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التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

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HANAA ALY

Mechanical and Antimicrobial Properties of Glass Ionomer Cement Incorporated with Dragon Blood Tree Extract

Thesis Submitted to the Faculty of Dentistry
Ain Shams University in Partial Fulfillment of the
Requirements for the Master Degree in Pediatric Dentistry

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Dedication

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Symbol	Meaning
GIC	Glass ionomer cements
DBT	Dragon blood tree
ART	atraumatic restorative treatment
MID	minimal invasive dentistry
IPT	Indirect pulp treatment
IPC	indirect pulp capping
Na	Sodium
Al	Aluminum
Si	Silica
P	Phosphate
F	Fluoride
MgO	Magnesium Oxide
EEP	ethanolic extracts of propolis
CHX	chlorhexidine gluconate
CH	Chitosan
CHX-CT	Chlorhexidine-Cetrimide
TC	Triclosan
TiO2	Titanium oxide nanoparticles
Hap	Hydroxyapatite
CPP-ACP	Casein phosphopeptide-amorphous calcium fluoride phosphate
CESP	chicken eggshell powder
OSCC	human oral squamous cell carcinoma
PBS	phosphate buffered saline
DMEM	Dulbecco's Modified Eagle'ss medium

Introduction

Glass ionomer cements (GICs) are clinically attractive dental materials that have certain unique properties that make them useful as restorative materials. This includes adhesion to moist tooth structures, anticariogenic properties due to release of fluoride, thermal compatibility with tooth enamel, biocompatibility, and low toxicity. However, the use of GICs in mechanically loaded situation has been hampered by their low mechanical performance. Poor mechanical properties, such as low fracture strength, toughness and wear, limit their extensive use in dentistry[1].

Glass ionomer cements are often used in deep caries where antibacterial property is required. GICs lack this property so several attempts have been made to improve it [2].

Herbal and natural products have been used in dental and medical practice for thousands of years by ancient civilizations. Thus, researchers are stimulated by their physical and chemical properties. Today, they are very popular to be used in dentistry because of their high antimicrobial activity, biocompatibility, antioxidant, anti-inflammatory properties, availability, less toxicity, and cost effectiveness[3]. Therefore, it would be very appropriate to study and examine their properties, safety and efficiency [4].

Dragon blood tree “DBT” is a species plant in the Agavaceae family. It is a tree endemic in the Island of Socotra, Yemen[5]. DBT is one of the renowned traditional medicines. It has got several therapeutic uses: hemostatic, antidiarrheic, antiulcer, antimicrobial, antiviral, wound healing, antitumor, anti-inflammatory, antioxidant, etc. Despite its wide uses, little research has been done to assess its effectiveness in clinical applications[6].

Review of literature

In the past few decades, scientific developments in cariology, dental materials and diagnostic systems have changed dentistry's approach in diagnosis and management of dental caries. The dental restorative and adhesive materials gave us a new understanding of the caries process, remineralization and the changes in caries prevalence have catalyzed the evolution in caries management from G.V. Black's "extension for prevention" to "minimally invasive" [7].

Glass ionomer cements (GICs) have many clinical applications. GIC is used in; indirect pulp capping, atraumatic restorative treatment (ART), restorations in patients with high caries risk incidence, cementation of metal crowns, bands, and brackets. Moreover GIC is widely applied as sealing layer over pulpotomy, pit and fissure sealants, as well as in step-wise excavation, which is a corner stone of minimal invasive dentistry (MID) development [8–11].

The treatment of deep carious lesions approaching healthy pulp has always been a challenge in dentistry. Indirect pulp treatment (IPT) or indirect pulp capping (IPC) is recommended for teeth that have deep carious lesions with residual decay approximating the pulp with no signs or symptoms of pulp degeneration[11]. Various materials have been used as IPC such as GIC.

Conventional GIC shows good biocompatibility [12] and low setting exotherm [13]. It releases Sodium (Na), Aluminum (Al), Silica (Si), Phosphate (P) and Fluoride (F) under neutral conditions and Ca under