# Evaluation of Presurgical Oral Orthopedics vs. Conventional Taping in Management of Infants With Complete Cleft Lip and Palate; A Comparative Study

Α

Thesis

Submitted to the faculty of Dentistry

Ain Shams University

In Partial Fulfilment of the Requirements for Philosopher Doctorate (PhD) Degree in Orthodontics

By

# Noha Ibrahim Abd El-Rahman B.D.S (2002), M.D.S. (2009)

Faculty of Dentistry
Ain Shams University
2014

#### **Supervisors**

#### Dr. Khaled Moustafa Fawzi

Professor of Orthodontics

Faculty of Dentistry

Ain Shams University

#### Dr. Islam Tarek Hassan

Associate Professor of Orthodontics

Faculty of Dentistry

Ain Shams University

### Dr. Marwa Abdel-Wahab El-Kassaby

Associate Professor of Oral and Maxillofacial Surgery

Faculty of Dentistry

Ain Shams University

To my mother, Dr. Eglal Zaki Abd El-Hameed, nothing would have been possible without your love, encouragement, and constant rock solid support.....I owe you everything.

To my late father, Professor Dr. Ibrahim Abd El-Rahman. Hope I made you proud.

To my beloved husband. You have taught me a lot, encouraged and supported me. No thank you is enough.

To my sister and brother, thank you for always being there for me.

Last but never least, to both my hearts running around everywhere, To Khadijah and Othman.

#### Acknowledgement

I would like to express my deep gratitude and sincere appreciation to *Professor Dr. Khaled Moustafa Fawzi*, Professor of Orthodontics, Faculty of Dentistry, Ain Shams University. His valuable guidance and immeasurable support will always be sincerely remembered.

I would also like to extend my deepest thanks and sincere gratitude to *Associate Professor Dr. Islam Tarek Hassan*, Associate Professor of Orthodontics, Faculty of Dentistry, Ain Shams University for his valuable advice, devoted efforts, sincere support and immeasurable guidance in this study and over the years.

My profound gratitude to *Associate Professor Dr. Marwa El-Kassaby*, Associate Professor of Oral and Maxillofacial surgery, Faculty of Dentistry, Ain Shams University. Her exceptional assistance, valuable guidance, extreme patience, and devoted efforts will always be deeply remembered. This work could have never been completed without her extraordinary efforts and sincere guidance.

I wish to express my deep thanks and appreciation to *Associate Professor Dr. Mamdouh Abou El-Hassan*, Associated Professor of Pediatric Plastic Surgery, Abou El- Reish Pediatric Hospital, Faculty of Medicine, Cairo University for his valuable efforts, co-operation, and support in this study.

I would like to extend my sincere appreciation to *Professor Dr. Adel El-Geiheini*, Professor of Engineering, Faculty of Engineering, Alexandria University, for his valuable help in this study.

Last but not least, my most sincere gratitude is expressed to all my Professors, all my colleagues, and the staff members of the Orthodontic Department for their guidance, support, and immeasurable help all the time.

## **Table of Contents**

Acknowle	edgement	i
Table of C	Contents	iii
List of Figures		- vii
List of Ta	bles	xvii
Introducti	on	1
Aim of the Study		
Literature	Review	5
Pathog	enesis of Cleft Lip and Palate	5
Classif	ication of Cleft Lip and Palate:	9
>	Veau's classification:	9
>	Kernahan Classification	- 11
>	Modifications of Kernahan's Symbolic Classification:	- 12
>	Clock Diagram	- 13
Bilatera	al cleft lip and palate:	- 16
>	The Septo-premaxillary Ligament:	- 17
>	Direction of alveolar growth:	- 18
>	Maxillary underdevelopment:	- 18
Unilate	eral Cleft Lip and Palate:	- 20
Implica	ations of Cleft Lip and/or Palate	- 23
Early I	ntervention in Cleft Lip and/or Palate	- 25
>	Facial Binding (Taping)	- 26

>	Presurgical Infant Orthopedic Therapy	26
>	Nasoalveolar Moulding:	40
Patients ar	nd Methods	49
Patients	::	49
Method	s:	57
1- Di	agnostic Procedures and Primary Record Taking:	57
2- PS	SOT Appliance Construction, Delivery, and Follow-up:	63
3-Me	ethods of Assessment:	74
Results		95
I - BCL	P Group Results	97
>	Intra Group Changes:	98
>	Inter- Group Changes:	- 118
Sumi	mary of BCLP Results	- 128
Case	Presentation for BCLP Group	- 132
II- UCL	.P Group Results	- 138
>	Intra-Group Changes:	- 139
>	Inter- Group Changes:	- 157
Sumi	mary of UCLP Results	- 166
Case	Presentation for UCLP Group	- 170
Discussion	n	- 177
I- BCLI	P Group	- 184
II- UCL	.P Group	- 189
Summary	and Conclusions	- 195

Recommendations	201
Appendix I: Informed Consent	203
Appendix II: Diagnostic Sheet	205
Appendix III: List of Abbreviations	213
References	217

## **List of Figures**

Figure 1: Normal development of the face and palate7
Figure 2: Formation of the secondary palate. <sup>8</sup> 7
Figure 3: Orofacial clefts (A) Cleft lip and primary palate. (B) Cleft
palate. (C) Incomplete unilateral cleft lip and palate. (D) Complete
cleft lip and palate. (E) Complete bilateral cleft lip and palate. 88
Figure 4: Veau's classification. (A) Clefts of the soft palate alone (B)
Clefts involving the hard and soft palates (not extending anterior to
the incisive foramen) (C) Complete unilateral cleft lip and palate (D)
Complete bilateral cleft lip and palate. 11
Figure 5: Kernahan's striped Y classification. Areas 1 and 4 represent
the right and left sides of the lip, respectively. The alveolus is
represented by areas 2 and 5, the hard palate anterior to the incisive
foramen by areas 3 and 6, the hard palate posterior to the incisive
foramen by 7 and 8, and the soft palate by area 9. 12
Figure 6: To the right: Kernahan Stripped "Y", To the left: Modified
Stripped "Y" Circle 12 represents the posterior pharyngeal wall and
Circle 13 represents the premaxilla. 13
Figure 7: Unilateral and bilateral primary palate component
severity. <sup>15</sup>
Figure 8: The Clock diagram. 15
Figure 9: Bilateral cleft lip and/or palate16

Figure 10: (A) Normal sagittal relationships of nasal septum, basal
premaxillary bone and alveolar bone (AB). At birth note anterior
nasal spine lies posterior to anterior inferior angle of nasal septum.
(B) Sagittal relationship of a newborn infant with BCLP. The dento-
alveolar part protrudes to lie in same horizontal plane as basal
premaxillary bone, itself also protruded. Note position of ANS
alveolar bone and vomero-premaxillary suture. 16
Figure 11: Diagram showing horizontally oriented nasal tip,
depressed and stretched alar cartilages. The premaxilla is suspended
from the tip of the nasal septum and is covered by the prolabuim
which also lacks muscular tissue and is directly suspended from the
shortened columella. <sup>17</sup>
Figure 12: Diagram illustrating mechanism of phase I (vertical
deformity). To the right; normal relationship between nasal septum
and upper jaw showing symmetrical septo-premaxillary ligament. To
the left; unilateral restraint of non-cleft side pulls the growing septum
off course. 18
Figure 13: Diagram illustrating the production of phase II of vertical
deformity by interference with downward displacement of upper jaw
as maxillary growth on orbital and posterior free surfaces provides
the motive force. Non-cleft maxilla rotates medially, tilting
premaxillary region upwards. 18
Figure 14: Diagram showing concave alar rim. Note how the nasal tip
is depressed and displaced towards the non- cleft side. 17

Figure 15: Palatal and cross sectional view of the pin retained
appliance. <sup>23</sup>
Figure 16: A: Intraoral palatal base plate. B: a latex rubber traction
strip is attached to the palatal plate and loops around the prolabium to
retract the premaxilla. <sup>34</sup>
Figure 17: Acrylic resin plate with orthodontic buttons incorporated
just medial to the alveolar ridge. Preparation of elastomeric
orthodontic chain with resilient denture lining material over a glass
slab to obtain a smooth conatact surface over the skin of he
eprolabuim. Platal aspect of plate after relinig with resilient denture
liner for close adaptation to palatal tissues. Orthodontic power chair
attached32
Figure 18: Figure showing the intraoral palatal plate with sulci hooks
that attach to the adjustable elastic, and screw nuts that harbour the
surgical screws. Also showing the microplate position. <sup>36</sup>
Figure 19: Inside of the retrusion plate. 1: ventral plate; 2: posterior
plate; 3: screw; 4: soft lining. <sup>43</sup> 38
Figure 20: Showing NAM appliance and its mode of action when
inserted inside the nostril
Figure 21: A: Showing the appliance in place. B and C: bilateral and
unilateral appliance respectively.49
Figure 22: Organizational chart showing BCLP group divisions and
subdivisions. 50