**Distribusi Tegangan Gigi Pasca Perawatan Saluran Akar Kavitas MOD dengan Restorasi Komposit Direk Diperkuat Pita Fiber (Teknik *Wallpapering*) Menggunakan Metode Elemen Hingga**

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# ABSTRAK

Restorasi pasca perawatan saluran akar menjadi komponen penting dalam keberhasilan perawatan saluran akar. Kehilangan jaringan keras gigi pasca perawatan saluran akar dengan kavitas MOD menurunkan kekakuan gigi hingga mencapai 63%. Restorasi direk komposit dengan teknologi adhesif menjadi salah satu usaha untuk mempertahankan lebih banyak jumlah struktur gigi. Kelemahan restorasi komposit direk diperkuat dengan penambahan pita fiber *polyethylene* dan *e-glass* dengan teknik *wallpapering.* Metode elemen hingga merupakan metode yang dapat mensimulasikan distribusi tegangan akibat pemberian gaya kepada material. Tujuan penelitian ini adalah untuk mengetahui distribusi tegangan gigi pasca perawatan saluran akar dengan kavitas MOD yang direstorasi dengan komposit direk diperkuat pita fiber *polyethylene* dan *e-glass*. Penelitian ini adalah penelitian deskriptif menggunakan metode elemen hingga. Model solid 3D gigi molar pertama rahang bawah di modelkan perawatan saluran akar dan preparasi kelas II MOD pada *software Solidworks*. Simulasi elemen hingga dilakukan menggunakan *software Abaqus*. Hasil penelitian ini menemukan daerah tegangan tertinggi pada gigi maupun restorasi terjadi pada daerah *pit* dan *fisur* di oklusal, daerah CEJ di distal, dentin bagian bifurkasi, serta 1/3 servikal dentin akar. Nilai tegangan yang dihasilkan akibat gaya vertikal maupun lateral tidak melebihi kekuatan tekan maupun tarik dari struktur gigi dan restorasi. Kriteria kegagalan terjadi pada *interface* antara email dan komposit di permukaan oklusal dekat daerah titik pembebanan akibat gaya vertikal maupun horizontal baik pada restorasi komposit diperkuat pita fiber *polyethylene* maupun *e-glass.* Distribusi tegangan gigi pasca perawatan saluran akar kavitas MOD dengan restorasi komposit direk diperkuat pita fiber (teknik *wallpapering*) menggunakan metode elemen hingga menunjukkan konsentrasi tegangan tertinggi terjadi pada permukaan dekat daerah pembebanan, daerah yang sempit, cekung dan tajam, serta lebih ke apikal pada gigi pasca perawatan saluran akar. Tidak terjadi kegagalan struktur gigi dan restorasi akibat gaya vertikal maupun horizontal pada komposit direk diperkuat pita fiber *polyethylene* dan *e-glass*, tetapi terjadi inisiasi kegagalan pada permukaan temu email dan komposit di oklusal dinding bukal.

Kata kunci: gigi pasca perawatan saluran akar, kavitas MOD, restorasi direk, komposit diperkuat pita fiber, pita fiber, fiber *polyethylene*, fiber *e-glass*, teknik *wallpapering*, metode elemen hingga

***Stress Distribution of Endodontically Treated Tooth with MOD Cavity Restored with Ribbon Fiber Reinforced Composite (Wallpapering Technique) Using Finite Element Method***

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## *ABSTRACT*

*Restoration for endodontically treated tooth was an important factor determining outcome of endodontic treatment outcome. A lot of hard tissue loss after endodontic treatment with MOD cavity caused stiffness reduction up to 63%. Restoration direct composite with adhesive technology was intended to preserve more tooth structure. Reinforcing composite with polyethylene and e-glass using wallpapering method was an attempt to overcome shortcomings of direct composite restoration. The finite element method was able to calculate and simulate the stress distribution after loading applied to material. The aim of this research was to describe the stress distribution of endodontically treated tooth with MOD cavity restored with direct composite reinforce with polyethylene and e-glass. This research was a descriptive study using finite element method. The 3D mandibular first molar solid after endodontic treatment and class II MOD preparation was created using Solidworks software. Finite element simulation was carried out using Abaqus software. This study showed that the stress concentration located on occlusal pit and fissure, CEJ distal area, bifurcation on dentin, and the 1/3 cervical area of root dentin. Stress value generated after vertical and lateral force did not exceed the value of compressive and tensile strength of tooth dan restoration. Failure criteria was shown at the interface of email and composite near loading point area due to vertical load both on polyethylene and e-glass fiber ribbon reinforced composite restoration. Stress distribution of endodontically treated tooth with MOD cavity restored with ribbon fiber reinforced composite using finite element method showed that the highest stress concentration occurred on surface close to loading point, narrow, concave, and sharp area, and more apical for endodontically treated tooth. Neither tooth or restoration was failed after vertical and horizontal load. Interface between enamel and composite on occusal surface was found an initial failure.*

*Keywords: endodontically treated tooth, MOD cavity, direct composite restoration, fiber reinforced composite, ribbon fiber, polyehtylene fiber, e-glass fiber, wallpapering technique, finite element method*