A study to evaluate the effect of obturation technique on sealer cement thickness and dentinal tubule penetration (An in vitro study)

A thesis
Submitted to the college of dentistry,
University of Baghdad
In partial fulfillment of the requirements for
The degree of Master of Science
In conservative dentistry

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2008 **1429**

Abstract

This study was conducted to compare the average sealer cement film thickness and the extent and pattern of sealer penetration into dentinal tubules in association with four obturation techniques in curved root canals.

Mesial canals of 25 extracted mandibular molars were randomly divided among A Single matched Protaper gutta–percha cone**;** Warm vertical condensation Protaper Gutta-percha Obturation, matched taper Protaper with lateral Compaction; and Thermafil (12 canals per group). AH26 sealer cement was coloured blue-black using Sudan Black B dye.

Roots were sectioned 1, 3 and 5 mm from the apex. Each slide was examined at original magnification of 20X by mean of stereomicroscope and photographed by digital camera. The obtained digital images edited with ACDSee 9.0 program by using IBM computer (IBM Corporation, Armonk, New York), and images were capture as (JPEG) image. The cross-sectional area of the canal contents was analyzed using Adobe Photoshop CS3` (Adobe systems incorporated, USA) and to determine:

1. Average sealer cement thickness (measured at 10 points around the canal wall)
2. Depth of dentinal tubule penetration was scored using a four-quadrant.

They were determined at the 1, 3 and 5 mm levels. Data were analyzed statistically for effect of obturation technique and level of section on sealer thickness and on the depth and distribution of tubule penetration.

Thermafil results demonstrated superior GP adaptation at all levels with a mean overall sealer cement thickness of (41.4 **µ**m), followed by matched taper Protaper with lateral Compaction (50.7 **µ**m), Warm vertical

condensation Protaper Gutta-percha Obturation (56 μm) and A Single matched Protaper gutta–percha cone (88.3 μm).

Sealer cement penetrated dentinal tubules as far as the outer one-third of dentine, with greater penetration observed buccally or lingually. Penetration was not significantly affected by obturation technique, but on average was deeper and more frequent at the 3 and 5 mm levels than at the 1 mm level.

Conclusions Sealer thickness was strongly dependent on obturation technique. Assuming that minimal sealer thickness good measures of long-term sealing ability, Thermafil resulted in the best outcome. Consistent, extensive sealer penetration into dentinal tubules was seen and was unrelated to the obturation technique.