بسم الله الرحمن الرحيم

﴿رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ
الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ
وَأَنْ أَعْمَلَ صَالِحاً تَرْضَاهُ
وَأَدْخِلْنِي بِرَحْمَتِكَ فِي عِبَادِكَ
الصَّالِحِينَ﴾

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Evaluation of Retrievability And Sealing Ability of GuttaFlow Bioseal

(An in vitro study)

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Dedication

I would like to dedicate this thesis to

My Dearest Mother

My Great Father

My Lovely siblings

My true friends

For their endless support and encouragement

This accomplishment would not have been possible without you

Thank you

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A hermetic three-dimensional obturation of the root canal system at the apical dentino-cemental junction is one of the conditions under which long-term successful root canal therapy can be achieved. The most common cause of endodontic failure is incomplete obturation which leads to leakage in the canal seal.

Gutta-percha is the most widely accepted root canal filling material. However it has a major drawback which is lacking of adaptation or adhesion to root canal walls that may lead to re-entry or re-growth of microorganisms in the root canal system. And this will irritate the periapical tissue and compromise the treatment success. Hence, the use of sealers in combination with Gutta-percha is mandatory.

Root canal sealers are necessary to seal the space between the dentinal wall and the obturating core interface. Sealers also fill voids and irregularities in the root canal, lateral and accessory canals, and spaces between gutta-percha points used in lateral condensation and serve as lubricants during the obturation process.

Different types of sealers with different properties including zinc oxide eugenol based sealers, calcium hydroxide sealers, glass ionomer based sealers, resin based sealers and bioceramic sealers were used but none of them fulfill the ideal requirements.

Adseal sealer is one of the most commonly used epoxy resin based sealers which provide excellent biocompatibility in an easy-

to-mix base and catalyst pastes. It features hermetic sealing ability because of its high flow properties, expansion during setting and decreased solubility in tissue fluids [1,2].

Bioceramic are biocompatible ceramic materials, inert to the human body, which are used in a variety of medical procedures. Endodontic applications include surgical root end filling material, root repair material, root canal sealer and pulp capping material.

MTA Fillapex is a bioceramic root canal sealer. It is designed to provide a high flow rate and a low film thickness for easy penetration of lateral and accessory canals. It contains 13% MTA and salicylate resin for their antimicrobial and biocompatibility properties [3,4].

Guttaflow bioseal is a recently introduced sealer to the market. It is considered a bioactive obturation material that seals and fills the root canal. Upon contact with fluids manufacturer claims that the bioactive material provides natural repair constituents such as calcium and silicates. It also activates biochemical processes that provide additional support for regeneration in the root canal. The idea is remarkably simple: after curing, the new GuttaFlow bioseal forms hydroxylapatite crystals on the surface. The crystals significantly improve adhesion and stimulates the regeneration of bone and dentine tissues. GuttaFlow

bioseal also combines free-flow gutta-percha with sealer at room temperature.

Athough these sealers can be regarded by some as an alternative to the other conventional sealers with gutta-percha, the retrievability of the root canal obturation material, and sealing ability of this new bioactive polydimethylsiloxane sealer has not been sufficiently evaluated.

Conventional endodontic retreatment is one of the greatest practical challenges faced by endodontists, as filling materials represent a mechanical barrier that can often demand considerable time and effort to be removed. It requires regaining access to the root canal system by removal of the original obturation filling material followed by cleaning, shaping and re-obturation.

Retrievability is defined as the process of removing something from somewhere that was not originally a part of it while removal means taking away formerly existent something from somewhere. In this section, literature was reviewed regarding efficient retrievability of different sealers.

1. Retrieval of root canal filling material

Maciel AC et al.[5] compared the retrievability of zinc oxide eugenol Endofill and epoxy resin based AH 26 sealers using different instruments. 100 extracted single-rooted teeth were obturated and divided into 2 groups. The remaining filling debris on the root canal walls were measured radiographically and roots were split for assessment in a stereomicroscope. Results showed that there was no significant difference between the filling materials on terms of their removal. Manual instrumentation left more filling debris on the root canal walls than automated instruments.

Ezzie et al.[6] compared the retrievability of gutta-percha and AH Plus sealer with Resilon/Epiphany obturation system. 60 single-canal teeth were instrumented and obturated. After retreatment the cleanliness of canal walls was determined by stereomicroscope and electron microscopy. Results showed that Resilon was faster to remove than GP with AH Plus. Apical thirds of root canals in all sample had more remaining filling material than middle and coronal thirds.

Hammad et al.[7] compared retrievability of different obturation materials including; gutta-percha and TubliSeal sealer, EndoRez points and EndoRez sealer, RealSeal points and RealSeal sealer and gutta-percha point and GuttaFlow sealer. 80 single-rooted teeth were collected, decoronated, and mechanically prepared. After retreatment teeth were scanned and volume measurements were carried out with micro–CT software. Results showed that all tested filling materials were not completely removed during retreatment by using hand or rotary files. Guttaflow left significantly less remaining material while TubliSeal with gutta-percha left more remanants than other groups.

Tasdemir et al.[8] compared retrievability of different obturation materials. 72 anterior teeth were instrumented with Mtwo rotary files. Teeth were randomly divided into 4 obturation groups as follows: group 1, Resilon and Epiphany; group 2,

GuttaFlow obturation system; group 3, EndoTwinn obturation system; group 4, gutta-percha with AH Plus sealer. After retreatment the amount of residual filling material on the canal walls measured. Results showed that Guttaflow and EndoTwinn groups left less remnants with no statistically significant difference among all 4 groups.

Somma et al.[9] compared retrievability of different obturation materials including gutta-percha and Kerr Pulp Canal Sealer, Resilon and Real Seal sealer and Resin-coated gutta-percha and EndoRez sealer using different instruments. 90 single-rooted teeth were instrumented and obturated. After retreatment canal wall cleanliness was evaluated through optical stereomicroscopy and scanning electron microscopy. Results showed that all instruments left remnants of filling material and debris on the root canal walls irrespective of the root filling material used, apical third had the greatest scores of filling remnants. EndoRez left less remnants than Kerr sealer and resilon.

Marfisi et al.[10] compared the retrievability of gutta-percha/AH plus with Resilon/Real Seal material using ProTaper Retreatment files, Mtwo Retreatment files and Twisted Files. 90 single root canals were instrumented and randomly allocated into 6 groups each with regards to the filling material and instruments used. Canal wall cleanliness was evaluated through optical microscope and