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Review Article

A SHORT REVIEW ON FORCE DEGRADATION IN ELASTIC/ELASTOMERIC CHAINS IN ORTHODONTIC APPLIANCES

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A B S T R A C T

For some decades elastics have been a valuable adjunct of any orthodontic treatment. Synthetic elastomers overcome various limitations of natural rubber. The use of elastics in clinical practice is predicted on force extension values given by the manufacturer for different sizes of elastics. Elastics can be used in various configurations for correction of a particular malocclusion. It is very important for the orthodontist to educate the patient regarding the correct use of elastics as treatment results are dependent on patient cooperation. This article strives to summarize the currently available data on the various aspects of elastics including their properties, clinical usage and limitations.

INTRODUCTION

Elastics and elastomeric chains are important sources of force transmission to the teeth and are therefore widely used in orthodontics. Nevertheless, these materials are not considered ideal, as the force they generate diminishes gradually during the activation period. Elastics and Elastomeric are routinely used as a active component of orthodontic therapy. Elastics have been a valuable adjunct of any orthodontic treatment for many years. There use combined with good patient cooperation provides the clinician with the ability to correct both Antero-posterior and vertical discrepancies.[1] However these chains are commonly used in orthodontics; therefore, viscoelastic power and loss of force over time must be strictly tested. A rapid loss of force in a chain causes inefficient tooth movement, which will result in a need for an increased number of consultations to reactivate the appliance.[2,3] Therefore, various studies have sought to establish the mechanical and environmental factors that contribute to the force degradation of different orthodonticchains. In this present study we can compare the efficacy of elastic and elastomeric chains on force degradation in the orthodontic appliances.[4]

History of Elastic and Elastomeric Chains

Elastics have become part of orthodontics after Calvin in 1893 discussion at the Columbia dental congress but Henry A. Baker used elastics in clinical practice to exert a intermaxillary forces. Following which both natural rubber and synthetic elastomers are widelyused in orthodontic therapy. Naturally produced latexelastics are used in the Begg technique to provide intermaxillary traction and intramaxillary forces.[3] Synthetic elastomeric materials in the form of chains find their greatest application with edge wise mechanics where they are used to move the teeth along the arch wire. The links of chain fit firmly under the wings of an edge wise bracket so that chain elastomers also serve to replace metal as the ligating force that holds the arch wire to the teeth.[5,6] This routine differs from that usually followed for latest elastics, which are changed by the patient every one or two days. The use of latexelastics in clinical practice is predicted on force extension values given by the manufactures for different sizes of elastics.[7,8]

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Analysis of Elastic Force

Force produced by elastics on a tooth or teeth dependson its magnitude. The stress produced depends on thesite of application, distribution through the periodont alligament and direction, length, diameter and contour of root, alveolar process, tooth rotation and health, ageand above all the co-operation of the patient.CL I elastic traction is judiciously combined with strong anchor bend. Deliberate consideration of anchorage conservation is essential, because the resultant of theretractive and intrusive forces that lies distant to the maxillary molars will induce adverse movements oranchorage loss of the maxillary molars.[9] Intermaxillary elastic force exerts pressure on the incisor in a vertical direction bringing them into supraocclusion oraccentuating supraocclusion already present. Tilting of anchor teeth may also occur. The arch wire forceon the lower molar tends to tip the crown distally and root mesially. [10,11] The forward pull of the elastic force tends to counter act distal crown tipping and to augmentmesial root tipping. If the anchor bent and elastic forces are appropriate the tooth will remain upright. The amount of light force exerted by the elastic is at anoptimal level to tip the anterior crowns backward buta minimal level to move the lower molars forward bodily. Elastic force received by the molars and anteriors are equal and opposite, the resistance is not equal. So the crown tipping is relatively rapid and bodily movements are slow. A continuous force can bring about rapid intrusive movement.[12] Each anterior tooth will intrude by a force as light as 20 to 30 gms. The light force produces very short hyalinizations periods and the anterior teeth will be intruded quite rapidly. The tip back of the lower anchor molar in response to the anchorage bend can be controlled by CL II elastic force. When t he elastic force is lower, the crown maytip back more and the root tip forward less. This is more often with 1 ½ to 2 ½ oz. (43 to 71 gms) elastics that usually sued in non extraction treatment. When the elastic force is greater, both crown and root mattip. It may upright the molar but imparting little or nonet distal movement. This is observed with 2 ½ to 3 ½oz. (71-99 gms) CL II elastic in extraction cases. The different amounts of elastics forces, increasing withthe rapid restoration rate of crown tipping and the slower rate of root movement can bring about tooth movement differentials suitable for problems ranging from CL II extraction cases to CL I non extraction cases.[13,14]

Force Degradation

Latex elastics showed a greater amount of loss instrength than plastic elastomers when stretched over 21 day period. The synthetic elastomers stretched overa specific length and time exhibited a great loss in force.[15-18] The force decay under constant force application to latex elastic, polymer chains and tied loops showed that the greatest amount of force decay occurred during the first three hours in water bath. The force remained relatively the same throughout the rest of the period.[19,20] After an exhaustive review of the literature regarding elastomeric chain, it can besaid that most marketed elastomeric chains generally loses 50% to 70% of their initial force during the first day of load application. At the end of three weeks they retained only 30 to 40% of original force.[21-23]

Elastic Errors

Latex allergy: allergies to the latex proteins are increasing which has implication for dental practitioners because latex is ubiquitous in dental environment. Only 3 reports have been cited in the literature relating latex allergies to orthodontic treatment. 2 of these studies related the allergic reactions to use of latex gloves, and 3rd report related to the development of stomatitis with acute swellings and erythematous buccal lesions to the use of orthodontic elastics.[24-26] Most documented allergic reactions to latex products have identified the residual rubber protein has the antigen. Reactions to latex carry with them a wide range of risk, and systemic reactions in the extreme anaphylactic shock. Cutaneous exposure of individual sensitive to latex frequently causes contact dermatitis, where as either mucosal orpotential contact - has with the use of orthodonticelastics- is more likely to induce a rapid systemic reaction such as anaphylactic shock.[27,28] As the incidence of latex allergic reactions increases, the use of nonelastic products within the orthodontic specialty as wellas assessment of material properties of non latexelastics, will become increasingly important clinically.[29,30]

CONCLUSION

Elastics are one of the most versatile material availableto the orthodontist .Its an invaluable tool of the orthodontist armamentarium. An orthodontist whodoes not exploit these materials to the fullest is not doing justice to the patient. As a matter of fact it is all but impossible to practice in this branch of dentistrywithout this material.

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