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A COMPARATIVE CLINICAL STUDY ON NICKEL HYPERSENSITIVITY AMONG ORTHODONTIC PATIENTS IN BENGALURU, SOUTH INDIA

Dental Science

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ABSTRACT

Background: Nickel is a primary component of appliances like brackets, bands and wires which are widely used in orthodontic patients. Nickel is the commonest allergen implicated in contact dermatitis. Constant exposure to nickel in the appliances can lead to sensitization and later contact dermatitis at the site. Study was done to identify and comparethe incidence of nickel hypersensitivity between the orthodontic group and the non-orthodontic group. **Materials and Methods:** A comparative study was conducted in a Dental College and Hospital in Bengaluru, India for a period of 6 months involving subjects aged between 10 – 50 years. There were two groups. In the orthodontic group, 50 patients who had undergone fixed orthodontic treatment for at least 3 months were selected by purposive sampling. For comparison 50 patients those who had not taken orthodontic treatment in the past were included in the non-orthodontic study group. Patients in both the groups were subjected to patch test.**Results:**There were 20(40%) males and 30(60%) females in orthodontic group and22(44%) males and 28 (56%) females non-orthodontic group. Mean age was 20.45 ±5.12 (Mean ± SD) years. The incidence of Nickel hypersensitivity among patients receiving orthodontic treatment was 12%. The incidence in non-orthodontic group was 8% and difference was not statistically significant. (p = 0.4). The incidence of nickel hypersensitivity was more in females (15.5%) when compared to males (2.3%) and the difference is statistically significant ((p=0.01). **Conclusion:** There is no difference in nickel hypersensitivity between orthodontic and non-orthodontic group.

KEYWORDS:

Nickel, Hypersensitivity, Orthodontics

Introduction

Nickel is a primary component of appliances like brackets, bands and wires which are widely used in orthodontic patients.1These appliances are kept in contact with periodontal tissues for a period of months to years. Nickel released from metallic appliances was observed in several in-vitro studies. 2 Constant exposure to nickel can lead to sensitization.

Nickel is a strong immunological sensitizer and can lead to contact hypersensitivit y.[3]

Nickel is the commonest allergen implicated in contact dermatitis. It is estimated that 4.5% to 28.5%of the population have hypersensitivity to nickel. [4,5]After placing appliances patients with sensitivity to nickel can develop gingivitis, gingival hyperplasia, lip desquamation, burning sensation in the mouth, metallic taste, angular cheilitis, and periodontitis due to the release of nickel from orthodontic appliances which are signs of dermatitis at the site of contact[6,7]. Sensitive patients can also develop lesions at distant sites[8]. Nickel hypersensitivity is a Type IV hypersensitivity reaction and developsat least 24 hrs after exposure. [9,10]The mainstay of diagnosis in allergic contact dermatitis is the patch test. This test has a sensitivity and specificity between 70% and 80%.[11]

There are few studies available on nickel hypersensitivity among orthodontic patients in India. Hence this study was conducted with the objectiveof identifying the incidence of nickel hypersensitivity in patients receiving orthodontic treatment and to compare the incidence of nickel hypersensitivity between the orthodontic group and the non-orthodontic group.

Materials and Methods

A comparative study was conducted in a Dental College and Hospital in Bengaluru, India for a period of 6 months following Institutional ethics committee approval. Informed consent was taken from all subjects and in the case of patients aged less than 18 years consent was taken from their guardian. Based on the inclusion criteria subjects aged between 10 -50 years undergoing fixed orthodontic treatment taking treatment for more than 3 months were selected. Subjects who were not willing to participate in the study were excluded from the study.

In the orthodontic group, 50 patients who had undergone fixed orthodontic treatment for atleast 3 months were selected by purposive sampling. For comparison 50 patients those who had not taken preventive, interceptive or corrective orthodontic treatment in the past were included in the non-orthodontic study group. Patients in both the groups were subjected to patch/cutaneous sensitivity test.

Patch test

Patch test was done for all the patients in both groups using 5% nickel sulphate. Commercial extract of nickel allergen was obtained from Creative Diagnostic Medicare Pvt Ltd, Navi Mumbai. Aluminium Finn chambers filled with nickel allergen was applied over the skin of the upper left arm after cleaning with spirit following which adhesive tape was applied over it to secure it in place(Fig1,2). First reading was taken after48 hours and the second reading after 96 hours(Fig 3). Readings were then graded as per the guidelines of contact dermatitis practice parameter 2015[12](Fig 4). Grade 2 and above were considered as positive for the sensitivity test.

Fig 1 - Patch test unit

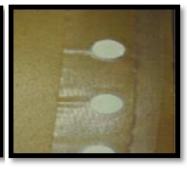

Fig 2- Patch test at the test site

Fig 3 - Test area outlined

Evaluation of the patch test

The readings are graduated according to the scale of the International Contact Dermatitis Research Group (ICDRG) , (Fig 4)

1. (–) negative
2. (?+) doubtful reaction

3. (+) weak (non-vesicular) reaction
4. (++) strong (edematous or vesicular) reaction
5. (+++) extreme (bullous or ulcerative) reaction

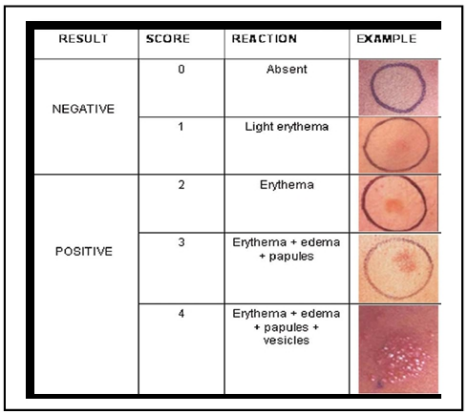

Fig 4 – Graduations of the readings

The final scoring (score 0-4) is given by the Orthodontist and is confirmed by the allergy specialist (Preventive Medicine unit) .

1. Score (0-1) are considered **negative**
2. Score (2-4) are considered **positive**

The data is subjected to statistical analysis.

Patient pictures :

Group A (Non-orthodontic group) : Test site outlined : Positive (score – 3), Fig 5,6,7,8

Fig 5

Fig 6 Fig 7 Fig 8

Group B (Orthodontic group) : Test site outlined (score 4), Fig 9,10,11,12

Fig 9

Intra- Oral Pictures

Fig 10 Fig 11 Fig 12

Results

The Orthodontic study group included20(40%) males and 30(60%) females and the Non-orthodontic group included 22(44%) males and 28 (56%) females. Mean age was 20.45 ±5.12 (Mean ± SD) years. Majority of the study subjects included in both the groups were students and were Hindu by religion **(Table 1).**

In the orthodontic group, 6 (12%)patients hadtested positive for nickel allergen sensitivity. Hence the incidence of Nickel hypersensitivity among patients receiving orthodontic treatment was 12%. In the non-orthodontic group, 4 (8%) tested positive for the nickel allergen sensitivity. Comparison between the two groups was done and the difference was not statistically significant. (p = 0.4). **(Table 2)**

The gender comparison for Nickel hypersensitivity in both the groups combined showed 9 (15.5%) females and 1 (2.3%) male had tested positive for nickel allergen sensitivity. Nickel allergen sensitivity was more in females when compared to females and the difference was statistically significant (p=0.01; OR = 7.53; 95% CI = 0.91 -61-93).**(Table 3)**

Tables Table 1: Baseline characteristics of the study subjects

	Nickel allergen Sensitivity	Orthodontic group	Non-orthodontic group
Sex	Male	20 (40%)	22 (44%)
	Female	30 (60%)	28 (56%)
Age	Mean age (yrs) ± SD	20.45 ±5.12	
Occupation	Students	31 (62%)	27 (54%)
Religion	Hindu	41 (82%)	38 (76%)

*Figure in the parenthesis indicate percentages

Table 2: Comparison of Nickel allergen sensitivity between Orthodontic group and Non-orthodontic group.

Nickel allergen Sensitivity	Orthodontic group (N =50)	Non-orthodontic group (N= 50)	p value*	Odds Ratio	95% CI
Yes	6 (12%)	4 (8%)	0.44	1.56	0.400 -6.657
No	44 (88%)	46 (92%)			

*Chi square test was used; **Figure in the parenthesis indicates percentages

Table 3: Comparison of Nickel allergen sensitivity between male and female

Nickel allergen Positivity	Female (N = 58)	Male (N = 42)	p value*	Odds Ratio	95% CI
Yes	9	1	0.01	7.53	0.91 – 61.93
No	49	41			

*Chi square test was used; **Figure in the parenthesis indicates percentages

Discussion

Nickel which is widely used in orthodontic appliances and is known to be a common cause of contact dermatitis and hypersensitivity reactions which was assessed in this study by patch/ cutaneous sensitivity test as it is an acceptable method for evaluating contact dermatitis. [13]

In our study 12 % of the subjects in orthodontic group are sensitive to nickel. In a study by Justin et al, 18.5% of subjects receiving orthodontic treatment were sensitized to nickel. 14It is estimated that 4.5% to 28.5% of the population has hypersensitivity to nickel. [4,5] Nickel hypersensitivity varies widely in different studies. This may be because of there are other factors like environmental exposures to nickel also influence the development of sensitization.

In our study Nickel allergen sensitivity is more frequent among females compared to males (9:1).This is in agreement with other studies from different parts of the world which also reported higher nickel hypersensitivity in females than males.[5,14,15,16]Sensitization in females is more because of environmental exposure to nickel in the form of jewellery, earrings, and other metallic objects.[3]

Though the12% of study subjects have shown to be sensitized to nickel, none of them showed any intra-oral features. Sensitization does not mean development of allergy. People may have sensitization without the development of allergy This lack of intra-oral features was explained by Spiechowiczby four different mechanisms - formation of salivary glycoprotein films which act as diffusion barriers, difference

in skin and oral mucosa permeability, difference in cellular hypersensitivity mechanisms in different sites and the distribution and function of Langerhans cells which all may prevent development of lesions in sensitized individuals.[17]In this study, it was observed that there is no difference between nickel hypersensitivity between orthodontic group and non orthodontic group. Meta analysisby Linagloz et al concluded that effect of orthodontic treatment on nickel hypersensitivity is weaker.16 Meta analysis by Kolokitha OE et al concluded that orthodontic treatment is not associated with an increase in the prevalence of nickel hypersensitivity unless subjects have history of cutaneous piercing.[18]

In conclusion, nickel hypersensitivity in those receiving orthodontic treatment was 12% and it is more common in females. We recommend conducting such type of studies in larger sample size for generalization of results.

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