

Allergic palmoplantar pustulosis caused by cobalt in cast dental crowns: a case report

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Cobalt chrome alloy is a common material in prosthodontic restorations; however, instances of palmoplantar pustulosis owing to cobalt allergy are rare. Here, we report an unusual case of palmoplantar pustulosis in the hands and feet of a 58-year-old male patient caused by a cobalt allergy. The patient developed palmoplantar pustulosis characterized by redness, pustules, vesicles, and scaly erythema on his hands and feet 1 month after obtaining cobalt chromium alloy cast crowns on his molar teeth. The symptoms persisted for 1 year. He underwent standard patch testing, which showed a strong positive reaction to cobalt chloride. After the crowns were removed, the symptoms disappeared in 3 weeks. This study may serve to remind dental practitioners to be aware of potential allergic reactions to dental materials used in prosthodontic treatment and to enable them to recognize a metal allergy if it appears. (*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;xx:xxx)

Palmoplantar pustulosis (PPP) is known as pustular psoriasis of the palms and soles. The skin develops tiny fluid-filled blisters that are associated with thickened, scaly, red skin that easily develops painful cracks. Symptoms generally arise in waves or crops and can occur on one or both hands and/or feet. The origin of PPP has not yet been well elucidated; however, metal allergens were found as exacerbating factors of PPP.¹

For clinical dental applications, various types of metal alloys are used in prosthodontic replacements. Although these metallic materials are biocompatible, metal allergies have occurred. Documented metal allergies from dental restorations include reactions to nickel, iron, cobalt, and zinc. Although allergic reactions present with various symptoms in the oral cavity, dermatoses affecting the entire body have been observed.^{2,3} Symptoms may include oral lichenoid reactions or hand eczema.⁴⁻⁶

Our study reports an unusual case of allergic palmoplantar pustulosis induced by cobalt exposure that may help to inform dentists concerned about the allergenic potential of dental metal materials in clinical practice. If metal allergy is suspected, the patch test is commonly used to identify the allergenic metal. Once identified, appropriate treatment and referrals are needed.

CASE REPORT

A 58-year-old Chinese man was referred to the Dermatology Clinic at the Fourth Military Medical University (FMMU). He presented with small pustules on his hands and feet that were accompanied with burning and itching. At the time of examination, these symptoms had persisted more than 1 year. The patient had received cobalt chromium alloy casting crowns of the right maxilla molars 1 year previous. One month following the prosthodontic restoration, he presented with the following skin manifestations: multiple pustules, redness of the skin around the pustules, scaling, and fissures that were distributed over his palms (Fig. 1, A) and the soles of his feet (Fig. 1, B). However, the patient did not exhibit any intraoral reactions or symptoms, and his complete blood results were within normal limits. Additionally, he did not have any systemic diseases, and there was no family or personal history of metal hypersensitivity.

We suspected a relationship between the patient's PPP and dental metal allergy. The alloy used in the patient's dental restorations was composed of cobalt (63.3%, weight percent), chromium (30%), molybdenum (5%), silicon (1%), carbon (0.3%), and manganese (0.2%). To determine if there was any metal allergy, the patient underwent a patch test (Dermatology Clinic, FMMU, Xi'an, China) that included chromium sulfate, cobalt chloride, thiol compounds, rosin, potassium dichromate, manganese chloride, epoxy resin, bromine nitrate propanol, molybdenum chloride, nickel sulfate, formaldehyde, palladium chloride, thiuram mix, benzene mixture, kab-bah mixture, Marquardt 15, and P-phenylenediamine substrate. Whereas all other tests were negative, the cobalt test was positive. Further, drug lymphocyte stimulation tests (DLSTs) revealed a strong reaction to cobalt chloride, with a stimulating index of 1000 (normal <200).⁷

The patient was diagnosed with PPP associated with cobalt chloride allergy. The patient was advised to remove the offending cast crowns and to change to a temporary resin crown. Three weeks after the removal of his crowns, the patient's symptoms on the palms (Fig. 2, A) and soles (Fig. 2,

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Fig. 1. Pustules, redness, scaling, and fissures on the palms of hands (A) and soles of feet (B).

B) of the feet disappeared without the use of any oral or topical medications. The patient has remained symptom free for 6 months.

DISCUSSION

Most materials used for dental restorations, fixed and removable replacements, and orthodontic instruments are intended for long-term use in the oral cavity and therefore must satisfy strict biocompatibility specifications. Cobalt is widely used in casting crowns, bridges, and porcelain-fused-to-metal crowns and bridges and is not considered highly allergenic.

Ingestion of appreciable amounts of the metals or metallic salts from dental metal alloys may occasionally induce a variety of dermatoses, including hand dermatitis, lichenoid reactions, and palmoplantar pustulosis. Lichenoid reactions, which are considered variants of lichen planus, may either be regarded as a disease by itself or as the exacerbation of an existing lichen planus by the presence of medication or dental



Fig. 2. Three weeks after removal of crowns, pustules, redness, scaling, and fissures disappeared from the palms (A) and soles (B).

materials.⁸ These dermatoses are most often associated with long-term exposure of the oral mucosa to dental metals; the release of metal ions is thought to cause the allergic reactions.^{9,10}

Studies investigating the serum levels of metal ions in patients following total knee arthroplasty have revealed higher levels of ions than normally observed.^{11,12} However, studies measuring blood levels of metal ions in patients following dental restorations have not been conducted. It is unknown whether the metal ions are being ingested or serve as a foci in the mouth for lymphocytic activity. PPP induced by zinc in dental materials has been reported.¹³

DLST is an *in vitro* method to identify the causative drug of adverse reactions. It examines the proliferation of the patient's lymphocytes in response to the soluble antigen of interest by measuring the incorporation of [³H] thymidine during DNA synthesis of the replicating cells.¹⁴ DLST, however, is controversial for several reasons, and its sensitivity differs greatly among pub-

lished reports. Everness et al.¹⁵ reported a sensitivity of 92% in 66 patients with nickel allergy. In contrast, a lower sensitivity of 33% was observed by Barna et al.¹⁶ The DLST result in our report was sensitive and informative for the diagnosis.

PPP is a chronic skin disease characterized by pustules associated with erythematous scaling on the palms and soles.¹ Although its cause is still under investigation, PPP has some features in common with other pustular forms of psoriasis and is often classified as a localized form of pustular psoriasis.¹⁷ Up to 24% of patients with PPP have psoriasis,¹⁸ which is much higher than the prevalence of psoriasis in the general population. Additionally, the histology of PPP skin lesions and other pustular forms of psoriasis share common features, including spongiform pustules and the presence of inflammatory mononuclear cell infiltrates.¹⁹ However, the relationship between PPP and psoriasis is controversial, and whether PPP is actually a variant of psoriasis remains debatable.²⁰

This clinical report documents a patient with PPP and an allergy to cobalt chromium alloy cast crowns. Complete remission was achieved by the removal of the cobalt chromium alloy crowns and did not require the use of oral or topical medications. Because cobalt allergy from dental crowns has not been previously reported, this phenomenon has not been widely recognized in the dental and medical fields. This article may serve to remind dentists and physicians to consider the possibility of a cobalt allergy in rare circumstances and to help patients who are exposed to the suspected allergens receive correct diagnoses and effective treatments.

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