

Orthodontic Elastics

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Abstract

Rubber elastics are an integral armamentarium of day to day orthodontic consumables as elastic chains, elastic module, elastic ligature, elastic separators, elastic thread etc. have intraoral applications and as rubber bands for extraoral applications in headgears and facemask. Elastic bands are manufactured by slicing the rubber tube of different lumen and thickness of walls. The lumen of the elastic band and thickness of its wall determines the force value when stretched. orthodontic elastics can be grouped in various ways according to use; force value; lumen size; their use/ placement in the arches and color.

Keyword: Elastic Chains, Elastic Module, Elastic Ligature, Elastic Separators.

Introduction

Elastics are extensively used orthodontic armamentarium for intraoral and extraoral applications. Elastics are usually classified by the direction of the force (e.g. class II or class III elastics). There are also short or long elastics. the

source of the elastic material is either natural rubber or synthetic polyurethane from petrochemical industry. Both natural and polyurethane or synthetic rubbers have a common property of returning to their original dimensions quickly after being stretched to a limited deformation. This property of resiliency is used to generate a continuous force to be applied on a tooth or a group of teeth to achieve tooth movement. Proper use of Maxillomandibular elastics requires consideration of the attachment point of elastic (line of action of the force) in respect to center of resistance of each arch. Sometimes more than a single elastic is needed when the attachment point is not directly accessible.

Classification

- 1) According To The Use Intra And Extraoral
- 2) According To Force Values (Usually Expressed In Ounces)
 - Light (2 OZ)- 56.7g
 - Medium light (3.5 OZ)- 128g

- Medium heavy (5OZ)- 141.8g
- Heavy (6.5OZ)- 184g
- Extra heavy (8OZ)- 226.8g

Strength ratings are based on the elastics being stretched three times of listed diameter.

3) According To Lumen Size

- $2/16'' = 1/8'' = 3.18\text{mm}$
- $3/16'' = 3/16'' = 4.76\text{mm}$
- $4/16'' = 1/4'' = 6.35\text{mm}$
- $5/16'' = 5/16'' = 7.94\text{mm}$
- $6/16 = 3/8'' = 9.5\text{mm}$
- $8/16'' = 1/2'' = 12.7\text{mm}$
- $10/16'' = 5/8'' = 15.8\text{mm}$
- $12/16'' = 3/4'' = 19.1\text{mm}$

4) According To Their Use/Placement In The Arches

- Class I or intra-arch or intramaxillary
- Inter-arch or inter-maxillary
- Class II
- Class III
- Cross elastics
- Vertical elastics
- M elastics
- W elastics
- Box elastics

5) According To Colour (Size May Vary According To Manufacturer)

- Purple- $1/8''$
- Green- $3/8''$
- Red- $1/8''$, $1/4''$
- Blue- $1/4''$
- Orange- $3/8''$
- Yellow- $5/16''$

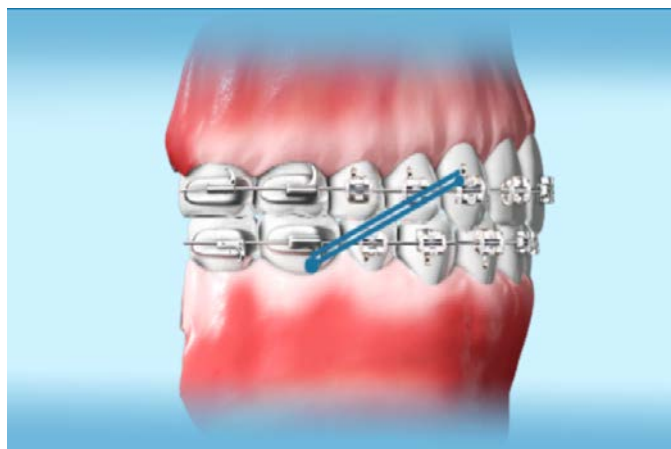
Elastic Bands: Elastic bands are manufactured by slicing the rubber tube of different lumen and thickness of walls. The lumen of the elastic band and thickness of its wall determines the force value when stretched.

Lumen dimensions: The lumen of elastic band is usually expressed in parts of an inch.

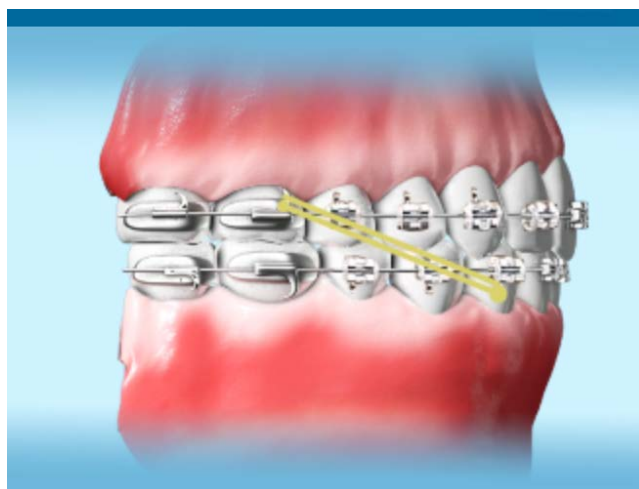
Tube thickness: Elastics are made from the rubber tubing of different thickness, mainly three types-thin, medium and thick that determine if the elastic is light, medium or heavy in terms of its force value.

Intraoral Elastics

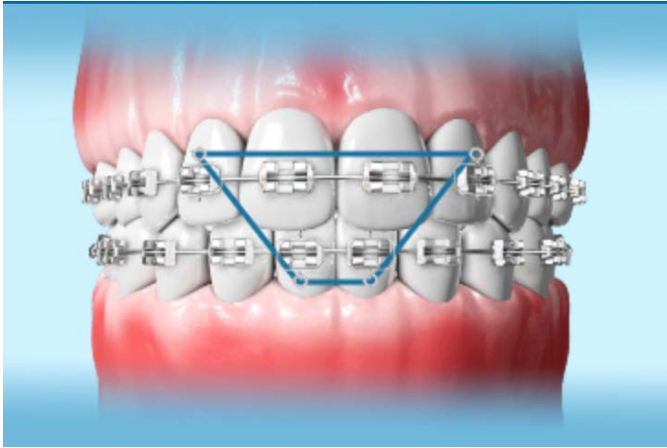
Class II Elastics: Interarch elastics are used for the retraction of maxillary anterior teeth, maxillary canine retraction and to counteract the labial vector of the torque force on maxillary incisors. They are also used for mesial shift of lower buccal segment i.e. correction of class II molar relation to class I.



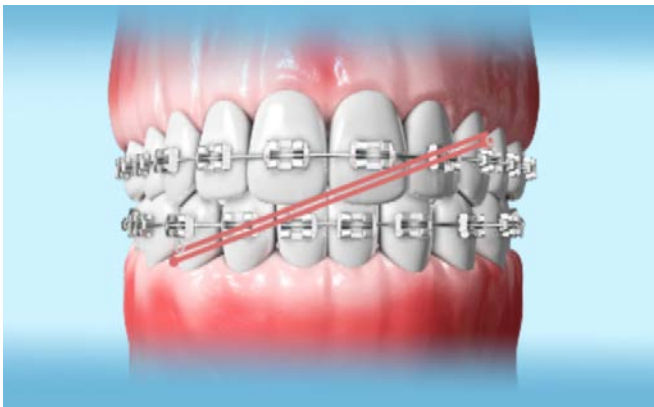
Class III Elastics: Class III elastics are given from upper molars to lower anterior segment for mesial movement of upper arch. For retraction of lower anteriors and for anchorage preparation in the lower arch.



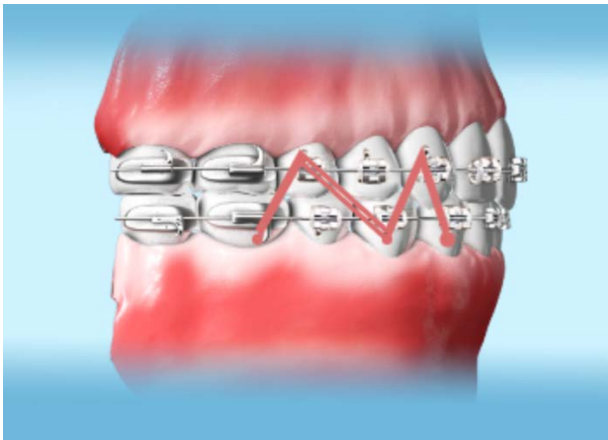
Box Shape Elastics: Elastics for open bite closure are applied in box shape in the anterior region for extrusion of teeth.



Cross Shape Elastics: Cross shape elastics are used for midline shift correction.



Settling Elastics: settling elastics can be used in various shape between upper and lower arch buccal segments such as M or W.



Extraoral Elastics are anchored from facebow to high pull strap. These elastics are thick and strong and supplied as-
LIGHT-8oz-230g

HEAVY-14oz-400g.

The heavy pull elastics are also called JUMBO ELASTICS. These elastics are 1/16x1/16 inches.

Instructions on Wearing of Elastics: The elastic should be worn continuously at all the time except meals if not indicated otherwise. When worn continuously they exert continuous force and produce favourable tooth movement with least discomfort to the patient and minimum tooth loosening and damage to the investing tissues.

Force Decay: The rubber bands show a decay of force within first hour of their placement in the mouth, about 30% of force decay is seen within 24 hours of which 15% occurs within first hour. therefore, elastics need to be replaced every day for optimum force delivery. force values do get affected with salivary contents and PH, bacteria, forces of mastication and various foods and temperature which make the rubber to breakdown due to formation of knotty tearing mechanism in its structure causing it to swell up and hence resulting in force decay.

Complications of use of natural latex elastics

Allergy: Allergy to latex can range from a simple skin rash to shock (which is rare). The amount of latex exposure needed to produce sensitization or an allergic

reaction is unknown, but frequent exposure to latex proteins increases the risk.

Allergic stomatitis from rubber bands is known to occur to those who are allergic to latex. Non-latex elastics should be used and advice of a dermatologist should be sought in such situations. History of allergies is useful in such situations.

Non-latex elastics: These are available as a substitute of latex for those children who are allergic to latex; however, they show greater decay of force in simulated oral environment. Therefore great improvements in the physical properties of the silicone band are required before they can actually substitute for latex.

Missing rubber bands and bone loss : The orthodontic rubber bands may slip over the tooth crown and may be retained in the gingival crevicular sulcus. It causes significant bone loss and tooth mobility. Such a clinical situation in an orthodontic patient should be suspected for a missing rubber band. The missing rubber band may be extremely difficult to locate by the dentist, and the child may be unaware of such a mishap, except pain and mobility. Extreme caution should be observed in the use of intraoral elastics. All attempts should be made to anchor the elastic bands to the orthodontic hook only. Thorough instructions in their placement and removal administered to the child and parents can minimize such accidents. The only possible solution is to develop a harmless radiopaque medium that can be safely incorporated into elastic bands, which should happen in near future.

Cytotoxicity: The preservatives and other chemicals used in the rubber bands may produce cytotoxicity to the oral/gingival tissues. The potential for nitrosamine formation from accelerating agents used for vulcanization and from other nitrosatable

amines, which may be present in rubber exposed to salivary nitrite, is known. Fiddler et al (1992) reported presence of N-nitrosodibutylamine and N-nitrosopiperidine from eight brands of elastic-rubber bands used in orthodontics.

Elastomeric Accessories

Synthetic Latex Elastic (Polyrubber Elastics): power chains are intended for the delivery of continuous force of recommended force value for a extended period of time with much of the comfort, these accessories are used in the following forms-

- 1) Elastic chains or power chains.
- 2) Elastic module
- 3) Elastic ligature
- 4) Elastic separators
- 5) Elastic thread

Elastic Chains (Power Chains)

They are available in four configurations-

- continuous/closed chain.
- Short link chain or short filament.
- Medium link chain or medium filament.
- Long link chain or long filament

These power chains have various uses depending upon how and at what stage they are placed in the arch, their uses can be listed as-

- Final space closure or arch consolidation
- Canine retraction
- Diastema closure
- Rotational correction
- Closure of extraction spaces
- Selective shift of the midline

The power chains are available in either grey, transparent or multicoloured.

They are available as: Long chains of various lengths (10 feet, 15 feet) rolled on an easy to hand spools.

Pre stretching effects: It is recommended that chains should be stretched up one third of its original length to prestretch the polymer chain. Prestretching is expected to prevent rapid decay of force on application. Some authors have found that 100% prestretching of their original length 10 seconds before loading, resulted in improvement of force decay from 4-6%, which was clinically insignificant. However, Brooks and Hershey found that pre stretching of power chains for one day retained 15-20% more force after 24 hrs and 10% more force after 4 weeks. The clinical value of pre stretching is questionable.

Environmental effects: It has been reported that immersion of power chains in alkaline Gluteraldehyde solution for the purpose of disinfection does not considerably affect the properties. The alkaline pH of the saliva has a slightly deleterious effect on the force decay of the chains. In intraoral environment, synthetic ligatures undergo enzymatic degradation, temperature related relaxation and absorption of lipids, which in turn induce plasticizing effects. Orthodontic mechanics that rely on elastomeric ligation or traction such as absolute correction of rotations, torque expression, absolute space closure might be adversely affected by the ageing induced decrease in the creep of these appliances. Therefore, either clinicians should shorten the period between the appointments or use steel ligatures while such mechanics are in place.

Ligation of archwire to brackets with elastic module

Elastic modules: Elastic modules are essentially single elastomeric ligatures which have virtually replaced steel ligatures. The modules are available in grey, clear, and almost all colours. This could be a factor to keep the young children excited about the treatment.

Advantage: The modules are easy to place on brackets, save chair time and are much comfortable to the patients compared to steel ligature ties. They also have an

advantage of delivering a less traumatic force of ligation of a wire and therefore comfort during the initial stages of alignment of the arches. Their placement takes less chair time. The modules have smooth borders without pigtailed, so less irritation to lips and cheek mucosa. The good quality modules should give reasonable control over a six-week period.

Disadvantages: Elastic modules do absorb water from saliva, swell up and absorb odours and are unable to deliver constant force over a long period of time. Discolouration and staining with coffee/tea, spices and mustard is definitely a problem. In India and Asia where turmeric is a part of everyday food, all modules and power chains do get a dirty yellow colour.

Gross Line Ligature: It is a twisted or braided cord which is supplied in different thickness. It has a property of shrinkage when moistened and provides light intermittent force which makes it suitable for movement of periodontally involved teeth. After completion of movement it holds the teeth in their new position and thus acts as a retentive device. It can be used for the closure of diastema and correction of rotated teeth, particularly when periodontal health is not so good.

Elastic Thread: Elastic thread is used for correction of rotations, orthodontic tooth movement of surgically exposed impacted teeth, closure of minor space and numerous of other intraoral applications. They are available as a clear thread which is smooth with a non-porous surface and exerts light, continuous long lasting predictable force.

Elastic Separators: They are available as small rings which when placed around the contact points of the teeth, gently cause separation of the teeth, to facilitate placement of steel molar bands.

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