

Importance of Determining and Establishing Latex Allergy in Orthodontic Patients

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Abstract

Introduction: The current study was commended with the aim of assessing the incidence of latex allergy in orthodontic patients. **Materials and Methods:** Silver-coloured orthodontic elastomeric ligatures (modular) from six different manufacturers were selected for the cytotoxicity study, being one of natural latex, two of latex-free and three containing polyurethane. The samples were divided into 6 groups of 15 elastics each. The cytotoxicity of these orthodontic elastics was determined through the dye-uptake technique, which is based on the neutral red absorption by living cells. Different periods of time were considered: 1, 2, 3, 7 and 28 days. **Results:** Among all the respondents to the survey, 7.5% showed positive change after wearing elastics. Most of the positive changes were seen in females. **Conclusion:** Safe orthodontics practice is dependent upon recognising patients with allergy along with awareness of etiologic materials.

Keywords: Allergic reactions, elastomers, tensile strength, latex, silicone elastomers, orthodontic material, patch test

INTRODUCTION

There is increasing concern in relation to the biocompatibility of materials used in the field of dentistry; this may be because of a real rise in the incidence of allergic reactions against the materials or due to a rise in awareness of antagonistic reactions to these materials.^[1-3] In subjects undergoing fixed orthodontic therapy, allergy is possible visible because of numerous reasons and these include nickel allergy, allergy to the acrylic resins and latex products.^[4] Harmless and efficacious therapy is dependent largely upon recognising subjects with allergy admixed with awareness of materials which can possibly cause them. The appliances used in orthodontic practices are composed of latex which is routinely employed in elastics and other materials. Latex is the organic raw material for natural rubber products.^[5-7] Its proteins and polypeptides, but not its polymer backbone (cis-1, 4-polyisoprene), are antigens. The remaining chemicals derived from the rubber built-up procedure resulted in irritation and contact dermatitis, which are focal, uncomfortable and distorting. Allergy occurring because of latex proteins results in immediate hypersensitivity responses, swelling and stomatitis, erythematous oral lesions, respiratory reactions and even anaphylactic shock in

severe cases.^[8-10] Incidence of latex allergy is approximately 3% to 17% of the cases. Since latex allergy is predominant among occupationally exposed subjects, the requirement for non-latex replacements is rising. Few laboratory researches were carried out for evaluating the behaviour of non-latex elastics in comparison to latex elastics.^[4,6,9,11-13] Majority of the researchers demonstrated a marked reduction in the strength levels of these elastics within the first 24 h, demonstrating the non-latex elastics limitation in upholding a continuous force for an extended period.^[4,6,11,12] Manufacturers have additional chemical materials to delay these effects and stretch the longevity of these elastomers.^[2] Nevertheless, in the oral cavity, the features of elastics substances are affected by physical, chemical and biological factors, few of them connected to functional activities, salivary alterations and nutrition habits.^[3,14] Non-latex elastics also must be tested in the oral environment and to our knowledge, just one clinical study^[15] was reported in the literature.^[3,16]

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Hence, under the inference of the above-documented data, the current study was commended with the aim of assessing the incidence of latex allergy in orthodontic patients.

MATERIALS AND METHODS

The current study was commended with the aim of assessing the incidence of latex allergy in orthodontic patients. For the present study, six different silver-coloured orthodontic elastomeric ligatures were employed:

- Natural latex (one)
- Latex-free (two)
- Polyurethane (three).

All the specimens were randomly and broadly categorised into six study groups, with 15 elastic in each group. After removing the powder coating, washing of the elastics was done for 15 s. Time before carrying out the testing procedure, sterilisation of elastomeric ligatures was done for exposure to ultraviolet light for half an hour.^[12,13] The cell culture model used was the monolayer containing L929 mouse fibroblast cells and cell culture incubate at 37 degrees for 48 h. The positive and negative controls were incubated in Eagles' minimum essential medium for 1, 2, 3, 7 and 28 days. Determination of the cytotoxicity was done through the dye-uptake technique.^[14] Repetition of the tests was done thrice. All the results were recorded in a Microsoft excel sheet and were analysed by SPSS Software IBM, Chicago, Illinois, USA.

RESULTS

While comparing the cellular viability among the Groups CC, A, G, TP and U at 2 and 28 days or among Groups CC, A, TP and U at 7 days or between Groups CC and U at 3 days, non-significant results were obtained. There were decrease viable cells in Groups M and Te at 1 and 2 days compared to the other experimental periods. At 24 h, the percentage of viable cells varied from 94.6% in Group U with the latex-free elastomeric ligatures to 76.1% in Group M polyurethane elastomeric ligatures. The percentage of viable cells increased slightly over the following 24 h in all Groups, continued to increase in Groups M, Te, TP and U between days 2 and 28. Among all the respondents to the survey, 7.5% showed positive

change after wearing elastics. Most of the positive changes were seen in females [Table 1].

DISCUSSION

In the present-day orthodontic practices, orthodontic elastics are still important significant expedients, extensively employed in dental practice, since they present numerous varieties of uses in relation to the direction of force applied to the teeth to be moved, consequently assisting in the correction of several malocclusions.^[1] Originally, these elastics were made up of natural rubber (latex) and employed for years and decades by the ancient Inca and Mayan civilisations.^[2] They are still widely used today,^[3,4] mostly due to high flexibility and cheap cost.^[5] Nonetheless, in the early eighties, allergic reactions to latex became more predominant and enhanced documentation.^[6,7] With the target of sustaining the mechanical qualities of the elastics without resulting in allergic reactions in subjects having hypersensitivity to latex, orthodontic rubber elastics based on synthetic rubber (non-latex) have been employed more routinely.^[8-10]

Hence, it is authoritative to assess the mechanical properties of above-mentioned dental materials. Few laboratory analysis has demonstrated a marked decrease in the strength levels of these elastics within the first 24 h, showing the non-latex elastics limitation in maintaining a constant force for an extended period.^[4,6,11-13] For decreasing the effects, few chemical modulations have been done by different manufacturers, which have resulted in the extension of the lifetime of these elastomers.^[2] Within the oral cavity, the parameters of elastics materials are altered by physical, chemical and biological features, few of them connected to functional accomplishments, salivary alterations and nutrition practices.^[3,11] Non-latex elastics also must be tested in the oral environment and to our knowledge, just one clinical study^[11] was reported in the literature. Dead or damaged cells cannot incorporate vital stain, thus not being recognised on optical reading. Therefore, spectrophotometry does not allow dead cells to be distinguished from the damaged ones.^[14-16]

Filon FL *et al.*, in previous research, assessed the prevalence of latex-related clinical manifestations in healthcare workers.

Table 1: The percentage of viable cells among different elastomeric ligatures over the time

Group	1 day		2 days		3 days		7 days		28 days	
	OD	VC (%)	OD	VC (%)	OD	VC (%)	OD	VC (%)	OD	VC (%)
CC	0.810 (0.089)	100.0	0.694 (0.078)	100.0	0.772 (0.094)	100.0	0.854 (0.052)	100.0	0.712 (0.073)	100.0
C-	0.795 (0.080)	98.2	0.686 (0.074)	98.9	0.753 (0.083)	97.6	0.834 (0.093)	97.7	0.698 (0.074)	98.1
C+	0.076 (0.010)	9.4	0.058 (0.013)	8.4	0.787 (0.009)	10.2	0.068 (0.012)	8.0	0.059 (0.009)	8.3
A	0.739 (0.072)	91.3	0.659 (0.062)	95.0	0.732 (0.079)	94.9	0.822 (0.08)	96.3	0.961 (0.090)	97.1
M	0.616 (0.069)	76.1	0.560 (0.080)	80.7	0.713 (0.077)	92.4	0.807 (0.053)	94.6	0.677 (0.061)	95.2
G	0.757 (0.082)	93.5	0.659 (0.071)	95.1	0.727 (0.077)	94.3	0.817 (0.070)	95.7	0.689 (0.087)	96.9
TE	0.651 (0.093)	80.4	0.603 (0.082)	87.0	0.718 (0.093)	93.1	0.802 (0.069)	94.0	0.676 (0.068)	95.0
TP	0.732 (0.059)	90.4	0.646 (0.079)	93.1	0.724 (0.071)	93.8	0.820 (0.084)	96.1	0.684 (0.096)	96.2

OD: Optical Density, VC: Viable Cells, CC: Cell Control, TE: Tecnident, TP: TP Orthodontics

An evaluation of a total of 1040 healthcare workers was analysed, which were exposed to latex allergen for latex-related symptoms and sensitisation. The evaluation was carried out by means of a pre-framed questionnaire and different antigen-antibody analysis admixed with clinical examination. A second assessment was also conducted. They observed Glove-related manifestations in approximately 22% of the nurses, the majority being mild dermatitis: Approximately 3½% of patients complained of contact urticaria and a little more than 2% complained of asthma and/or rhinitis. These symptoms were significantly related to skin prick tests positive to latex. Simple measures such as the avoidance of unnecessary glove use, the use of non-powdered latex gloves by all workers and use of non-latex gloves by sensitised subjects can stop the progression of latex symptoms and can avoid new cases of sensitisation.^[17]

CONCLUSION

Safe orthodontics practice is dependent upon recognising patients with allergies along with awareness of etiologic materials. A thorough history, with distinctive consideration to prior allergic reactions, is the main prognostic factor to avoid allergic reactions during orthodontic therapy.

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Conflicts of interest

There are no conflicts of interest.

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