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AINSHAMS DENTAL
JOURNAL

AIN SHAMS DENTAL JOURNAL
Official Publication of Ain Shams Dental School
June 2020 - Vol. XXIII

Comparative Evaluation Of Gutta Flow Bioseal Versus Two Different Root Canal Sealers.(In Vitro Study)

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ABSTRACT:

This study aimed to compare Guttaflow Bioseal, MTA-Fillapex, and Ah plus with regards to their adaptability on dentin interface and their effect on fracture resistance of the roots. Sixty single rooted human teeth were instrumented and divided into three groups according to the type of sealer used. All root canals were obturated with lateral condensation technique. Roots were subdivided into two subgroups according to the method of testing. Subgroup A (n=5) roots were cut longitudinally and evaluated for adaptability using scanning electron microscope, three readings were taken for the widest gap distances for each specimen. For subgroup B (n=15) roots were evaluated for fracture resistance using instron testing machine. Results showed that AH plus was superior to GuttaFlow Bioseal and MTA-Fillapex for both tests with no significant difference.

Introduction:

No doubt that the ideal outcome of root canal treatment is hard tissue closure which separate root canal content from naturally wet surrounding periapical environment to prevent any future predilection of re-infection, thus special attention should be paid to the interface between gutta percha, sealer and dentin walls on one side, body fluids and periodontium on the other side. Manufacturers took into consideration the favorable properties of MTA, and introduced MTA based sealers with higher flow, lower film thickness, shorter setting time and better handling properties than MTA. Further studies revealed better alternatives; bioceramic based sealers have shown excellent physical, mechanical and biological properties. Lately, a new attempt has been carried to combine the expansion property of silicon based sealers, better

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penetration of cold nanoparticulate gutta percha, and biomineralization of bioactive glass and introduced a new sealer" GuttaFlow Bioseal" in market which will be our material of study.

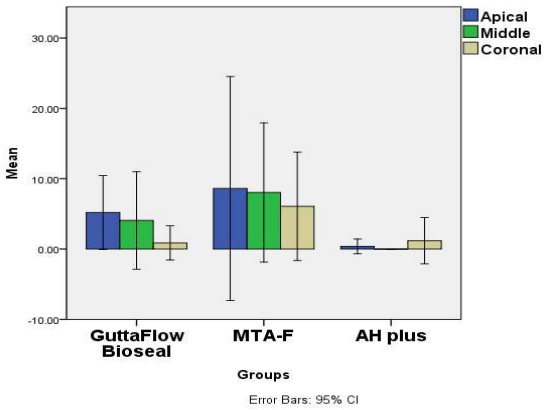
Materials and methods:

Sixty extracted human mandibular incisors with no signs of internal or external resorption were used. Root canals were instrumented using ProTaper Universal rotary files * up to F4. Irrigation with 2ml of 2.5 % NAOCL** and 17 % EDTA gel*** was done, then final rinse with saline was performed. All teeth were divided randomly into three groups according to the sealer used for obturation; GuttaFlow Bioseal group, MTA Fillapex group, AH plus group. All roots were obturated using lateral condensation technique and kept in 100% humidity at 37°C for 24 hours to ensure complete setting of sealers. Roots were subdivided into two subgroups according to the method of evaluation, *Subgroup a;* Roots were cut into 2 longitudenal sections and evaluated for adaptation of the sealer on the dentinal wall using SEM. Readings at the widest gaps were taken to evaluate a mean value for the gap distance at each third of the root. *Subgroup b;* roots were evaluated for fracture resistance using Instron universal testing machine**** in which vertical load of 5KN was applied at a crosshead speed of 1 mm/min until fracture occured. The load of failure was defined by sharp drop at load deflection curve recorded using computer software. Data were collected, tabulated and statistically analyzed using SPSS*****® Software******.

Results:

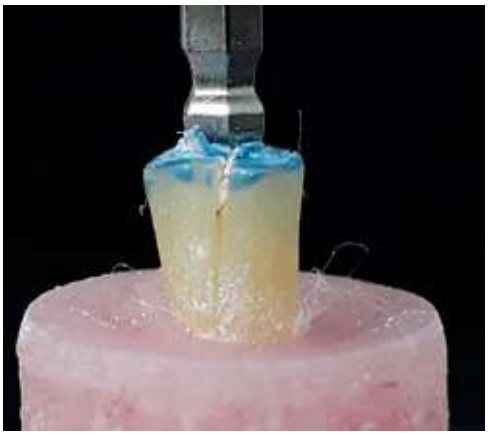
Adaptation: all materials showed both gap free and gap containing areas, however, AH plus was superior to GuttaFlow Bioseal and the worst was MTA-Fillapex. Statistically there was no significant difference between groups (p-value > 0.001).

Figure 1: Bar chart showing mean gap distance among groups.



B) Fracture resistance: AH plus group showed the highest mean value (357.96) followed by the MTA-F group (345.22) then GuttaFlow Bioseal group (262.60). Statistically there was no significant difference between the three groups (p<0.05).

Figure 2: A photograph showing vertical root fracture.



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**** Model 3345 england.

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****** SPSS, Version 25, Inc., an IBM Company, NY, USA.

Discussion:

The most common reason of failure of root canal treatment is bacterial invasion from filled root canals into the periapical tissues, thus a perfectly tight seal should be obtained in order to block the pathway of communication between root canal systems and periradicular tissues and gurantee long term success1. Therfore this study aimed to evaluate adaptability of Guttaflow bioseal on dentin surface versus the other two sealers. A strict cleaning protocol of the root canals was done before obturation, the instrumented root canals were flushed with EDTA gel after copious irrigation with NAOCL in order to remove smear layer. Smear layer adversely affect adhesion of sealers to dentin and increase the presence of gaps at sealer-dentin interface. Then the root canals were finally flushed with saline. 2, 3 Longitudinal root sections were scanned under SEM for measurement of gaps distances along sealer dentin interface. For the sake of accuracy, readings of the largest gap distance were measured and mean gap distance was calculated at each third of the root4. Results revealed the presence of both gap-free regions and gap-containing region in canals filled with the three materials, overall Ah plus sealer was superior to GuttaFlow bioseal at apical and middle thirds, while GuttaFlow Bioseal showed better adaptation at the coronal one third without a statistical significant difference. Our results are in agreement with studies held by Amoroso-silva et al5the canals were filled using the single cone technique. After setting, all samples were sectioned at 2, 4, and 6 mm from the apex. CLSM was used to analyze the gaps and sealer penetration into the dentinal tubules. All samples were scanned 10 mm below the dentin surface and images were recorded at 1003 magnification using the fluorescent mode. Additionally, the solubility, flowability and setting time of the sealers were evaluated. All the measured quantities of the examined materials were evaluated for significant differences by means of statistical analysis. The CLSM analysis of the MTA Fillapex showed the highest percentage of gaps at all sections (P 5 0.0001, Sevimay et al6 which stated that AH plus sealer was the best sealer regarding adaptability on dentin surface when compared with other sealers. On the other hand Zhang et al7 stated that Ah plus sealer was equivelant in adaptability to the bioceramic sealer, IRoot SP. Low adaptability of MTA-F on root dentin may be related to its chemical composition, the resinous component may adversely affect its bonding behavior.8MTA Fillapex, or AH Plus sealer by means of the gutta-percha lateral condensation technique. After 7 days, the roots were sectioned perpendicularly to its long axis, and the push-out test was carried out. The data were analyzed by using the Kruskal-Wallis and Dunn post hoc tests. RESULTS Endo-CPM sealer showed the highest values of bond strength to root dentin (8.265 MPa

Vertical root fracture is a serious complication that can occur in 11–20% endodontically treated teeth that eventually ends with tooth extraction.[9] For measurement of fracture resistance of specimens Instron testing machine was used. Vertical force was applied at 90° angle to the decoronated roots with loading rate of 1 mm/min until VRF occurred.[10] AH Plus sealer had the highest mean value for fracture resistance followed by MTA Fillapex sealer then GuttaFlow Bioseal without statistical significant difference. Our results agree with **Sagsen et al**[11]**, Mandava et al**[12]**, Mittal et al**[13] in which Ah Plus had the highest fracture reistance values in comparison with other sealers. This may be due to the formation of a covalent bond between the open epoxide ring of the epoxy resin sealer and amino groups in the exposed collagen of the root canal dentin[14]. In contrary, results of our study didn't agree with **Nagpal et al**[15]**, Patil et al**[16]**obturated using gutta-percha with three different sealers. Materials and Methods Seventy-five extracted mandibular incisors with intact and fully formed apices, exhibiting single root and canal were acquired. The teeth were decoronated obtaining a root segments of 15 mm and were divided into five groups (n = 15**, in which roots obturated with AH Plus sealer showed lower fracture reistance values than others obturated with bioceramic sealers, this may be explained by the incorporation

of Ca and Si in dentine that causes chemical, physical, structural modification of dentine and may result in higher acid resistance and strength[17].

Conclusions and recommendations:

- GuttaFlow Bioseal is bioactive material with less adaptability on dentin wall than the gold standard AH plus.
- The type of sealer used for obturation didn't affect fracture resistance of endodontically treated teeth.
- Further investigations using XRD to determine the crystalline phases of the globules formed on sealer surface and confirm quantitatively wether it's true apatite or not.
- Although the adaptability of sealers on dentin walls reflects the sealing quality, further investigation of sealing ability by other methods are needed.

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