

## CASE REPORT

# Eugenol Hypersensitivity in Pediatric Dental Patient: A Rare Case Report

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## ABSTRACT

Eugenol is a phenolic compound commonly used in dentistry as an analgesic and anti-inflammatory drug. Zinc oxide eugenol is an important root canal filling material in primary teeth with excellent documented success. Its cytotoxic effect is documented in some cases due to production of zinc eugenolate which is highly unstable and induces type IV hypersensitivity reactions and even generalized anaphylactic symptoms. But, the case reports documenting immediate hypersensitivity reaction to eugenol are very rare. This was a case of type I immediate hypersensitivity reaction to eugenol in a 3 years old pediatric patient. During the full mouth rehabilitation under general anesthesia, hard indurated swelling of lower lip was observed at the time of obturation of mandibular primary teeth. The procedure was stopped immediately suspecting an allergic response which was later confirmed to be eugenol allergy by patch test. Hence, it is important to evaluate all local allergies even if the patient fails to report allergy history.

**Keywords:** Allergy, General anesthesia, Zinc oxide eugenol.

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## INTRODUCTION

Zinc oxide eugenol has for a long time been the material of choice for the obturation of primary teeth. Nevertheless, zinc oxide eugenol cannot be considered as the ideal root canal filling material because of its limited antimicrobial action. Also it resorbs at a slower rate as compared to the roots of deciduous teeth. Eugenol is a para-substituted phenolic compound found in various plants, i.e., commonly used in dentistry as an analgesic and anti-inflammatory drug.<sup>1,2</sup> It can also be used as an impression material and in periodontal packs. It is also used as a flavoring agent in cosmetics and food items.<sup>1</sup>

According to the Food and Agriculture Organization of the WHO, an acceptable daily intake of 2.5 mg/kg body

weight of eugenol is approved and it is accepted as safe by the FDA.<sup>2-4</sup> A number of studies do exist on the cytotoxic effect of eugenol but its mechanism of cytotoxicity is not known<sup>2,5,6</sup> Zinc eugenolate is produced via the setting reaction of eugenol with zinc oxide.

Zinc eugenolate is highly unstable and its surface undergoes hydrolysis and eugenol is released which can induce type IV hypersensitivity reactions and even generalized anaphylactic symptom.<sup>7</sup> As a primary irritant, it is known to cause contact urticaria as well as chronic urticaria.<sup>8</sup> There have been rare reports of immediate hypersensitivity reaction to eugenol.

In this case report, we are reporting a case of type I immediate hypersensitivity reaction to eugenol in a pediatric patient referred for dental treatment.

## CASE REPORT

A 3-year-old boy reported to the Department of Pedodontics and Preventive Dentistry, Mahatma Gandhi Dental College and Hospital, Jaipur, with complain of decay and pain in all his teeth. After clinical and radiographic evaluation, a diagnosis of early childhood caries was made and full mouth rehabilitation was indicated. Medical history revealed no episodes of allergic responses to any drug. Since the patient was highly uncooperative, it was decided to perform the treatment in general anesthesia (Fig. 1).

Once all the procedures prior to general anesthesia were done (including blood tests, chest X-ray and pre-anesthetic examination), the procedure was started. Treatment was started in the mandibular teeth (Fig. 2). Extirpation of caries with respect to the mandibular molars was done, and the pulpectomy was done using sodium hypochlorite and saline as irrigants. Obturation with zinc oxide eugenol was done. After 5 minutes, the zinc oxide eugenol placement, the patient's lower lip started showing evident urticaria (Fig. 3). Lips showed redness, swelling and was hard on palpation. The treatment was immediately terminated and the patient was immediately removed from general anesthesia.

The patient was given IV avil (pheniramine maleate) 10 mg intravenous injection as a single dose and hydrocortisone. The swelling completely subsided within 24 hours. The patient was kept under observation for

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**Fig. 1:** Frontal view before starting procedure



**Fig. 2:** Frontal view during procedure



**Fig. 3:** Frontal view after placement of zinc oxide as obturating material

another 48 hours and IV antibiotic coverage of amoxicillin was given.

Owing to the fact that the erythema was noticed during the treatment, it was thought that the patient could have had a reaction to drugs used in general anesthesia or any medicament used in the dental treatment. A provisional diagnosis of immediate hypersensitivity reaction was made due to rapid onset of urticaria clinically.

The patient was kept under observation and within 48 hours after the procedure the swelling had subsided substantially. The patient was then recalled after 15 days for the remaining treatment. During the second visit, the obturation of the mandibular posteriors was initiated. As soon as zinc oxide eugenol was placed for obturation in the child's oral cavity immediate mucosal inflammation was noted and treatment was terminated.

## INVESTIGATIONS

Parental consent was taken, and the patient was referred to a consultant dermatologist for allergy test to zinc oxide

eugenol. The patient underwent skin prick test for various chemicals (eugenol, zinc oxide, sodium hypochlorite, and lidocaine). The patient showed positive response for eugenol (10%) and negative for zinc oxide (10%). This confirmed the hypothesis of the reaction being eugenol allergy.

## OUTCOMES AND FOLLOW-UP

Information regarding the allergic reaction to zinc oxide eugenol and its contraindication for further treatment was provided to the parents. The remaining dental treatment was done using metapex as the obturating material. Patient was recalled after 3 weeks of completion of treatment to see for any relapse or recurrence of the allergic reaction but no relapse occurred.

## DISCUSSION

Eugenol is a major volatile constituent of clove essential oil obtained through hydrodistillation of eugenia caryophyllata buds and leaves.<sup>9</sup> Eugenol was first isolated in 1929.<sup>10</sup> Chisholm in 1873 first described the mixture of zinc oxide and eugenol to form a polymerized cement used for surgical dressings, temporary fillings, pulp capping agents and cavity liners.<sup>4,11</sup>

The adverse effects related to the use of dental products containing eugenol range from localized irritation of the skin, ulcer formation, allergic contact dermatitis, tissue necrosis, reduced healing and in rare cases even anaphylactic-like shock.<sup>4</sup> According to Barkin, therapeutic action of eugenol on the pulp is cytotoxic and three reaction types may be promoted which are:

- Direct tissue damage due to the nature of the medication
- Contact dermatitis and
- True allergic reaction.<sup>12</sup>

Eugenol causes allergic contact dermatitis because it can react directly with proteins to form conjugates.<sup>4,13</sup> Hypersensitivity reactions according to Gell and Coombs classification may be:

- Type I (immediate hypersensitivity reaction mediated by IgE antibodies)
- Type II (cytotoxic reactions)
- Type III (immune complexes)
- Type IV (delayed hypersensitivity reaction mediated by sensitised T-lymphocytes).<sup>14</sup>

Allergic reactions associated with dental materials are generally delayed hypersensitive and they manifest several hours after the exposure.<sup>15</sup> Eugenol is known to cause contact urticaria in which immediate reactions are due to the release of active mediators by interaction between the IgE immunoglobulin in the mast cells, eosinophils and platelets and the intruding allergen.<sup>16</sup>

The patient in the present case report showed type I immediate hypersensitive reaction to eugenol which is very rare in dentistry. The signs and symptoms clinically manifested within minutes after placement of eugenol. This indicates the importance of proper medical history as prevention is always better than cure. Although allergy to eugenol is rare and difficult to diagnose the dentist must always keep an open eye about the possibility and look for the clinical signs and symptoms.

Whenever such skin symptoms are present the patient should be referred to a dermatologist for consultation. Diagnosis of type I drug allergy includes a complete medical history along with the history of atopy. The commonest diagnostic test for drug allergy is skin prick test. IgE mediated reaction can be demonstrated by a positive skin prick test and/or intradermal test.<sup>17,18</sup>

Once positive test is confirmed by the dermatologist, the offending material should be withdrawn. Rapid remission of the symptoms confirms the positive allergy test and once confirmed the dentist should inform the patient about it.

Thus, this case report concludes about one of the rare phenomenons seen in dentistry and describes management of the same.

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