

Localized contact urticaria due to epoxy resin-based endodontic sealer

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Abstract

This case report aimed to report the localized contact Urticaria with epoxy resin-based root canal sealer (AH Plus). Dental materials usually contain chemical that may cause potential allergic reactions to the clinicians as well as patients. Occupational disease in form of contact dermatitis may occur to the dentists. An adolescent postgraduate student in the department of conservative dentistry and endodontics, with an ASA physical status I encountered itching, erythema, and swelling of her left-hand skin with the first-time use of AH Plus sealer in her career. A diagnosis of Contact Urticaria was established by the dermatologist upon examination. Topical steroids and antihistamine drugs were advised to the endodontic postgraduate and within a week the symptoms were resolved. The case report focuses attention on handling of epoxy resin-based root canal sealer. The dentists should exercise care and follow manufacturer's instructions while handling the dental materials.

Keywords: AH Plus sealer, allergic reactions, contact urticaria, dental materials, occupational disease

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INTRODUCTION

It has been observed that the most common occupational disease among all health-care professionals is contact dermatitis.^[1]

Occupational exposure to chemicals including allergens and irritants poses risks of skin reactions to the dentists.^[2,3] Hand eczema has been reported among the dentists with the incidence ranging between 13.5% and 32.8%.^[4-7]

Epoxy resins are widely used chemicals. They are based on diglycidyl ether of the bisphenol A (DGEBA) at 75% to 90%.^[8,9] Bisphenol F may be used by the manufacturer to increase physical (e.g., heat) and chemical resistance, instead of bisphenol A.^[10] Allergic/irritant contact dermatitis, which occur during the production, setting of epoxy resins, or the manipulation, are the most common adverse cutaneous effects caused by epoxy resins.^[9,11,12] However, contact urticaria with epoxy resin is very rare.^[13]

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From 1954, since the introduction of first resin-based sealer by Schröder, over the years, AH Plus® (Dentsply, DeTrey GmbH, Konstanz, Germany), an epoxy resin-based sealer with good physicochemical properties, was developed.^[14] It is considered as gold standard for comparing the endodontic sealers and exists in a paste–paste mixture.^[15]

Although epoxy resin is known for their potential to cause adverse reactions as well as allergies, only one study has reported an allergy to AH Plus due to epoxy resin components.^[16] The present case report aims to describe hypersensitivity reaction that occurred immediately with AH Plus sealer, which was diagnosed as an contact urticaria.

CASE REPORT

Written informed, valid consent was obtained from a 25-year-old Indian female endodontic postgraduate student. She was healthy with the ASA physical score I and she was not aware of any allergies. Her medical history was noncontributory. There was no congenital tooth deficiency or a familial presentation. Prior to wearing gloves, she regularly cleanses her hands with soap and dries it with a paper towel. She totally covers her hands and uses powdered latex gloves for all dental procedures and has not experienced any allergic reactions before. Before the root canal filling, she routinely mixed the root canal sealer over her gloved left hand and applied it to the gutta-percha cones, prior to her enrolment for the postgraduate course. She previously used a root canal sealer containing calcium hydroxide and had not experienced any allergic reaction.

She mixed the AH Plus sealer for the first time on her latex gloved left hand in the lab. The paste A and B were mixed until homogeneous consistency was obtained on her totally covered gloved hand instead of a mixing pad. After a few minutes, itching started over the same region of the left hand skin where the root canal sealer (AH Plus) was mixed on gloved hand. Erythema and swelling at the contact site was observed upon removal of gloves [Figure 1a]. No systemic symptoms, including wheezing, dyspnea, or hypotension, were observed. Table 1 shows composition of AH Plus sealer. The patient reported to the dermatologist and was diagnosed with contact urticaria. Her blood investigation revealed an increased level of IgE immunoglobulin and eosinophils. Oral drugs in the form of Nucort M (steroid), Nexkast (anti-histamine) and Topical application [Figure 1b] of Clonate F, and Utmoist cream were prescribed and she was advised to mix the sealer on the mixing pad or discontinue it. Within a week, the symptoms resolved [Figure 1c]; the timeline of events is shown in Table 2.

DISCUSSION

Allergic reactions can cause urticaria, swelling, rash, and runny nose, as well as dangerous conditions such as laryngeal edema, anaphylaxis, and cardiac arrhythmias.^[17] There are various publications on hypersensitivity or allergic reactions during endodontic treatments at patients. These are allergy to rubber dam and gloves – especially involving powdered latex glove and Ledermix paste, anaphylactic shock due to formaldehyde and formocresol, hypersensitivity to sodium hypochlorite and zinc oxide, and skin injury to chloroform.^[18-24] There are a few reported incidents of contact urticaria because of epoxy resin.^[13,25,26] This case is interesting because the prevalence of contact urticaria in dental practices from epoxy resin seems to be quite low. Only one report has been published regarding a generalized urticaria with anaphylactic shock to the use of epoxy resin-based sealer during root canal treatment.^[16]

Contact urticaria is one of the most common skin pathologies and is described by its primary lesion, which appears as wheal. There is transient edema of the dermal tissue and surrounding reflex erythema with itch or sometimes burning sensation at the same time.^[27] It occurs within 10 to 60 min at the site of the contact area and completely resolves within 24 h. Clinical presentation is commonly wheal and flare response and urticarial swelling.^[28] Direct activation of mast cells, resulting in the release of histamine and possibly the release of other vasoactive substances such as substance A, bradykinin,

Table 1: Composition of AH Plus sealer according to the manufacturer

AH Plus (Dentsply Sirona, Germany)	
Paste A: Bisphenol A epoxy resin, zirconium oxide, bisphenol f epoxy resin, calcium tungstate, iron oxide, silica	
Paste B: N, N-dibenzyl-5-oxanonadiamin-1,9, amantiamine, tricyclodecane diamine, calcium tungstate, zirconium oxide	

Table 2: The timeline of events

Time	Event	Clinical Evaluation
0	Paste A and B mixed over gloved left hand	No immediate symptoms noticed
Within 10 min		Localized erythema, itching, and swelling
+1 day	Visit to dermatologist	Diagnosed with contact urticaria Increased blood level of IgE immunoglobulin and eosinophils Medications advised Advised to avoid contact with irritant
+3 days		Reduction in clinical signs and symptoms
1 week		Symptom free



Figure 1: Image (a) representing dentist's skin with localized erythema and swelling (b) Topical steroids application (c) reduction in symptoms

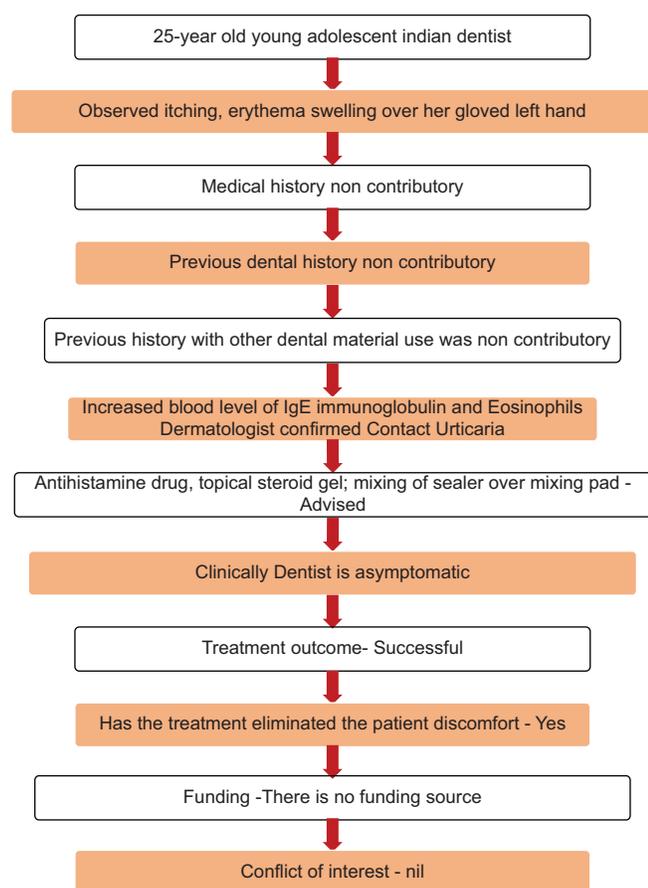


Figure 2: PRICE 2020 flowchart

prostaglandins, and leukotrienes, causes the reaction.^[29] Nonprotein substances that cause urticaria are diverse and may include paraphenylenediamine, ethylhexyl acrylate, hexahydrophthalic anhydride, potassium and ammonium persulfate, iridium salts, abietic acid and furfuryl aldehyde, and bisphenol A epoxy resin.^[30]

Hand-mixed sealers are mixed on a sterile pad following the manufacturer's recommendations.^[31] Although our postgraduate student was aware of this, she applied

the mixing procedure on her hand. Topical steroid application and antihistamine drugs were prescribed. It was recommended to mix the sealer on the mixing pad in order to avoid dermal reactions in future. The most effective way to prevent a deterioration of an exacerbation of dermatitis/eczema is to start treatment with an effective anti-inflammatory agent as soon as possible.^[32] Topical steroids have strong anti-inflammatory effects to reduce the symptoms and clinical manifestations.^[33] Antihistamines also reduce itching by blocking the action of histamine in the skin and help relieve symptoms.^[34]

Resin-based sealers are extensively used in endodontics owing to their excellent physical, chemical, and biological properties.^[35] AH Plus, an epoxy-based endodontic sealer, offers adequate dimensional stability, low solubility, and micro-retention to dentin.^[36] It contains low-molecular weight epoxy resins and amines and sets by the addition reaction between their epoxide groups to form the polymer.^[37] Furthermore, bisphenol F compounds may be emerging dental allergens that cross-react with bisphenol A.^[38]

Freshly mixed conventional root canal sealer especially demonstrated high cytotoxicity and inadequate biological activity in culture.^[39] The primary released monomer from the epoxy-based resin is DGEBA.^[40]

In vitro studies reported cytotoxicity with monomers from the uncured material.^[41,42] Zirconium oxide and calcium tungstate are added to promote the radiopacity of AH Plus®.^[43] The cytotoxicity and contact reaction might be attributed to the presence of tungsten in AH Plus.^[44]

Many materials used in dentistry are irritants and pose an occupational hazard. It is important to realize the resulting clinical skin symptoms and their reasons to prevent further exposition and to avoid other problems.^[45] The

sensitizing chemicals such as local anesthetics, acrylics, and antimicrobial agents may cause immediate contact reactions. Diagnosis can be made with a patch test.^[46] There is a limitation in the presented case due to the absence of a patch test. In the case of contact urticaria to nonprotein molecules, tests are available for a limited number of allergens.^[30] In addition, due to false-negative or false-positive reactions, diagnosis can be difficult.^[46] Therefore, the diagnosis was made by the level of IgE in the blood and clinical findings.

The reactions mediated through the amplifying mechanisms of the immune system by a small amount of irritant may lead to allergic contact dermatitis and urticaria. Occupational dermatitis represents a serious problem, especially from the constituents of the resin-based filling materials and adhesives, as they are volatile and penetrate latex and vinyl gloves easily.^[47] Leaching and diffusion of these components through gloves is a concern for health-care workers.^[48]

Gloves protect against microbes as well as most of the skin irritants, but in susceptible operators, the monomers may leach through the gloves. For this reason, gloves should be changed every half hour. Stretching of gloves overhead could increase resin permeability, and also, the presence of fluids (sweat/water) speeds monomer movement across the glove layer.^[49] Nitrile gloves are less permeable than latex gloves.^[50] This case report was prepared according to the PRICE 2020 Guidelines [Figure 2].^[51]

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

CONCLUSION

These allergic instances are quite rare among the dental staffs, considering the number of cases of urticaria with epoxy resin sealer.

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Conflicts of interest

There are no conflicts of interest.

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