

Failure Mechanisms in Adherence of Fiberglass Posts to Dentine

M. Avalos⁽³⁾, D. Medina⁽¹⁾, A. Kaplan⁽²⁾

(1) Maestría en Rehabilitación bucal: Prosthodontia. Facultad de Odontología. Universidad Nacional de Rosario

(2) Facultad de Odontología. Universidad de Buenos Aires.

(3) Laboratorio de Metalurgia Física- Instituto de Física de Rosario. IFIR. CONICET. Rosario, Argentina.

Abstract – The aim of the present study was to evaluate morphological and mechanical aspects of failure mechanism in adherence of fiberglass posts to root dentine. The observations at different magnification showed three patterns of failure in different specimens of the total failure group. The results of this study provide evidence regarding the excellent biomechanical performance of fiberglass posts used since it was clear that the post adherence fails prior to the occurrence of damage to the tooth. It was further noted that the adhesive system favours the spread of cracks that would protect the integrity of the post and the teeth.

The aim of the present study was to evaluate morphological and mechanical aspects of failure mechanisms in adherence of fiberglass posts to root dentine. Thirty lower single-root premolars were randomly selected. The pieces were endodontically treated and rehabilitated with fiberglass posts cemented by adhesive technique with a self-etching primer (Multilink Primer A/B, Ivoclar- Vivadent) in combination with an auto-polymerizing resin luting agent (Multilink, Ivoclar- Vivadent). The specimens were divided into 2 groups and 2 were used as control pieces. The mechanical tests were conducted in an electromechanical 1362 Instron machine operated in traction.

In specimens of group A, the load of decohesion was used to estimate the “Resistance Adhesive Bonding” (RUA) Figure 1. With the specimen of group B, the tests were conducted at a load of approximately 65% of the RUA average. Environmental scanning electron microscopy and conventional optical microscopy observations were performed to analyze the post-test microstructure.

The results indicate that the RUA average is 181 ± 40 N. An analysis of the experimental load-displacement curves for Group A showed basically two types of curves. The observations at different magnification showed three patterns of failure in different specimens of the total failure group, namely: adhesive failures at the resin-dentin interface (22.2%); adhesive failures at the interface post-resin (16.7%) and mixed failures (61.1%). There were no observed cohesive failures. In the specimens tested at intermediate load most of the cracks (60%) were located at the interface dentin-resin. The results of this study provide evidence regarding the excellent biomechanical performance of the used fiberglass posts. This feature would improve the prognosis of the rehabilitated root since it was clear that the post adherence fails prior to the occurrence of damage to the tooth. It was further noted that much of the failures are mixed and starting in the resin-dentin interface. Finally the adhesive system favors the spread of cracks that would protect the integrity of the post and the teeth.

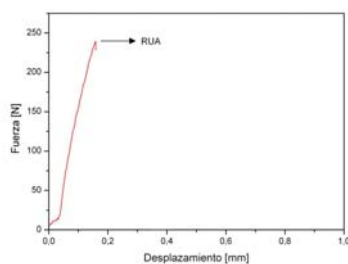


Figure 1: definition of the “Resistance Adhesive Bonding” (RUA)

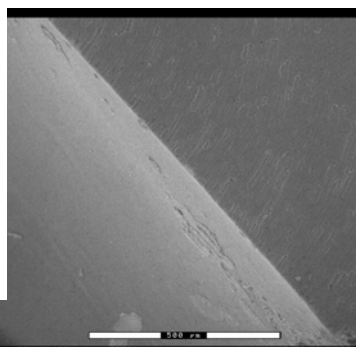


Figure 2: adhesive failures at the resin-dentin interface

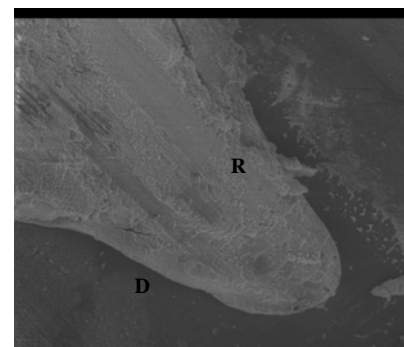


Figure 3: adhesive failures at the interface post-resin

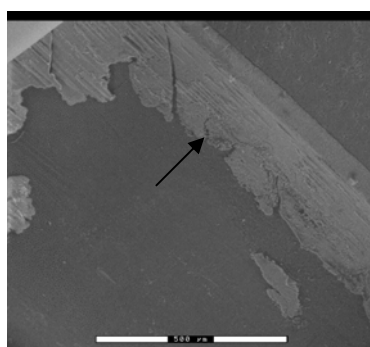


Figure 4: mixed failures