

Nickel allergy and orthodontic treatment

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ABSTRACT

Objectives Tolerance induction to prevent development of nickel allergy has been suggested with permanent dental braces. We wanted to find out which effect orthodontic treatments had had on the development of nickel allergy in university students.

Study design We examined and patch tested 153 students, of whom 113 had a history of pierced skin, and 70 a history of orthodontic treatment roughly 10 years earlier.

Results All except one student with pierced skin were females. Development of nickel allergy was significantly associated with skin piercing (54% compared with 12%). At the time of the study, there was a slight but non-significant difference in the prevalence of nickel allergy between students who had been subjects for orthodontic treatment (49%) compared with non-treated ones (58%) if they had pierced skin. There were no significant differences in the development of nickel allergy among students who had had permanent dental braces before (50%) or after skin piercing (48%). However, from 40 students without skin piercing four of 11 (three males) with a history of permanent braces had developed nickel allergy, as compared with none of 22 ($P = 0.008$) without orthodontic treatment suggesting possibility of sensitization through dental devices.

Conclusions Orthodontic treatment may not lead to tolerance induction on all occasions, and sensitization through permanent devices seems to be possible.

Key words: nickel allergy, orthodontic treatment, tolerance

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Introduction

Nickel allergy is common. In several studies the central role of skin piercing for the development of nickel allergy has been pointed out, as has the high prevalence figures for nickel allergy among females.^{1–5} To decrease the exposure even legislative measures have been implemented.⁶

In addition, other possibilities to affect nickel sensitization have been looked into. Promising results have been obtained from animal experiments focusing on tolerance induction through per oral exposure.⁷ These observations have gained support from patient studies of an association of orthodontic treatment in the decrease of development of nickel allergy.^{8–11} This seemed to be the case if orthodontic treatment with permanent dental braces took place before skin piercing. However, in addition to possible tolerance induction, increased figures for

nickel sensitization have also been observed by some authors^{12,13} among patients treated with intraoral dental devices. Thus the data of benefits of dental appliances for the development of nickel allergy are contradictory. We carried out a study among university students concerning nickel sensitization and exposure to orthodontic treatment.

Materials and methods

One hundred and fifty-three randomly selected university students visiting the Finnish Student Health Service in Turku in 1997–98 participated. One hundred and twenty-one were females and 32 were males with a mean age of 22 years. They were subjected to clinical examination with specific enquiry focused on orthodontic treatment. Seventy students had a history of orthodontic treatment; 55 with permanent devices,

i.e. dental metal appliances removed only by the dentist at certain follow-up visits, and 15 a history of non-permanent devices, i.e. braces kept in the mouth only during night-time. Both appliances are known to contain nickel and other metals. At the visit the students were patch tested with 5% NiSO₄ in petrolatum (Chemotechnique Diagnostics, Malmö, Sweden). The occlusion time was 48 h and the final interpretation took place after 72 or 96 h according to ICDRG guidelines. Indurated erythematous reactions were regarded as significant. Plain erythema or single follicular accentuations were regarded as non-significant.

Statistical analysis

For statistical analysis, Fisher's exact test was used.

Results

The distribution of students according to orthodontic treatment and nickel allergy is presented in Table 1. Seventy students had a history of orthodontic treatment, 55 with permanent devices. The orthodontic treatment had occurred on average 12 years earlier (range 7–14 years) with a mean duration of 2 years (range 6 months to 8 years). From these 55 students with permanent devices 44 had their skin pierced; 20 before orthodontic treatment (more than 1 year earlier) and 24 after; 11 had never carried out skin piercing. At clinical examination 21 of 44 of the students with pierced skin displayed a positive skin patch test to nickel with no differences regarding timing of orthodontic treatment. Among those 15 with non-permanent appliances, five of eight females with skin piercing had developed nickel allergy, and all seven males without skin piercing were patch test negative.

Table 1 The number of female and male students according to dental treatment, nickel allergy (Ni+, Ni-), skin piercing, and sex (153 students included)

	Females		Males	
	Ni+	Ni-	Ni+	Ni-
<i>Orthodontic treatment (total 70)</i>				
<i>Permanent devices (total 55)</i>				
Before piercing	10 (50%)	10 (50%)	–	–
After piercing	11 (48%)	13 (52%)	–	–
No piercing*	1 (33%)	2 (67%)	3 (38%)	5 (62%)
<i>Non-permanent devices (total 15)</i>				
After piercing	5 (62%)	3 (38%)	–	–
No piercing	–	–	– (0%)	7 (100%)
<i>No orthodontic treatment (total 83)</i>				
Skin piercing	35 (58%)	25 (42%)	– (0%)	1 (100%)
No piercing*	– (0%)	6 (100%)	– (0%)	16 (100%)
Total	62	59	3	29
	51%	49%	10%	90%

*Difference in the number of nickel allergic patients significant ($P = 0.008$).

Eighty-three students had had no orthodontic treatment. Among these 61 had pierced skin and 22 were non-pierced. Sixty of 61 were females and 35 (58%) had developed nickel allergy. All 22 subjects without skin piercing in this group were patch test negative.

From the 40 students with no piercing, 11 had a history of orthodontic treatment with permanent devices. Four of these 40 students had developed nickel allergy, each of them with a history of permanent orthodontic treatment; three were males. The difference in the prevalence of nickel allergy between students who had no skin piercing but who had permanent orthodontic treatment, and those who were non-treated is significant ($P = 0.008$).

Discussion

According to our study development of nickel allergy was significantly associated with skin piercing as suggested earlier^{1–5} as 61 of 113 (54%) displayed a positive patch test reaction compared with four of 40 (10%) students without piercing. When these students without skin piercing were analysed it appeared that all four who had developed nickel allergy, had a history of orthodontic treatment with permanent dental devices. The prevalence of nickel allergy in this group four of 11 (with permanent devices) differs significantly from non-treated students who were all patch test negative ($P = 0.008$). Interestingly, the only sensitized male students in this study were these three. Male students had significantly less skin piercing than females and generally nickel allergy among males is not so common compared with females,^{1–5} which may reflect different exposures.^{14,15} However, our patients were young students without occupational exposures. They had noticed symptoms in skin contact with metals, i.e. jeans buttons (the study was run before EU directive was in force in Finland). Also according to earlier reports, in addition to tolerance induction, orthodontic treatment has been suspected to be the source of sensitization in certain individuals.^{12,13} Our findings give support to these associations.

Our follow up was carried out roughly 10 years after the use of orthodontic treatment, which had lasted on average 2 years. We did not find a lower prevalence for nickel sensitization regarding the use of dental appliances. Different timing may explain results different from earlier reports in which the patch testing was generally carried out in closer association with orthodontic treatment.^{10,11} At the time of our study, the prevalence of nickel allergy was high in all female student groups irrespective of treatment.⁴ The fact that we could not see differences according to dental devices may reflect break down of immunological tolerance if ever developed. It may also reflect differences in used materials, as it is reported that also nickel release shows wide variation.¹⁶ Also individual characteristics, e.g. saliva, may have an effect on nickel release in certain subjects.¹⁷

It is tempting to think that nickel sensitization can be decreased through orthodontic treatment. However, it seems

important to gather more data about the effects of orthodontic metal devices in nickel sensitization, tolerance induction and maintenance.

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