

Post-Operative Pain Assessment Following The Use Of Two Zinc Oxide Eugenol-Based Root Canal Sealers In Mandibular Molars With Irreversible Pulpitis: A Randomized Clinical Study

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Abstract

Background:

Post-operative pain following root canal treatment remains a common clinical challenge. Root canal sealers, due to their physicochemical and biological properties, can influence periapical tissue responses and post-operative discomfort.

Aim:

To evaluate and compare the incidence and intensity of post-operative pain following root canal obturation using two zinc oxide eugenol (ZOE)-based sealers-Endoseal (Prevest DenPro, India) and conventional ZOE sealer (Maarc, India)—in mandibular molars with irreversible pulpitis.

Materials and Methods:

A total of 60 patients (aged 20–50 years) with irreversible pulpitis in mandibular first molars were enrolled and randomly assigned into two groups ($n=30$ each). Standardized single-visit root canal treatments were performed using rotary NiTi instrumentation, 5.25% sodium hypochlorite irrigation, and cold lateral condensation obturation. Group 1 used Endoseal, and Group 2 used ZOE sealer (Maarc). Post-operative pain was assessed using a 10-point visual analogue scale (VAS) at 6, 18, 24, and 48 hours. Data were analyzed using repeated-measures ANOVA with significance set at $p<0.05$.

Results:

At 6 and 18 hours, both groups showed comparable pain scores ($p>0.05$). At 24 hours, mean pain scores were significantly lower in the Endoseal group (1.86 ± 0.79) compared to the ZOE sealer group (2.97 ± 0.94 , $p=0.004$). At 48 hours, minimal pain persisted in either group, and none reported swelling.

Conclusion:

Endoseal demonstrated slightly lower postoperative pain compared to conventional ZOE sealer, suggesting that its improved formulation may enhance periapical biocompatibility and patient comfort following endodontic therapy.

Keywords: Postoperative pain, Zinc oxide eugenol sealer, Endoseal, Root canal obturation, Irreversible pulpitis

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I. Introduction

Root canal therapy (RCT) aims to eliminate infection, prevent reinfection, and maintain functional integrity of the tooth [1]. Despite improvements in endodontic techniques, post-operative pain remains a frequent and distressing outcome for patients, occurring in 25–58% of cases [2–3]. Such pain is multifactorial, involving mechanical, chemical and microbiological factors [4–5]. Among these, the root canal sealer plays a significant role as it remains in intimate contact with periapical tissues. An ideal sealer should provide good adhesion, dimensional stability and biocompatibility [6]. Traditional zinc oxide eugenol (ZOE)-based sealers, though widely used can cause irritation due to eugenol release and limited dimensional stability [7]. Recent advances in material science have led to the development of modified ZOE-based sealers such as Endoseal (Prevest DenPro, India), which claim superior flow, radiopacity, and biocompatibility. These modifications aim to minimize periapical inflammation and thus postoperative discomfort [8–9]. Postoperative pain has also been correlated with sealer extrusion, cytotoxicity, and inflammatory mediator release in periradicular tissues [10–11]. Studies by Huang et al. [12] and Silva-Herzog et al. [13] have shown that traditional sealers may induce

inflammatory cell infiltration, while newer formulations exhibit better tolerance. However, evidence comparing contemporary ZOE sealers with newer formulations such as Endoseal in clinical settings is scarce. Therefore, this randomized clinical study aimed to evaluate and compare postoperative pain intensity following the use of Endoseal and conventional ZOE sealer (Maarc, India) in mandibular molars diagnosed with irreversible pulpitis.

II. Materials And Methods

Study Design and Sample Selection:

This randomized, single-blinded clinical study included 60 patients aged 20–50 years reporting to Department of Conservative Dentistry and Endodontics, Nanded Rural Dental College and Research Centre, India between 2023-24 with irreversible pulpitis in mandibular first molars. Ethical approval was obtained, and written informed consent was secured from all participants.

Inclusion criteria:

- Vital mandibular first molars with carious exposure and confirmed irreversible pulpitis (lingering pain to thermal stimulus).
- No periapical radiolucency or sinus tract.
- No analgesic intake within 8 hours before treatment.

Exclusion criteria:

- Systemic illness, pregnancy, or allergy to local anesthetics.
- Teeth with calcified canals, resorption, or requiring multiple visits.

Clinical Procedure:

All treatments were performed by a single operator. After anesthesia with 2% lidocaine with 1:80,000 epinephrine and rubber dam isolation, access cavity preparation was done. Working length was established using an apex locator (J Morita) and confirmed radiographically. Canal preparation used ProTaper Gold rotary files (Dentsply Sirona, Germany) up to F2 size, with irrigation using 5.25% NaOCl and final rinse with 17% EDTA followed by saline. Canals were dried and obturated using gutta-percha and either: Group 1: Endoseal (Prevest DenPro, India) Group 2: ZOE sealer (Maarc, India). Patients were instructed to record pain intensity on a 10-point visual analogue scale (VAS) at 6, 18, 24, and 48 hours.



Figure 1: Root canal treatment performed with both sealers

Statistical Analysis:

VAS scores were analyzed using SPSS v.22 (IBM, USA) applying repeated-measures ANOVA and Chi-square tests. A p-value <0.05 was considered statistically significant.

III. Results

Of 60 patients (28 males, 32 females), all completed follow-up. Baseline pain and demographic data were comparable between groups ($p > 0.05$).

Time (hours)	Endoseal (Mean $\pm$ SD)	ZOE (Mean $\pm$ SD)	p-value
6 h	3.67 $\pm$ 1.02	3.83 $\pm$ 0.94	0.56
18 h	2.64 $\pm$ 0.89	3.05 $\pm$ 1.11	0.12
24 h	1.86 $\pm$ 0.79	2.97 $\pm$ 0.94	0.004
48 h	0.47 $\pm$ 0.52	0.68 $\pm$ 0.58	0.19

No patient reported swelling or flare-up during the 48-hour period. Pain decreased progressively in both groups, with Endoseal showing statistically significant lower mean pain scores at 24 hours.

IV. Discussion

The present study demonstrated that Endoseal resulted in slightly lower postoperative pain at 24 hours compared to conventional ZOE sealer. The reduced pain with Endoseal may be attributed to its improved biocompatibility and controlled eugenol release. Studies have shown that excessive eugenol diffusion can cause irritation and activation of nociceptors [14–15]. Endoseal's modified formulation possibly limits this release, resulting in milder periapical responses. Zinc oxide eugenol sealers remain valued for their antibacterial properties and sealing ability [16–17], but their cytotoxicity during initial setting can influence periapical inflammation [18]. Moreover, extrusion beyond the apex can provoke inflammatory cytokine release, worsening discomfort [19]. Our findings align with previous work showing pain reduction over time, reflecting typical post-treatment healing patterns [20–21]. Factors such as operator skill, irrigation protocols, and apical control also affect flare-up rates. Although both sealers performed satisfactorily, Endoseal's improved handling and lower pain scores suggest it could be a preferable ZOE-based alternative for clinical use.

V. Conclusion

Endoseal (Prevest DenPro, India) exhibited slightly lower postoperative pain compared to conventional ZOE sealer (Maarc, India) in mandibular molars with irreversible pulpitis. Both materials were well-tolerated, but Endoseal's improved properties may contribute to enhanced patient comfort and reduced periapical irritation.

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