

# Effect of Cellphone Radiation on Permanent Deformation of Elastic Chains

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**Abstract:** *AIM: To find out the effect of cellphone radiation on permanent deformation of elastic chains. OBJECTIVE: To investigate the effect of electromagnetic radiation from cellphone this will lead to changes in mechanical properties of orthodontic elastomeric chains. BACKGROUND: The most popular method of space closure in orthodontics is achieved with the help of elastomeric chains. It has ease of application, low cost, patient and clinician comfort. Change in mechanical properties in these chains is one of the serious disadvantages which is influenced by various factors. As it is essential for clinicians to know about the material they use, this study was done to find out the effect of cellphone radiation in orthodontic treatment. MATERIALS AND METHOD: The study was done with materials like Echains and two scales with markings. Echains of length 3cm each were selected and were divided into two groups. Group A is control group consisting of five Echains of length 3cm which weren't exposed to cell phone radiation. Group B in turn consists of five Echains of length 3cm which were exposed to cell phone radiation 7 days. The change in the length of the Echains in group B was measured daily using the graduations in the scale with the help of the control group. The results were tabulated each day. CONCLUSION: Effect of mobile radiation is a subject of interest as a result of enormous increase in mobile phone usage through the world. So it is very important to know about the effect of cellphone on elastomeric Chains.*

**Keywords:** elastomeric chains, cell phone radiation

## 1. Introduction

Orthodontia, also known as orthodontics and dentofacial orthopedics, is a special branch of dentistry. An orthodontist is a specialist who has undergone special training in a dental school and treats malocclusions by using various devices and instruments. It was established by the efforts of pioneering orthodontists such as Edward Angle and Norman William Kingsley. The specialty deals primarily with the diagnosis, prevention and correction of malpositioned teeth and the jaws.[1]



One of the most important aims in orthodontic treatments is to apply a continuous force lightly in order to achieve a maximum effective tooth movement with minimum side effects (optimal tooth movement). elastomeric chains is always used for space closure due to its properties like ease of application, low cost, patient as well as clinician comfort. Elastomers are materials that have the ability to return quickly to their original size after substantial deformation, which is similar to the action of coil spring.[2] They are structurally classified as polymers. The material is composed of repeating chain with simpler chemical structure. Polyurethane elastomers are used in orthodontics in the form of ligatures and chains or module. Various studies have been conducted which was done to evaluate the strength of echains in terms of force delivery and rate of force decay in various environments and different testing conditions. Factors such as tooth movement, temperature changes, pH variations,

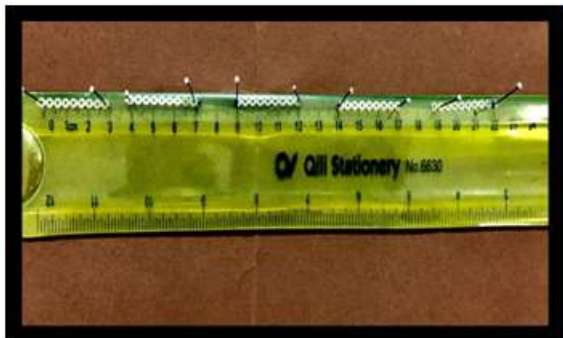
oral fluoride rinses, salivary enzymes, cellphone radiation and masticatory forces have all been associated with the deformation, force degradation, and relaxation behavior of these elastomers. It has been found that a force loss of about 50% to 70% occurs in the first 24 hours followed by a steady decline over 3 to 4 weeks [3].



## 2. Materials and Methods

The study was done with materials like Echains and two scales with markings.

Echains of length 3cm each were selected and were divided into two groups. Group A is control group consisting of five Echains of length 3cm which weren't exposed to cell phone radiation. Group B in turn consists of five Echains of length 3cm which were exposed to cell phone radiation 7 days. The change in the length of the Echains in group B was measured daily using the graduations in the scale with the help of the control group. The echains were placed in a box with cellphone which was kept at a distance of 20cm in order to replicate the distance from the pockets to the teeth in the jaws. The results were tabulated each day.[4]



### 3. Results

GROUP -A					
DAYS	CHAIN 1	CHAIN 2	CHAIN 3	CHAIN 4	CHAIN 5
DAY 1	3 cm	3 cm	3 cm	3 cm	3 cm
DAY 2	3 cm	3 cm	3 cm	3 cm	3 cm
DAY 3	3 cm	3 cm	3 cm	3 cm	3 cm
DAY 4	3 cm	3 cm	3 cm	3 cm	3 cm
DAY 5	3 cm	3 cm	3 cm	3 cm	3 cm
DAY 6	3 cm	3 cm	3 cm	3 cm	3 cm
DAY 7	3 cm	3 cm	3 cm	3 cm	3 cm

GROUP -B					
DAYS	CHAIN 1	CHAIN 2	CHAIN 3	CHAIN 4	CHAIN 5
DAY 1	3 cm	3 cm	3 cm	3 cm	3 cm
DAY 2	3 cm	3 cm	3 cm	3 cm	3 cm
DAY 3	3.1 cm	3.1cm	3.1 cm	3.1 cm	3.1 cm
DAY 4	3.2cm	3.2cm	3.2cm	3.2cm	3.2cm
DAY 5	3.2cm	3.2cm	3.2cm	3.2cm	3.2cm
DAY 6	3.4cm	3.4cm	3.4cm	3.4cm	3.4cm
DAY 7	3.5cm	3.5cm	3.5cm	3.5cm	3.5cm

The research clearly states that there is a significant increase in the E chains in group B by 0.5 cm. The average increase in all chains in group B (Chains exposed to cell phone radiation) is by 0.5cm. It's necessary to know these chains as it might affect the orthodontic treatment with increased use of cell phone in these generations.

### 4. Discussion

Although the exact composition of elastomeric chains is an industry secret, these polymers have been widely used by orthodontists since the 1960s. Ammonia is normally added to prevent the rise in alkalinity and retard microbial growth. In addition, it can raise the stability of rubber particles through incorporation of negative ions on its surface. The elastic chains lose their capacity to return to their original dimensions when submitted to cellphone radiation. Excessive forces may exceed the elastic property and cause permanent deformation. The cellphone radiations lead to change in the composition of the chain which will alter the reinforcing property of the chain which makes it more expandable.[5]

Halimi et al. 2013), designed a study to know about mechanical properties of elastomeric chains after stretching in various artificial saliva solutions and in air. Five brands of elastomeric chain from different manufacturers were selected. They were then immersed in pre-prepared solutions, with control samples exposed to air only. The force delivered by the elastomeric chains decayed rapidly and differently over time.[6] This decay varied depending on multiple factors like PH of the environments. In the more acidic PH, force decay was occurred more. In artificial saliva with PH = 7 and 37 degree centigrade temperature, clear chain was shown faster force-decay than gray chain. Closed chain was shown slower force-decay in comparison to open one.[7]

Kumar et al. () (2014), compared the effect of Coca-Cola, tea and Listerine mouthwash on the force delivered by elastomeric chain in vitro. They concluded that all these solutions cause an increase in force decay of elastomeric chains over time. Tea caused highest force decay followed by Listerine and Coca-Cola when compared to control group. [8]

### 5. Conclusion

In this generation there is an increased use of cellphones, hence it is important to know the effect of cellphone radiation on the elastomeric chains which will be useful for the clinicians for they can incorporate and calculate the degradation amount of echains and change the echains accordingly.[9]

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