene blue 0.005% into the canal and leaving it there for 5 minutes as a preirradiation period. The irradiation process was conducted via a low-power diode laser and an optical fiber inserted into the canal. The irradiation was conducted utilizing a visible red wavelength of 660 nm and an output power of 100 mW/cm<sup>2</sup> for a continuous duration of 2 minutes. The irradiation followed a helical movement from the apical to cervical direction. A energy density of around 120.0 J/cm<sup>2</sup> was utilized. The root canal was filled with gutta-percha and Ah Plus sealant at the same session. There was no administration of medicine prior to or throughout the course of treatment. The patient was instructed to administer acetaminophen (500 mg) up to four times daily as needed for pain relief. Following tomographic planning, the apicoectomy procedure was carried out with local anesthesia using a single anesthetic tube containing 4% articaine with epinephrine at a ratio of 1:100,000. Intraoral access to the lesion was established by making an incision in the buccal region from teeth 11 to 24. Following the removal of the flap, the perforation was evident, and a little osteotomy was carried out to create a surgical opening using a surgical carbide drill no. 06 with thorough irrigation using sterile saline solution.

**Results:** All the cases of perforated root canal were successfully treated with bioceramic cement and photodynamic therapy. Bioceramic cement played its role to the fullest in sealing the exposed



periapical area of teeth, induction of repair of periapical lesion and in providing good marginal adaptation while photodynamic therapy played role in disinfecting the canal effectively.

**Conclusion:** Biceramic cement and photodynamic therapy are effective when used during apicoectomy for treating a perforated root canal.

## Introduction

Symptomatic periapical periodontitis is classified as an endodontic condition resulting from necrotic pulp, with its management primarily hinging on the disinfection of the root canal system.<sup>1</sup> This process involves the mechanical removal of microorganisms through manual or automated instruments, complemented by the chemical action of auxiliary substances.<sup>2</sup> In certain instances, supplementary techniques may be necessary to enhance decontamination, such as photodynamic therapy (PDT)<sup>3,4</sup> and passive ultrasonic irrigation (PUI).<sup>5</sup> Furthermore, endodontic irrigants are crucial in minimizing torsional and fatigue resistance during the instrumentation phase.<sup>6</sup> Throughout the endodontic procedure<sup>7</sup>, complications such as perforation of the root chamber or canal may arise due to procedural mishaps, which can stem from the operator's inexperience or underlying pathological conditions.<sup>8-10</sup> Such perforations create a pathway between the root canal system and the periodontium, potentially resulting in tooth loss if not managed appropriately.<sup>11</sup> This study was conducted to assess the efficiency of bioceramic cement and photodynamic therapy used during apicoectomy for perforated root canal.

## Material and methods

This study comprised of 10 patients who reported for root canal treatment. It was found that out of 10 patients, 5 patients had perforated root canal. Each patient had 1 perforated root canal. So, apicoectomy was decided to be the choice of procedure for treatment using bioceramic cement and photodynamic therapy. The procedure was explained to the subjects and the subjects were asked for consent. The subjects who gave consent had been included in the study. The mean age of the subjects was 26.8 years. The root canal was first disinfected followed by instrumentation with RECIPROC system R40/0.06 file and irrigated by sodium hypochlorite 2.5% and ethylenediaminetetraacetic acid with detergent (EDTA-T). The canal was thereafter rinsed with 10 mL of sterile saline solution to eliminate any chemical residue and dried

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## Results

**Table 1: Properties of bioceramic cement and phototherapy**

Properties	Number of cases
Good marginal adaptation	5
Sealing of exposed periapical area of tooth	5
Induction of repair of periapical lesion	5

All the cases of perforated root canal were successfully treated with bioceramic cement and photodynamic therapy. Bioceramic cement played its role to the fullest in



sealing the exposed periapical area of teeth, induction of repair of periapical lesion and in providing good marginal adaptation while photodynamic therapy played role in disinfecting the canal effectively.

**Table 2: Gender-wise distribution of subjects**

Gender	Number of subjects	Percentage
Males	3	60%
Females	2	40%
Total	5	100%

In this study, there were 3 male and 2 female.

### Discussion

Endodontic (paraendodontic) surgery emerged in the previous century as a last resort for endodontic treatment, yielding favorable outcomes and regression of lesions without the presence of clinical signs or symptoms of inflammation.<sup>12-14</sup> The advent of bioceramic cements has significantly influenced the success rates of endodontic surgery, particularly with the introduction of mineral trioxide aggregate (MTA), Biodentine, and more recently, five mineral oxides (5MO).<sup>15,16</sup>

The photodynamic therapy is a complementary technique, which aids in additional disinfection using a light source like laser or light-emitting diode (LED) acting over a photosensitizer and thus liberating reactive oxygen specimens that disinfect some facultative microorganisms and resulting in more accelerated tissue repair.<sup>17-19</sup>

This study was conducted to assess the efficiency of bioceramic cement and photodynamic therapy used during apicoectomy for perforated root canal.

In this study, all the cases of perforated root canal were successfully treated with bioceramic cement and photodynamic therapy. Bioceramic cement played its role to the fullest in sealing the exposed periapical area of teeth, induction of repair of periapical lesion and in providing good marginal adaptation while photodynamic therapy played role in disinfecting the canal effectively.

**Abu Hasna A et al**<sup>20</sup> conducted a study in which a patient was referred to treat root perforation due to a previous treatment of tooth #22. The diagnosis was symptomatic

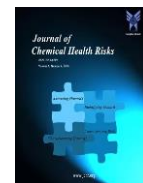
periapical periodontitis, and the treatment plan was to retreat the root canal of #22 and make a surgical intervention (apicoectomy) associated with antimicrobial photodynamic therapy as a complementary technique. Five mineral oxides (5MO) cement was used as a root-end filling material. The procedures were performed in two sessions and controlled in two visits (after 30 days and 12 months). A bone neoformation was observed at the periapical area of tooth #22. 5MO bioceramic cement was effective in inducing the repair of the periapical lesion and had the ability to seal the exposed periapical area of the tooth. Its success depended mainly on root canal and surgical site disinfection.

### Conclusion

Biceramic cement and photodynamic therapy are effective when used during apicoectomy for treating a perforated root canal.

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