

# Pigment effect on the long term elasticity of elastomeric ligatures

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**Objective:** To evaluate the response of elastomeric ligatures in several colors for a 4 mm traction over time.

**Methods:** Morelli® elastomeric ligatures, were submitted to traction forces using two rods of circular cross section, until a 4 mm distance was reached, matching the approximate diameter of an upper central incisor bracket of the same manufacturer. The ligatures were kept in artificial saliva immersion at 37 °C. Forces levels were measured immediately (0 h), 2, 4, 6, 8, 10, 12, 24, 48, 72, 96 hours, 1, 2, 3, 4 weeks and results were submitted to two-way repeated-measures ANOVA statistical analysis.

**Results:** The gray samples showed the higher initial values of tensile strength. The lowest values were presented by purple, light pink, green, black and red groups. The greater tensile strength instability was presented by red, black, silver, green and gray groups. The greater tensile strength stability was presented by deep pink, dark blue, blue, purple and light pink groups.

**Conclusion:** Elastomeric ligatures do not present stable behavior when suffering traction forces over time and different colors display different behaviors. Deep pink, dark blue, blue, purple and light pink groups, displayed the most stable forces, suggesting that they should be used during the treatment to obtain constant forces.

**Keywords:** Ligatures. Elastomers. Color. Elasticity.

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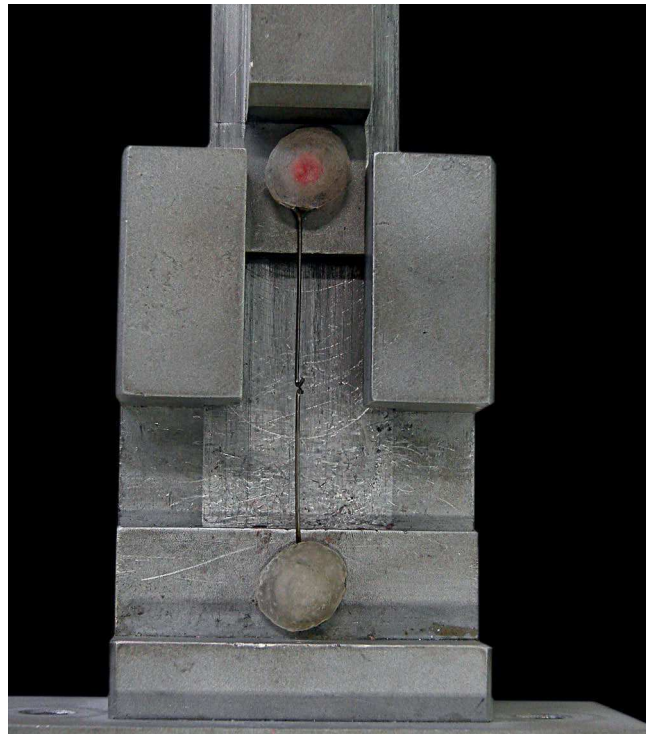
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## Editor's abstract

Elastomeric ligatures are used at the different stages of orthodontic treatment in order to pull the wire against the orthodontic brackets providing force transmission to the teeth. The elastomeric ligatures are polyurethane polymers produced by the polymerization through condensation of the di-isocyanate and polyamide crosslinked, allowing the elastic recovery to the initial spiral pattern. Although they have elastic properties, these are not considered perfect elastics, since they suffer degradation of the polymer chain leading to permanent deformation and characterizing the phenomenon called force relaxation. Pigments are incorporated into these materials in the attempt of achieving greater treatment adherence mainly by young patients. There are doubts about the mechanical properties of these materials after having been incorporated pigments. The authors' aim with this study was to evaluate the mechanical behavior of elastomeric ligatures of different colors in different intervals. For this study, we used rod-loaded elastomeric ligatures, Morelli®, in 10 different colors: light green, red, light pink, purple, deep pink, blue, dark blue, black, gray and silver (n = 10).

Traction of the ligatures was carried out on a universal testing machine EMIC DL 2000, with the aid of a device formed by two L-shaped rods (Fig 1). The ligatures were tensioned at a speed rate of 1 mm / sec until the inner diameter of the ligature (1.5 mm, at rest) reached 4 mm. The force (N) required to stretch each ligature was recorded immediately (0 h) and after storage periods of: 2, 4, 6, 8, 10, 12, 24, 48, 72, 96 hours and 1, 2, 3, 4 weeks. During the experimental period samples were stored in



**Figure 1** - Stainless steel device used to attach the ligatures during testing.

artificial saliva and incubated at 37 °C. After results were obtained, statistical analysis was carried out. Results showed that the gray pigment presented the highest initial force, and the purple, light pink, green, red and black groups had the lowest values. The greatest instability in the maintenance of forces were found in red, black, silver, green and gray groups. The most stable were the colors: deep pink, dark blue, blue, purple and light pink. The authors conclude with the completion of this work that the ligatures do not exhibit stable behavior when subjected to traction over time and that the various colors in which they are produced behave differently from each other.