

# Contents

<b>Foreword</b> .....					xix
<i>Panayotis N. Soucacos, MD, FACS</i>					
<b>Foreword</b> .....					xxi
<i>Robert A. Chase, MD</i>					
<b>Preface</b> .....					xxii
<b>Acknowledgments</b> .....					xxiv
<b>1. Principles of Thumb and Finger Reconstruction: Concept of Ray and Cascade</b> .....					1
<i>David T. W. Chiu, J. William Littler, and Joseph Upton</i>					
<b>1.1 Key Points</b> .....	1	<b>1.6 Thumb and Finger Reconstruction</b> .....			29
<b>1.2 Introduction</b> .....	1	1.6.1 To Begin, Know Your Patient .....			29
<b>1.3 Concept of Ray and Cascade</b> .....	1	1.6.2 Evaluation Phase .....			29
<b>1.4 The Essence of Hand Anatomy</b> .....	1	1.6.3 Formulation Phase .....			29
<b>1.5 Anatomical Characteristics of the Human Hand</b> .....	4	1.6.4 Execution Phase .....			30
1.5.1 The Skeletal System .....	5	1.6.5 Technical Considerations .....			31
1.5.2 The Musculotendinous System .....	13	1.6.6 Rehabilitation Phase .....			31
1.5.3 Intrinsic Muscles .....	14	1.6.7 Endpoint and Perspectives .....			31
1.5.4 Digital Extension .....	19	<b>1.7 Classification of Defects</b> .....			32
1.5.5 Thumb and Digital Flexion .....	22	1.7.1 Transverse Defects of the Thumb and Finger ...			32
1.5.6 Nervous System .....	24	1.7.2 Oblique Longitudinal Defects: Thumb, Fingers, and Hand .....			34
1.5.7 Vascular System .....	25	1.7.3 DDI (Digital Defect Index): An Indexing System for Evaluation of Thumb and Finger Loss .....			34
1.5.8 Integument System .....	28	<b>1.8 Functional and Aesthetic Subunits of the Hand</b> .....			38
<b>2. Transverse Zones I and II of the Thumb</b> .....					42
<i>Joseph Upton, Guy Foucher, David T. W. Chiu, and J.W. Littler</i>					
<b>2.1 Key Points</b> .....	42	<b>2.6 Principles of Reconstruction</b> .....			45
<b>2.2 Introduction</b> .....	42	<b>2.7 Reconstructive Options</b> .....			45
<b>2.3 Normal Anatomy</b> .....	43	2.7.1 Reconstructive Options Thumb Zone I .....			45
2.3.1 Critical Thumb Zone I .....	43	2.7.2 Reconstructive Options Thumb Zone II .....			46
2.3.2 Critical Thumb Zone II .....	43	<b>2.8 Illustrative Case Studies and Discussions</b> ...			46
<b>2.4 Deformity/Functional Deficit</b> .....	44	2.8.1 Case Study 02-01: Reattachment as a Composite Graft .....			46
2.4.1 Deformity/Functional Deficit Thumb Zone I ...	44	2.8.2 Case Study 02-02: Full-Thickness Hypothenar Skin Graft .....			48
2.4.2 Deformity/Functional Deficit Thumb Zone II ...	44	2.8.3 Discussion: Thumb Zone I and II Injuries .....			50
2.4.3 Terminology of Fingertip Losses .....	45	2.8.4 Case Study 02-03: Cross-Finger Flap .....			51
<b>2.5 Reconstructive Objectives</b> .....	45	2.8.5 Discussion: Cross-Finger Flaps to the Thumb ...			53

2.8.6	Case Study 02-04: Debridement and Local Flap Revision . . . . .	54	2.8.11	Lister's Treatment Algorithm: Thumb and Fingertip . . . . .	59
2.8.7	Discussion: The Painful Thumb . . . . .	55	2.8.12	Case Study 02-06: Chest Flap + Bone Graft . . . . .	60
2.8.8	Case Study 02-05: Palmar V-to-Y Advancement . . . . .	55	2.8.13	Case Study 02-07: Heterodigital Neurovascular Island Transfer . . . . .	60
2.8.9	Discussion: V-to-Y Flaps for Thumb and Fingertip Reconstruction . . . . .	57	2.8.14	Discussion: Distant and Regional Flaps for Secondary Reconstruction of the Distal Thumb . . . . .	63
2.8.10	Discussion: Reconstruction in Critical Thumb Zone II . . . . .	59	2.8.15	Discussion: Microvascular Reattachment in the Distal Thumb and Finger . . . . .	64
<b>3.</b>	<b>Transverse Zone III of the Thumb</b> . . . . .				66
	<i>Joseph Upton, Guy Foucher, Fu Chan Wei, David T. W. Chiu, and J. William Littler</i>				
<b>3.1</b>	<b>Key Points</b> . . . . .	66	3.8.8	Case Study 03-04: Local Advancement Flap Closure + FTSG in the Emergency Setting . . . . .	80
<b>3.2</b>	<b>Introduction</b> . . . . .	66	3.8.9	Case Study 03-05: Local Bipedicle Advancement Closure + FTSG as an Elective Reconstruction . . . . .	82
<b>3.3</b>	<b>Normal Anatomy Including Nail Complex</b> . . . . .	66	3.8.10	Discussion: Local Bipedicle Island Flap Advancement + FTSG . . . . .	82
<b>3.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	68	3.8.11	Case Study 03-06: Spare Parts Reconstruction of the Thumb . . . . .	84
<b>3.5</b>	<b>Reconstructive Objectives</b> . . . . .	68	3.8.12	Discussion: Spare Parts Reconstruction . . . . .	86
<b>3.6</b>	<b>Principles of Reconstruction</b> . . . . .	70	3.8.13	Case Study 03-07: Immediate "Custom-Made" Great Toe to Thumb . . . . .	87
<b>3.7</b>	<b>Reconstructive Options</b> . . . . .	70	3.8.14	Case Study 03-08: Immediate Modified or Trimmed Great Toe Transfer . . . . .	89
<b>3.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	72	3.8.15	Case Study 03-09: Elective Trimmed or Modified Great Toe Transfer . . . . .	91
3.8.1	Case Study 03-01: Primary Amputation Closure and Secondary Distraction Lengthening . . . . .	72	3.8.16	Discussion: Technique of Modified Wraparound and Trimmed Great Toe Reconstruction—Technical Considerations . . . . .	91
3.8.2	Discussion: Primary Closure . . . . .	72	3.8.17	Discussion: Immediate versus Delayed Thumb Reconstruction . . . . .	93
3.8.3	Case Study 03-02: Microvascular Reattachment . . . . .	74	3.8.18	Cases Study 03-10: Heterodigital Ring-to-Thumb Transposition . . . . .	94
3.8.4	Case Study 03-03: Distal Revascularization, Secondary Flexor Tendon Graft . . . . .	75	3.8.19	Case Study 03-11: Osteoplastic Reconstruction of the Thumb . . . . .	95
3.8.5	Discussion: Reattachment versus Primary Closure . . . . .	77	3.8.20	Discussion: Osteoplastic Reconstructions in Zone III of the Thumb . . . . .	97
3.8.6	Discussion: Use of Vein Grafts . . . . .	78	3.8.21	Case Study 03-12: Prosthesis . . . . .	97
3.8.7	Discussion: Venous Congestion . . . . .	78	3.8.22	Discussion: Prosthesis and Appearance . . . . .	98
<b>4.</b>	<b>Transverse Zone IV of the Thumb</b> . . . . .				99
	<i>Joseph Upton, Fu-Chan Wei, and David T. W. Chiu</i>				
<b>4.1</b>	<b>Key Points</b> . . . . .	99	<b>4.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	101
<b>4.2</b>	<b>Introduction</b> . . . . .	99	4.8.1	Case Study 04-01: Thumb Reattachment . . . . .	101
<b>4.3</b>	<b>Normal Anatomy</b> . . . . .	99	4.8.2	Case Study 04-02: Skeletal Reattachment + Groin Flap Coverage . . . . .	103
<b>4.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	99	4.8.3	Discussion: Technique of Groin Flap Transfer to the Hand . . . . .	105
<b>4.5</b>	<b>Reconstructive Objectives</b> . . . . .	99	4.8.4	Case Study 04-03: Failed Replantation and Secondary Osteoplastic Reconstruction . . . . .	107
<b>4.6</b>	<b>Principles of Reconstruction</b> . . . . .	100	4.8.5	Discussion: Failed Replants and Osteoplastic Reconstruction . . . . .	108
<b>4.7</b>	<b>Reconstructive Options</b> . . . . .	100	4.8.6	Case Study 04-04: Immediate Trimmed or Modified Toe Transfer . . . . .	109

4.8.7	Case Study 04–05: Second Toe to Thumb and Second Toe to Long Finger . . . . .	111	4.8.11	Case Study 04–08: Triple-Toe Transfer . . . . .	117
4.8.8	Case Study 04–06: Bilateral Thumb Reconstruction—Second Toe to Left Thumb and Trimmed Toe to Right Thumb . . . . .	113	4.8.12	Discussion: Anatomical Differences between Toes and Thumb . . . . .	120
4.8.9	Discussion: Technique and Nuances of “Trimmed” or “Modified” Toe Transfer. . . . .	114	4.8.13	Discussion: Which Toe to Choose? . . . . .	122
4.8.10	Case Study 04–07: Bilateral Thumb Reconstruction: Right, Osteoplastic; Left, Second Toe Transfer . . . . .	116	4.8.14	Discussion: Preparation of the Vascular Pedicle? . . . . .	124
			4.8.15	Study 04–09: Modified (Trimmed) Great Toe Transfer in a Child. . . . .	124
			4.8.16	Discussion: Congenital Differences and Thumb Construction . . . . .	126
<b>5.</b>	<b>Transverse Zone V Defect of the Thumb</b> . . . . .				128
	<i>Joseph Upton, David T. W. Chiu, Fu-Chan Wei, and J. William Littler</i>				
<b>5.1</b>	<b>Key Points</b> . . . . .	128	5.8.4	Case Study 05–03: The Painful, Parasitic Thumb Following Replantation . . . . .	135
<b>5.2</b>	<b>Introduction</b> . . . . .	128	5.8.5	Discussion: Thumb Salvage Failures . . . . .	137
<b>5.3</b>	<b>Normal Anatomy</b> . . . . .	128	5.8.6	Discussion: Release of the Thumb–Index Web Space Following Trauma . . . . .	137
<b>5.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	129	5.8.7	Case Study 05–04: Damaged Ring Finger to Thumb Transposition . . . . .	138
<b>5.5</b>	<b>Reconstructive Objectives</b> . . . . .	130	5.8.8	Discussion: Finger to Thumb Transposition . . . . .	140
<b>5.6</b>	<b>Principles of Reconstruction</b> . . . . .	130	5.8.9	Case Study 05–05: Immediate Trimmed Toe Reconstruction . . . . .	142
<b>5.7</b>	<b>Reconstructive Options</b> . . . . .	130	5.8.10	Case Study 05–06: Custom Hybrid Second Toe + Lateral Great Toe Flap Transfer to Thumb . . . . .	144
<b>5.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	131	5.8.11	Case Study 05–07: Metacarpal Distraction Lengthening + Creation of First Web Space (Phalangealization). . . . .	144
5.8.1	Case History 05–01: Elective Great Toe Transfer. . . . .	131	5.8.12	Discussion: Which Thumb Reconstruction Is Preferred? . . . . .	147
5.8.2	Case Study 05–02: Delayed Replant and Immediate Osteoplastic Reconstruction . . . . .	133	5.8.13	Discussion: Thumb Length and Options at Critical Levels IV and V. . . . .	148
5.8.3	Discussion: Cold and Warm Ischemia Time . . . . .	135			
<b>6.</b>	<b>Transverse Zone VI Defect of the Thumb</b> . . . . .				151
	<i>Guy Foucher, Joseph Upton, and Fu-Chan Wei</i>				
<b>6.1</b>	<b>Key Points</b> . . . . .	151	6.8.4	Discussion: Complete Loss of Phalangeal Thumb . . . . .	158
<b>6.2</b>	<b>Introduction</b> . . . . .	151	6.8.5	Discussion: Importance of DIP Fusion of the Second Toe. . . . .	158
<b>6.3</b>	<b>Normal Anatomy</b> . . . . .	151	6.8.6	Case Study 06–04: Great Toe Transfer with Dorsalis Pedis Pedicle Flap . . . . .	159
<b>6.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	152	6.8.7	Discussion: Skin Graft Placement—Hand or Foot? . . . . .	161
<b>6.5</b>	<b>Reconstructive Objectives</b> . . . . .	152	6.8.8	Case Study 06–05: Elective Trimmed (Modified) Great Toe Transfer—MP Joint Mobility Preserved. . . . .	161
<b>6.6</b>	<b>Principles of Reconstruction</b> . . . . .	152	6.8.9	Case Study 06–06: Trimmed (Modified) Great Toe Transfer—MP Joint Fused . . . . .	163
<b>6.7</b>	<b>Reconstructive Options</b> . . . . .	152	6.8.10	Discussion: Modification of the Great Toe Transfer . . . . .	165
<b>6.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	153	6.8.11	Case Study 06–07: Bilateral Second Toe Transfer for Adactyly, One MP Mobile, and One MP Fused . . . . .	167
6.8.1	Case Study 06–01: Thumb Reattachment . . . . .	153	6.8.12	Discussion: Thumb Length and Relative Importance of MP Mobility . . . . .	170
6.8.2	Case Study 06–02: Immediate Second Toe Transfer and Index Ray Resection . . . . .	154			
6.8.3	Case Study 06–03: Elective Second Toe Transfer. . . . .	156			

6.8.13	Case Study 06–08: Osteoplastic Reconstruction . . . . .	171	6.8.19	Case Study 06–11: Nonvascularized Toe Phalanx, Secondary Distraction Lengthening of the Thumb . . . . .	183
6.8.14	Case Study 06–09: Groin Pedicle Flap and Trimmed Great Toe Transfer . . . . .	172	6.8.20	Discussion: Distraction Lengthening of the Thumb at Critical Level VI. . . . .	185
6.8.15	Discussion: Osteoplastic Principles . . . . .	174	6.8.21	Case Study 06–12: Second Toe Transfer, Distraction of Ulnar Post. . . . .	185
6.8.16	Brief History of Thumb Reconstruction . . . . .	175	6.8.22	Case Study 06–13: Symbrachydactyly Treated with Customized Double Second Toe Transfer. . .	187
6.8.17	Discussion: Thumb Appearance, Contour and Revisions . . . . .	181	6.8.23	Discussion: Congenital Differences and Thumb Loss Critical Thumb Zone VI. . . . .	189
6.8.18	Case Study 06–10: Distraction Metacarpal Lengthening. . . . .	181			
<b>7.</b>	<b>Transverse Zone VII of the Thumb</b> . . . . .				191
	<i>Fu Chan Wei, Joseph Upton, David T. W. Chiu, and Guy Foucher</i>				
<b>7.1</b>	<b>Key Points</b> . . . . .	191	7.8.5	Discussion: Vascularized Toe Phalangeal Transfer Versus Finger Transposition . . . . .	201
<b>7.2</b>	<b>Introduction</b> . . . . .	191	7.8.6	Case Study 07–04: Free Custom-Made Distal Great Toe + Second Toe Transfer to Thumb. . . . .	201
<b>7.3</b>	<b>Normal Anatomy</b> . . . . .	191	7.8.7	Discussion: Are “Custom-Made”, “Double Toes” or “Twisted Toes” the Ultimate Reconstruction? . . . . .	203
<b>7.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	192	7.8.8	Case Study 07–05: Pedicle Flap Transfer + Second Toe Transfer. . . . .	203
<b>7.5</b>	<b>Reconstruction Objectives</b> . . . . .	192	7.8.9	Case Study 07–06: Groin Flap + Modified (Trimmed) Great Toe Transfer + Soft Tissue Revisions . . . . .	205
<b>7.6</b>	<b>Principles of Reconstruction</b> . . . . .	192	7.8.10	Case Study 07–07: Groin Flap with Complication Followed by ALT Flap + Trimmed (Modified) Toe Transfer . . . . .	207
<b>7.7</b>	<b>Reconstructive Options</b> . . . . .	192	7.8.11	Discussion: Strategic Planning, Details, and Execution . . . . .	210
<b>7.8</b>	<b>Illustrative Case Studies and Discussions</b> . . .	192	7.8.12	Case Study 07–08: Failed Replant, Groin Flap + Second Toe Transfer . . . . .	211
7.8.1	Case Study 07–01: Normal Index Finger Transposition to the Thumb . . . . .	192	7.8.13	Discussion: Options for Thumb Reconstruction and the Truth about Fasciocutaneous Flaps . . . . .	213
7.8.2	Case Study 07–02: Damaged Index Finger to Thumb Transposition . . . . .	196			
7.8.3	Case Study 07–03: Damaged Long Finger to Thumb Transposition . . . . .	198			
7.8.4	Discussion: Finger Transposition to Thumb . . . .	200			
<b>8.</b>	<b>Transverse Zone VIII of the Thumb</b> . . . . .				216
	<i>Joseph Upton, Fu Chan Wei, and David T. W. Chiu</i>				
<b>8.1</b>	<b>Key Points</b> . . . . .	216	8.8.1	Case Study 08–01: Reattachment of All Fingers and Thumb . . . . .	218
<b>8.2</b>	<b>Introduction</b> . . . . .	216	8.8.2	Discussion: Thumb and Hand Reattachment at the Mid-Palmar Level . . . . .	220
<b>8.3</b>	<b>Normal Anatomy</b> . . . . .	216	8.8.3	Case Study 08–02: Multiple Toe Transfer Following Vascular Catastrophe in Infancy . . . . .	220
<b>8.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	217	8.8.4	Case Study 08–03: Groin Flap, Modified (Trimmed) Great Toe Transfer . . . . .	223
8.4.1	Deformity . . . . .	217	8.8.5	Discussion: Vascular Compromise during and Following Toe or Free Tissue Transfer . . . . .	225
8.4.2	Functional Deficit . . . . .	217	8.8.6	Discussion: Foot Morbidity Following Great Toe Transfer . . . . .	227
<b>8.5</b>	<b>Reconstructive Objectives</b> . . . . .	217	8.8.7	Second Toe Harvest . . . . .	227
<b>8.6</b>	<b>Principles of Reconstruction</b> . . . . .	217	8.8.8	Great Toe Harvest . . . . .	227
<b>8.7</b>	<b>Reconstructive Options</b> . . . . .	217	8.8.9	Partial Great Toe and Second Toe Harvest . . . . .	229
<b>8.8</b>	<b>Illustrative Case Studies and Discussions</b> . . .	218	8.8.10	Multiple Toe Harvest . . . . .	230
			8.8.11	Case Study 08–04: Index Transposition . . . . .	230

8.8.12	Case Study 08–05: Partial Index Transposition . . . . .	232	8.8.17	Discussion: Transposition of Spare Parts into the Thumb Position. . . . .	241
8.8.13	Case Study 08–06: Distraction + Index Finger Transposition, Secondary Groin Flap . . . . .	234	8.8.18	Case Study 08–10: Second Toe Transfer to Thumb Metacarpal . . . . .	242
8.8.14	Case Study 08–07: Index Metacarpal Transposition, Metacarpal Distraction Lengthening . . . . .	236	8.8.19	Discussion: Thumbs in Aplastic Hands . . . . .	242
8.8.15	Case Study 08–08: Fifth Metacarpal Transposition to Thumb Position . . . . .	238	8.8.20	Case Study 08–11: Thumb Gigantism Treated with Great Toe Transfer . . . . .	244
8.8.16	Case Study 08–09: Index Stump Transposition + Prosthesis. . . . .	239	8.8.21	Discussion: CLOVES and pik3CA Patients . . . . .	246
			8.8.22	Discussion of Vascular Anomalies . . . . .	247
<b>9.</b>	<b>Transverse Zone IX of the Thumb</b> . . . . .				248
	<i>Joseph Upton, David T. W. Chiu, and Guy Foucher</i>				
<b>9.1</b>	<b>Key Points</b> . . . . .	248	9.8.5	Case Study 09–04: Second Toe to Thumb Transfer for Thumb Aplasia . . . . .	260
<b>9.2</b>	<b>Introduction</b> . . . . .	248	9.8.6	Discussion: Microvascular Transfers at Thumb Level IX. . . . .	262
<b>9.3</b>	<b>Normal Anatomy</b> . . . . .	249	9.8.7	Discussion: Approach to Reconstruction of the Severely Hypoplastic Thumb (German Types IIIB, IV, and V) . . . . .	263
<b>9.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	249	9.8.8	Case Study 09–05: Index Rotation–Recession Osteotomy . . . . .	265
9.4.1	Deformity . . . . .	249	9.8.9	Discussion: Limited Rotation–Recession Osteotomy . . . . .	267
9.4.2	Functional Deficit . . . . .	249	9.8.10	Case Study 09–06: Type IIIB Thumb Hypoplasia Treated with Second Toe Transfer . . . . .	268
<b>9.5</b>	<b>Reconstructive Objectives</b> . . . . .	249	9.8.11	Case Study 09–07: Type V Thumb Hypoplasia Treated with Formal Pollicization . . . . .	270
<b>9.6</b>	<b>Principles of Reconstruction</b> . . . . .	249	9.8.12	Discussion: Fanconi Anemia and Early Diagnosis . . . . .	273
<b>9.7</b>	<b>Reconstructive Options</b> . . . . .	249	9.8.13	Discussion: The Evolution and Refinement of the Technique of Pollicization for Congenital Differences. . . . .	274
<b>9.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	250	9.8.14	Discussion: Long-Term Outcomes of Pollicization. . . . .	280
9.8.1	Case Study 09–01: Fifth Finger Transposition to Thumb. . . . .	250	9.8.15	Case Study 09–08: Thumb Prosthesis . . . . .	283
9.8.2	Case Study 09–02: Monodactyly Associated with Cleft Hand/Cleft Foot Syndrome . . . . .	253			
9.8.3	Case Study 09–03: Foot to Hand Transfer . . . . .	256			
9.8.4	Discussion: One-Digit Hand. . . . .	259			
<b>10.</b>	<b>Transverse Zone X of the Thumb (Wrist Level)</b> . . . . .				284
	<i>David T. W. Chiu, Joseph Upton, and Fu Chan Wei</i>				
<b>10.1</b>	<b>Key Points</b> . . . . .	284	10.8.1	Case Study 10–01: Reattachment of Amputated Hand at the Wrist Level . . . . .	286
<b>10.2</b>	<b>Introduction</b> . . . . .	284	10.8.2	Discussion: Entire Hand Reattachment at the Wrist Level. . . . .	288
<b>10.3</b>	<b>Normal Anatomy</b> . . . . .	284	10.8.3	Case Study 10–02: Parascapular Flap + Second Toe Transfer . . . . .	288
<b>10.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	285	10.8.4	Case Study 10–03: Immediate Transfer of Long Finger to Forearm Following Crush Mutilation . . . . .	292
<b>10.5</b>	<b>Reconstructive Objectives</b> . . . . .	285	10.8.5	Discussion: Salvage Following Mutilating Injuries. . . . .	294
<b>10.6</b>	<b>Principles of Reconstruction</b> . . . . .	285	10.8.6	Case Study 10–04: Hand Allograft . . . . .	295
<b>10.7</b>	<b>Reconstructive Options</b> . . . . .	285	10.8.7	Discussion: Hand Allograft . . . . .	297
<b>10.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	286	10.8.8	Case Study 10–05: Cosmetic Hand Prosthesis for Amputated Hand . . . . .	298



<b>11. Transverse Zones I and II of the Finger</b> .....	300		
<i>Joseph Upton, Guy Foucher, and David T. W. Chiu</i>			
<b>11.1 Key Points</b> .....	300	<b>11.8.4 Discussion: Fingertips Reattached as Composite Grafts</b> .....	310
<b>11.2 Introduction</b> .....	300	<b>11.8.5 Discussion: Skin Grafts for Fingertip Injuries</b> ....	311
<b>11.3 Normal Anatomy</b> .....	300	<b>11.8.6 Case Study 11-04: Revascularization of Nonviable Fingertip in a Toddler</b> .....	312
11.3.1 Terminology.....	300	<b>11.8.7 Case Study 11-05: Revascularization of a Completely Amputated Fingertip</b> .....	313
11.3.2 The Hyponychium: Its Unique Characteristics.....	301	<b>11.8.8 Discussion: Microvascular Salvage in Critical Digital Zones II and III</b> .....	314
11.3.3 Nail Complex.....	303	<b>11.8.9 Case Study 11-06: V-to-Y Advancement Flap of a Finger</b> .....	315
<b>11.4 Deformity/Functional Deficit (Finger Zones I and II)</b> .....	305	<b>11.8.10 Case Study 11-07: Antegrade Homodigital Island Advancement Flap</b> .....	317
11.4.1 Zone I.....	305	<b>11.8.11 Discussion: V-to-Y Flap Indications</b> .....	318
11.4.2 Zone II.....	305	<b>11.8.12 Case Study 11-08: Multiple Cross-Finger Flaps</b> .....	319
<b>11.5 Reconstructive Objectives</b> .....	305	<b>11.8.13 Discussion: Cross-Finger Flaps</b> .....	321
<b>11.6 Principles of Reconstruction</b> .....	305	<b>11.8.14 Case Study 11-09: Elective Thenar Flap to Ring Finger</b> .....	322
<b>11.7 Reconstructive Options</b> .....	305	<b>11.8.15 Case Study 11-10: Thenar Flap for Palmar Oblique Loss of the Ring Finger</b> .....	324
11.7.1 Reconstructive Options, Zone I.....	305	<b>11.8.16 Case Study 11-11: Broad Thenar Flap to Index Finger</b> .....	325
11.7.2 Reconstructive Options, Zone II.....	305	<b>11.8.17 Discussion: Thenar Flaps</b> .....	326
<b>11.8 Illustrative Case Studies and Discussions</b> ...	306	<b>11.8.18 Discussion: How Much Bone Debridement with Thenar and Cross-Finger Flaps?</b> .....	327
11.8.1 Case Study 11-01: Reattach as Composite Graft in a Neonate, Tidy (Uncontaminated) Case.....	306	<b>11.8.19 Case Study 11-12: Retrograde (Reversed) Homodigital Island Flap</b> .....	328
11.8.2 Case Study 11-02: Composite Graft, Untidy (Contaminated) Case.....	307	<b>11.8.20 Case Study 11-13: Failed Initial Revascularization and Reversed Homodigital Island Flap</b> .....	330
11.8.3 Case Study 11-03: Reattach as a Composite Graft in a Septuagenarian.....	309	<b>11.8.21 Discussion: Homodigital Island Flaps</b> .....	332
<b>12. Transverse Zone III of the Finger</b> .....	334		
<i>Joseph Upton, Guy Foucher, Fu Chan Wei, and David T. W. Chiu</i>			
<b>12.1 Key Points</b> .....	334	<b>12.8.2 Case Study 12-02: Reattachment of Avulsion Amputation</b> .....	339
<b>12.2 Introduction</b> .....	334	<b>12.8.3 Case Study 12-03: Primary Reattachment of Amputated Parts and Delayed Thenar and Hypothenar Flaps</b> .....	340
<b>12.3 Normal Anatomy</b> .....	334	<b>12.8.4 Discussion: Microsurgical Salvage in Zones III and IV</b> .....	342
<b>12.4 Deformity/Functional Deficit</b> .....	335	<b>12.8.5 Case Study 12-04: Delayed Primary Modified Second Toe to Long Finger and Secondary Pulp Reduction</b> .....	344
<b>12.5 Reconstructive Objectives</b> .....	335	<b>12.8.6 Case Study 12-05: Second Toe to Index Finger as Primary Reconstruction</b> .....	346
<b>12.6 Principles of Reconstruction</b> .....	335	<b>12.8.7 Discussion: Isolated Distal Toe Transfers</b> .....	348
<b>12.7 Reconstructive Options (Zone III)</b> .....	336	<b>12.8.8 Case Study 12-06: Custom Partial Great Toe Transfer to Index Finger</b> .....	349
<b>12.8 Illustrative Case Studies and Discussions</b> ...	337	<b>12.8.9 Case Study 12-07: Custom Partial Great Toe Transfer to the Left Long Finger</b> .....	351
12.8.1 Case Study 12-01: Reattachment and Revascularization of Amputated Part.....	337	<b>12.8.10 Discussion: Nail Matrix Reconstruction</b> .....	352

12.8.11	Discussion: Custom-Made Fabrication . . . . .	353	12.8.15	Case Study 12–10: Gangrene, Vascular Insufficiency, V to Y, and Amputations . . . . .	358
12.8.12	Case Study 12–08: Primary Closure with Lateral V-to-Y Flaps . . . . .	354	12.8.16	Discussion: Vascular Insufficiency and Distal Gangrene . . . . .	358
12.8.13	Case Study 12–09: Cross-Finger Flap in an Older (Middle-Aged) Person. . . . .	355	12.8.17	Discussion: Prosthetic Wear at the Phalangeal Level . . . . .	360
12.8.14	Discussion: Preservation of the Finger Length. . . . .	357			
<b>13.</b>	<b>Transverse Zone IV of the Finger</b> . . . . .				<b>361</b>
	<i>Joseph Upton, Fu Chan Wei, David T. W. Chiu, and Guy Foucher</i>				
<b>13.1</b>	<b>Key Points</b> . . . . .	<b>361</b>	<b>13.8.5</b>	Discussion: Immediate versus Delayed Reconstruction . . . . .	<b>370</b>
<b>13.2</b>	<b>Introduction</b> . . . . .	<b>361</b>	<b>13.8.6</b>	Case Study 13–05: Elective Second Toe to Long Finger transfer. . . . .	<b>371</b>
<b>13.3</b>	<b>Normal Anatomy</b> . . . . .	<b>362</b>	<b>13.8.7</b>	Case Study 13–06: Elective Second Toe Transfer to the Left Long Finger. . . . .	<b>373</b>
<b>13.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	<b>362</b>	<b>13.8.8</b>	Discussion: Normal Digital Cascade and Other Factors . . . . .	<b>374</b>
<b>13.5</b>	<b>Reconstructive Objectives</b> . . . . .	<b>362</b>	<b>13.8.9</b>	Case Study 13–07: The Failing Toe Transfer (Lazarus Finger) . . . . .	<b>375</b>
<b>13.6</b>	<b>Principles of Reconstruction</b> . . . . .	<b>362</b>	<b>13.8.10</b>	Case Study 13–08: Cross-Hand Transfer of the Long Finger . . . . .	<b>378</b>
<b>13.7</b>	<b>Reconstructive Options</b> . . . . .	<b>362</b>	<b>13.8.11</b>	Discussion: Potential Complications and Patient Expectations . . . . .	<b>380</b>
<b>13.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	<b>363</b>	<b>13.8.12</b>	Case Study 13–09: Pedicled Second Toe to Fifth Finger Transfer . . . . .	<b>380</b>
13.8.1	Case Study 13–01: Immediate Reattachment of Amputated Digits . . . . .	363	<b>13.8.13</b>	Discussion: Unusual Indications for Toe Transfer . . . . .	<b>382</b>
13.8.2	Case Study 13–02: Immediate Second Toe Transfer to the Index. . . . .	365	<b>13.8.14</b>	Case Study 13–10: Distraction Lengthening at the Digital Level . . . . .	<b>383</b>
13.8.3	Case Study 13–03: Failed Replant Followed by Immediate Second Toe Transfer . . . . .	366	<b>13.8.15</b>	Case Study 13–11: Digital Lengthening Prior to Prosthetic Wear . . . . .	<b>384</b>
13.8.4	Case Study 13–04: Multiple Toe Transfers to Three Digital Amputations. . . . .	368	<b>13.8.16</b>	Discussion: Distraction Lengthening at Digital Level IV. . . . .	<b>385</b>
<b>14.</b>	<b>Transverse Zone V of the Finger</b> . . . . .				<b>388</b>
	<i>Joseph Upton, Fu-Chan Wei, and David T. W. Chiu</i>				
<b>14.1</b>	<b>Key Points</b> . . . . .	<b>388</b>	<b>14.8.4</b>	Case Study 14–04: Two Single Toe Transfers + Index Ray Resection . . . . .	<b>395</b>
<b>14.2</b>	<b>Introduction</b> . . . . .	<b>388</b>	<b>14.8.5</b>	Discussion: Reconstruction of a Finger in the Phalangeal Hand . . . . .	<b>397</b>
<b>14.3</b>	<b>Normal Anatomy and Anatomical Considerations</b> . . . . .	<b>389</b>	<b>14.8.6</b>	Discussion: Selection of Toes for Transfer . . . . .	<b>399</b>
<b>14.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	<b>389</b>	<b>14.8.7</b>	Discussion: Toe Placement and Appearance. . . . .	<b>399</b>
<b>14.5</b>	<b>Reconstructive Objectives</b> . . . . .	<b>389</b>	<b>14.8.8</b>	Discussion: Foot Morbidity Following Toe Transfer . . . . .	<b>401</b>
<b>14.6</b>	<b>Principles of Reconstruction</b> . . . . .	<b>389</b>	<b>14.8.9</b>	Discussion: Secondary Pulp Reduction of the Transferred Toe . . . . .	<b>404</b>
<b>14.7</b>	<b>Reconstructive Options</b> . . . . .	<b>390</b>	<b>14.8.10</b>	Case Study 14–05: Multiple Toe Transfers Transfers for Child with Constriction Ring Syndrome (CRS) . . . . .	<b>405</b>
<b>14.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	<b>390</b>	<b>14.8.11</b>	Case Study 14–06: Digital Transposition, Multiple Toe Transfers to Both Hands in CRS Patient . . . . .	<b>408</b>
14.8.1	Case Study 14–01: Simultaneous Second Toe Transfers to Index and Long Fingers. . . . .	390	<b>14.8.12</b>	Case Study 14–07: Ipsilateral Quad Toe Transfer of Four Toes to One Hand. . . . .	<b>410</b>
14.8.2	Case Study 14–02: Simultaneous Second Toe Transfers to Index and Ring Fingers . . . . .	392	<b>14.8.13</b>	Case Study 14–08: Multiple Local Releases, Index Transposition, Second Toe Transfer for CRS . . . . .	<b>413</b>
14.8.3	Case Study 14–03: Triple Toe Transfer to Hand . . . . .	393			

14.8.14	Discussion: Toe Transfers for Children with the Constriction Ring Syndrome . . . . .	416	14.8.19	Discussion: Unusual Indications and “Special Thumbs” . . . . .	423
14.8.15	Discussion: The Foot in the Constriction Ring Syndrome (CRS) . . . . .	417	14.8.20	Discussion: Thinking Out of the Box at Digital Level V . . . . .	423
14.8.16	Case Study 14-09: Symbrachydactyly, Transposition, Lengthening . . . . .	418	14.8.21	Case Study 14-11: Vascularized Toe PIP joint Transfer . . . . .	424
14.8.17	Discussion: Symbrachydactyly . . . . .	421	14.8.22	Discussion: Vascularized Joint Transfers. . . . .	426
14.8.18	Case Study 14-10: Thumb Polydactyly to Finger Transposition. . . . .	421			
<b>15.</b>	<b>Transverse Zone VI of the Finger (Distal)</b> . . . . .	<b>427</b>			
	<i>Fu-Chan Wei, Joseph Upton, and David T. W. Chiu</i>				
<b>15.1</b>	<b>Key Points</b> . . . . .	<b>427</b>	15.8.4	Discussion: Purpura Fulminans and the Hand . . . . .	436
<b>15.2</b>	<b>Introduction</b> . . . . .	<b>427</b>	15.8.5	Case Study 15-03: Burned Hands, Bilateral Type IIB Metacarpal Hands . . . . .	437
<b>15.3</b>	<b>Normal Anatomy</b> . . . . .	<b>427</b>	15.8.6	Discussion: Metacarpal Hands Following Burn Injuries. . . . .	441
<b>15.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	<b>427</b>	15.8.7	Case Study 15-04: Unilateral Metacarpal Hand, Type IA, Multiple Toe Transfers . . . . .	442
15.4.1	Deformity. . . . .	427	15.8.8	Case Study 15-05: Unilateral Double Toe and Trimmed (Modified) Great Toe Transfers to the Hand, Type IIC Metacarpal Hand . . . . .	443
15.4.2	Functional Deficit . . . . .	428	15.8.9	Case Study 15-06: Double Second-Third Toe Transfer in One Hand, Type IB Metacarpal Hand . . . . .	445
15.4.3	Metacarpal Hand . . . . .	428	15.8.10	Discussion: Unilateral Metacarpal Hand. . . . .	447
15.4.4	Classification of Metacarpal Hand . . . . .	428	15.8.11	Discussion: Bilateral Metacarpal Hands . . . . .	448
<b>15.5</b>	<b>Reconstructive Objectives</b> . . . . .	<b>430</b>	15.8.12	Discussion: Foot Donor Site with Multiple Toe Transfers . . . . .	449
<b>15.6</b>	<b>Principles of Reconstruction</b> . . . . .	<b>430</b>	15.8.13	Case Study 15-07: Symbrachydactyly Treated with Nonvascularized Phalangeal Transfers, Type IA Metacarpal Hand. . . . .	449
<b>15.7</b>	<b>Reconstructive Options</b> . . . . .	<b>430</b>	15.8.14	Discussion: Nonvascularized Toe Phalangeal Transfers . . . . .	451
15.7.1	Soft-Tissue Coverage . . . . .	430	15.8.15	Case Study 15-08: Typical Cleft Hand Reconstruction with Index Transposition, Bilateral . . . . .	452
15.7.2	Osteoplastic Reconstruction . . . . .	430	15.8.16	Discussion: Digital Transposition in Zone VI in the Typical Cleft Hand . . . . .	456
15.7.3	Skeletal Lengthening . . . . .	430			
15.7.4	Microvascular Toe Transfer . . . . .	431			
<b>15.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	<b>431</b>			
15.8.1	Case Study 15-01: Metacarpal Resection, Osteotomy, for Type IIA Metacarpal Hand. . . . .	431			
15.8.2	Discussion: Phalangealization . . . . .	433			
15.8.3	Case Study 15-02: Thumb and Digital Loss Treated with Transposition and Metacarpal Distraction. Type IIC Metacarpal Hand . . . . .	434			
<b>16.</b>	<b>Transverse Zone VI of the Finger (Proximal)</b> . . . . .	<b>457</b>			
	<i>Fu Chan Wei, Joseph Upton, and David T. W. Chiu</i>				
<b>16.1</b>	<b>Key Points</b> . . . . .	<b>457</b>	<b>16.7</b>	<b>Reconstructive Options</b> . . . . .	<b>458</b>
<b>16.2</b>	<b>Introduction</b> . . . . .	<b>457</b>	<b>16.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	<b>459</b>
<b>16.3</b>	<b>Normal Anatomy</b> . . . . .	<b>457</b>	16.8.1	Case Study 16-01: Reattachment of the Hand Amputated at the Mid-Proximal Metacarpal Level. . . . .	459
<b>16.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	<b>458</b>	16.8.2	Discussion: Thumb and Hand Reattachment . . . . .	461
<b>16.5</b>	<b>Reconstructive Objectives</b> . . . . .	<b>458</b>	16.8.3	Case Study 16-02: Hemi-Hand Amputation and Ectopic Implantation into the Forearm. . . . .	462
<b>16.6</b>	<b>Principles of Reconstruction</b> . . . . .	<b>458</b>			



16.8.4	Discussion: Ectopic Tissue Banking and Subsequent Transfer Back to the Hand . . . . .	464	16.8.10	Discussion: Combined Toe Composite Transfers and Donor Sites . . . . .	477
16.8.5	Case Study 16–03: Unilateral Type IIB Metacarpal Hand Following Traumatic Amputation at the Mid-Palmar Level . . . . .	465	16.8.11	Case Study 16–07: Bilateral Forefoot to Hand Transfers Following Frostbite Amputations . . . . .	479
16.8.6	Case Study 16–04: Severely Crushed Hands with No Fingers or Thumbs, Bilateral Metacarpal Hand, Type IIB (Right), IIC (Left), Treated with Five Toe Transfers . . . . .	467	16.8.12	Discussion: Bilateral Forefoot to Hands . . . . .	483
16.8.7	Case Study 16–05: Type IIB Metacarpal Hand Treated with Digital Transposition Followed by Several Second Toe Transfers . . . . .	470	16.8.13	Case Study 16–08: Index Finger Amputation . . . . .	483
16.8.8	Case Study 16–06: Triple Toe Transfers in a Type IID Metacarpal Hand, Followed by Partial Digital Loss . . . . .	473	16.8.14	Case Study 16–09: Partial Long Metacarpal Resection Followed by Index Transposition . . . . .	485
16.8.9	Discussion: Treatment Strategies in Type II Metacarpal Hands . . . . .	476	16.8.15	Discussion: Ray Transposition versus Primary Closure . . . . .	487
			16.8.16	Discussion: Ray Resection Indications and Functional Loss . . . . .	488
			16.8.17	Case Study 16–10: Ray Resection at the Proximal Metacarpal Level Due to “Index Neglect” . . . . .	489
			16.8.18	Discussion: Accept Defeat and Ablate the Useless Finger . . . . .	491
<b>17.</b>	<b>Longitudinal Palmar Defects Involving the Fingers and Thumb</b> . . . . .	<b>494</b>			
	<i>Joseph Upton, David T. W. Chiu, Fu Chan Wei, and Guy Foucher</i>				
<b>17.1</b>	<b>Key Points</b> . . . . .	<b>494</b>	17.8.10	Discussion: Free Great Toe Pulp Transfer to Thumb . . . . .	512
<b>17.2</b>	<b>Introduction</b> . . . . .	<b>494</b>	17.8.11	Case Study 17–06: Palmar Oblique Pulp Loss and Thenar Flap . . . . .	513
<b>17.3</b>	<b>Normal Anatomy</b> . . . . .	<b>494</b>	17.8.12	Discussion: Thenar Flaps for Palmar Pulp Loss of the Finger . . . . .	514
<b>17.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	<b>494</b>	17.8.13	Case Study 17–07: Pulp Loss of Previously Replanted Index Finger with Cross-Finger Flap . . . . .	515
17.4.1	Deformity . . . . .	494	17.8.14	Case Study 17–08: Painful Scar and RSD Treated with Cross-Finger Fascial Flap + STSG . . . . .	517
17.4.2	Functional Deficit . . . . .	495	17.8.15	Case Study 17–09: Extensive Pulp Loss of Multiple Fingers . . . . .	518
<b>17.5</b>	<b>Reconstructive Objectives</b> . . . . .	<b>495</b>	17.8.16	Discussion: Pulp Loss of the Fingers . . . . .	519
<b>17.6</b>	<b>Principles of Reconstruction</b> . . . . .	<b>495</b>	17.8.17	Case Study 17–10: Extensive Longitudinal Palmar Loss of a Finger Revascularized with a First Webspace Flap . . . . .	521
<b>17.7</b>	<b>Reconstructive Options</b> . . . . .	<b>495</b>	17.8.18	Discussion: Neurosensory First Web Toe Flap for Restoration of the Palmar Surface of the Long Finger . . . . .	524
<b>17.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	<b>497</b>	17.8.19	Case Study 17–11: Palmar Loss Covered with Antegrade Homodigital Flap . . . . .	524
17.8.1	Case Study 17–01: Traumatic Distal Pulp Loss . . . . .	497	17.8.20	Discussion: Local Island Flap Transfer for Other Regions of the Palm . . . . .	526
17.8.2	Case Study 17–02: Traumatic Avulsion of the Entire Thumb Pulp with Poor Outcome . . . . .	499	17.8.21	Case Study 17–11: Extensive Palmar Loss Secondary to Recurrent Dupuytren Contracture . . . . .	526
17.8.3	Case Study 17–03: Unsatisfactory Free Medial Instep Free Flap Followed by Heterodigital Neurovascular Island Flap . . . . .	501	17.8.22	Case Study 17–13: Extensive Loss of Palmar Surface on Two Fingers . . . . .	528
17.8.4	Discussion: Thumb Pulp Loss and Classic Heterodigital Neurovascular Island Flap . . . . .	503	17.8.23	Discussion: The Dorsalis Pedis Free Fasciocutaneous Flap . . . . .	530
17.8.5	Discussion: 40-Year Experience with the Heterodigital Neurovascular Island Flap (Littler Flap): Technical Caveats . . . . .	505	17.8.24	Case Study 17–14: Multiple Large Defects on the Thumb, Fingers, and Palm Covered with Scapular Flap . . . . .	531
17.8.6	Discussion: Palmar Advancement Flaps for the Thumb . . . . .	507	17.8.25	Discussion: Loss of Larger Defects of the Finger(s) or Thumb . . . . .	533
17.8.7	Case Study 17–04: Palmar Pulp Loss Treated with FDMA Island Flap (“Kite” or “Flap” Flap) . . . . .	508	17.8.26	Discussion: The Old versus the New Techniques . . . . .	534
17.8.8	Discussion: Heterodigital Island “Kite” or “Flag” Flaps from Dorsal to Palmar Surfaces . . . . .	509	17.8.27	Pulp and Glabrous Surface Reconstruction . . . . .	534
17.8.9	Case Study 17–05: Free Lateral Great Toe Pulp Flap to Thumb . . . . .	510			

<b>18. Longitudinal Dorsal Defects Involving the Fingers and Thumb</b> .....	541		
<i>Joseph Upton, David T. W. Chiu, and Fu-Chan Wei</i>			
<b>18.1 Key Points</b> .....	541	<b>18.8.5 Discussion: The Hyponychium and Its Unique Characteristics</b> .....	551
<b>18.2 Introduction</b> .....	541	<b>18.8.6 Discussion: Nail Complex Reconstruction—Is It Worthwhile?</b> .....	552
<b>18.3 Normal Anatomy</b> .....	541	<b>18.8.7 Case Study 18–04: Epigastric Flap + Extensor Reconstruction</b> .....	553
<b>18.4 Deformity/Functional Deficit</b> .....	542	<b>18.8.8 Case Study 18–05: Radial Forearm Fascial Flap + STSG to the Thumb</b> .....	555
18.4.1 Deformity .....	542	<b>18.8.9 Case Study 18–06: Complex, Compound Dorsal Digital Injury Following Failed Groin Flap</b> .....	557
18.4.2 Functional Deficit .....	543	<b>18.8.10 Case Study 18–07: Third Dorsal Metacarpal Artery Flap to a Finger</b> .....	559
<b>18.5 Reconstructive Objectives</b> .....	543	<b>18.8.11 Discussion: Coverage of Larger, Compound Defects on the Dorsum of the Fingers and/or Thumb</b> .....	560
<b>18.6 Principles of Reconstruction</b> .....	543	<b>18.8.12 Case Study 18.08: Parascapular Flap for Defect of Long Finger and Hand</b> .....	561
<b>18.7 Reconstructive Options</b> .....	544	<b>18.8.13 Case Study 18–09: Immediate Temporoparietal Fascial Flap (TPF) + Skin Graft Coverage of Complex Dorsal Injuries</b> .....	563
<b>18.8 Illustrative Case Studies and Discussions</b> ...	545	<b>18.8.14 Technique: Nuances of TPF Fascial Flap Dissection</b> .....	565
18.8.1 Case Study 18–01: Nail Complex Reconstruction with Modified Great Toe Wraparound .....	545	<b>18.8.15 Discussion: Fascial Flaps for Dorsal Surfaces</b> ...	568
18.8.2 Case Study 18–02: Nail Complex Reconstruction of Thumb with Trimmed Second Toe Transfer .....	547	<b>18.8.16 Discussion: Treatment of Larger Combined Losses of Fingers on Dorsal or Palmar Surfaces of the Hand</b> .....	568
18.8.3 Case Study 18–03: Lateral Great Toe and the First Web Space Flap to Index Digit .....	549		
18.8.4 Discussion: Dorsal Nail Reconstruction with Toe Transfers .....	550		
<b>19. Longitudinal and Oblique Loss of the Fingers and Thumb Involving the Lateral Surface</b> .....	570		
<i>Joseph Upton, David T. W. Chiu, and Guy Foucher</i>			
<b>19.1 Key Points</b> .....	570	<b>19.8.3 Discussion: Spare Parts and Lateral Oblique Injuries</b> .....	575
<b>19.2 Introduction</b> .....	570	<b>19.8.4 Case Study 19–03: First Dorsal Metacarpal Artery Flap (FDMA) for a Burn Contracture in the First Web Space for Burn Contracture</b> .....	576
<b>19.3 Normal Anatomy</b> .....	570	<b>19.8.5 Case Study 19–04: FDMA Flap to Index</b> .....	578
<b>19.4 Deformity/Functional Deficit</b> .....	571	<b>19.8.6 Discussion: First Dorsal Metacarpal Artery Flap (FDMA)</b> .....	579
19.4.1 Deformity .....	571	<b>19.8.7 Case Study 19–05: Index to Thumb Transposition as a Neurovascular Island + Free Flap to First Web Space</b> .....	580
19.4.2 Functional Deficit .....	571	<b>19.8.8 Discussion: Index Transposition for Lateral Defect of Thumb</b> .....	583
<b>19.5 Reconstructive Objectives</b> .....	571	<b>19.8.9 Case Study 19–06: Partial Great Toe Pulp Transfer</b> .....	583
<b>19.6 Principles of Reconstruction</b> .....	571	<b>19.8.10 Discussion: Free Great Toe Pulp Flaps</b> .....	585
<b>19.7 Reconstructive Options</b> .....	571	<b>19.8.11 Case Study 19–07: Adipofascial Flap Plus Skin Graft</b> .....	586
<b>19.8 Illustrative Case Studies and Discussions</b> ...	572	<b>19.8.12 Case Study 19–08: Immediate Fascial Flap Plus Skin Graft to Lateral Border of the Thumb for Gunshot Wound</b> .....	588
19.8.1 Case Study 19–01: Reattachment of the Amputated Part as a Composite Graft .....	572	<b>19.8.13 Discussion: Choice of Flap: Fascial Flap + Skin Graft versus Fasciocutaneous Flap</b> .....	590
19.8.2 Case Study 19–02: Extensive Lateral Digital Defect Covered with Spare Part .....	574		

19.8.14	Case Study 19–09: Chest Pedicle Flap to Lateral Thumb Surface . . . . .	591	19.8.16	From Prospective Amputation to Limb Salvage: Legacies of the American Civil War and Era of Microsurgery . . . . .	593
19.8.15	Discussion: Pedicle Flaps and Lateral Defects . . . . .	593			
<b>20.</b>	<b>Elective Incisions for the Finger, Hand, Wrist, and Forearm</b> . . . . .	596			
	<i>Joseph Upton, J. William Littler, and David T. W. Chiu</i>				
<b>20.1</b>	<b>Key Points</b> . . . . .	596	<b>20.8</b>	<b>Importance of the First Web Space and Incision Options for Reconstruction</b> . . . . .	608
<b>20.2</b>	<b>Introduction</b> . . . . .	596	20.8.1	The Thumb–Index (First) Web Space Anatomy and Functional Considerations . . . . .	608
<b>20.3</b>	<b>Pertinent Anatomy</b> . . . . .	597	20.8.2	Options for First Web Space Release . . . . .	610
20.3.1	Cleland Ligament (Septum) . . . . .	597	20.8.3	Teaching the Mechanics of the Z (Zed)-Plasty . . . . .	616
20.3.2	Grayson Ligament (Septum) . . . . .	597	<b>20.9</b>	<b>The Interdigital Web Spaces; Second (Index–Long); Third (Long–Ring); Fourth (Ring–Fifth)</b> . . . . .	618
20.3.3	Peritendinous Cutaneous Fibers . . . . .	597	20.9.1	Geometry and Relationships of the Interdigital Web . . . . .	618
20.3.4	Oblique Retinacular Ligament (ORL) (Septum) . . . . .	599	20.9.2	The Evolution of Incision Placement for Interdigital Web Release . . . . .	620
20.3.5	Transverse Retinacular Ligament (TRL) (Septum) . . . . .	599	20.9.3	Practical Lessons from Incisions Used for Correction of Simple Incomplete and Complete Syndactyly Releases . . . . .	620
20.3.6	Mid-Axial, Mid-Lateral, and Oblique Lines of the Finger and Thumb . . . . .	599	20.9.4	Preferred Incisions and Techniques for Syndactyly Release . . . . .	622
<b>20.4</b>	<b>Zigzag Incision Concept</b> . . . . .	600	<b>20.10</b>	<b>Wrist and Forearm Incisions</b> . . . . .	629
<b>20.5</b>	<b>Palmar Digital Incisions</b> . . . . .	602			
<b>20.6</b>	<b>Dorsal Digital Incisions</b> . . . . .	604			
<b>20.7</b>	<b>Palmar and Dorsal Hand Incisions</b> . . . . .	604			
20.7.1	Palmar Hand Incisions . . . . .	604			
20.7.2	Dorsal Hand Incisions . . . . .	607			
<b>21.</b>	<b>Degloving and Avulsion Injuries of the Fingers and Thumb</b> . . . . .	632			
	<i>David T. W. Chiu, Joe Upton and Fu-Chan Wei</i>				
<b>21.1</b>	<b>Key Points</b> . . . . .	632	21.8.2	Case Study 21–02: Ring Avulsion, Class IIav . . . . .	636
<b>21.2</b>	<b>Introduction</b> . . . . .	632	21.8.3	Discussion: Ring Avulsion Injuries (Classes I and II) with Intact Skeleton . . . . .	638
<b>21.3</b>	<b>Normal Anatomy</b> . . . . .	632	21.8.4	Case Study 21–03: Class IVd Ring Avulsion/Amputation . . . . .	639
<b>21.4</b>	<b>Deformity/Functional Deficit</b> . . . . .	632	21.8.5	Case Study 21–04: Class IVd Ring Avulsion . . . . .	641
21.4.1	Classification . . . . .	632	21.8.6	Case Study 21–05: Secondary Reconstruction Using Second Toe Transfer, Class IVc . . . . .	642
21.4.2	Deformity . . . . .	633	21.8.7	Discussion: Class IV Ring Avulsion Injuries . . . . .	644
21.4.3	Functional Deficit . . . . .	634	21.8.8	Case Study 21–06: Reattachment of Skin Envelope as a Composite Graft—Class IIIav . . . . .	645
<b>21.5</b>	<b>Reconstructive Objectives</b> . . . . .	634	21.8.9	Case Study 21–07: Ring Avulsion in an Older Patient, Class IVd . . . . .	647
<b>21.6</b>	<b>Principles of Reconstruction</b> . . . . .	634	21.8.10	Discussion: Central Amputations with or without Transposition . . . . .	648
<b>21.7</b>	<b>Options for Reconstruction</b> . . . . .	634	21.8.11	Discussion: Microsurgical Salvage in an Older Patient . . . . .	650
<b>21.8</b>	<b>Illustrative Case Studies and Discussions</b> . . . . .	635	21.8.12	Case Study 21–08: Avulsion Amputation of the Thumb, Class IVc,d . . . . .	650
21.8.1	Case Study 21–01: Ring Avulsion Class IIa . . . . .	635			

21.8.13	Case Study 21–09: Avulsion/Degloving Amputation of the Thumb—Groin Flap Followed by a Modified Wraparound Toe Transfer, Class IVC,p	652	21.8.14	Discussion: Avulsion Amputation of the Thumb	652
			21.8.15	Discussion: Similarities and Differences Between Ring Finger and Thumb Avulsion Injuries with Degloving	654
<b>22.</b>	<b>Degloving and Mutilation Injuries of the Hand and Wrist</b>	656			
	<i>David T. W. Chiu, Joseph Upton, and Fu-Chan Wei</i>				
<b>22.1</b>	<b>Key Points</b>	656	22.8.7	Discussion: Best Flap for Dorsal Hand Resurfacing?	671
<b>22.2</b>	<b>Introduction</b>	656	22.8.8	Case Study 22–05: Avulsion of All Palmar Skin	672
<b>22.3</b>	<b>Normal Anatomy</b>	657	22.8.9	Case Study 22–06: Incomplete Amputation of Hand from Water Ski Towrope Avulsion	674
<b>22.4</b>	<b>Deformity/Functional Deficit</b>	657	22.8.10	Discussion: Unique Palmar Surface	675
22.4.1	Deformity	657	22.8.11	Discussion: Incompletely Amputated Parts and Muscle Loss	676
22.4.2	Functional Deficit	657	22.8.12	Case Study 22–07: Dorsal and Palmar Degloving with Amputations	677
<b>22.5</b>	<b>Reconstructive Objectives</b>	657	22.8.13	Discussion: Spare Parts Salvage in the Circus Arena	679
<b>22.6</b>	<b>Principles of Reconstruction</b>	658	22.8.14	Case Study 22–08: Degloving Amputations of the Index and Thumb	679
<b>22.7</b>	<b>Reconstructive Options</b>	658	22.8.15	Case Study 22–09: Thumb and Triple Digital Avulsion/Amputations	681
<b>22.8</b>	<b>Illustrative Case Studies and Discussions</b>	658	22.8.16	Discussion: Mutilation and Multiple Digital Losses	684
22.8.1	Case Study 22–01: Bilateral Degloving, Multiple Finger Amputations	658	22.8.17	Case Study 22–10: Total Hand Avulsion and Multiple Finger and Thumb Amputations and Thumb Amputations Treated with Skin Graft + Phalangealization and Web Deepening	685
22.8.2	Case Study 22–02: Bilateral Crush/Avulsion Treated with Bone Graft and Free Dorsalis Pedis Flap	661	22.8.18	Case Study 22–11: Avulsion of Hand and All Fingers Treated with Groin Flap + Bone Graft, Secondary Second Toe Transfer	687
22.8.3	Case Study 22–03: Total Palmar and Dorsal Degloving Plus Amputations	664	22.8.19	Discussion: Traditional Procedures for Basic Hand Reconstruction	689
22.8.4	Case Study 22–04: Total Loss of All Dorsal Structures of the Metacarpals and Proximal Phalanges	666	22.8.20	Discussion: The Metacarpal-Like Hand	690
22.8.5	Discussion: Dorsal Hand Resurfacing	669			
22.8.6	Discussion: Secondary Reconstruction Following Dorsal Resurfacing	671			
	<b>Glossary</b>	695			
	<b>Bibliography</b>	697			
	<b>Index</b>	713			