

# **The Use of Cone Beam Computed Tomography (CBCT) for Orthodontic Elaboration of Egyptian Cleft Lip and Palate Patients**

**A  
Thesis**

*Submitted to the Faculty of Dentistry  
Ain Shams University*

*In partial Fulfillment of the Requirements for  
Master Degree in Orthodontics*

**By**

**Eman Hossam El-Din El-Abbassy**

*B.D.S. (2005)  
Ain Shams University*

*Faculty of Dentistry  
Ain Shams University  
2012*

## *Supervisors*

### **Dr. Noha Ezzat Sabet**

Professor of Orthodontics  
Faculty of Dentistry- Ain Shams University

### **Dr. Dina Hussein El-Ghoul**

Lecturer of Orthodontics  
Faculty of Dentistry - Ain Shams University

### **Dr. Marwa Abd El-Wehab El-Kassabby**

Lecturer of Oral and Maxillofacial Surgery  
Faculty of Dentistry - Ain Shams University

# استخدام الأشعة المقطعية بالشعاع المخروطى للتوصيف التقويمى لمرضى شق الشفة والحنك المصريين

## رسالة

توطئة للحصول على درجة الماجستير  
فى تقويم الأسنان

## مقدمة من

الطبيبة / إيمان حسام الدين العباسى

بكالوريوس طب وجراحة الفم والأسنان  
( ٢٠٠٥ )

جامعة عين شمس

كلية طب الأسنان

جامعة عين شمس

٢٠١٢

## المشرفون

١٠٠ د / نهى عزت ثابت

استاذ تقويم الاسنان  
كلية طب الاسنان - جامعة عين شمس

د/ دينا حسين الغول

مدرس تقويم الاسنان  
كلية طب الاسنان - جامعة عين شمس

د/ مروة عبد الوهاب القصبى

مدرس جراحة الوجه و الفكين  
كلية طب الاسنان - جامعة عين شمس





# Acknowledgement

First of all, I would like to express my deepest gratitude and appreciation to **Professor Dr. Noha Ezzat Sabet**, Professor of Orthodontics, Faculty of Dentistry, Ain Shams University, for her great support, valuable instructions and continuous encouragement throughout the whole work. It is a great honor to work under her guidance and supervision.

My deepest appreciation and grateful thanks are to **Dr. Dina Hussein El-Ghoul**, Lecturer of Orthodontics, Faculty of Dentistry, Ain Shams University. Her valuable suggestions, close supervision and remarkable help are highly appreciated and will always be remembered.

I am truly grateful to **Dr. Marwa Abd El-Wehab El-Kassaby**, Lecturer of Oral and Maxillofacial surgery, Faculty of Dentistry, Ain Shams University, for her unique cooperation and great efforts throughout this work that would have never been completed without her extraordinary assistance and sincere guidance.

I would also like to express my deepest thanks to my dear professors, colleagues and staff members of Orthodontic Department, Faculty of Dentistry, Ain Shams University for their great support, encouragement and cooperation.

Last, but not least, I cannot express by any words my deep gratitude to my parents, brother and sister for supporting me throughout this work until it reached its end, as a part of their generous help throughout my life.

**Eman Hossam El-Abbassy**



To the soul of my uncle  
**Professor Dr. Ossman El-Abbassy,**  
who was and will always be my role model.





# LIST OF CONTENTS

Title	Page No.
<i>List of Figures</i> .....	i
<i>List of Tables</i> .....	vi
<i>List of Abbreviations</i> .....	x
I. Introduction.....	<b>Error! Bookmark not defined.</b> 1
II. Review of literature .....	<b>Error! Bookmark not defined.</b> 4
III. Aim of the study.....	<b>Error! Bookmark not defined.</b> 42
IV. Material and methods.....	<b>Error! Bookmark not defined.</b> 43
V. Results.....	<b>Error! Bookmark not defined.</b> 72
VI. Summary and conclusion .	<b>Error! Bookmark not defined.</b> 142
VII. Recommendations.....	<b>Error! Bookmark not defined.</b> 145
VIII. References .....	<b>Error! Bookmark not defined.</b> 146
IX. Appendix I.....	==
X. <u>Appendix II</u> .....	==
XI. <u>Arabic Summary</u> .....	==

# LIST OF FIGURES

Fig. No.	Title	Page No.
Figure (1):	<i>i-CAT</i> scanner ..... <b>Error! Bookmark not defined.</b>	44
Figure (2):	Patient positioning in <i>i-CAT</i> scanner. <b>Error! Bookmark not defined.</b>	45
Figure (3):	Preview screen..... <b>Error! Bookmark not defined.</b>	46
Figure (4):	MPR screen. .... <b>Error! Bookmark not defined.</b>	47
Figure (5):	a- MIP screen of synthesized lateral cephalometric image b- MIP screen of synthesized lateral cephalometric image with excision of the parietal bone..... <b>Error! Bookmark not defined.</b>	47
Figure (6):	Synthesized lateral cephalogram with a line drawn on the corner of the image to allow for correction of any magnification. <b>Error! Bookmark not defined.</b>	48
Figure (7):	Onyx Ceph Software Program. <b>Error! Bookmark not defined.</b>	49
Figure (8):	Digitization of the synthesized lateral cephalometric image. <b>Error! Bookmark not defined.</b>	50
Figure (9):	Synthesized lateral cephalogram showing Cranial base measurements. .... <b>Error! Bookmark not defined.</b>	51
Figure (10):	Synthesized lateral cephalogram showing Maxillary base measurements. .... <b>Error! Bookmark not defined.</b>	52
Figure (11):	Synthesized lateral cephalogram showing Mandibular base measurements. .... <b>Error! Bookmark not defined.</b>	53
Figure (12):	Synthesized lateral cephalogram showing Maxillary-Mandibular Jaw Relation measurements. .... <b>Error! Bookmark not defined.</b>	54
Figure (13):	Synthesized lateral cephalogram showing Dental measurements. .... <b>Error! Bookmark not defined.</b>	55
Figure (14):	Synthesized lateral cephalogram showing Soft tissue measurements. .... <b>Error! Bookmark not defined.</b>	56
Figure (15):	MIP screen of synthesized PA cephalometric image. <b>Error! Bookmark not defined.</b>	57
Figure (16):	Digitization of synthesized PA cephalometric image. <b>Error! Bookmark not defined.</b>	58

## LIST OF FIGURES (Cont...)

Fig. No.	Title	Page No.
Figure (17):	Landmarks, Reference lines and measurements used in PA analysis. ..... <b>Error! Bookmark not defined.</b>	59
Figure (18):	Synthesized axial view . <b>Error! Bookmark not defined.</b>	60
Figure (19):	Cranial base landmarks and reference system used in axial views analysis..... <b>Error! Bookmark not defined.</b>	61
Figure (20):	a- Antomic landmarks representing midfacial anatomy b- axial view showing landmarks and measurements used CBCT analysis of the midface ..... <b>Error! Bookmark not defined.</b>	62
Figure (21):	Synthesized axial views in different levels. <b>Error! Bookmark not defined.</b>	64
Figure (22):	Synthesized axial views showing unpaired measurements with respect to midsagittal construct a- ANS and nasal tip shift, b- nasal septum shift. .... <b>Error! Bookmark not defined.</b>	65
Figure (23):	Landmarks and measurements in axial views of the maxillary dentoalveolar complex.. <b>Error! Bookmark not defined.</b>	66
Figure (24):	Implant screen. .... <b>Error! Bookmark not defined.</b>	67
Figure (25):	Huddart/Bodenham scoring system. (a) Segmental divisions of the maxillary arch. (b) Incisor scoring. (c) Canine scoring. (d) Molar scoring. ..... <b>Error! Bookmark not defined.</b>	68
Figure (26):	3D model for assessment of Angle's classification. <b>Error! Bookmark not defined.</b>	69
Figure (27):	Pie chart representing gender distribution. <b>Error! Bookmark not defined.</b>	73
Figure (28):	Bar chart representing comparison between mean N-S-Ba in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	76
Figure (29):	Bar chart representing comparison between mean N-S (mm) in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	76

## LIST OF FIGURES (Cont...)

Fig. No.	Title	Page No.
Figure (30):	Bar chart representing comparison between mean SNA° in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	78
Figure (31):	Bar chart representing comparison between mean ANS-PNS in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	78
Figure (32):	Bar chart representing comparison between mean SNB°, MP/FH° and MP/SN° in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	80
Figure (33):	Bar chart representing comparison between mean Go-Pog in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	80
Figure (34):	Bar chart representing comparison between mean ANB° and PP/MP° in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	82
Figure (35):	Bar chart representing comparison between mean AO-BO in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	82
Figure (36):	Bar chart representing comparison between mean angular sagittal dental measurements in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	84
Figure (37):	Bar chart representing comparison between mean linear sagittal dental measurements in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	84
Figure (38):	Bar chart representing comparison between mean Ls-E line and Li-E line in UCLP patients and normal value. <b>Error! Bookmark not defined.</b>	86
Figure (39):	Bar chart representing comparison between mean N-S-Ba in boys and girls..... <b>Error! Bookmark not defined.</b>	87
Figure (40):	Bar chart representing comparison between mean N-S (mm) in boys and girls..... <b>Error! Bookmark not defined.</b>	87
Figure (41):	Bar chart representing comparison between mean SNA° in boys and girls. .... <b>Error! Bookmark not defined.</b>	89

## LIST OF FIGURES (Cont...)

Fig. No.	Title	Page No.
Figure (42):	Bar chart representing comparison between mean ANS-PNS in boys and girls.....	<b>Error! Bookmark not defined.</b> 89
Figure (43):	Bar chart representing comparison between mean SNB°, MP/FH° and MP/SN° in boys and girls.	<b>Error! Bookmark not defined.</b> 91
Figure (44):	Bar chart representing comparison between mean Go-Pog in boys and girls. ....	<b>Error! Bookmark not defined.</b> 91
Figure (45):	Bar chart representing comparison between mean ANB° and PP/MP° in boys and girls. ....	<b>Error! Bookmark not defined.</b> 93
Figure (46):	Bar chart representing comparison between mean AO-BO in boys and girls. ....	<b>Error! Bookmark not defined.</b> 93
Figure (47):	Bar chart representing comparison between mean angular sagittal dental measurements in boys and girls.	<b>Error! Bookmark not defined.</b> 95
Figure (48):	Bar chart representing comparison between mean linear sagittal dental measurements in boys and girls.	<b>Error! Bookmark not defined.</b> 95
Figure (49):	Bar chart representing comparison between mean Ls-E line and Li-E line in boys and girls.....	<b>Error! Bookmark not defined.</b> 96
Figure (50):	Bar chart representing comparison between horizontal asymmetry measurements of cleft and non-cleft sides in PA views.	<b>Error! Bookmark not defined.</b> 98
Figure (51):	Bar chart representing comparison between vertical asymmetry measurements of cleft and non-cleft sides in PA views.	<b>Error! Bookmark not defined.</b> 99
Figure (52):	Bar chart representing comparison between midline asymmetry measurements of cleft and non-cleft sides in PA views.	<b>Error! Bookmark not defined.</b> 100
Figure (53):	Bar chart representing comparison between degree of asymmetry in boys and girls in PA views.	<b>Error! Bookmark not defined.</b> 102

## LIST OF FIGURES (Cont...)

Fig. No.	Title	Page No.
Figure (54):	Bar chart representing comparison between sagittal asymmetry measurements of cleft and non-cleft sides in axial views. <b>Error! Bookmark not defined.</b>	105
Figure (55):	Bar chart representing comparison between transverse asymmetry measurements of cleft and non-cleft sides in axial views. <b>Error! Bookmark not defined.</b>	106
Figure (56):	Bar chart representing comparison between degree of asymmetry measurements in boys and girls in axial views. <b>Error! Bookmark not defined.</b>	108
Figure (57):	Pie chart representing ANS shift. <b>Error! Bookmark not defined.</b>	108
Figure (58):	Pie chart representing nasal septum shift. <b>Error! Bookmark not defined.</b>	109
Figure (59):	Pie chart representing nasal tip shift. <b>Error! Bookmark not defined.</b>	109
Figure (60):	Bar chart representing cleft side in boys and girls. <b>Error! Bookmark not defined.</b>	111
Figure (61):	Bar chart representing cleft site in boys and girls. <b>Error! Bookmark not defined.</b>	112
Figure (62):	Bar chart representing prevalence of missing teeth. <b>Error! Bookmark not defined.</b>	113
Figure (63):	Bar chart representing association between side of cleft and side of missing teeth..... <b>Error! Bookmark not defined.</b>	114
Figure (64):	Bar chart representing comparison between Huddart/ Bodenham scoring in boys and girls. <b>Error! Bookmark not defined.</b>	116
Figure (65):	Bar chart representing Angle's classification in boys and girls. .... <b>Error! Bookmark not defined.</b>	117