

Comparative Evaluation Of Root Canal Obturating Materials In Primary Molars Using Cbct & Rvg...

Dr. Saransh Chauhan¹, Dr. Tarun Sethi², Dr. Vartika Jain³

^{1,3}- 3rd year Post Graduate in the Department of Pediatric And Preventive, Rajasthan Dental College And Hospital Bagru, Jaipur (Raj).

²- Head of Department in Pediatric And Preventive Dentistry, Rajasthan Dental College And Hospital Bagru, Jaipur (Raj).

***Corresponding Author:**

Dr. Saransh Chauhan¹

(3rd year Post Graduate in the Department of Pediatric And Preventive)

Email

¹chauhansaransh21@gmail.com

²Drtarunsethi@gmail.com

³vartikajain1998@gmail.com

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ABSTRACT

Pulpectomy is performed in primary molars with irreversible pulpitis or pulpal necrosis to retain the tooth until physiological exfoliation. The choice of obturating material is important because it should provide adequate canal filling and resorb in harmony with the primary tooth roots. Thus, the present study was done to compare ZOE and Metapex as obturating materials in primary molar pulpectomy using CBCT and RVG evaluation in 54 primary molars requiring pulpectomy, equally divided into ZOE and Metapex groups (27 each). After biomechanical preparation and irrigation, canals were obturated with the allocated material. Obturation quality and root-resorption pattern were evaluated using RVG and CBCT at baseline and six-month follow-ups. We have found that, optimal obturation was observed in 22 teeth (81.5%) in each group, with no statistically significant intergroup difference ($p=0.574$). The groups were comparable regarding age, gender distribution and preoperative root resorption ($p=0.460$). At six months, resorption of tooth root equal to filling material was more frequent in the Metapex group (51.9%), whereas tooth-root resorption greater than filling-material resorption was more common in the ZOE group (74.1%). This difference in postoperative radiographic resorption pattern was statistically significant ($p=0.002$). Thus, we come to conclude that, both the materials provided comparable obturation quality; however, Metapex demonstrated a more favourable resorption pattern than ZOE at six months.....

Keywords: ZOE, Metapex, CBCT, RVG, Primary Molars...

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INTRODUCTION

Primary molars with irreversible pulpitis or pulpal necrosis require effective non-vital pulp therapy to relieve infection, preserve mastication, maintain arch length, and retain the tooth until normal exfoliation.¹ Pulpectomy involves removal of infected pulp tissue, biomechanical preparation and irrigation of root canals, followed by obturation with a resorbable material and a coronal restoration that prevents reinfection.² Zinc oxide eugenol (ZOE) has long been used for obturation of primary teeth because of its antimicrobial action, radiopacity and ease of manipulation.³ However, its relatively slow resorption, particularly when extruded beyond the root apex, may be discordant with physiological root resorption.⁴ Metapex, a calcium hydroxide-iodoform paste, is a commonly used alternative because of its

resorbability, antibacterial potential and handling characteristics. However, its clinical and radiographic performance remains variable across studies.^{4,5} Moreover, conventional intraoral radiographs such as RVG are useful for evaluating pulpectomized teeth but provide only two-dimensional information and may be affected by anatomical superimposition.² CBCT enables three-dimensional assessment of root canal filling, material extrusion, root resorption and furcation or periapical changes, thereby offering a more detailed radiographic evaluation when clinically justified.^{1,3}

Hence, the available evidence does not establish uniform superiority of either ZOE or Metapex, especially regarding their resorption behaviour in primary molars. Therefore,

this study was undertaken to compare ZOE and Metapex in pulpectomized primary molars using RVG and CBCT, with particular emphasis on obturation quality and the relationship between root resorption and filling-material resorption at follow-ups.

AIM

To compare zinc oxide eugenol (ZOE) and Metapex as obturating materials in primary molar pulpectomy using CBCT and RVG evaluation.

MATERIAL AND METHODS

This in vivo comparative clinical study which was conducted in the Department of Pediatric and Preventive Dentistry, Rajasthan Dental College and Hospital, Jaipur Rajasthan. Where patients with primary molars requiring pulpectomy were selected after clinical and radiographic examination and allocated to two treatment groups i.e. Group I received Metapex obturation as shown in figure 1

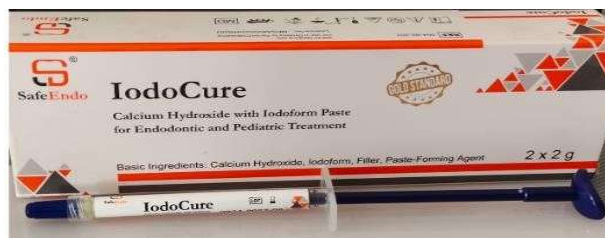


FIGURE 1 : METAPEX

whereas group II received zinc oxide eugenol (ZOE) obturation as shown in figure 2.



FIGURE 2 : ZOE

After access opening, complete pulp extirpation, biomechanical preparation using hand and rotary files, and canal irrigation, the root canals were obturated with the allocated material as shown in figure 3-5.



FIGURE 3 : BURS



FIGURE 4 : IRRIGANT SOLUTION



FIGURE 5 : . K-FILES (HAND AND ROTARY)

Postoperative assessment of obturation quality and root-resorption status was performed using RVG and CBCT imaging as shown in figure 6-8.

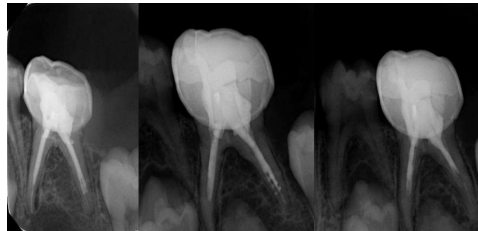


FIGURE 6 : TOOTH 74 GROUP I : METAPEX: IMMEDIATE POSTOPERATIVE RADIOGRAPH AT 3 AND 6 MONTHS FOLLOW-UP



FIGURE 7 : TOOTH 75 GROUP II: ZINC OXIDE EUGENOL: IMMEDIATE POSTOPERATIVE RADIOGRAPH AT 3 AND 6 MONTHS FOLLOW-UP



FIGURE 8 : POST OPERATIVE METAPAEX CBCT AT 6 MONTHS W.R.T 7

The treated teeth were reassessed radiographically after 3rd and 6th month to compare material-related changes and treatment outcomes.

INCLUSION CRITERIA

Children with primary molars indicated for pulpectomy due to irreversible pulpitis or pulpal necrosis.
Restorable primary molars with adequate coronal tooth structure.
Teeth with sufficient periodontal support.
Teeth with minimal or no physiological root resorption
Patients whose parents or guardians provided informed consent and who could attend follow-up visits.

EXCLUSION CRITERIA

Non-restorable primary molars
Teeth showing advanced physiological root resorption or inadequate remaining root length
Teeth with extensive furcal or periapical pathology involving the developing permanent successor

Teeth with inadequate periodontal support
Children with systemic conditions compromising dental treatment or those unable to cooperate for treatment and follow-up.

Patients unavailable for the six-month radiographic follow-up.

STATISTICAL ANALYSIS

The collected data were entered into a spreadsheet and analyzed using appropriate statistical software. Continuous variables, including age, were expressed as mean and standard deviation, while categorical variables such as gender distribution, obturation quality, and preoperative and postoperative root resorption were presented as frequencies and percentages. Intergroup comparisons were performed using the Chi-square test or Fisher's exact test where appropriate. A p-value of less than 0.05 was considered statistically significant.

RESULT

Group Statistics					
	Groups	N	Mean	Std. Deviation	Std. Error Mean
Age	ZOE	27	6.9630	.93978	.18086
	Metapex	27	6.9259	.95780	.18433

TABLE 1 : MEAN AGE

According to table 1, we have found that, the mean age of participants in the ZOE group was 6.96 ± 0.94 years, while that in the Metapex group was 6.93 ± 0.96 years. The very small difference in mean age indicates that both groups were comparable with respect to age at baseline. Thus, age was unlikely to act as a confounding factor while comparing the treatment outcomes of ZOE and Metapex respectively.

			Groups		Total
			ZOE	Metapex	
Sex	f	Count	12	12	24
		% within Groups	44.4%	44.4%	44.4%
	m	Count	15	15	30
		% within Groups	55.6%	55.6%	55.6%
Total		Count	27	27	54
		% within Groups	100.0%	100.0%	100.0%

TABLE 2 : GENDER DISTRIBUTION

According to table 2 we have found that, both ZOE and Metapex groups had identical gender distribution, with 12 females (44.4%) and 15 males (55.6%) in each group. Overall, the study included 24 females and 30 males, indicating comparable baseline gender distribution between the two groups respectively

			Groups		Total	
			ZOE	Metapex		P value
Obturation Quality	Optimal	Count	22	22	44	0.574
		% within Groups	81.5%	81.5%	81.5%	
	Overfill	Count	1	0	1	
		% within Groups	3.7%	0.0%	1.9%	
	Underfill	Count	4	5	9	
		% within Groups	14.8%	18.5%	16.7%	
Total		Count	27	27	54	
		% within Groups	100.0%	100.0%	100.0%	

TABLE 3 : COMPARATIVE ANALYSIS BASED ON QUALITY

Tbale 3 showed that, optimal obturation was achieved in 22 teeth (81.5%). Overfilling occurred in one ZOE case (3.7%) and none in the Metapex group, whereas underfilling was observed in 14.8% and 18.5%, respectively. The difference was not statistically significant ($p=0.574$), indicating comparable obturation quality between groups.

			Groups		Total	P value
			ZOE	Metapex		
Preoperative Resorption	Grade 1	Count	22	19	41	
		% within Groups	81.5%	70.4%	75.9%	
	Grade 2	Count	5	7	12	
		% within Groups	18.5%	25.9%	22.2%	
	Grade 3	Count	0	1	1	
		% within Groups	0.0%	3.7%	1.9%	
Total		Count	27	27	54	
		% within Groups	100.0%	100.0%	100.0%	0.460

TABLE 4 : COMPARISON OF PREOPERATIVE RESORPTION

Preoperatively, Grade 1 resorption was most common in both ZOE (81.5%) and Metapex (70.4%) groups. Grade 2 resorption occurred in 18.5% and 25.9%, respectively, while Grade 3 resorption was observed only in one Metapex case (3.7%). The difference was not statistically significant ($p=0.460$), indicating comparable baseline resorption between groups.

			Groups		Total	
			Metapex	ZOE		P value
Post Op 6 Months Radiographic Resorption	Resorption of tooth root equal to filling material	Count	14	7	21	
		% within Groups	51.9%	25.9%	38.9%	
	Resorption of tooth root greater than filling material	Count	8	20	28	
		% within Groups	29.6%	74.1%	51.9%	
	Resorption of tooth root less than filling material	Count	5	0	5	
		% within Groups	18.5%	0.0%	9.3%	
Total		Count	27	27	54	0.002*
		% within Groups	100.0%	100.0%	100.0%	

TABLE 5 : COMPARISON OF POST-OP 6th MONTH RADIOGRAPH RESORPTION

At six months, resorption of the tooth root greater than the filling material was most frequent in the ZOE group (74.1%), whereas resorption of the tooth root equal to the filling material was more common with Metapex (51.9%). This intergroup difference was statistically significant ($p=0.002$), indicating a more favourable resorption pattern with Metapex.

DISCUSSION

In the present study, the optimal obturation was achieved in 81.5% of teeth in both the ZOE and Metapex groups, with no statistically significant intergroup difference ($p=0.574$). The two groups were also comparable at baseline regarding age, sex distribution and preoperative root-resorption grades ($p=0.460$). These findings indicate that subsequent differences in radiographic resorption were more likely associated with the properties of the obturating materials rather than baseline imbalance. At the six-month follow-up, a significant difference in the relationship between physiological root resorption and material resorption was observed ($p=0.002$). In the Metapex group, root resorption equal to filling-material resorption was seen in 51.9% of teeth, while in the ZOE group, tooth-root resorption greater than filling-material resorption predominated (74.1%). This may reflect the relatively faster resorption of the calcium hydroxide-iodoform-based material, whereas ZOE may persist within the canal as root resorption progresses. Moreover, our observation was comparable with reports that calcium hydroxide-iodoform pastes show more favourable resorption behaviour in primary teeth, particularly in teeth nearing exfoliation.^{6,7} However, it contrasts with systematic-review evidence showing no

significant difference in overall clinical and radiographic success between calcium hydroxide-iodoform paste and ZOE at six and twelve months, with ZOE showing better success at longer follow-up periods.⁸⁻¹⁰ Thus, resorption compatibility alone should not be interpreted as overall treatment superiority. Overall, the present study demonstrated that both materials achieved comparable obturation quality, but Metapex exhibited a significantly more favourable radiographic resorption pattern than ZOE after six months.

CONCLUSION

Both ZOE and Metapex provided a comparable obturation quality in pulpectomized primary molars, with optimal obturation achieved in 81.5% of cases in each group. The groups were comparable at baseline with respect to age, gender and preoperative root-resorption status. At six months, a statistically significant difference was observed in radiographic resorption patterns between the materials. Metapex more frequently showed resorption corresponding to root resorption, whereas ZOE more commonly persisted as the primary tooth roots resorbed. Therefore, Metapex demonstrated a more favourable resorption pattern and may be considered a suitable obturating material for primary molars, particularly when physiological exfoliation is expected. However, larger studies with longer follow-up are required to establish long-term clinical and radiographic success.

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