

**Republic of Iraq
Ministry of Higher Education
and Scientific Research
University of Baghdad/ College of Dentistry
Department of Conservative and Esthetic
Dentistry**



**A New Strategy for Strengthening Endodontically
Treated Teeth with the Use of Natural Collagen Cross-
Linking Agent “Proanthocyanidin”**

(A Comparative *in vitro* Study)

A Thesis Submitted to the Council of the College of Dentistry,
University of Baghdad, in Partial Fulfillment of the Requirements
for the degree of Doctor of Philosophy in Conservative and Esthetic
Dentistry

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**November
2019 A.D.**

**Rabi Al-Awwal
1441 A.H.**

Acknowledgments

First of all, thanks and praise to **Allah**, the Almighty, for inspiring and giving me strength and patience to complete this work, praying and peace be upon **His Prophet Mohammed and his Household**.

I am deeply indebted to the College of Dentistry, University of Baghdad, especially for the dean Prof. Dr. Nidhal H. Ghaib for her continuous and unlimited support for the postgraduate students.

I would also like to express my gratitude and respect to Prof. Dr. Adel Farhan, the chairman of the department of Conservative Dentistry at the University of Baghdad for his tremendous effort, scientific support and encouragement.

It is with immense gratitude that I acknowledge the support and help of my supervisor Asst. Prof. Dr. Abdullah Mohammed Wajeih Al-Shamma whose unique support and scientific suggestions have proved quite fruitful throughout the preparation of this thesis and being patient with me in accomplishing this work.

Special thanks and appreciation are due to all senior staff in the department of conservative dentistry for their help and valuable advice.

Special thank is dedicated to Dr. Hasanain M. Habeeb a wonderful human being, who has always inspired me with his endless enthusiasm and innate curiosity. A great example of how one fine friend could shape many more other lives.

I am very grateful to Dr. Salah Al-Ameri, Dr. Karar Mahboba, Ahmad Al-Sarraf, Mr. Shakir Mahood, Mr. Salih Abbas, Mr. Muhaned Abud and Mr. Alaa Abd Elshahib for their unforgettable efforts and assistance.

Heartily indebted to my wonderful family, especially my wife for her unlimited support and encouragement, thank you for putting up with me all those years.

Abstract

Objective: to investigate the efficacy of natural collagen cross linking agent (Proanthocyanidin) on the biomechanics of endodontically treated teeth when used as final step in endodontic irrigation protocol.

Specimens preparation: palatal roots of maxillary 1st molars were decoronated to obtain standardized root length of 12 mm and instrumented with ProTaper hand system up to F4. Specimens were allocated into three groups relative to the final irrigation protocol. **Group 1(control group):** irrigant was distilled water. **Group 2 (conventional group):** irrigants were NaOCl (5.25%)/EDTA (17%). **Group 3(tested group):** irrigants were NaOCl (5.25%)/EDTA (17%) followed by Proanthocyanidin. The specimens obturated with AH Plus sealer and gutta-percha using single cone technique. All the specimens were stored in an incubator at 37°C for one week.

Cytotoxicity test

Result: Proanthocyanidin with concentration of 0.07 was non-toxic material with cells viability of 95.33%.

Apical microleakage test

Results: group 3 demonstrated a significant lowest leakage followed by group2.

Fracture resistance of endodontically treated roots

Results: group 3 showed significantly the highest value followed by group1.

Fracture resistance of roots restored with fiber post and composite core

Results: the highest fracture resistance was observed in group 1 followed by group 3 then group 2 with no significant difference among all groups.

Microhardness test

Results: at 100 µm, group1 scored the highest values along the canals with no significant difference with group 3, while group 2 was significantly the lowest one. At 500 µm, group 1 was significantly the higher at all levels. Group 2 was higher than group 3 at coronal and middle thirds, while group 3 was higher than

group 2 at the apical third with no significant difference between them. For groups 1 and 2 and along the canals, the microhardness at 500 μm was higher than at 100 μm with no significant differences for group 1, while there were significant differences for group 2, whereas for group 3 the microhardness at 500 μm was significantly lowest than at 100 μm except at the apical third, where the difference was not significant. For all groups the microhardness was decreased in coronal-apical direction.

Flexural strength test

Results: the highest value was observed in group 3 with no significant difference with group 1, while group 2 showed significantly the lowest value.

Push-out bond strength of fiber post luted to root canal dentin with a self-adhesive resin cement

Result: group 3 scored the highest bond strength at coronal and middle levels, with no significant difference with group 2 at the middle third. Group 1 showed significantly the lowest values. In all groups, the coronal thirds showed higher value of bond strength than the middle thirds.

Push-out bond strength of obturation materials to root canal walls

Results: group 3 scored the highest bond strength at all levels, no significant difference with group 2 at coronal and apical thirds. Group 1 showed significantly the lowest scores. The bond strength decreased in coronal-apical direction. Group 1 showed 75% adhesive failure and 25% mixed. Group 2 showed 25% adhesive, 33.4% cohesive and 41.6% mixed failure, while group 3 showed 16.7% adhesive, 54.1% cohesive and 37.5% mixed failure.

Smear layer removal test using SEM

Results: group 2 was significantly more effective in removing the smear layer than other groups at all levels followed by group 3 and lastly group 1. Except at the apical third where no significant difference between group 2 and 3. For all groups the score of smear layer removal was decreased in coronal-apical direction.