Oral cavity status and IgE level in orthodontic patients

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Abstract

Purpose: Considering nickel release from fixed orthodontic appliances, determination of the relationship between the clinical status of the mouth, IgE level and treatment duration in orthodontic patients seems to be advisable.

Material and methods: Twenty-one patients with symptoms of nickel hypersensitivity observed during treatment with fixed orthodontic appliances were separated from a group of 50 subjects, aged 11-33 years, undergoing orthodontic treatment for malocclusion. The patients were divided into two subgroups PgA and PgB.

Results: The mean IgE level in PgA was 39.20 IU/ml and in PgB 210.61 IU/ml. In PgA, the majority of patients were wearing ear-rings (8/10), but not in PgB (4/11). The mean treatment duration in PgA was 21.3±4.83 months, while in PgB 14.4±2.84. There were no statistically significant differences in the symptoms indicating stomatitis between the groups of patients subjected to treatment with intra-oral appliances.

Conclusions: The immunologic profile of the patient plays a key role in the choice of the type of appliance used to treat abnormalities of the masticatory organ. Determination of IgE is necessary in the case of allergy-positive history.

Key words: nickel allergy, immunologic profile, orthodontic treatment.

Introduction

The common use of fixed appliances for the treatment of occlusal and dental abnormalities requires a guideline of procedure standards to follow in case of nickel intolerance. Nickel is a component of many orthodontic materials, including brackets, rings and arches. Kanerva et al. [1] and Kerosuo and Kanerva [2] described the effect of nickel released from the steel of fixed appliances on contact dermatitis as type IV of delayed hypersensitivity reaction. The mean nickel content ranges from 8 to 30% [3]. It is a very strong allergen and its presence in the oral cavity can induce a cascade reaction manifested in reddening, softening and hyperplasia of the gums, bleeding, angular cheilitis or dermal exanthema of varied intensity [4,5]. Clinical symptoms of nickel allergy may resemble periodontitis and mucosal erosions can be seen as the effect of friction between the superficial epithelial layer and the appliance. Literature reports concerning the amount of nickel released in the course of treatment are contradictory. In the study conducted by Agaoglu et al. [3] with the saliva of 100 patients subjected to a 24-month-orthodontic treatment, the level of nickel increased in the first week up to 4.45ppb, reached the peak (11.53 ppb) after a year, but returned to the first-week values at the end of the second year. The results are inconsistent with the data reported by Kerosuo et al. [6], who found no statistically significant increase in the salivary nickel level in the first months of treatment. According to Carvalho [7], in the initial phase, allergy is confined to local inflammatory changes, while in a long-term exposure the patients exhibit inflammatory, hyperkeratic and ulcerative fields in the oral cavity [8].

Therefore, determination of the relationship between the clinical status of the mouth, IgE level and treatment duration in orthodontic patients seems advisable.
Material and methods

Twenty-one patients with symptoms of nickel hypersensitivity observed during treatment with fixed orthodontic appliances were separated from a group of 50 subjects undergoing orthodontic treatment for malocclusion. Immunoglobulin E was determined in the patients and according to the findings two subgroups were distinguished: A (10 patients with IgE <100 IU/ml) and B (11 patients with IgE >100 IU/ml).

Ethics

The Ethics Committee of Medical University of Białystok accepted the study.

Results

Tab. 1 presents patients’ distribution with regard to age, nickel-containing jewellery worn by patients and orthodontic treatment duration. PgA and PgB were comparable with regard to age. The mean IgE level in PgA was 39.20 IU/ml and in PgB 210.61 IU/ml. In PgA, the majority of patients were wearing earrings (8/10), but not in PgB (4/11). The mean time of treatment in PgA was 21.3±4.83 months, while in PgB 14.4±2.84. There were no statistically significant differences in the symptoms indicating stomatitis between the groups of patients subjected to treatment with intra-oral appliances (Tab. 2).

Discussion

The current study indicates that determination of IgE level is an extremely useful marker helping to assess whether the inflammatory changes observed during fixed appliance therapy are the result of hygiene neglect or are due to reaction to the released nickel [1,9] (Fig. 1). Gingivitis, bleeding, hyperplasia are associated with dental plaque, which in orthodontic patients has favourite conditions for accumulation. Lack of proper hygienic regime causes a slow but steadily progressing destructive effect on periodontium, promotes hard tissue demineralization and increases the risk of caries. On the other hand, the appliance itself is not a threat when appropriate level of hygiene is maintained. However, in cases when despite proper hygienic procedures gum hyperplasia and bleeding are still observed (Fig. 2), determination of IgE should be considered to check if the person is allergic to nickel [1,10]. According to literature data, the incidence of allergy to nickel has increased in the past 10 years in Europe and USA in the proportion of 1 man: 8 women [11]. Most frequently, allergy appears in women between 16 and 35 year of life [12].
Nickel released to the oral cavity in the course of orthodontic treatment stimulates the immune process in the body. It has been estimated that the level of 30 ppm is likely to induce a cytotoxic response. Faccioni et al. [13] have demonstrated that nickel and cobalt impair DNA generation in oral mucosal cells. In normal processes, the cells have restorative capabilities, but when these are disturbed, the whole enzymatic process being a cell response to the operating cytotoxic compound is impaired. The time of treatment was nearly twice as short in PgB than in PgA, which confirms the opinion of Agaoglu et al. [3] that the greatest amount of nickel is released in patients with considerably elevated IgE. A fixed metal appliance that remains in the oral cavity for 24-48 months can emit a metal dose causing a cytotoxic effect [13]. According to Kocadereli et al. [14], the levels of metals that permeate to saliva, blood and urine during orthodontic treatment is below the accepted daily dose and does not cause any damage at the cellular level. On the other hand, the status of the oral cavity is also affected by biochemical processes that occur between oral hygiene preparations and metabolic products of dental plaque bacterial flora. Most PgA patients had been wearing nickel-containing ear-rings or other jewellery before insertion of the appliance. Nickel in ear-rings, watches, coins, after multiple piercings of ears. Am J Orthod Dentofacial Orthop, 1996; 109: 148-54.

Conclusions

The immunologic profile of patients plays a key role in the choice of the type of appliance used to treat abnormalities of the masticatory organ. Determination of IgE is necessary in the case of allergy-positive history.

References