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Orthodontics and allergy treatment

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ABSTRACT

The purpose of this paper is to conduct a literature review on the topic of allergy in orthodontics, identify the factors that make patients more likely to have an allergic reaction, and discuss the implications of this reaction for the management of patients who are undergoing orthodontic treatment. A computerised literature search on the subject of allergy in relation to orthodontics was performed in PubMed. The results of this search are being analysed. The allergy and orthodontics combination was the MeSH term that was used.

There has been a significant amount of research conducted on allergic reactions to alloys used in orthodontics, specifically nickel. Several case reports of nickel-induced contact dermatitis have also been compiled. The evidence that is currently available suggests that the most common allergic reaction that is reported in orthodontics is related to nickel in orthodontic appliances, and that allergic responses are more common in women due to a previous sensitising exposure from nickel in jewellery. According to the findings of some studies, allergies may be the cause of hypodontia. During the course of orthodontic treatment, it has also been considered to be a high-risk factor for the development of extensive root resorption. In this review, the relationship between allergy and orthodontics as well as its implications are discussed.

Keywords: Allergy, nickel, orthodontics.

INTRODUCTION

Practitioners in health-related fields are reporting an increased level of concern regarding allergic reactions. Because of this, having a fundamental understanding of these conditions and being able to effectively treat them is of the utmost significance as the susceptibility of patients continues to rise. An allergic reaction is one in which specific parts of the immune system react excessively to a foreign substance. This type of reaction is known as an allergy. Patients undergoing orthodontic treatment may develop allergies for a number of different reasons. Some of these reasons include an allergy to nickel, an allergy to the acrylic resins that are used during treatment, an allergy to latex products, and so on. [1] In the field of dentistry, a wide range of different metallic alloys are frequently used. Root resorption and hypodontia have both been linked to

allergy as a possible contributing factor in some cases.

Up until the 1930s and 1940s, orthodontic accessories were typically fabricated out of gold up until that point. In 1929, stainless steel was first utilised as a substitute for gold for the first time. The field of orthodontics makes use of a variety of metallic alloys, including cobalt-chromium, nickel-titanium, and b-titanium, to name a few; the vast majority of these alloys contain nickel as one of their components. The amount of this metal found in alloys can range anywhere from eight percent, as is the case with stainless steel, to more than fifty percent, as is the case with nickel-titanium alloys. The purpose of this paper is to provide clinical implications based on the scientific evidence available on the topic of allergy in orthodontics, as well as to review and critically analyse the current available literature in the field of allergy in orthodontics.

SEARCH STRATEGY

A search was carried out on PubMed in order to collect all of the available research on orthodontics and allergic reactions. The investigation turned up a total of 114 articles related to the subject. In the fields of nickel allergy and orthodontics, a combined total of 106 articles was found. The nickel allergy was the subject of 14 of these articles' reviews, while the other 92 were case reports. There were four reviews that were written in a language besides English. These articles were excluded from the analysis, and 10 articles were taken into consideration. There were five articles that discussed allergic reactions and root resorption, and there were three that discussed allergic reactions and hypodontia.

NICKEL ALLERGY IN ORTHODONTICS

Nickel is a metal that is known to cause allergic reactions and is a potent sensitizer. Workers in the nickel plating industry were the ones who reported the first cases of dermatitis brought on by contact with nickel. In 1925, this condition was identified as an allergic reaction. [2,3] Nickel is frequently cited as an example of a biological sensitizer that is able to trigger both short-term and long-term sensitivity reactions in humans. Wearing jewellery that contains nickel at a young age could be the cause of an increased risk of nickle sensitization in people who are candidates for orthodontic treatment [4].

RELEASE OF SALVARY NICKEL FROM FIXED APPLIANCES

According to the findings of Park and Shearer[5,] a simulated orthodontic appliance released an average of 40 micrograms of nickel and 36 micrograms of chromium. The amount of nickel that is released is not necessarily related to the amount of nickel that is present in the alloy. [6] Under stress, there may be an increase in the amount of nickel released. The quantities that were released may be insignificant from a toxicological standpoint, but it is possible that they could be significant for patients who have a high degree of nickel sensitivity. When compared with patients who did not have orthodontic appliances, Fors and Persson[7] discovered that patients who had orthodontic appliances had significantly higher levels of nickel in their plaque and saliva. In addition, the plaque that formed on metal surfaces (band and brackets) in orthodontic patients contained a significantly higher concentration of nickel

than the plaque that formed on enamel surfaces.

BIOLOGY OF NICKEL ALLERGY

The conditions of nickel exposure, such as the concentration of haptens on the contact area, whether the exposure is open or occluded, the presence of an irritant, and the severity of the contact allergy, all play a role in the induction of an allergic reaction to nickel. The elicitation threshold differs not only between patients but also between individuals and over the course of time. [8,9] Nickel can provoke a type IV delayed hypersensitivity immune response known as contact dermatitis in susceptible individuals. The following are the two distinct phases that make up this process: [10] When an allergen enters the body, it must first be recognised before a reaction can take place. This is the beginning of the sensitization phase. Following subsequent exposure to the allergen and prior to the manifestation of the full clinical reaction, the elicitation phase takes place. There may not have been any symptoms present at the time of the initial exposure; however, repeated exposure will lead to a more obvious reaction. [11]

CLINICAL FEATURES ASSOCIATED WITH ALLERGY

The release of nickel from orthodontic appliances has been linked to a number of clinical abnormalities, including gingivitis, gingival hyperplasia, lip desquamation, multiform erythema, a burning sensation in the mouth, a metallic taste, angular cheilitis, and periodontitis. [12-16] Corrosion of orthodontic appliances and the subsequent release of nickel are thought to be the cause of these reactions, which are associated with an inflammatory response. Nickel-sensitive contact stomatitis is the manifestation of this condition (NiACS). The sensation of burning is the one that occurs most frequently. Also variable is the appearance of the affected mucosa, which can range from a slight erythema to shiny lesions and may or may not include edoema. Vesicles are only observed very infrequently, but when they are present, they quickly rupture, resulting in the formation of erosion areas. In cases that are chronic, the affected mucosa is typically in contact with the agent that is responsible for the condition, and it can range in appearance from erythematous to hyperkeratotic to ulcerated. [17] Other symptoms, such as peri-oral dermatitis and, in extremely rare cases, orolingual paresthesia, may also be present.

PREVALENCE OF NICKEL ALLERGY

It is unknown how often orthodontic materials containing nickel cause adverse reactions in individuals who are not allergic to nickel. Furthermore, it has been hypothesised that the patients in question are not at an elevated risk of developing a sensitivity to Ni as a result of orthodontic treatment. Nickel allergy is the most common type of contact allergy in industrialised countries; patch test verified data of general populations in several studies have shown that this allergy affects 10%-30% of females and 1-3% of males. Nickel allergy is the most common type of contact allergy in industrialised countries. [18-22] According to the findings of two recent surveys conducted in Europe, the incidence of adverse patient reactions in orthodontic practises ranges somewhere between 0.3 and 0.4 percent. [23,24] According to the findings of Kerosuo et al. [25], the prevalence of nickel allergy among adolescents in Finland was found to

be 30% in girls and 3% in boys. It is believed that ear piercing is a major cause of nickel sensitization because the prevalence of nickel sensitization was 31% in people whose ears had been pierced while it was only 2% in people whose ears had not been pierced.

NICKEL ALLERGY AND PERIODONTAL STATUS

The positioning of orthodontic brackets has an effect on the formation of biofilm and the colonisation of bacteria, which in turn makes a patient more susceptible to inflammation and bleeding [26]. According to the findings of Pazzini and colleagues, nickel can have an effect on the inflammatory reactions that occur during orthodontic treatment. Gingival hyperplasia, changes in colour, and gingival bleeding upon probing are some of the symptoms associated with such reactions. Nickel seems to be more of an indirect sensitising agent of the skin and mucosa than a direct one. It also appears to alter the periodontal status, acting as a modifying factor of periodontal disease in patients who are sensitive to it. The findings point to a cumulative effect of nickel throughout the orthodontic treatment process, and they suggest that this effect is linked to periodontal abnormalities that are clinically significant [27].

DIAGNOSIS

Reactivity to nickel has been evaluated using in vitro cell proliferation assays. Nickel sensitivity has been determined using biocompatibility tests, including cutaneous sensitivity (patch) tests. Nickel sensitivity has also been determined using patch tests. It is critical to make an accurate diagnosis of nickel allergy, the symptoms of which can manifest in the oral environment or in locations that are not directly related to it, which can be found here. The following patient history is consistent with an allergic reaction to nickel being the likely diagnosis. [11]

MANAGEMENT OF NICKEL ALLERGY

According to the findings of the vast majority of studies, individuals who are allergic to nickel are able to tolerate stainless steel without experiencing any kind of discernible reaction [28]. The majority of research comes to the conclusion that stainless steel is a nickel-free material that can be used for all intra-oral orthodontic components without the risk of nickel allergies.

ALLERGY AND ROOT RESORPTION

Root resorption is a common consequence of orthodontic treatment that has been observed in 93% of adolescents who have been through the process. During the course of orthodontic treatment, Davidovitch et al. hypothesised that patients who have medical conditions that affect the immune system may be at an increased risk for developing excessive root resorption than patients who do not have such conditions. Reviewing the orthodontic patient records at the University of Oklahoma, the researchers found that the incidence of asthma, allergies, and signs indicative of psychological stress were significantly higher in patients who had experienced excessive root resorption during orthodontic treatment as compared with the group of orthodontic patients who had completed their course of treatment without suffering this unfavourable outcome. This was found to be the case when comparing patients who had experienced excessive root resorption during orthodontic

treatment with patients who had completed their course of treatment without suffering this unfavourable

ALLERGY AND HYPODONTIA

The search turned up three articles, but only one of them addressed the topic of allergy in relation to hypodontia. The second premolars and the maxillary lateral incisors are the teeth that are most commonly lost, followed by the third molars as the most common missing teeth. The aetiology of hypodontia is thought to be multifactorial, with both genetic and environmental factors playing important roles in the disease's development. In 2008, Yamaguchi et al. Conducted research on 3683 orthodontic patients in Japan and found a positive correlation between allergy and hypo-dontia.

They came to the conclusion that health issues, particularly those associated with allergic reactions, are significant issues that could have a strong connection to hypodontia.

CONCLUSION

The identification of patients who are allergic, in conjunction with an understanding of the substances that have the potential to trigger allergic reactions, is essential to the success of any practise. It is essential for a practitioner to have a thorough understanding not only of the material's physical and mechanical properties, but also of the material's biological compatibility with the organisms that will be using it. The ability to effectively manage patients with allergies in routine clinical practise requires, among other things, a solid understanding of materials that do not trigger allergic reactions.

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