

Contents

I Facial Embryology and Neonatal Palatal Cleft Morphology

1	Developmental Biology and Morphogenesis of the Face, Lip and Palate	
	<i>Alphonse R. Burdi</i>	
1.1	Summary	9
	References	10
2	Prenatal Diagnosis of Oral Clefts	
	<i>Jorge L. Gomez</i>	
	References	15
3	The Value of Longitudinal Facial and Dental Casts Records in Clinical Research and Treatment Analysis	
	<i>Samuel Berkowitz</i>	
3.1	Serial Cephaloradiographs and Casts of the Maxillary and Mandibular Dentition and Occlusion	17
3.2	The Beginning of Longitudinal Cleft Palate Research Studies	20
3.3	Research Methods	20
3.3.1	Retrospective Studies	20
3.3.2	Prospective Studies	20
3.3.3	Clinical Trials	20
3.3.3.1	Randomization of Surgical Procedures	20

3.3.3.2	The Ethics of Surgical Retrospective Clinical Trials (RCT)	21
3.3.3.3	Informed Consent	21
3.4	The Need for Geometric and Quantitative Analysis of Cleft Palate Casts	21
	References	22

4 Facial and Palatal Growth

Samuel Berkowitz

4.1	Maxillary and Mandibular Growth Concepts	23
4.1.1	Newborn Palate with a Cleft of the Lip or Palate	23
4.1.2	Genetic Control Theory: Craniofacial Growth is Entirely Predetermined	23
4.1.3	Functional Matrix Theory	23
4.1.4	Cartilage-Directed Growth: Nasal Septum Theory	25
4.1.4.1	Stimulation of Bone Growth – Is it Possible?	26
4.1.4.2	The Need to Prevent Collapse	26
4.1.5	Basion Horizontal Concept: The Direction of Facial Growth	28
4.2	Mandibular Development in Cleft Palate	30
4.3	Patterns of Postnatal Growth	31
4.3.1	Bone Remodeling During Growth	32
4.3.2	Maxillary Growth	33
	References	33

5	Alternative Method Used to Correct Distorted Neonatal Cleft Arch Forms <i>Samuel Berkowitz</i>	
5.1	Effects of Reversing the Facial Force Diagram	35
5.2	Variations in the Palate's Arch Form ...	35
5.3	Reversing Aberrant Cleft Facial Forces in the Neonate	35
5.3.1	Lip Surgery, Elastic Traction, or Presurgical Orthodontic Treatment	35
	References	40

II Types of Clefts

6	The Effect of Clefting of the Lip and Palate on the Palatal Arch Form <i>Samuel Berkowitz</i>	
6.1	Varieties of Cleft Lip and Cleft Palate ..	43
6.1.1	Action of Intact Facial Muscular Forces on the Maxillary Arch	43
6.2	Aberrant Muscle Forces in Clefts of the Lip and Palate	43
6.3	Categories of Clefts	45
6.3.1	Clefts of the Lip	46
6.3.2	Cleft Lip and Cleft Palate	48
6.3.3	Isolated Cleft Palate	50
6.3.4	Submucous Cleft Palate	52
6.4	Congenital Palatal Insufficiency (CPI) ..	53
	References	53
6A	Clefts of the Lip and Alveolus and Clefts of the Uvulae and Soft Palate <i>Samuel Berkowitz</i>	
6A.1	Clefts of the Lip and Alveolus	55
6A.2	Clefts of the Uvulae and Soft Palate and Cleft of the Uvulae Alone	60
6B	Complete Unilateral Cleft of the Lip and Palate <i>Samuel Berkowitz</i>	
6B.1	Facial Characteristics	63
6B1.1	The Oslo Study	64
6B1.2	Multicenter CUCLP Cephaloradiographic Study	64
6B1.3	Reflection on Ross' Excellent Multicenter Study	65

6B.2	How the Palate Grows	66
6B.3	Treatment Sequence	66
6B3.1	Usual Treatment Sequence	66
6B.4	Reports	66
	References	98
6C	Complete Bilateral Cleft Lip and Palate	
	<i>Samuel Berkowitz</i>	
6C.1	Premaxillary Protrusion: Real or Apparent. Is the Palate Deficient in Bone?	99
6C.2	The Premaxillary-Vomerine Suture	102
6C.3	Facial Growth Studies Show That Midfacial Retrusion Is Not Predictable	105
6C.4	Long-Term Facial Growth Findings Show Class III Outcomes Are Not Predictable	105
6C.5	The Vomer Flap: Good or Bad? Are all Vomer Flaps the Same?	108
6C.5.1	External Elastics Attached to a Head Bonnet or Elastic Tape Strapped to the Cheeks	108
6C.5.2	Uniting the Lip	109
6C.6	Profile Changes	109
6C.6.1	Why Some Premaxillae Continue to Project Following Lip Repair and Others Do Not	113
6C.6.2	Dental Occlusion	113
6C.6.2.1	After Birth	113
6C.6.2.2	In the Deciduous Dentition (3–6 Years of Age)	118
6C.6.2.3	Mixed Dentition (6–11 Years of Age)	118
6C.6.2.4	At Adolescence	118
6C.6.2.5	Retention	119
6C.7	The Following Case Studies Represent Conservative Surgical and Orthodontic Treatment Sequence	119
	References	190
6D	Isolated Cleft Palate	
	<i>Samuel Berkowitz</i>	
6E	Submucous Cleft Palate	
	<i>Samuel Berkowitz</i>	

7	Lip Pits; Orthodontic Treatment, Dentition and Occlusion; Associated Skeletal Structures <i>Samuel Berkowitz</i>	
7.1	Lip Pits	201
7.1.1	Pits of the Lower Lip in Cleft Lip and/or Palate – Genetic Considerations	201
7.1.2	Frequency	201
7.1.3	Morphology	202
7.1.4	Association with Other Malformations	203
7.1.5	Inheritance	204
7.1.6	Evidence of Heterogeneity	204
7.2	Orthodontic Treatment, Dentition and Occlusion	204
7.2.1	Crossbite Correction	204
7.2.1.1	Unilateral Cleft Lip and Palate	207
7.2.1.2	Bilateral Cleft Lip and Palate	208
7.2.1.3	Use of Orthopedic Forces to Correct Midfacial Recession	208
7.2.2	Supernumerary (Extra) Teeth, Missing Teeth, and Aplasia (Malformed Teeth)	208
7.2.3	Caries	209
7.3	The Relationship Between the Clefting Process and Contiguous Skeletal Structures ...	210
7.3.1	The Position of the Cleft Maxilla Within the Cranium and the Mandible	210
7.3.2	The Cranial Base	210
7.3.3	Relationship of the Nasal Cavity to Arch Form	211
	References	212
8	Pierre Robin Sequence <i>Samuel Pruzansky, Julius B. Richmond</i>	
8.1	Growth of Mandible in Infants with Micrognathia	215
8.1.1	Case 1	216
8.1.2	Case 2	218
8.1.3	Case 3	219
8.2	Comment	221
8.3	Summary and Conclusions	222
	References	222

III Facial Growth in Cleft Palate Children

9 Characteristics of Facial Morphology and Growth in Infants with Clefts

*Sven Kreiborg, Nuno V. Hermann,
Tron A. Darvann*

9.1	Introduction	225
9.2	The Danish Experience	225
9.2.1	Cleft Lip (CL)	227
9.2.2	Cleft Palate (CP)	227
9.2.3	Robin Sequence (RS)	227
9.2.4	Cleft Lip and Palate (CLP)	229
9.3	Discussion and Conclusions	229
9.3.1	Intuitive Visualization of the Location of Growth Differences	230
	References	234

10 Facial Growth and Morphology in the Unoperated Cleft Lip and Palate Subject: The Sri Lanka Study

Michael Mars

10.1	Sri Lankan Cleft Lip and Palate Project .	237
10.1.1.	Controls	238
10.1.2	Records Collected for Study	238
10.1.3	Radiographs	238
10.2	Unoperated Unilateral Cleft Lip and Palate	241
10.2.1	Dental Study Models	241
10.2.2	The GOSLON Yardstick	245
10.2.3	Unilateral Cleft Lip and Palate Study Models Analysis by Reflex Microscope	245
10.2.3.1	Arch Widths	245
10.2.3.2	Tooth Widths	245
10.2.3.3	Chord Lengths	246
10.2.3.4	Crossbites	246
10.2.3.5	Overjet	246
10.2.3.6	Missing Teeth	246
10.2.3.7	Crowding	246
10.2.4	Summary of Reflex Microscope Findings on Study Models: UCLP	247