A Comparative Evaluation of The Antibacterial Properties of Diode Laser and Grape Seeds Extract as Cavity Disinfecting Agents against Streptococcus Mutans and their Effects on the Bond Strength to Glass Ionomer Restorative Material – an In-vitro study

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Dedication

To my beloved parents and sister, who always give me the strength and support throughout these years. Without your encouragement, this achievement wouldn’t be possible. No word can express how much I love you.

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List of abbreviations

AAPD: American Academy of Pediatric Dentistry

ART: Atraumatic Restorative Treatment

BHI: Brain Heart Infusion

CHX: Chlorhexidine gluconates

CFU: Colony forming units

ECC: Early Childhood Caries

FDI: Federation Dentaire Internationale

GIC: Glass Ionomer Cement

GSE: Grape Seeds Extract

HEMA: Hydroxyethyle methacrylate

MMP: Matrix Metalloproteinase

nm: nanometer

PBS: Phosphate buffer solution

SD: standard deviation

W: watt

WHO: World Health Organization

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Introduction

Introduction

Dental caries is one of the most common preventable childhood diseases [1] which occurs due to a dynamic process of demineralization and remineralization of enamel and dentin. This process stems from the production of organic acids by the cariogenic bacteria [2]. One common form of tooth decay is early childhood caries (ECC) which is characterized by the occurrence of one or more decayed, missed teeth due to caries, or filled tooth surfaces in any of primary teeth in a child under the age of six. It results from tooth-adherent bacteria that can be transmitted vertically from mother or caregiver to the child or horizontally from one child to another while sharing toothbrushes or drinking from the same cup or bottle [3].

The new era of minimum invasive dentistry which is also called micro-dentistry, aimed to keep teeth in function as much as possible. It advocates for maximum conservation of the remaining tooth structure rather than the old concept of G.V. Black; which supported the removal of sound dental tissue to prevent the occurrence of dental caries. However, it was found that placement of amalgam restoration after cavity preparation that follows the G.V. Black's concept, does not eliminate the "repeat restoration cycle" [4,5].

Thus, it was suggested that placement of adhesive materials, instead, would eliminate the need for removing healthy tooth structure to gain retention [5]. In addition, restorative/curative care should go hand-in-hand with the preventive care [5].

In this effect and in order to retain sound tooth structure, maintain its function and preserve its vitality, it was recommended that only the infected outer decomposed dentine need to be removed whereas removal of the affected inner demineralized dentine could be avoided assuming that it would undergo remineralization in the long run[6].

Based on some existing evidence, it has been reported that any bacteria left in the prepared cavity under a well-sealed restorations will be deprived from the source of nutrition required for acid production; thereupon, no further dentin demineralization would take place as long as the collagen fibers are intact[4,7]. Yet, on the other hand, some studies have raised concerns that bacteria left in the cavity might still multiply leading to secondary caries development [8,9,10].

Therefore, this study was conducted to test the efficacy of using two cavity disinfectants namely diode laser and grape seed extract under glass ionomer restorations in primary teeth.

Review of Literature

Review of literature

1. Dental Caries:

Dental caries is considered the most common chronic disease which affects people throughout their life [1]. Dental caries refers to localized destruction of dental enamel which arises from acidic by-product produced by the action of bacterial fermentation of dietary carbohydrates [1,11]. However, it is agreed that dental caries is a multifactorial disease which is initiated and aggravated by virtue of several risk factors, including a host which is the tooth structure and aciduric bacteria which colonizes the tooth surfaces in the presence of dietary substrate such as carbohydrates[12]. Moreover, the risk to develop tooth decay is influenced by the interaction between other determinants including the individual's socio-economic status, genetic makeup as well as psychosocial factors [1].

2. Early Childhood Caries (ECC):

Early childhood caries (ECC), nursing bottle caries, or baby bottle tooth decay are all terms used to indicate the