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**Chapter Name: Side Effects of Dental Materials in Pediatric Patients.**

**Abstract and Keywords:**

There is a possibility that the use of various dental materials, from diagnostic to rehabilitation for the management of oral diseases, could cause allergic responses in the patient, the technician, and the dentist. This Chapter discusses the numerous dental materials that result in dental hypersensitivity or have a negative impact on the oral musculature, the diagnosis of that allergy, and the prevention and treatment of that undesirable reaction in the pediatric population. This dental materials and their adverse reactions were broadly categorized based on diagnostic method, restorative procedure, local anesthetic solution, endodontic irrigation and root canal filling materials, orthodontic appliances, and stainless steel crown which primarily include Ni-Cr.

**Keywords:** Adverse Reactions, Pediatric Dentistry, Dental Materials, Hypersensitivity

**Introduction**

The lips and oral cavity are frequently exposed to a large range of potentially irritant and sensitizing substances. During dental care, about 10 to 15 different metals, as well as synthetic resin, topically applied agents and other dental materials, might be used on the buccal mucosa. The clinical signs of contact hypersensitivity in the mouth include anything from subjective issues like burning, pain, and dryness of the mucosa (burning mouth syndrome) to objective changes in type of stomatitis and cheilitis with reddish and erosive, edematous mucosa.

Fleischmann noted the first instance of dental metal allergy in 1928, attributing it to amalgam fillings in the mouth, which led to stomatitis and dermatitis around the anus. Type IV allergic reactions (oral cavity contact allergy) are T-cell-mediated (delayed) hypersensitivity reactions. Cellular immunity and delayed hypersensitivity are also referred to as the same reactions, with hypersensitivity actually being such a powerful reaction that it damages the tissue. It is not possible to generalize the safety of medications used in adult age group patients to a pediatric age group. Certain commonly used drugs have very different pharmacokinetics and pharmacodynamics in pediatric patients compared to adult patients.

**Chapter Content**

**Adverse reaction of Dental Material:**

Allergy or allergic reaction from dental products can be categorized according to the treatment we undertake, for example in the diagnostic treatment latex allergy, allergy due to restorative materials, allergy due to the use of endodontic irrigation or root canal filling material in primary dentition, allergy because of local anaesthesia during the treatment, allergic reaction owing to the use of stainless steel crystals In the Pediatric population, there was very less study describing the adverse reaction of dental material.

**Adverse reaction to Latex gloves or Rubber Dam**

In 1979, Nutter first mentioned having a latex allergy. Children with spina bifida have the highest risk of developing a latex allergy, followed by people who have surgery before turning one year old, people who have latex-fruit syndrome (an allergy to various fruits), and healthcare workers, who have the second-highest risk due to their frequent glove changes and sweating.

Based on a clinical history and laboratory investigations, the diagnosis of latex allergy is made. The best way to diagnose a latex allergy is typically with a skin prick test. This test has a diagnostic sensitivity of 95% in people with a history of latex allergy and a precision of 100% in people without a history of latex allergy. As latex sensitization reacts with a variety of foods, including kiwi, avocado, tomato, banana, chestnut, potato, food allergies are a sign of latex allergy.

A child's oral rubber dam angioneurotic edema was described by Blinkhorn and Leggate. Three patients with delayed rubber hypersensitivity were also observed by Smart et al. Daniela Prócida Raggio et al. have documented two cases in which 19-year-old and 5-year-old girl was found to have adverse reaction due to rubber and had swelling in her body.

**Adverse reaction to restorative materials:**

In process employing restorative materials, adverse effects are reportedly present at a rate of between 1 in 1000 and 1 in 10,000. Asthma and urticaria were reported as unfavorable reactions after the application of a fissure sealant, but the symptoms vanished after removal, indicating an allergy, according to a case study by Hallstrom U.

 Contact dermatitis and asthma brought on by methacrylate are common complaints among dentists. The responsibility for occupational contact allergies lies with HEMA, EGDMA and TEG-DMA. A case was reported in which patients experienced lichenoid reactions and patch testing revealed positive reactivity to composite materials. Antifungal treatment and the removal of preexisting restorations are improvements.

 Fisher et al identified MMA monomer as the primary contributor to allergic dermatitis in dental professionals and dental laboratory technicians. Previously used as restorative material in children, but now a few days of amalgam replaced by composite or Glass ionomer cement restoration due to toxic effects of mercury.

**Adverse reaction due to local Anaesthesia:**

The reported incidence of hypersensitive reactions to LA in the pediatric population is low, accounting for less than 1 per cent of all LA-related adverse reactions. Adverse reactions are often reported as 'allergies' after administration of LA. For these cases, however, it is estimated that in the paediatric population, less than 1 percent are reported allergies to LA. It has been reported that adverse reactions can be reduced by careful injection. Most of the adverse reactions are vasovagal or psychogenic. Physicians and dentists should be aware of these facts in order to reduce the common misconceptions and worries around the use of LA in dental offices.

As for IgE-mediated allergy, Bhole et al. updated the literature and found 23 case series involving 2978 patients with alleged LA allergy. An IgE-mediated allergy has been confirmed in just 29 out of 2978 patients, which means a prevalence of 0.97 percent in patients tested for suspected LA allergy.

 Skin tests can be used to determine whether a patient is allergic to LA, but if the cause of the skin reaction is unclear, a challenge test is carried out. In this test, the patient is 'challenged' by subcutaneous injection with graded doses of LA until the therapeutic dose. Only two patients out of 188 cases in the study have successfully overcome this challenge.

**Adverse reaction due to endodontic irrigation and primary root canal filling materials:**

Just a few cases of allergic reaction to Naocl are recorded in which the skin patch tests indicated hypersensitivity to household bleach.

It also records another case study of sodium hypochlorite allergy. Patients had burning sensation and trouble in breathing while irrigating the canals with the same, and were given symptomatic relief corticosteroids, antibiotics, antihistamines and analgesics. Positive skin scratch test was observed after 15 days that reported allergy to 1 percent sodium hypochlorite.

Dermatitis due to allergic contact is frequently brought on by formaldehyde. According to reports, formaldehyde was in responsible for between 40% to 60% of responses. Patients with formaldehyde allergies are mostly female and exhibit dermatitis on their hands or faces. Generalized urticaria and anaphylactic response are two signs of formaldehyde allergies. The most effective and accurate method for identifying formaldehyde allergy is the evaluation of specific IgE antibodies to formaldehyde.

There has only been one incidence of a patient with a zinc oxide allergy receiving an effective root canal treatment. Eugenol has irritating contact effects and causes type IV hypersensitivity reactions as well as extensive anaphylaxis symptoms. In addition to experiencing gingival irritation, the patient also experienced an allergic reaction to eugenol in the mucosa near the metal-ceramic bridge. Additionally, when eugenol was employed as a temporary restorative material and glass inomer was substituted, the lesion healed and no longer caused allergic contact stomatitis.

**Adverse reaction due to Stainless steel crown and orthodontic brackets contain Ni-Cr.**

According to Fisher, nickel is one of the factors contributing to allergic contact dermatitis in women. The first instance of nickel dermatitis, which is characterized by sensitivity to nickel compounds, was documented by Goldman in 1889. There are 0.1–0.2% of people who are allergic to nickel. Overall, sensitivity to nickel is more common in women (4–10 times) than in men, although chromium allergy is uncommon (10% in men and 3% in women). Burning, gingival hyperplasia, and numbness on one side of the tongue are some of the clinical indications and symptoms of nickel allergy. Patch testing with nickel sulphate in 5% petroleum jelly is used to confirm the diagnosis. Sensitized people who are exposed to nickel develop persistent allergic contact dermatitis.

When new-generation SSCs (9–12% nickel) were used in place of the old-generation SSCs (72% nickel), no nickel sensitivity was seen in the children treated with them. Orthodontic products, space maintainers, and archwires all have the highest levels of in vitro nickel leaching during the first week, which thereafter gradually decreases. Reactivity to chromium and cobalt and allergy to nickel are frequently associated. 18.5 percent of the 1208 patients with contact dermatitis who underwent the Duarte patch test responded favorably to two or three metals.

**Conclusion:**

Mouth is frequently exposed to allergen-inducing sensitizing chemicals. Dental professionals frequently experience adverse responses to formaldehyde, latex, and acrylates. While polymethylmethacrylates and latex elicit delayed hypersensitivity reactions, sodium metabisulphite and nickel generate rapid reactions. To make a diagnosis, a thorough history of allergies, a clinical evaluation, and confirmation tests such patch tests and MELISA are required. A pediatric dentist should be knowledgeable about the different types of allergies they might cause, how to recognize them, and how to treat them.

**References**

* Torgerson RR, Davis MD, Bruce AJ, Farmer SA, Rogers RS 3rd. Contact allergy in oral disease. J Am Acad Dermatol 2007; 57:315–21.
* Koch P, Bahmer FA. Oral lesions and symptoms related to metals used in dental restorations: a clinical, allergological and histological study. J Am Acad Dermatol 1999; 41:422–30.
* Gawkrodger DJ. Investigation of reactions to dental materials. Br J Dermatol 2005; 153:479–85.
* Dobešová J, Ditrichová D, Kaprálová S, Pírek P, Eber M. Kontaktní alergická cheilitida. Derma 2007; 7:12–6.
* Karabucak B, Stoopler ET. Root canal treatment on a patient with zinc oxide allergy: a case report. Int End J. 2007;40(10):800-07.
* Spina A, Levine HJ. Latex allergy: A review for the dental professional. Oral Surg Oral Med Oral Path Oral Rad Endod. 1999;87(1):5-11.
* Nainar SM. Dental management of children with latex allergy.Int J Paediatr Dent. 2001;11(5):322–26.
* Beezhold DH, Sussman GL, Liss GM, Chang N-S. Latex allergy can induce clinical reactions to specific foods. Clinical and Experimental Allergy 1996; 26: 416–422.
* Raggio DP, Camargo LB, Naspitz GM, Bonifacio CC, Politano GT, Mendes FM, Kiertsman F. Latex allergy in dentistry: clinical cases report.
* Mjor IA. Problems and benefits associated with restorative materials: side effects and long term cost. Advances in Dental Research 1992;6:7-16.
* Hallstrom U. Adverse reaction to a fissure sealant. Report of a case. [16]J Dent Child. 1993;60(2):143-46.
* Allen G, Chan D, Gue S. Investigation and diagnosis of an immediate allergy to amide local anaesthetic in a paediatric dental patient. Aust Dent J 2017 Jun;62(2):241-45.
* Sambrook PJ, Smith W, Elijah J, Goss AN. Severe adverse reactions to dental local anaesthetics: systemic reactions. Aust Dent J. 2011;56(2):148-53.
* Schatz M. Skin testing and incremental challenge in the evaluation of adverse reactions to local anaesthetics. J Allergy ClinImmunol. 1984;74(4 Pt 2):606-16.
* Oral and Dental Expert Group. Therapeutic Guidelines: Oral and Dental. Version I. Melbourne: Therapeutics Guidelines Limited, 2007.
* Kaufman AY, Keila S. Hypersensitivity to sodium hypochlorite. J Endod. 1989;15(5):224-26.
* Latorre N, Silvestre JF, Monteagudo AF. Allergic Contact Dermatitis Caused by Formaldehyde and Formaldehyde Releasers. Actas Dermosifiliogr. 2011;102(2):86–97.
* Haïkel Y, Braun JJ, Zana H, Boukari A, de Blay F, Pauli G. Anaphylactic shock during endodontic treatment due to allergy to formaldehyde in a root canal sealant. J Endod. 2000;26(9):529-31.
* Braun JJ, Zana H, Purohit A, Valfrey J, Scherer PH, HaBkel Y, et al. Anaphylactic reactions to formaldehyde in root canal sealant after endodontic treatment: four cases of anaphylactic shock and three of generalized urticaria. Allergy. 2003;58(11):1210-15.
* Silvestre JF, Albares MP, Blanes M, Pascual JC, Pastor N. Allergic contact gingivitis due to eugenol present in a restorative dental material. Contact Dermatitis. 2005;52(6):341.
* Deshpande A, Verma S, Macwan C. Allergic Reaction Associated with the use of Eugenol Containing Dental Cement in a Young Child. Austin J Dent. 2014;1(2):1007.
* Feasby WH, Ecclestone ER, Grainger RM. Nickel sensitivity in pediatric dental patients. Pediatr Dent. 1988;10(2):127–29.
* Randall RC. Preformed metal crowns for primary and permanent molar teeth: review of the literature. Pediatr Dent. 2002;24(5):489–500.
* Barrett RD, Bishara SE, Quinn JK. Biodegradation of orthodontic appliances. Part I. Biodegradation of nickel and chromium invitro. Am J Orthod Dentofacial Orthop. 1993;103(1):8-14.
* Duarte I, Amorim JR, Perázzio EF, Schmitz Junior R. Metal contact dermatitis: prevalence to nickel, cobalt and chromium. An Bras Dermatol. 2005;80(2):137–42.