AinShamsUniversity
Faculty of Dentistry
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Effectiveness of Mepivacaine as a Primary Intraligamentary Injection Administered with Computer-Controlled Local Anesthetic Delivery System in Vital Pulpotomy (Interventional Study)

Thesis

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﴿رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي
أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ وَأَنْ أَعْمَلَ
صَالِحاً تَرْضَاهُ وَأَدْخِلْنِي بِرَحْمَتِكَ فِي
عِبَادِكَ الصَّالِحِينَ﴾
النمل:١٩

Dedication

This Thesis is lovingly dedicated to…

***My mother**, who taught me that success is not the key to happiness. Happiness is the key to success. If we love what we are doing, we will be successful.*

***My father**, who taught me that luck is not something that is given to us at random and should be waited for. Luck is the sense to recognize an opportunity and the ability to take advantage of it.*

***My sister & brothers,**who never cease to support me, motivated me to do a good work,encouraged me to try something new and taught me how to think.*

***My uncleSaadBarakat, my uncle Amin Barakatand their families,** who were a great help in my life.*

***All my respected teachers and professors,** who have inspired and guided me through every moment of my life.*

***My friends,** who have always advised me, never spare any effort to help me and trusted me to do this work.*

***My future wife,**who I will spend my rest of life with her.*

Everyone who spent his life searching for truth and knowledge.

In the Name of Allah, the Most Beneficent, the Most Merciful

Acknowledgment

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I, therefore, express my deepest gratitude to all those who contributed directly or indirectly to bringing this publication to this final format, because I would never have been able, by myself, to achieve this.

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May Allah, the Most High bless all of us, and may He cause the efforts of all involved to be purely for Him, and may He store its reward for us with Himself. Ameen.

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List of Abbreviations

Abbreviation	Definition
AMSA	anterior middle superior alveolar
ANOVA	analysis of variance
ASA	anterior superior alveolar
BM	behavior modification
CASI	conventional atraumatic syringe injection
CCLADS	computer-controlled local anesthetic delivery system
CDS-IS	computerized delivery system for intrasulcular
CFSS-DS	Dental Subscale of the Children's Fear Survey Schedule
CHEOPS	Children's Hospital of Eastern Ontario pain Scale
CNS	central nervous system
CVS	cardiovascular system
DPS	dynamic pressure sensing
ECS	Eland Color Scale
EDA	electronic dental anesthesia
EMLA	eutectic mixture of local anesthetics
FDA	Food and Drug Administration
FPS	Face Picture Scale
IAN	inferior alveolar nerve
IASP	International Association for the Study of Pain
IO	intraosseous
LA	local anesthesia

MBPS	Modified Behavioral Pain Scale
mg	milligram
mg/kg	milligram per kilogram
ml	milliliter
mm	millimeter
MRD	maximum recommended dose
MSA	middle superior alveolar
N_2O	nitrous oxide
P-ASA	palatal anterior superior alveolar
PDL	periodontal ligament
PDP	postoperative dental pain
pH	A measure of the activity of the solvated hydrogen ion
PSA	posterior superior alveolar
psi	pound per square inch
SEM	sound, eye &motor
STA	Single Tooth Anesthesia
TENS	transcutaneous electrical nerve stimulation
VAS	Visual Analogue Scales
VASOF	Visual Analog Scale of Faces
VDS	Venham Distress Scale
VRS	Verbal Response Scale

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Introduction

Dental anxiety and fear preoccupies the mind of many patients during dental procedures.[1,2]There is a high correlation of adult dental fear and avoidance stemming from childhood experiences.[3,4]For these patients, one of the disturbing aspects of dental treatment is the anxiety caused by the fear of dental injection.[5]When local anesthesia (LA) is administrated properly, it affords advantages such as child/patient comfort, cooperation, and increase operatory performance.[6]In pediatric dentistry, delivering a relatively painless injection is the key to having cooperative patient and a skill every pediatric dentist should strive to master. Having a cooperative patient can alleviate stress and wasted time.[7]

Despite the skill of operator and the care with which the injection is administered, the pain of the injection and the anxiety that comes with it continue to plague the profession.[7]

The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in term of such damage.[8]It can be conceptualized as a psychological phenomenon having both physiological and psychological component of perception and reaction to it.[9]

Numerous studies have been conducted in an effort to alleviate the discomfort associated with the injection.[10,11] Yet, the fact remains that 30-40 million people in the United States continue to be phobic and avoid dental treatment, while 90 percent of all dental patients report being anxious about going to the dentist and receiving an injection.[12]Because of this fact, dentists continue to look for better and more comfortable way to

deliver LA.[7] Topical anesthesia and increased injection time have been employed with limited results.[13] Even though these techniques have helped, they have not eliminated anxiety and fear in patients. Administrating local anesthetic via traditional injection continue to elicit a significant pain response in most dental patient, whether child or adult.[7]

Pediatric dentistry has seen many recent changes in both materials and equipment that have changed our everyday practice. The "Wand" appears to be another tool that we can employ in order to help our patients better accepts dental treatment.[14] In the mid1990s, the "wand" local anesthetic delivery system was introduced into the United States Dental Market Place.[15]The "Wand", a computerized local anesthetic delivery system, has been developed as a possible means of eliminating injection pain.[16] The "Wand" delivers anesthetic at a constant pressure and controlled volume, regardless of the resistance in the tissues. Slow injections can be regulated more precisely by this computerized system than the traditional syringe.[17] Precise regulation is important because pressure and volume are thought to be directly related to pain.[11]Although dentists have tried to regulate the pressure and volume of anesthetic given by pushing slowly with their thumbs, manual gauging is not perfect. Gauging the pressure and volume of the anesthetic injection is difficult because the amount of resistance and pressure needed varies with each individual.[17]

The purpose of this investigationwas to provide a well-controlled empirical evaluation of the effectiveness of theprimary intraligamentary injection administered with computer-controlled local anesthetic delivery system (CCLADS) for reducing the pain and discomfort experienced by children duringlocal injectionsand dental procedures. Given the proposed ability of the system to provide delivery of anesthesia under constant

pressure and controlled volume, we hypothesized that those children who experienced anesthesia administered by CCLADSwould report less pain, exhibit less pain behavior and report greater satisfaction with treatment, when comparedto children who experienced a traditional anesthetic injection method.