

**EVALUATION OF FRICTIONAL FORCES  
GENERATED BY DIFFERENT  
BRACKETS AND ORTHODONTIC WIRES  
(AN IN VITRO STUDY)**

**A Thesis Submitted to the Council of  
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In Orthodontics**

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# *Abstract*

Sliding mechanics is widely used during orthodontic treatment. One of the disadvantages of this mechanics is the friction generated at the bracket/archwire interface, which may reduce the amount of desired orthodontic movement obtained.

Due to the great acceptance of this type of mechanics, the role of friction in Orthodontics has been of interest for clinicians.

The aim of the present in vitro study was to evaluate and compare the static frictional forces produced by two passive self-ligating brackets stainless-steel and hybrid and two conventional brackets stainless-steel and monocrystal ligated with stainless-steel ligature wire under dry condition.

One hundred and sixty brackets has been used in this study divided into four groups, each group consist of forty brackets as follows: conventional stainless-steel brackets, conventional monocrystal brackets, passive self-ligating stainless –steel brackets and passive self-ligating hybrid brackets, the conventional type used with stainless-steel ligature wires and all the brackets were 0.022" preadjusted Roth type (from Ortho Classic company , USA). Each bracket ligation system was tested with two types of arch wires (0.016" × 0.022" stainless steel wire and 0.019" × 0.025" stainless steel wire), at two degrees of torque (Zero and twenty degree). Resistance to sliding of the bracket/wire/ligature systems was measured with an experimental model mounted on the crosshead of an Instron testing machine with a 10 Newton load cell and crosshead speed of 1 mm/min. Each sample was tested 10 consecutive times every time new bracket –wire combination were used under a dry state for a total of 160 readings.

1. Both Self-ligating brackets able to produce a statistically high significant lower static frictional forces compared with both conventional brackets ligated by stainless-steel ligature wire when coupled with both arch wire types at both degrees of torque.
2. There was no significant difference in static friction between the two self-ligating brackets when coupled with both wires at zero torque .

So we can conclude that the resistance to sliding in orthodontics is multifactorial and the presence of friction is unfavorable in many clinical situations. However it may be very important in others. On the other hand we can conclude that self-ligating brackets can produce a significantly lower static friction than the conventional orthodontic appliance.