

Contents

Introduction 1

GENERAL CONSIDERATIONS

1 Aims and Fundamental Principles of the AO Method 3

1.1 Aims of the AO Method 5

1.2 Basic Principles of the AO Method 10

1.2.1 Histology of Bone Healing in the Presence of Stable Internal Fixation 10

1.2.2 Bone Reaction to Compression 12

1.2.3 Bone Reaction to Movement 14

1.2.4 Reaction of Bone to Metallic Implants 16

1.2.5 Documentation 18

1.2.6 Surgical Bone Instruments 20

1.3 Principles of the AO Method 26

1.2.1 Inter-fragmental Compression 26

1.3.2 Splinting 27

1.3.3 Combination of Inter-fragmental Compression and Splinting 27

2 Means by Which Stable Internal Fixation is Achieved 27

2.1 Lag Screws 28

2.1.1 Cancellous Lag Screws 30

2.1.2 Cortical Screws 32

2.1.3 Technique of Screw Fixation 36

2.1.4 Orientation of Cortical Screws 40

2.2 Dynamic Compression with the Tension Band 42

2.2.1 Tension Band Wires 42

2.2.2 AO Wire Tightener 44

2.2.3 Combination of Tension Band Wire and Kirschner Wires 46

2.3 Standard AO Plates Grouped According to Shape 48

2.3.1 Straight Plates 52

2.3.1.1 Round Hole Plates 52

2.3.1.2 Tubular Plates 66

2.3.1.3 Dynamic Compression Plates (DCP) 70

2.3.2 Special Plates 80

2.3.3 Angled Plates 85

2.3.4 Mini-Implants and Mini-Instruments	102
2.4 Intra-medullary Nailing	104
2.4.1 AO Intra-medullary Nails	106
2.4.2 AO Intra-medullary Reamers	108
2.4.3 Technical Complications of Intra-medullary Reaming	110
2.4.4 AO Insertion Assembly for the Tibial and Femoral Nails	112
2.4.5 Complications of Nail Insertion	114
2.4.6 Technique of Open Intra-medullary Nailing of the Tibia	116
2.4.7 Technique of Open Intra-medullary Nailing of the Femur	118
2.4.8 Femoral Distractor	120
2.4.9 Closed Intra-medullary Nailing of the Tibia and Femur	124
2.5 External Fixators	126
2.5.1 Instrumentation	126
2.5.2 Correction of Rotational Alignment with the External Fixator	128
2.5.3 External Fixator and Compression	130
2.6 Composite Internal Fixation	132
3 Preoperative, Operative and Postoperative Guidelines	134
3.1 Organizational Prerequisites	134
3.2 Priorities in the Assessment and Treatment of Injuries	134
3.3 Timing of Surgery	134
3.4 General Guidelines for Operative Procedures	135
3.4.1 Planning	135
3.4.2 Preparation of the Operative Field	135
3.4.3 The Operation	136
3.4.4 Autologous Cancellous Bone Grafts	138
3.4.5 Wound Closure	140
3.4.6 Release of the Tourniquet	140
3.5 Postoperative Positioning and Treatment	142
3.5.1 Guidelines for Weight Bearing	144
3.5.2 Secondary Plaster Fixation	144
3.5.3 Education of the Patient	144
3.5.4 Prophylactic Antibiotics	144
3.5.5 Prophylaxis of Thromboembolism	145
3.5.6 Radiological Follow-Up of Bone Healing	146
3.6 Removal of Implants	148
3.6.1 Timing of Implant Removal	148
3.6.2 Technique of Metal Removal	148
3.6.3 Safeguards After Metal Removal	148
3.7 Postoperative Complications	152
3.7.1 Haematomas	152
3.7.2 Postoperative Pain	152
3.7.3 Infections	152
3.7.4 Refractures	153

3.8 Plate Fractures	154
3.8.1 Removal of Broken Screws	158
3.8.2 Removal of Broken Intra-medullary Nails	158

SPECIAL PART

Internal Fixation of Fresh Fractures	161
Introduction.	161
1 Closed Fractures in the Adult	164
1.1 Fractures of the Scapula	164
1.2 Fractures of the Clavicle	166
1.3 Fractures of the Humerus	168
1.3.1 Proximal Humerus	172
1.3.2 Fractures of the Shaft of the Humerus	174
1.3.3 Distal Extra-articular Metaphyseal Fractures (Type A)	178
1.3.4 Distal Intra-articular Fractures of the Humerus	180
1.4 Fractures of the Forearm	182
1.4.1 Fractures of the Olecranon	188
1.4.2 Fractures of the Radial Head	190
1.4.3 Fractures of the Shaft of the Radius and Ulna	192
1.4.4 Fractures of the Distal Radius	196
1.5 Hand Fractures	198
1.6 Acetabular Fractures	202
1.6.1 Surgical Approaches	202
1.6.2 Diagnosis of Acetabular Fractures	204
1.6.3 Classifications of Acetabular Fractures	206
1.6.4 Surgical Technique	208
1.6.5 Postoperative Care	208
1.7 Fractures of the Femur	210
1.7.1 Fractures of the Proximal Femur.	210
1.7.2 Fractures of the Femoral Shaft	228
Comminuted and Badly Comminuted Subtrochanteric Fractures	234
1.7.3 Fractures of the Distal Femur (Metaphyseal and Transcondylar Fractures)	242
1.8 Fractures of the Patella	248
1.8.1 Tension Band Fixation of Patellar Fractures	249
1.8.2 Fixation of Patellar Fractures Using Two Kirschner Wires and a Tension Band	250
1.8.3 Postoperative Care	250
1.9 Fractures of the Tibia	254
1.9.1 Fractures of the Tibial Plateaus	256
1.9.2 Fractures of the Tibial Shaft.	264

1.10 Malleolar Fractures	282
1.10.1 Malleolar Fractures Type A	292
1.10.2 Malleolar Fractures Type B	294
1.10.3 Malleolar Fractures Type C	296
1.11 Fractures of the Foot	300
1.12 Fractures of the Spine	304
2 Open Fractures in the Adult	306
3 Fractures in Children	319
3.1 Epiphyseal Plate Fracture Separations	320
3.2 Fractures of the Humerus	322
3.3 Fractures of the Radius and Ulna	324
3.4 Fractures of the Femur	326
3.5 Fractures of the Tibia	328
3.6 Malleolar Fractures	330
SUPPLEMENT	
Reconstructive Bone Surgery (M.E. MÜLLER)	333
Introduction	333
1 Delayed Union	334
2 Pseudarthroses	335
2.1 Non-infected Pseudarthroses	338
2.1.1 Pseudarthroses of the Arm	340
2.1.2 Pseudarthroses of the Leg	344
2.2 Previously Infected Pseudarthroses, Closed Pseudarthroses and Pseudarthroses with Bone Loss	350
2.3 Infected Pseudarthroses	352
3 Osteotomies	357
3.1 Osteotomies of the Arm	358
3.2 Osteotomies of the Leg	360
3.2.1 Intertrochanteric Osteotomies	360
3.2.2 Osteotomies of the Femoral Shaft	372
3.2.3 Supracondylar Osteotomies	376
3.2.4 High Tibial Osteotomies	378
3.2.5 Osteotomies of the Tibial Shaft	380
3.2.6 Supramalleolar Osteotomies	382
4 Arthrodeses	384
4.1 Arthrodesis of the Shoulder	384
4.2 Arthrodesis of the Elbow and Wrist	386

4.3 Arthrodesis of the Hip with the Cobra Plate (R. SCHNEIDER)	388
4.4 Arthrodesis of the Knee	390
4.5 Arthrodesis of the Ankle	392
 Bibliography	 397
 Index	 405
 Templates for Preoperative Planning I, II (to be found in a pocket attached to the back cover)	