بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / حسام الدين محمد مغربي

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات : لا يوجد

PED-4M

“Evaluation Of Innovative 3D Printed Space Maintainer Versus Conventional One”

A Thesis Submitted to Faculty of Dentistry,

Ain shams University for partial fulfillment of the Master degree in

Pediatric Dentistry

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B.D.S 2014

Ain Shams University

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2022

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Acknowledgement

My sincere thanks go to Professor ***Dr. Islam Tarek Hassan*** Professor & Head of the Orthodontic Department, Faculty of Dentistry, Ain-Shams University, for his professional guidance, valuable insight and continuous support & reassurance throughout the course of this project.

I wish to express my deep appreciation and gratitude to ***Dr. Gehan Gaber Allam,*** Associate Professor of Pediatric Dentistry & Dental Public Health, Faculty of Dentistry, Ain-Shams University, for her scientific advice, constant help and for her huge efforts in accomplishing this research.

I am also grateful to all my professors and colleagues of the Pediatric dentistry and Public Health Department, Faculty of Dentistry, British University in Egypt and Ain Shams University for their great support and cooperation. who didn't hesitate to help me with my research.

My due thanks go to the children participating in this study and their parents for their cooperation and trust.

Dedication

*To my **Mother**,*

Thank you for your never ending love & support. Thank you for believing in me and always pushing me forward.

*To my **Father and Grandmother,***

For always encouraging and helping me to go on for a better future.

*To my **Husband,***

Without your patience, support and encouragement, I could not have achieved this.

*To my **Sister and Brother,***

For your constant love, help and support.

*To my **lovely Son Ali,***

You inspire me to be a better person as your smile brings the best out of me.

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SM	Space maintainer
B & L	Band and Loop
DB	Direct bonded
FRC	Fiber reinforced composite
3D	Three dimensional
FRCR	Fiber reinforced composite resin
STL	Standard tessellation language
SLA	Stereolithography
PI	Plaque index
GI	Gingival index
GIC	Glass ionomer cement
RMGIC	Resin modified glass ionomer cement

Introduction

The primary dentition plays a determining role in the child's growth and development of the occlusal relations and dentofacial structures.[1]

The premature loss of primary teeth due to caries, trauma, ectopic eruption and many other causes can lead to undesirable tooth movements of primary and/or permanent teeth including loss of arch length[2]. Arch length deficiency may produce or increase the severity of malocclusions with crowding, rotations, ectopic eruption, crossbite, excessive overjet, excessive overbite, and unfavorable molar relationships.[3]

The most effective way of preventing future malocclusion from tooth loss is to place an effective, durable, and economical space maintainer(SM).[4]

There are different kinds of appliances that can be used for space maintenance depending on the child's stage of dental development, dental arch, involved missing teeth, occlusion, patient's age, ability to cooperate and to tolerate an appliance.[5]

The conventional stainless steel band and loop (B&L) space maintainer is the most commonly used appliance among fixed space maintainers for single tooth loss.[4] B&L space maintainer adjusts easily to accommodate changing dentition as well as being economical and requiring little chair time.[6]

However, the fabrication of metal B&L consumes more time due to the laboratory work. In addition to many disadvantages as being

embedded in gingival tissues, cement dissolution, esthetic insufficiency and being unable to prevent rotation and tipping of abutment teeth.[5,6]

These disadvantages in addition to the rising interest in esthetic dentistry, have led to the development of newer materials & designs in the fabrication of space maintainers such as such as direct bonded (DB) SMs, fiber-reinforced composite (FRC) SMs, and prefabricated SMs.[7]

Nowadays, digital technology has raised the bar for searching for an alternative to overcome the drawbacks of the metal B&L space maintainers. Since the introduction of three dimensional (3D) printing, its area of dental application has increased widely[8].

3D printing, also known as additive manufacturing, is the process of making a solid object of virtually any shape based on a digital 3D model.[9] There is a wide range of machines and biocompatible materials that can be utilized with this technology. [10]

The advantage of using 3D scanning and printing in manufacturing space maintainers, is its ability to produce accurate custom made appliance without the need of impression making or laboratory work. In addition to, being cost and time efficient, as well as reducing the failure of the appliance as it is printed in one unit minimizing the chances of breakage.[10]

The availability of various 3D printing technology systems in several dental facilities and dental laboratories, and the technical advantages regarding its precision, time saving and quality, made it a strongly recommended substitute for regular conventional treatment modalities.