

EXPERIMENTAL STUDIES ON DENTAL RESINS

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Introduction: The basis criteria in fracture mechanics are linked to expansion force of fractures and to resistance on fracturing. Based on cracks propagation speed and on variation graphics $da/dN=f(\Delta K)$, one can determine number of fatigue cycles until breaking and can make predictions regarding dental prostheses durability.

Objectives: Achieving objective standards for quality control of flaw dentures, that should provide bio-safety and durability warranties.

Materials and methods: An experimental program for determining variation diagrams $da/dN = f(\Delta K)$ on 5 types of heat curing resins (Meliodent, Triplex, Royaldent, Vertex, Superacryl) and 3 light curing resins (Eclipse Base Plate, Eclipse Set Up, Eclipse Resin Contour) was established. A fatigue device type Walter-Bai - 10 kN was used, according to standard procedure ASTM 647, and tests were conducted on tearing mechanics samples, type CT (Compact Tension). A 3D LPX-1200 Laser Scanner (Roland DG Corporation, Japan) and Ansys (Ansys Inc., Philadelphia, USA) or Abacus 6.6.1. software were used.

Results: Main factors that influence crack's propagation process are: microstructure, average tension of stress cycle and working environment.

First domain corresponds to propagation speeds of up to 10^{-8} m/cycle, meanwhile second domain consists in $10^{-8} - 10^{-6}$ m/cycle speeds. For amplitudes of stress that are under ΔK_{th} value, cracks stop propagating.

Third domain is characterized by high propagation speeds for fatigue cracks, which leads to its unstable extension.

Life time for complete dentures submitted to fatigue tests fluctuates in connection with internal flaws, and reaches up to 4.5-5.5 years.

Conclusions: Studies in connection with fracture mechanics can reveal and explain coexistence of structural defects with significant long life-time for dental prostheses.

Key Words: fracture mechanics, resins, dental prostheses durability