

Biomechanical Device for Strength Control in Dental Restorations Procedures

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ABSTRACT

BACKGROUND: In dentistry, rehabilitation of a damaged tooth using indirect restorations is one of the most common procedures. Depending on the technique used, a force is applied when inserting the restoration in the tooth. This step becomes crucial, as sufficient force should be applied to cause the cement to flow out of the tooth^[1]. However, the applied force is dependent on the sensitivity of the dentist and there are no tools that guarantee the aid in its monitoring. An indirect restoration's main advantages are polymerization contraction control, a greater rigidity of the material and a better anatomy with respect to the occlusal and interproximal side of the tooth. These may be composite or ceramic restorations^[2]. The applied force must be such that it causes the cementing material to flow out of the restoration, ensuring its proper seating and therefore improving the prognosis and longevity of the restoration-tooth assembly. Fracture of the restorations is common when excessive force is applied^[3]. **OBJECTIVE:** This work describes a new biomechanical device that allows the force applied in the tooth restoration procedure to be monitored. **METHODS:** The device is divided into three main components: An active, disposable or reusable tip that will interact with the tooth; An anchoring body of the tip, with the end instrumented, in order to identify its structural behavior (mechanical deformation) when the force is applied; A handle for support and interface with the user, and also for embedding the electronic system. By the calibration of the device, the deformation is transformed into force. A built-in embedded electronic system allows a wireless communication with a smartphone, tablet or computer graphical interface. A prototype was produced by lathing, instrumented with strain gauges and calibrated, allowing to convert the measured deformation into force. **RESULTS:** The device was tested performing a simulated facet application on a volunteer tooth, with a good result and feedback from the dentist, showing that is possible to easily apply a controlled force over a time period. **CONCLUSION:** The biomechanical device represents a simple way for the Dentist to adapt his clinical practice to what the literature refers as the most correct and effective procedures in cementing dental restorations and can also be used as a tool in the learning context of dental students and by

experienced dentists who have never had the opportunity to analyze or calibrate the force performed in this type of procedure.

Keywords: *Orofacial Biomechanics, Dental Restoration, Adhesive Cementation*

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