

**UNIVERSITI TEKNOLOGI MARA**

**THE EFFECTIVENESS OF  
MICRO-OSTEOPERFORATIONS IN  
ACCELERATING ALIGNMENT OF  
MAXILLARY ANTERIOR  
CROWDING: A RANDOMISED  
CLINICAL TRIAL**

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**PhD**

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## AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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## ABSTRACT

The demand for orthodontic treatment among adults is increasing considerably where the maxillary anterior crowding is known to be the major concern among patients rather than underlying skeletal problems. Patients' biological indicators are beyond the control of the orthodontist. However, several adjunctive modalities may have direct influence. This study aims to investigate the efficacy of micro-osteoperforations (MOPs) in the alleviation of maxillary anterior crowding during fixed appliance treatment, and its associated side effects related to root resorption and pain experience at six-months observation. This prospective, randomised, single-blind, single-centre, two-arm parallel was conducted at the UiTM Postgraduate Orthodontic Clinic. Thirty consecutive adult participants (25 females and 5 males; mean  $\pm$  SD age,  $22.66 \pm 3.27$  years) with 5-8mm moderate upper labial segment crowding were randomly allocated using block randomisation into intervention and control groups. All participants had first premolar extractions, bonded conventional fixed appliances and 0.014-inch followed by 0.018-inch nickel-titanium archwire were placed for initial alignment. The intervention group received 3-mm deep MOPs procedure under local anaesthesia using a Propel device (PROPEL Ortho Singapore) on the labial aspect of the maxillary incisors at every month visit until complete alignment. Treatment alignment duration was recorded, and alignment improvement percentage was observed from model casts for six months. Root resorption was measured blindly from long-cone periapical radiographs taken at the start and the sixth month of treatment. Both groups were given a prepared pain diary to complete over the first week, recording pain utilising of 100 mm Visual Analogue Scale at 24 hours, 3 days and 1 week. Data were analysed using Mann-Whitney U test, independent t-test, and repeated-measures analysis of variance. Median overall time taken to complete alignment for MOPs and the control group was 128 days (IQR 60) and 143.43 days (IQR 109) respectively, showed statistically no significant difference ( $p=0.818$ ). Root resorption within six months was 0.07mm (SD 0.39) in MOPs group and 0.17mm (SD 0.58) in the control group demonstrated no significant difference ( $p=0.589$ ). There was a statistically significant difference observed in perceived pain levels between MOPs and control group at all time points. Pain intensity gauged from mild to moderate pain for both groups, peaked at day 1 postoperatively then subsiding to baseline level at day 7. The present study found no evidence to support the implementation of MOPs in shortening the duration of orthodontic alignment phase. However, MOP is a safe and less traumatic procedure without exacerbating root resorption, pain intensity, and no scarring occurred.

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# TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>ii</b>
<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>xi</b>
<b>LIST OF FIGURES</b>	<b>xiii</b>
<b>LIST OF PLATES</b>	<b>xiv</b>
<b>LIST OF SYMBOLS</b>	<b>xvi</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xvii</b>
<b>LIST OF NOMENCLATURES</b>	<b>xx</b>
<b>CHAPTER ONE INTRODUCTION</b>	<b>1</b>
1.1 Research Background	1
1.2 Problem Statement	5
1.3 Research Objectives	5
1.4 Research Questions	6
1.5 Hypotheses	6
1.6 Significance of Study	6
1.7 Scope and Limitations of the Study	7
<b>CHAPTER TWO LITERATURE REVIEW</b>	<b>9</b>
2.1 Orthodontic Tooth Movement	9
2.1.1 Pressure Tension Theory	9
2.1.2 Bone Bonding Theory	10
2.1.3 Biology of Tooth Movement	10
2.1.4 Maxillary and Mandibular Bone Density	11