## TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
ABSTRACT (THAI)	iv
ABSTRACT (ENGLISH)	vi
LIST OF TABLES	xi
LIST OF FIGURES	xiii
CHAPTER 1 INTRODUCTION	1
Statement of the problems and objectives	1
CHAPTER 2 LITERATURE REVIEW	4
2.1 History of skeletal anchorage	4
2.2 Clinical assessment of sites for miniscrew implant	6
placement in dento-alveolar bone	
2.3 Availability of interradicular space for miniscrew	9
implant placement	
2.4 Dento-alveolar compensation in skeletal discrepancies	12
CHAPTER 3 MATERIALS AND METHODS	14
3.1 Dento-skeletal pattern factors	15
3.2 Interradicular space assessment	22

3.3 Other factors	24
3.4 Statistical analysis	25
CHAPTER 4 RESULTS	27
4.1 Dento-skeletal pattern	28
4.2 Effects of dento-skeletal pattern on the interradicular space	31
4.3 Effects of other factors on the interradicular area	37
CHAPTER 5 DISCUSSION	39
5.1 Skeletal pattern and dento-alveolar compensation	39
5.2 Effects of dento-alveolar compensation on the interradicular	43
space	
5.3 Effects of other factors on the interradicular area	47
CHAPTER 6 CONCLUSIONS	50
BIBLIOGRAPHY	51
APPENDIX A DESCRIPTION OF THE STATE OF THE S	59
A BRENDIN B	68
CURRICULUM VITAE  CURRICULUM VITAE	80

## LIST OF TABLES

Table	e Sharing a shar	Page
4.1	Error of the method in the present study	27
4.2	Results of cephalometric and mesiodistal tooth angulation measurements	28
4.3	The Pearson product-moment correlation coefficients between the	32
	angles formed between tooth axes and the interradicular areas	
4.4	The number of teeth in convergent and divergent tooth root groups and	32
	the differences between skeletal patterns	
4.5	Means and standard deviations of the interradicular distance	33
	measurements including the right and left sides of the maxilla and	
	mandible in the patients with skeletal Class I, II, and III relationships	
	and comparisons between the different skeletal patterns	
4.6	Means and standard deviations of the interradicular area measurements	35
	on the right and left sides of the maxilla and mandible in the patients	
	with skeletal Class I, II and III relationships and comparisons	
	between sides	
4.7	Means and standard deviations of the interradicular area measurements	36
	including the right and left sides of the maxilla and mandible in the	
	patients with skeletal Class I, II and III relationships and	

comparisons between the different skeletal patterns

4.8	The effects of sex, age, severity of malocclusion and presence or	37
	absence of the maxillary third molar on the interradicular areas in	
	the maxilla	
4.9	The effects of sex, age, severity of malocclusion and presence or	37
	absence of the mandibular third molar on the interradicular areas in	
	the mandible	
4.10	The interradicular area measurements between the present and	38
	absent maxillary third molar groups in the patients and	
	comparisons between these groups	

## ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright<sup>©</sup> by Chiang Mai University All rights reserved

## LIST OF FIGURES

Figur	Figure	
3.1	Smart'n Ceph researcher V9.0 digitizer software (Chiang Mai, Thailand)	16
3.2	Sagittal (A) and vertical (B) skeletal cephalometric measurements	20
3.3	Mesiodistal tooth angulation measurements of the maxillary teeth	21
3.4	Mesiodistal tooth angulation measurements of the mandibular teeth	21
3.5	Angle formed between tooth axes, interradicular area, and interradicular	23
	distance measurements at 3, 5, 7, 9, and 11 mm from the alveolar crest	
3.6	The custom-made digitizer software, Smart'n Ceph V 15.0 (Chiang Mai,	23
	Thailand)	
3.7	A schematic of periapical radiographs indicating locations of	23
	measurements	
3.8	The electronic digital caliper (A&D Company Ltd., Tokyo, Japan)	25
4.1	Schematics of characteristic dento-alveolar compensation in the patients	29
	with, A; skeletal Class I, B; skeletal Class II and C; skeletal	
	Class III relationships	
4.2	Mean mesiodistal tooth angulation values of the maxillary teeth in the	30
	control group, patients with skeletal Class I, II and III relationships	
4.3	Mean mesiodistal tooth angulation values of the mandibular teeth in the	30
	control group, patients with skeletal Class I, II and III relationships	