

Fracture Characteristics of Fiber Reinforced Composite Bars Used To Form Rigid Orthodontic Anchorage Units

F. Heravi¹, SM. Moazzami², S. Tahmasbi³

¹ Assistant Professor, Department of Orthodontics, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran

² Assistant Professor, Department of Operative Dentistry, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran

³ Assistant Professor, Department of Orthodontics, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran

Abstract:

Objective: The aim of this study was to evaluate fracture characteristics of rigid two-tooth segments splinted with fiber reinforced composite (FRC), with and without application of simulated masticatory forces.

Material and Methods: In this experimental study, 80 extracted maxillary bicuspid were joined in pairs from the buccal aspect using FRC. The specimens were divided into two groups. In group A, the fracture load of FRC was measured. The 20 specimens of group B were initially loaded in a chewing simulator machine for 4×10^5 cycles to simulate a two-year chewing period. Samples that withstood these loads were assessed for fracture load. The results were compared using student t-test. Stereomicroscopic evaluation of fracture areas was performed to determine the fracture pattern.

Results: None of the specimens in group B failed during application of simulated masticatory forces, meaning that the survival rate was 100%. Mean (standard deviation) of fracture loads in groups A and B were 195.80 (14.345) and 190.57 (24.027), respectively. No significant difference was found in mean fracture loads between the two groups. The overall fracture pattern was similar in both groups.

Conclusions: FRC bars demonstrated sufficient durability to withstand chewing forces within the chewing simulation period. The fracture loads were higher than the mean mastication forces and remained almost unchanged after application of these forces.

Key Words: Fiber reinforced composites; Fracture load; Masticatory forces

✉ Corresponding author:
F Heravi, Department of Orthodontics, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran.
heravif@mums.ac.ir

Received: 28 May 2006
Accepted: 27 September 2006

Journal of Dentistry, Tehran University of Medical Sciences, Tehran, Iran (2007; Vol: 4, No.2)

INTRODUCTION

Fiber reinforcement was introduced to clinical dentistry for the first time in the 1960s, when investigators attempted to reinforce polymethyl-methacrylate dentures with glass or carbon fibers [1,2]. It has recently been shown that crowns, bridges and posts made of FRC can be used successfully in dental practice and they possess adequate flexural modulus [3], flexural strength [3,4] and fracture strength [5,6].

Initial application of FRC in orthodontics was limited to bonded lingual retainers [7]. In a

clinical study, Rose et al [8] found that retainers made of plasma-treated woven polyethylene ribbons remained in place for approximately 11.5 months.

Fallis and Kusy [9] introduced a novel esthetic glass fiber-reinforced composite wire for specific purposes with reasonable patient acceptance and structural integrity.

Burstone and Kuhlberg [10] presented a new clinical use of FRC to make an esthetic connecting bar utilized as an adjunct for active tooth movement. In this application, teeth were