Contents

DVD Contents ................................................................. xxii
Foreword by Marc F. Swiontkowski, M.D. .................................... xxviii
Foreword by Thomas P. Rüedi, M.D., F.A.C.S. ............................ xxix
Preface .................................................................. xxx
Contributors ............................................................... xxxii

Chapter 1 Care of the Soft Tissue Envelope ........................................ 1
David A. Volgas
Classification ................................................................. 1
Nonoperative Treatment ..................................................... 1
Surgical Treatment ............................................................ 2
Indications ................................................................ 2
Anatomy ................................................................ 2
Initial Wound Management .................................................. 3
Preoperative Considerations ............................................... 4
Surgical Techniques .......................................................... 5
New Techniques ............................................................ 14
Skin Graft Substitutes ......................................................... 14
Negative Pressure Wound Therapy (Vacuum-Assisted Closure) .... 14
Antibiotic Bead Pouch ....................................................... 14
Basic Science Research ...................................................... 15
Outcomes ................................................................ 15
Complications ............................................................... 15
Free Flap Complications ..................................................... 15
Rotational Flap Complications ............................................. 16

Chapter 2 Musculoskeletal Infection Associated with Skeletal Trauma .......... 20
Jeffrey O. Anglen and J. Tracy Watson
Prevention of Infection ....................................................... 20
Diagnosis ................................................................ 21
Diagnostic Laboratory Studies .............................................. 22
Imaging ................................................................ 22
Cultures ................................................................ 24
Staging and Classification .................................................. 25
Treatment ................................................................ 25
Pin or Wire-Site Infection ..................................................... 25
Acute or Subacute Infection with Stable Hardware ....................... 27
# Contents

## Chapter 3: Acute Compartment Syndrome

*Andrew H. Schmidt*

- Diagnosis ............................................. 44
- Technique for Measurement of Intramuscular Pressure .................................. 46
- Nonoperative Treatment .................................................................................. 47
- Surgical Treatment ......................................................................................... 47
- Fasciotomy ...................................................................................................... 49
- Outcomes ........................................................................................................ 54
- Complications .................................................................................................. 55
- New Techniques .............................................................................................. 55

## Chapter 4: Evolving Concepts in Plate Fixation

*Amir Matityahu, Christian Krettek, and Theodore Miclau III*

- History and Evolution of Plating .................................................................... 58
- Fracture Stabilization and Vascularity ............................................................ 59
- Locking Plating .............................................................................................. 61
- Evolution of Minimally Invasive Plating .......................................................... 62
- Locking Plates and Plating Systems ................................................................. 63
- Indications for Locked Plating ......................................................................... 63
- Surgical Technique for the Less-Invasive Stabilization System ....................... 63
- Surgical Technique for Condylar Locking Compression Plate .......................... 71
- Surgical Technique for 4.5 mm Proximal Tibial Locking Compression Plate .... 71
- Surgical Technique for Distal Tibia Locking Plates ........................................ 72
- Surgical Technique for Distal Radius Plates ................................................... 72
- Rehabilitation .................................................................................................... 73
- Outcomes .......................................................................................................... 73
- Complications .................................................................................................. 75

## Chapter 5: Treatment Strategy for Nonunions and Malunions

*Michael A. Miranda and Mary S. Moon*

- Evaluation ........................................................................................................ 77
- Surgical Treatment for Malunions .................................................................... 78
- Indications ......................................................................................................... 78
- Preoperative Planning ...................................................................................... 78
- Anatomy ............................................................................................................ 79
- General Principles of Internal Fixation for Malunions ..................................... 82
- Types of Deformity ............................................................................................ 82
- Osteotomies for Malunion Correction ............................................................. 84
- Surgical Techniques for Specific Malunions ..................................................... 85
- New Techniques for Malunion Correction ....................................................... 88
- Outcomes of Malunion Correction ................................................................... 88
- Complications of Malunion ............................................................................ 88
- Epidemiology of Nonunions ............................................................................ 89
- Classification of Nonunions ............................................................................. 89
- Evaluation of Nonunions ................................................................................ 89
- Surgical Treatment of Nonunions ................................................................... 90
- Intertrochanteric Osteotomy for Femoral Neck Nonunion ................................ 91
- Hypertrophic Tibial Shaft Nonunion .................................................................. 93
- Humeral Shaft Atrophic Nonunion .................................................................... 95
- Clavicle Nonunion ............................................................................................ 95
- Rehabilitation from Nonunion Surgery ............................................................ 96
# Contents

New Techniques for Malunions and Nonunions .................................................. 96
Bone Grafts and Bone Graft Substitutes ............................................................. 96
Outcomes of Nonunion Surgery ........................................................................ 98
Complications of Nonunion Surgery ................................................................. 98

Chapter 6 Injuries to the Cervicocranium ............................................................... 101
Carlo Bellabarba, Sohail K. Mirza, Jens R. Chapman
Nonoperative Treatment ...................................................................................... 101
General Concepts ............................................................................................... 101
Bracing ................................................................................................................. 101
Halo Orthosis ........................................................................................................ 101
Skeletal Traction .................................................................................................. 102
Injury Classification and Indications for Surgical Treatment .............................. 102
Occipital Condyle Fractures .............................................................................. 102
Craniocervical Dissociation .............................................................................. 102
Fractures of the Atlas ......................................................................................... 104
Atlantoaxial Instability ...................................................................................... 106
Odontoid Fractures ............................................................................................. 110
Traumatic Spondylolisthesis of the Axis (Hangman’s Fractures) ...................... 113
Surgical Treatment .............................................................................................. 118
Surgical Options ................................................................................................. 118
Patient Positioning .............................................................................................. 118
Radiographic Imaging ......................................................................................... 119
Surgical Approaches .......................................................................................... 119
Surgical Techniques ........................................................................................... 120
Postoperative Care ............................................................................................... 128
New Technology ................................................................................................. 128
Outcomes and Complications ........................................................................... 129
Injury-Specific Outcomes and Complications ............................................... 129
Treatment-Specific Outcomes and Complications .................................... 132

Chapter 7 Lower Cervical Spine Injuries ............................................................... 138
John Charles France
Injury Evaluation and Classification .................................................................. 138
Imaging ............................................................................................................... 140
Nonoperative Treatment ................................................................................. 142
Indications for Surgical Treatment ................................................................ 145
General Indications ........................................................................................... 145
Neurological Deficit .......................................................................................... 145
Stability ............................................................................................................... 145
Facet Joint Dislocation ..................................................................................... 145
Burst and Teardrop Fractures .......................................................................... 145
Lateral Mass Fractures ...................................................................................... 146
Surgical Treatment ............................................................................................ 146
General Considerations .................................................................................... 146
Facet Joint Fracture-Dislocations .................................................................. 146
Compression, Burst, and Teardrop Fractures ................................................. 153
Lateral Mass Fractures ...................................................................................... 154
Outcomes ........................................................................................................... 155
Factors That Influence Outcome .................................................................... 156
Interval to Decompression .............................................................................. 156
Complications .................................................................................................... 157
New Technology and Future Treatments ......................................................... 158

Chapter 8 Thoracic Spine Fractures .................................................................... 163
Rajiv K. Sethi, Kirkham B. Wood, and Mitchell B. Harris
Biomechanics ...................................................................................................... 163
Contents

Fracture Classification .......................................................... 163
Minor Injuries ........................................................................... 163
Major Injuries ........................................................................... 165
Radiological Assessment ......................................................... 167
Treatment Planning .................................................................... 168
Nonoperative Treatment ............................................................. 168
Surgical Treatment ...................................................................... 169
Vertebroplasty and Kyphoplasty ................................................... 170
Posterior Instrumentation ......................................................... 171
Spinal Decompression ............................................................... 171
Surgical Technique of Anterior Decompression and Fusion ............ 173
Surgical Technique and Instrumentation of Posterior Decompression and Fusion .................................................... 173
Rehabilitation ........................................................................... 175
Outcomes .................................................................................. 175
Compression Fractures ............................................................... 175
Burst Fractures ........................................................................... 175
General Outcomes after Thoracic Spine Fracture ......................... 175
Complications ........................................................................... 175
New Techniques ......................................................................... 176

Chapter 9 Thoracolumbar and Lumbar Spine Trauma ......................... 179
Steven M. Theiss
Classification ............................................................................. 179
Nonoperative Treatment ............................................................. 181
Compression Fractures ............................................................... 181
Burst Fractures ........................................................................... 184
Flexion-Distraction Injuries ......................................................... 184
Fracture-Dislocations ............................................................... 185
Surgical Treatment ..................................................................... 185
Indications for Surgical Treatment ............................................... 185
Surgical Anatomy and Approaches .............................................. 186
Timing of Surgery ...................................................................... 188
Surgical Techniques .................................................................... 189
Complications ........................................................................... 198
Outcomes .................................................................................. 201
New Techniques ......................................................................... 202

Chapter 10 Shoulder Girdle Injuries ................................................. 207
Peter Alexander Cole and Daniel Joseph Marek
Acromioclavicular Joint Dislocation .............................................. 207
Classification ............................................................................. 207
Clinical Assessment .................................................................... 207
Nonoperative Treatment ............................................................. 207
Indications for Surgical Treatment ............................................... 208
Surgical Treatment ..................................................................... 208
Outcomes .................................................................................. 211
Complications ........................................................................... 211
Scapula Fractures ........................................................................ 212
Classification ............................................................................. 212
Clinical Evaluation ..................................................................... 212
Nonoperative Treatment ............................................................. 212
Indications for Surgical Treatment ............................................... 214
Surgical Treatment ..................................................................... 217
Outcomes .................................................................................. 230
Complications ........................................................................... 231
Chapter 11 Proximal Humerus Fractures and Shoulder Dislocations

Andrew H. Schmidt

Proximal Humeral Fractures
- Classification: 238
- Nonoperative Treatment: 240
- Indications for Surgical Treatment: 242
- Surgical Treatment: 246
- Outcomes: 254
- Complications: 254

Shoulder Dislocations
- Classification: 256
- Nonoperative Treatment: 257
- Indications for Surgical Treatment: 259
- Surgical Treatment: 260
- Outcomes: 260
- Complications: 260

Chapter 12 Humeral Shaft Fractures

David C. Templeman and Stephen Andrew Sems

Nonoperative Treatment: 263
- General Concepts: 263
- Coaptation Splinting: 263
- Functional Bracing: 263
- Hanging Arm Casts: 265
- Other Nonoperative Treatment Methods: 266
- Injury Classification: 266
- Indications for Surgical Treatment: 267
- Failure to Maintain Appropriate Alignment: 267
- Open Fractures: 267
- Associated Articular Injuries: 267
- Neurovascular Injuries: 267
- Floating Elbow Injuries: 267
- Impending Pathological Fractures: 267
- Polytrauma Patients: 269

Surgical Treatment: 270
- General Concepts: 270
- Surgical Techniques: Open Reduction and Internal Fixation with Plates: 270
- Outcomes and Complications: 280
- Malunion: 280
- Nonunion: 280
- Neurovascular: 281
- Treatment-Specific Outcomes and Complications: 282

Chapter 13 Distal Humeral Fractures

Lisa Cannada

Indications for Surgical Treatment: 286
- Physical Examination: 286
- Radiographic Evaluation: 287
Contents

Injury Classification ................................................................. 287
Nonoperative Treatment .......................................................... 288
Surgical Treatment .................................................................. 290
  General Concepts ................................................................. 290
  Considerations in Planning Surgical Treatment ......................... 290
  Preoperative and Intraoperative Planning ................................... 290
  Approaches ......................................................................... 292
  Ulnar Nerve Management ...................................................... 297
  Fracture Reduction and Fixation ............................................. 297
  Postoperative Care ............................................................... 298
Outcomes .............................................................................. 323
Complications ......................................................................... 300
  Failure of Fixation ............................................................... 300
  Nonunion ........................................................................... 300
  Malunion ............................................................................ 300
  Infection ............................................................................ 301
  Ulnar Neuropathy ................................................................. 302
  Loss of Motion ..................................................................... 302
  Heterotopic Ossification ........................................................ 303
  Complications Related to the Olecranon Osteotomy .................... 303
New Techniques ...................................................................... 303

Chapter 14 Elbow Trauma ....................................................... 306
David Ring and Neil Harness

Anatomy .............................................................................. 306
Radial Head Fractures ............................................................ 307
  Classification ..................................................................... 307
  Nonoperative Treatment ...................................................... 308
  Indications for Surgical Treatment ........................................ 308
  Surgical Treatment ............................................................. 308
  Outcomes ......................................................................... 311
Complications ......................................................................... 311
Simple Elbow Dislocations ....................................................... 312
  Classification ..................................................................... 312
  Nonoperative Treatment ...................................................... 312
  Indications for Surgical Treatment ........................................ 314
  Surgical Treatment ............................................................. 314
  Outcomes ......................................................................... 318
Complications ......................................................................... 319
Elbow Fracture-Dislocations: Elbow Dislocation with Fracture of the Radial Head ............................................. 319
  Nonoperative Treatment ...................................................... 321
  Indications for Surgical Treatment ........................................ 323
  Surgical Treatment ............................................................. 323
  Outcomes ......................................................................... 323
Elbow Fracture-Dislocations: Coronoid Fracture-Dislocations ................................................................. 324
  Classification ..................................................................... 324
  Elbow Dislocation with Fractures of the Coronoid and
  Radial Head (Terrible Triad) .................................................... 325
  Varus Posteromedial Rotational Instability Pattern Injuries ............. 328
Olecranon Fractures ................................................................. 328
  Classification ..................................................................... 328
  Nonoperative Treatment ...................................................... 329
  Indications for Surgical Treatment ........................................ 329
  Surgical Treatment ............................................................. 329
  Outcomes ......................................................................... 334
Fracture-Dislocations of the Olecranon ........................................ 334
## Contents

<table>
<thead>
<tr>
<th>Chapter 15</th>
<th>Forearm Fractures</th>
<th>Rena L. Stewart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>Indications for Nonoperative Treatment</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>Reduction and Casting Techniques</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>Functional Bracing</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>Indications for Surgical Treatment</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>General Principles</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>Preoperative Planning</td>
<td>343</td>
<td></td>
</tr>
<tr>
<td>Positioning and Draping</td>
<td>343</td>
<td></td>
</tr>
<tr>
<td>Imaging</td>
<td>343</td>
<td></td>
</tr>
<tr>
<td>Surgical Anatomy and Choice of Surgical Approach</td>
<td>345</td>
<td></td>
</tr>
<tr>
<td>Surgical Techniques</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td>360</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 16</th>
<th>Distal Radius Fractures</th>
<th>Paul M. Simic and Jeffrey D. Placzek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>Classification</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>Radiographic Evaluation</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>Indications for Treatment</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>366</td>
<td></td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>366</td>
<td></td>
</tr>
<tr>
<td>Surgical Approaches</td>
<td>366</td>
<td></td>
</tr>
<tr>
<td>Specific Procedures</td>
<td>371</td>
<td></td>
</tr>
<tr>
<td>Advances in Rehabilitation</td>
<td>382</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td>383</td>
<td></td>
</tr>
<tr>
<td>New Technologies</td>
<td>383</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 17</th>
<th>Carpus Fractures and Dislocations</th>
<th>Jeffry Todd Watson and Martin I. Boyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpal Instability</td>
<td>387</td>
<td></td>
</tr>
<tr>
<td>Classification</td>
<td>388</td>
<td></td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>391</td>
<td></td>
</tr>
<tr>
<td>Indications for Surgical Treatment</td>
<td>392</td>
<td></td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>394</td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td>402</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td>402</td>
<td></td>
</tr>
<tr>
<td>Scaphoid Fractures</td>
<td>403</td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>403</td>
<td></td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>404</td>
<td></td>
</tr>
<tr>
<td>Indications for Surgical Treatment</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td>408</td>
<td></td>
</tr>
</tbody>
</table>
Contents

Outcomes ................................................................. 409
Other Carpal Fractures ............................................. 409

Chapter 18  Hand Fractures and Dislocations. .................. 412
James P. Higgins and Thomas J. Graham

Fractures of the Distal Phalanx ................................... 412
Nonoperative Treatment .............................................. 413
Surgical Treatment .................................................. 413
Extra-articular Proximal and Middle Phalanx Fractures ..... 416
Nonoperative Treatment .............................................. 416
Surgical Treatment .................................................. 417
The Proximal Interphalangeal Joint .............................. 422
Anatomy ................................................................. 422
Dorsal Dislocation of the Proximal Interphalangeal Joint ... 422
Lateral and Volar Dislocations of the Proximal Interphalangeal Joint ... 428
Condylar Fractures of the Proximal Interphalangeal Joint ... 429
Metacarpophalangeal Joint Dislocations ....................... 430
Nonoperative Treatment .............................................. 430
Surgical Treatment .................................................. 430
Metacarpal Fractures ................................................. 431
Base Fractures and Carpometacarpal Fracture-Dislocations ... 431
Nonoperative Treatment .............................................. 433
Operative Treatment ................................................ 434
Surgical Technique .................................................. 434
Postoperative Care .................................................. 437

Chapter 19  Pelvic Ring Injuries ................................. 442
Kyle F. Dickson

Classification and Anatomy ....................................... 442
Nonoperative Treatment .............................................. 445
Indications for Surgical Treatment ............................... 445
Surgical Treatment .................................................. 448
Anterior Ring Injuries ................................................. 448
Posterior Ring Injuries ................................................. 453
Rehabilitation .......................................................... 465
New Techniques ........................................................ 467
Outcomes ............................................................... 467
Complications .......................................................... 467

Chapter 20  Acetabular Fractures .............................. 470
Philip J. Kregor and Michael Stover

Classification .......................................................... 471
Nonoperative Treatment .............................................. 477
Indications for Surgical Treatment ............................... 477
Surgical Treatment .................................................. 479
Surgical Anatomy and Approaches ................................ 479
Surgical Techniques .................................................. 488
Rehabilitation .......................................................... 504
New Techniques ........................................................ 507
Outcomes ............................................................... 509
Quality of Fracture Reduction ...................................... 509
Radiographic and Clinical Results of Operatively Treated Acetabular Fractures .... 513
Results of Operative Fixation of Posterior Wall Acetabular Fractures .................. 513
Results Following Delayed or Revision Fixation of Acetabular Fractures ............. 514
Functional Outcomes ................................................. 514
Complications .......................................................... 514
Deep Vein Thrombosis ................................................. 515
### Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 21</td>
<td>Hip Dislocations and Femoral Head Fractures</td>
<td>522</td>
</tr>
<tr>
<td></td>
<td>Classification</td>
<td>523</td>
</tr>
<tr>
<td></td>
<td>Nonoperative Treatment</td>
<td>524</td>
</tr>
<tr>
<td></td>
<td>Indications for Surgical Treatment</td>
<td>528</td>
</tr>
<tr>
<td></td>
<td>Surgical Treatment</td>
<td>528</td>
</tr>
<tr>
<td></td>
<td>Surgical Anatomy, Surgical Approaches, and Surgical Technique</td>
<td>528</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
<td>532</td>
</tr>
<tr>
<td></td>
<td>New Techniques</td>
<td>532</td>
</tr>
<tr>
<td></td>
<td>Outcomes and Complications</td>
<td>536</td>
</tr>
<tr>
<td>Chapter 22</td>
<td>Intracapsular Hip Fractures</td>
<td>539</td>
</tr>
<tr>
<td></td>
<td>Classification</td>
<td>539</td>
</tr>
<tr>
<td></td>
<td>Nonoperative Treatment</td>
<td>541</td>
</tr>
<tr>
<td></td>
<td>Indications for Surgical Treatment</td>
<td>542</td>
</tr>
<tr>
<td></td>
<td>Surgical Implant Options</td>
<td>542</td>
</tr>
<tr>
<td></td>
<td>in the Young Patient</td>
<td>544</td>
</tr>
<tr>
<td></td>
<td>Surgical Options in the Elderly Patient</td>
<td>544</td>
</tr>
<tr>
<td></td>
<td>Surgical Treatment</td>
<td>546</td>
</tr>
<tr>
<td></td>
<td>Surgical Anatomy</td>
<td>546</td>
</tr>
<tr>
<td></td>
<td>Surgical Approaches</td>
<td>549</td>
</tr>
<tr>
<td></td>
<td>Surgical Techniques</td>
<td>550</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
<td>557</td>
</tr>
<tr>
<td></td>
<td>New Techniques</td>
<td>558</td>
</tr>
<tr>
<td></td>
<td>Outcomes</td>
<td>559</td>
</tr>
<tr>
<td></td>
<td>Internal Fixation in Young Adults</td>
<td>559</td>
</tr>
<tr>
<td></td>
<td>Femoral Neck Fractures in Elderly Adults</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Complications</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Medical Complications</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Nonunion</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Osteonecrosis</td>
<td>561</td>
</tr>
<tr>
<td>Chapter 23</td>
<td>Intertrochanteric Femur Fractures</td>
<td>567</td>
</tr>
<tr>
<td></td>
<td>Classification</td>
<td>567</td>
</tr>
<tr>
<td></td>
<td>Nonoperative Treatment</td>
<td>568</td>
</tr>
<tr>
<td></td>
<td>Indications for Surgical Treatment</td>
<td>569</td>
</tr>
<tr>
<td></td>
<td>Surgical Treatment</td>
<td>570</td>
</tr>
<tr>
<td></td>
<td>Basic Concepts</td>
<td>570</td>
</tr>
<tr>
<td></td>
<td>Surgical Anatomy</td>
<td>570</td>
</tr>
<tr>
<td></td>
<td>Surgical Technique</td>
<td>571</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
<td>583</td>
</tr>
<tr>
<td></td>
<td>New Techniques</td>
<td>583</td>
</tr>
<tr>
<td></td>
<td>Outcomes</td>
<td>584</td>
</tr>
<tr>
<td></td>
<td>Complications</td>
<td>585</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Infection</td>
<td>515</td>
</tr>
<tr>
<td></td>
<td>Neurological Injury</td>
<td>515</td>
</tr>
<tr>
<td></td>
<td>Vascular Injury</td>
<td>516</td>
</tr>
<tr>
<td></td>
<td>Posttraumatic Arthritis</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Avascular Necrosis</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Heterotopic Ossification</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Osteonecrosis</td>
<td>561</td>
</tr>
<tr>
<td></td>
<td>Nonunion</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Osteoarthropathy</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Infection</td>
<td>515</td>
</tr>
<tr>
<td></td>
<td>Neurological Injury</td>
<td>515</td>
</tr>
<tr>
<td></td>
<td>Vascular Injury</td>
<td>516</td>
</tr>
<tr>
<td></td>
<td>Posttraumatic Arthritis</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Avascular Necrosis</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Heterotopic Ossification</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Osteonecrosis</td>
<td>561</td>
</tr>
<tr>
<td></td>
<td>Nonunion</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Osteoarthropathy</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Infection</td>
<td>515</td>
</tr>
<tr>
<td></td>
<td>Neurological Injury</td>
<td>515</td>
</tr>
<tr>
<td></td>
<td>Vascular Injury</td>
<td>516</td>
</tr>
<tr>
<td></td>
<td>Posttraumatic Arthritis</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Avascular Necrosis</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Heterotopic Ossification</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Osteonecrosis</td>
<td>561</td>
</tr>
<tr>
<td></td>
<td>Nonunion</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Osteoarthropathy</td>
<td>517</td>
</tr>
</tbody>
</table>
Chapter 24 Subtrochanteric Femur Fractures ................................. 589
   Stephen H. Sims
   Classification ................................................. 590
   Nonoperative Management .................................... 590
   Indications for Surgical Treatment ......................... 591
   Intramedullary Nails ........................................... 591
   Plates ...................................................... 592
   Surgical Treatment ............................................ 594
   Surgical Techniques .......................................... 594
   Rehabilitation ................................................. 604
   New Techniques .............................................. 605
   Outcomes ..................................................... 606
   Complications ............................................... 608

Chapter 25 Femoral Shaft Fractures .......................... 611
   Brent L. Norris and Peter J. Nowotarski
   Classifications ............................................... 612
   Nonoperative Treatment .................................... 612
   Indications for Surgical Treatment ......................... 614
   Surgical Treatment ............................................ 614
   Surgical Anatomy ............................................ 614
   Surgical Techniques .......................................... 614
   Special Considerations ...................................... 625
   New Techniques .............................................. 627
   Outcomes ..................................................... 628
   Complications ............................................... 628
   New Horizons ................................................. 630

Chapter 26 Distal Femur Fractures ............................ 633
   Philip J. Kregor and Michael Zlowodzki
   Classification ............................................... 634
   Nonoperative Treatment .................................... 634
   Indications for Surgical Treatment ......................... 636
   Surgical Treatment ............................................ 636
   Surgical Anatomy ............................................ 636
   Surgical Approaches ...................................... 637
   Surgical Techniques .......................................... 642
   Rehabilitation ................................................. 658
   New Techniques .............................................. 659
   Outcomes ..................................................... 659
   Complications ............................................... 660

Chapter 27 Patella Fractures and Injuries to the Knee Extensor Mechanism .......... 664
   George V. Russell and Robert K. Mehrle
   Patella Fractures .............................................. 664
   Classification ............................................... 664
   Nonoperative Management .................................. 666
   Indications for Surgical Treatment ......................... 667
   Surgical Treatment ............................................ 667
   Outcomes ..................................................... 676
   Complications ............................................... 677
   Injuries to the Knee Extensor Mechanism ................... 678
   Nonoperative Treatment .................................... 678
   Indications for Surgical Treatment ......................... 679
   Surgical Treatment ............................................ 679
   Complications ............................................... 685
## Contents

### Chapter 28 Knee Dislocations and Ligamentous Injuries

**James P. Stannard and Robert C. Schenck Jr.**

- Classification ................................................. 687
- Nonoperative Treatment ................................... 688
- Indications .................................................. 689
- Techniques .................................................. 689
- Indications for Surgical Treatment and Treatment Algorithm .......... 690
- Surgical Treatment ......................................... 691
  - Anatomy .................................................. 691
  - Posteromedial Approach to the Knee .................. 692
  - Posterolateral Approach to the Knee .............. 692
  - Posterior Cruciate Ligament Reconstruction ....... 693
  - Modified Two-Tailed Reconstruction of the Posterolateral Corner .. 698
  - Posteromedial Complex Reconstruction (Simple Loop) .......... 699
  - External Fixation-Immobilization ....................... 699
  - Rehabilitation .......................................... 700
  - New Techniques ........................................ 701
- Outcomes .................................................... 704
  - Reconstruction versus Nonoperative Treatment .......... 705
  - Range of Motion ......................................... 705
  - Pain ...................................................... 705
  - Instability .............................................. 706
  - Return to Work ........................................ 706
  - Return to Sports or Recreation ....................... 706
  - Outcome Scores ......................................... 707
  - Summary ................................................. 707
  - Complications ......................................... 707

### Chapter 29 Tibial Plateau Fractures

**James P. Stannard and Steven L. Martin**

- Classification ............................................. 713
- Nonoperative Treatment .................................. 715
- Indications for Surgical Treatment ...................... 717
- Surgical Treatment ....................................... 717
  - Surgical Anatomy ..................................... 717
  - Surgical Approaches .................................. 719
  - Surgical Technique .................................... 721
  - Rehabilitation .......................................... 734
  - Fracture-Dislocation of the Knee .................... 734
  - New Techniques .......................................... 736
- Outcomes ..................................................... 737
  - Complications .......................................... 738

### Chapter 30 Tibial Shaft Fractures

**Franklin D. Shuler and William T. Obremskey**

- Classification ............................................. 742
- Nonoperative Treatment .................................. 742
  - Technique for Nonoperative Treatment of a Tibial Shaft Fracture .... 743
- Indications for Surgical Treatment ...................... 745
- Surgical Treatment ....................................... 746
  - Surgical and Radiographic Anatomy ................... 746
  - Surgical Techniques ..................................... 748
  - New Techniques .......................................... 759
- Outcomes ..................................................... 761
  - Limb Salvage versus Amputation ...................... 761
  - Complications .......................................... 762
## Contents

- Infection .................................................. 762
- Anterior Knee Pain Following Intramedullary Fixation .................. 763
- Nonunion .................................................. 763

**Chapter 31** Distal Tibia Fractures ............................................. 767

*Sean E. Nork*

- Classification ........................................... 767
- Nonoperative Treatment .................................... 767
- Indications for Surgical Treatment ......................... 769
- Surgical Treatment ........................................ 770
  - General Approach to Open Reduction and Internal Fixation ........ 770
  - Surgical Anatomy ....................................... 770
  - Surgical Approaches and Techniques ...................... 771
- Rehabilitation and Postoperative Management ................. 786
- Alternative or “Newer” Techniques .......................... 786
- Outcomes .................................................. 789
- Complications ............................................ 789

**Chapter 32** Ankle Fractures and Dislocations .............................. 792

*Cory A. Collinge and Keith Heier*

- Functional and Surgical Anatomy ............................ 792
- Classification ............................................. 793
- Fracture Assessment and Decision Making ..................... 793
- Indications for Surgical Treatment ........................... 796
- Surgical Treatment ........................................ 796
  - Timing of Surgery ...................................... 796
  - Examination ............................................ 796
  - Implants ................................................. 797
  - Preoperative Care and Planning ............................ 797
  - Operative Setup ........................................ 797
- Isolated Lateral Malleolus Fractures ............................. 797
- Medial Malleolus Fractures .................................. 800
- Bimalleolar Fractures ...................................... 801
- Posterior Malleolus Fractures ................................ 803
- Syndesmosis Injury ........................................ 804
- Open Fractures ............................................ 807
- Ankle Fractures in Osteoporotic Bone ......................... 807
- Ankle Fractures in Diabetic Patients .......................... 808
- Ankle Dislocations ......................................... 809
- Postoperative Management .................................... 809
- New Technology ............................................. 809
- Complications ............................................. 810
  - Wound Problems and Infection .............................. 810
  - Nonunion ................................................ 810
  - Malunion ................................................. 810
  - Arthritis ................................................. 811
  - Stiffness ................................................ 811
  - Symptomatic Hardware ..................................... 811
  - Neuropraxia or Neuroma .................................. 811
  - Osteochondral Fracture ................................... 811
  - Outcomes ................................................. 811

**Chapter 33** Foot Fractures .................................................. 815

*Timothy G. Weber, David S. Brokaw, Angela Scharfenberger, and J. Scott Broderick*

- Talus Fractures .............................................. 815
- Anatomy ..................................................... 815
<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Chapter Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talar Neck Fractures</td>
<td>815</td>
</tr>
<tr>
<td>Classification</td>
<td>815</td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>823</td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>824</td>
</tr>
<tr>
<td>Complications and Outcomes</td>
<td>824</td>
</tr>
<tr>
<td>Talar Body Fractures</td>
<td>821</td>
</tr>
<tr>
<td>Classification</td>
<td>822</td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>822</td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>824</td>
</tr>
<tr>
<td>Complications and Outcomes</td>
<td>824</td>
</tr>
<tr>
<td>Posterior Process Talus Fractures</td>
<td>824</td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>824</td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>824</td>
</tr>
<tr>
<td>Complications and Outcomes</td>
<td>825</td>
</tr>
<tr>
<td>Calcaneus Fractures</td>
<td>825</td>
</tr>
<tr>
<td>Initial Evaluation</td>
<td>826</td>
</tr>
<tr>
<td>Management of the Soft Tissues</td>
<td>826</td>
</tr>
<tr>
<td>Classification</td>
<td>827</td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>829</td>
</tr>
<tr>
<td>Indications for Surgical Treatment</td>
<td>830</td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>830</td>
</tr>
<tr>
<td>Open Calcaneus Fractures</td>
<td>834</td>
</tr>
<tr>
<td>Outcomes</td>
<td>834</td>
</tr>
<tr>
<td>Complications and Outcomes</td>
<td>835</td>
</tr>
<tr>
<td>Navicular Fractures</td>
<td>837</td>
</tr>
<tr>
<td>Classification of Navicular Fractures</td>
<td>837</td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>837</td>
</tr>
<tr>
<td>Indications for Surgical Treatment</td>
<td>837</td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>837</td>
</tr>
<tr>
<td>Complications and Outcomes</td>
<td>839</td>
</tr>
<tr>
<td>Fractures of the Cuboid</td>
<td>839</td>
</tr>
<tr>
<td>Classification</td>
<td>839</td>
</tr>
<tr>
<td>Nonoperative Treatment</td>
<td>839</td>
</tr>
<tr>
<td>Indications for Surgical Treatment</td>
<td>839</td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>840</td>
</tr>
<tr>
<td>Complications and Outcomes</td>
<td>840</td>
</tr>
<tr>
<td>Metatarsal Fractures</td>
<td>840</td>
</tr>
<tr>
<td>Tarsometatarsal Joint Injuries</td>
<td>841</td>
</tr>
<tr>
<td>Classification</td>
<td>841</td>
</tr>
<tr>
<td>Indications for Surgical Treatment</td>
<td>842</td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>842</td>
</tr>
<tr>
<td>Complications and Outcomes</td>
<td>845</td>
</tr>
<tr>
<td>Metatarsal–Phalangeal Joint Injuries</td>
<td>845</td>
</tr>
<tr>
<td>First Metatarsal–Phalangeal Joint</td>
<td>845</td>
</tr>
<tr>
<td>Second through Fifth Metatarsal–Phalangeal Joints</td>
<td>848</td>
</tr>
</tbody>
</table>
Chapter 34 The Polytrauma Patient

Erika J. Mitchell, Philip J. Kregor, and Andrew H. Schmidt

Phalangeal Fractures ................................................................. 848
Great Toe ............................................................................. 848
Lesser Toes .......................................................................... 848

Evaluation of the Polytrauma Patient ........................................ 852
The Physiological Response to Trauma ..................................... 853
Systemic Inflammatory Response Syndrome ......................... 853
Multiorgan Dysfunction Syndrome ....................................... 854
Fracture Care and the Systemic Inflammatory Response—The Second Hit 854
Prioritization of Injury Treatment ............................................ 857
Timing of Surgical Interventions .............................................. 859
Damage-Control Orthopaedics ............................................... 859
Special Considerations in the Head-Injured Patient .................. 860
Outcomes ............................................................................... 862
Case Studies .......................................................................... 863
Summary ................................................................................ 875

Index .................................................................................... 879
DVD Contents

Disk 1

1. Care of the Soft Tissue Envelope

Video 1–1 Gastrocnemius Flap. This video demonstrates preparation of a gastrocnemius flap, which is a simple, rotational flap that may be used to cover soft-tissue defects in the upper third of the tibia.

Video 1–2 Soleus Flap. This video demonstrates preparation of a soleus flap, which is a simple, rotational flap which may be used to cover defects in the middle third of the tibia.

Video 1–3 Reverse-Flow Sural Artery Flap. This video demonstrates preparation of a reverse-flow sural artery flap, a rotational hindfoot application.

Video 1–4 Split Thickness Skin Grafting. This video demonstrates wound coverage using a split thickness skin graft with the use of a vacuum-assisted closure (VAC) as the postoperative dressing.

Video 1–5 Antibiotic Bead Pouch. This video shows how to make antibiotic beads and create a bead pouch to treat an infection or severely contaminated wound.

2. Musculoskeletal Infection Associated with Skeletal Trauma

Video 2–1 Antibiotic Bead Pouch. This video shows how to make antibiotic beads and create a bead pouch to treat an infection or severely contaminated wound. Same as 1–5, Disk 1.

Video 2–2 Circular External Fixation of the Lower Extremity. This video demonstrates placement of a circular external fixator on a proximal tibia fracture. The principles of application are very similar for deformity correction to reconstruct following infection.

Video 2–3 Arthrodesis of the Knee. Arthrodesis of the knee is accomplished using compression plating following a septic knee that led to severe damage to the articular cartilage and periarticular bone. The technique demonstrated uses cutting jigs designed for a total knee arthroplasty to obtain good alignment and stable bone surfaces in order to achieve arthrodesis.

Video 2–4 Above-Knee Amputation. This video demonstrates treatment of a mangled lower extremity with an above-knee amputation. The technique includes myodesis of the adductor and hamstring muscles.

3. Acute Compartment Syndrome

Video 3–1 Two-Incision Leg Fasciotomy. This video shows the dual-incision technique for four-compartment release of the leg.

Video 3–2 Single-Incision Leg Fasciotomy. This video shows a four-compartment release of the leg from a single lateral incision, followed by application of a VAC to the wound.

4. Evolving Concepts in Plate Fixation

Video 4–1 Rules of Locked Plating. This presentation reviews the “rules” that should be applied by surgeons employing locked plating. Included in this presentation is unicortical locked plating systems designed for minimally invasive submuscular application, as well as hybrid plating that includes mixing locked and unlocked screws. The appropriate order of application of screws is stressed.

Video 4–2 Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) of the Distal Femur. The patient in this case is treated with a DCS plate applied using MIPPO techniques and bridge plating. The surgeon demonstrates tricks for success with MIPPO, including judgment of length and rotation.

Video 4–3 Open Reduction and Internal Fixation (ORIF) of a Periprosthetic Fracture with Submuscular Locked Plating. LlSS fixation of a distal femur fracture is performed in an osteoporotic distal femur fracture above a total knee arthroplasty. Minimal exposure of the fracture and closed reduction techniques are emphasized.

Video 4–4 ORIF of a C2 Distal Femur Fracture with Submuscular Locked Plating. Submuscular locked fixation is performed for a ballistic C2 distal femur fracture in a 34-year-old male. Delayed reconstruction is carried out following placement of a spanning external fixator, originally placed after repair of a vascular injury.
Video 4–5 **ORIF of a Comminuted Tibial Plateau Fracture with Locked Plating.** This case demonstrates techniques for handling a markedly comminuted bicondylar fracture. The video stresses the importance of centering the plate on the bone and the recommended screw placement proximally.

Video 4–6 **ORIF of a Distal Tibia Fracture with Locked Plating.** This video demonstrates the use of locked plating and minimally invasive approaches in a patient who has sustained a distal tibia fracture.

5. Treatment Strategy for Nonunions and Malunions

Video 5–1 **Correction of Varus Malunion of the Proximal Humerus by Osteotomy.** The patient in this video has a varus malunion of the proximal humerus. He is treated with a closing wedge osteotomy and locked plating based on the preoperative surgical plan.

Video 5–2 **Compression Plating of a Femur Nonunion.** This video demonstrates compression plate fixation of a femur nonunion with a titanium broad LCDCP. The lateral approach to the femur, as well as the importance of debridement of the nonunion and compression of viable bone fragments are stressed.

Video 5–3 **The Use of a Reamer-Irrigator-Aspirator.** This video demonstrates a new technique for obtaining autologous bone graft and some bioactive substances using the Reamer-Irrigator-Aspirator (Synthes, Paoli, Pennsylvania).

6. Injuries to the Cervicocranium

Video 6–1 **Posterior Instrumentation and Fusion C1–C2.** This patient sustained an irreducible fracture subluxation of C1–C2. Treatment consisted of posterior instrumentation and fusion of C1 to C3 with lateral mass screw fixation in C1.

Video 6–2 **ORIF of an Odontoid Fracture.** This patient sustained a type 2 odontoid fracture and was treated with open reduction and internal fixation with placement.

7. Lower Cervical Spine Injuries

Video 7–1 **Posterior Open Reduction C6–C7 with Posterior Fusion C6–T1 with Instrumentation.** This patient sustained a bilateral facet fracture dislocation at C6–C7 with a spinal cord injury. Operative treatment consisted of open reduction of a persistent subluxation followed by posterior instrumentation and fusion of C6–T1. Pedicle screw instrumentation was placed in T1.

8. Thoracic Spine Fractures

Video 8–1 **Posterior Open Reduction T4–T5, Posterior Fusion T2–T7 with Instrumentation.** This patient sustained a fracture dislocation of T4–T5 with a spinal cord injury. It was treated with open reduction and posterior pedicle screw instrumentation and fusion from T2–T7. Instrumentation spanned two full levels above and below the injured motion segments to ensure adequate fixation.

9. Thoracolumbar and Lumbar Spine Trauma

Video 9–1 **Open Reduction, Posterior Lateral Decompression T12, Posterior Fusion T10–L2 with Instrumentation.** This patient sustained a flexion distraction injury at T12 with a spinal cord injury. Operative treatment consisted of open reduction of the fracture followed by instrumentation and fusion from T10–L2 with posterolateral decompression at T12.

Video 9–2 **Anterior L1 Corpectomy, Anterior Fusion T12–L2 with an Expandable Cage and Instrumentation.** This patient sustained an L1 burst fracture with a neurologic injury. An anterior corpectomy was performed, with reconstruction and fusion using an expandable cage and anterior instrumentation from T12–L2.

Disk 2

10. Shoulder Girdle Injuries

Video 10–1 **ORIF of Distal Clavicle Fracture Using a Hook Plate.** This video shows the application of a clavicular hook plate to reduce and stabilize the distal clavicle and AC joint in a patient who also underwent open reduction and internal fixation of his associated scapula fracture.

Video 10–2 **ORIF of Scapula Using a Posterior Approach and Intermuscular Windows.** This video demonstrates repair of a comminuted scapular fracture utilizing the Judet approach combined with an intermuscular window to approach and repair the lateral border of the scapula.

Video 10–3 **Reconstruction of Clavicular Malunion.** This video demonstrates the open reduction and internal fixation of a malunited clavicle fracture that was 6 to 8 weeks old, had displaced significantly, and was causing pain in this overhead laborer. Lag screw fixation through the plate was employed after callus was debrided and an anatomic reduction was obtained.

11. Proximal Humerus Fractures and Shoulder Dislocations

Video 11–1 **Closed Reduction and Percutaneous Pinning.** This video example demonstrates the technique of closed reduction and pinning of an unstable surgical neck fracture.

Video 11–2 **ORIF of an Anterior Shoulder Fracture—Dislocation with a Nonlocking Periarticular Plate.** This patient had both an anterior dislocation of the humeral head and an oblique fracture of the proximal humeral shaft. This video demonstrates repair of this injury using a periarticular plate.
Video 11–3 **Open Reduction of a Comminuted Proximal Humeral Fracture with a Locking Plate.** This video demonstrates the repair of a valgus-impacted fracture associated with displacement and comminution of both tuberosities, using a locking proximal humerus plate.

Video 11–4 **Intramedullary Nailing of the Proximal Humerus with a Locking Nail.** This video demonstrates repair of an unstable surgical neck fracture with an intramedullary nail that incorporates locking screws for humeral head fixation.

Video 11–5 **Intramedullary Nailing of the Proximal Humerus with a Spiral Blade Nail.** This video demonstrates repair of an unstable surgical neck fracture with an intramedullary nail that uses a spiral blade for fixation of the humeral head.

Video 11–6 **Shoulder Hemiarthroplasty for Proximal Humerus Fracture.** This video demonstrates the technique of shoulder hemiarthroplasty for management of a proximal humeral fracture, specifically highlighting the technique of tuberosity reconstruction.

Video 11–7 **Correction of Varus Malunion of the Proximal Humerus by Osteotomy.** This video shows correction of a varus malunion of the proximal humerus that was treated with a closing wedge osteotomy and locked plating. See Video 5–1, Disk 1.

12. **Humeral Shaft Fractures**

Video 12–1 **Posterior Plating Humerus Fracture.** This video demonstrates posterior plating of a simple transverse fracture in a patient with a floating elbow injury.

Video 12–2 **Intramedullary Nailing of the Humerus.** This video demonstrates the use of a cannulated intramedullary nail to treat a diaphyseal humerus fracture. The starting point, handling the rotator cuff, and eliminating all gaps are critical steps demonstrated in this procedure.

Video 12–3 **Humerus Flexnail.** This video demonstrates the use of the flexible humerus nail. Proper start point and angle as well as the function of the stiffening mechanism are demonstrated.

13. **Distal Humeral Fractures**

Video 13–1 **Total Elbow Arthroplasty.** This video demonstrates the management of a comminuted distal humeral fracture in an elderly, osteoporotic patient with total elbow arthroplasty.

Video 13–2 **ORIF of the Distal Humerus.** This video shows the technique of internal fixation of a supracondylar/intercondylar (C2) fracture in a polytrauma patient. The video highlights the surgical exposure including olecranon osteotomy, fracture reduction, provisional fixation, and fixation of the medial and lateral column.

14. **Elbow Trauma**

Video 14–1 **Trans-olecranon Elbow Fracture Dislocation.** This video shows repair of a comminuted proximal ulnar fracture with associated radial head/neck fractures through a posterior incision. Repair of the radial head through the ulna fracture and repair of the coronoid fragment are emphasized.

Video 14–2 **ORIF of a Complex Elbow Injury.** This video depicts open reduction and internal fixation of an olecranon fracture associated with a large coronoid process fracture. This probably represents a spontaneously reduced anterior olecranon fracture-dislocation. The patient also sustained a radius fracture treated with ORIF as well as pinning of the distal radial-ulnar joint.

Video 14–3 **Tension Band Wiring of the Olecranon.** This video demonstrates posterior tension band wiring of a displaced olecranon fracture. A revision fixation with a plate was necessary secondary to wire pullout from the cortex following the tension band wiring. Salvage reconstructive methods are shown.

15. **Forearm Fractures**

Video 15–1 **ORIF of an Isolated Radius Fracture.** This video demonstrates compression plating of a displaced radius fracture using Henry's anterior approach, with an evaluation of the distal/radial ulnar joint (DRUJ) following stabilization of the radius.

Video 15–2 **ORIF of a ‘Both Bone Forearm Fracture.’** This video demonstrates plate fixation of a forearm fracture involving both the radius and ulna in an adult. A detailed explanation of Henry's approach as well as the appropriate order of fixation of the radius and ulna are demonstrated.

Video 15–3 **Radius Fracture with Pinning of the Distal Radial-Ulnar Joint (Galeazzi Fracture, Part of ORIF of a Complex Elbow Injury).** This video depicts open reduction and internal fixation of an olecranon fracture as well as a large coronoid fracture. The patient also sustained a radius fracture treated with ORIF as well as pinning of the distal radial-ulnar joint. See Video 14–2, Disk 2.

16. **Distal Radius Fractures**

Video 16–1 **ORIF of a Distal Radius Fracture with Volar Plate.** This video demonstrates open reduction and internal fixation of a distal radius fracture through a volar approach to the distal radius. The fracture is stabilized with a volar plate designed for the distal radius. A fragment-specific radial styloid plate is also used.

Video 16–2 **External Fixation and Pinning of a Distal Radius.** This patient sustained a distal radius fracture treated with closed reduction and external fixation of the distal radius, combined with percutaneous pinning with Kirschner wires.

Video 16–3 **Stabilization of a Distal Radius Fracture Using a Dorsal Intramedullary Plate.** This video demonstrates an innovative device that combines intramedullary fixation with dorsal plate fixation to treat a distal radius fracture.
17. Carpus Fractures and Dislocations
Video 17–1 Repair of Perilunate Dislocation. This video of a 6-week-old lunate dislocation demonstrates the surgical repair of this injury. A precise reduction is necessary, and in this case mandates both a volar and dorsal approach. Stabilization is provided by temporary wire fixation and scapholunate ligament reconstruction.

18. Hand Fractures and Dislocations

19. Pelvic Ring Fractures
Video 19–1 ORIF of Pubic Symphysis Iliosacral Lag Screws Placement. Pubic symphysis plate fixation and percutaneous iliosacral screw fixation are demonstrated. The Pfannensteil approach, symphysis reduction techniques, and plate application are emphasized.

Video 19–2 ORIF of a “Tilt” Fracture Variant of the Pelvis. This video is a malunion of the anterior pelvis in a young female with dysparunia. A Pfannensteil approach is used to expose the malunion, and an osteotomy with open reduction and internal fixation is used to treat this deformity.

Video 19–3 Iliosacral Lag Screws. This video reviews the anatomy of the posterior pelvis, the risks involved in placement of iliosacral screws, and the technique to safely implement this technique.

Video 19–4 ORIF of a Left Sacroiliac Joint Fracture-Dislocation. A fracture-dislocation of the sacroiliac joint is openly reduced after being exposed through the posterior approach. Stabilization is provided through iliosacral screws.

Video 19–5 ORIF of Left Sacral Fracture. The posterior approach to the sacrum is demonstrated for open reduction and internal fixation of a Denis II left sacral fracture with significant displacement. Open reduction techniques and iliosacral screw fixation are shown.

20. Acetabular Fractures
Video 20–1 Kocher-Langenbeck Approach for a Transverse Posterior Wall Acetabulum Fracture. The detailed steps of the KL approach in the prone position with use of a specialized fracture table are shown. Distraction of the hip joint through use of the table allows for easy retrieval of incarcerated fragments of the posterior wall. Precise anatomic reduction of multiple fragments is seen.

Video 20–2 Ilioinguinal Approach for Associated Both-Column Acetabulum Fracture. The development of the three windows of the ilioinguinal approach is demonstrated. The approach is utilized for a step-wise reconstruction of a complex injury. Clamp application, screw fixation, and assessment of reduction quality are key concepts which are discussed.

Disk 3

21. Hip Dislocations and Femoral Head Fractures
Video 21–1 ORIF of Infrafoveal Femoral Head Fracture. This video demonstrates open reduction and internal fixation of a large Pipkin I femoral head fracture using countersunk screws.

Video 21–2 ORIF of a Pipkin II Femoral Head Fracture Using the Smith-Petersen Approach. This video shows open reduction of a Pipkin II femoral head fracture using the Smith-Petersen approach. The details of the approach are reviewed.

22. Intracapsular Hip Fractures
Video 22–1 Watson-Jones Approach for ORIF of Femoral Neck. The steps of a Watson-Jones approach for optimal visualization of a femoral neck fracture are shown. The approach allows for clamp placement and for use of reduction aids to insure anatomic reduction.

Video 22–2 Closed Reduction and Pinning of a Femoral Neck Fracture. This video demonstrates treatment of a femoral neck fracture using 7.3-mm cannulated screws. Proper placement of the screws to avoid the “stick in a can” phenomenon is emphasized.

Video 22–3 ORIF of Femoral Neck and Subtrochanteric Femur Fracture with Locking Proximal Femur Plate. This video demonstrates ORIF of a complex femoral neck/subtrochanteric femur fracture using the Watson-Jones approach. A systematic approach to reduction and fixation of this severe injury is demonstrated, with the use of a locking precontoured proximal femur plate to stabilize the fracture.

Video 22–4 Hemiarthroplasty of a Displaced Femoral Neck Fracture. This video reviews hip hemiarthroplasty using a Kocher-Langenbeck approach. The details of the approach are reviewed.

Video 22–5 Hemiarthroplasty of a Displaced Femoral Neck Fracture via the Anterior Approach. A specialty fracture table allows for hemiarthroplasty through a 10-cm Smith-Petersen Approach. Advantages include supine positioning, avoidance of abductor devitalization, and real-time fluoroscopic control of component position.

23. Intertrochanteric Femur Fractures
Video 23–1 ORIF of an Intertrochanteric Fracture Using Sliding Screw and Side Plate. This video demonstrates ORIF of a high energy intertrochanteric femur fracture following a skiing injury in a 45-year-old man. We review the proper placement of screws in the femoral head and neck to avoid cutout as well as the tip-to-apex distance.

Video 23–2 Intramedullary Nailing of an Unstable Intertrochanteric Fracture. This video reviews the use of intramedullary nailing to treat intertrochanteric fractures. The correct starting point and indications for intramedullary nailing are discussed.
24. Subtrochanteric Femur Fractures

Video 24–1 Unreamed Femoral Nailing To Treat Bilateral Femur Fractures in a Multitrauma Patient. This video demonstrates a multitrauma patient with bilateral femur fractures. Unreamed nailing is used to minimize any pulmonary insult to the patient, with an assessment of his pulmonary function following the first nail to determine if he was able to withstand the second nailing procedure.

Video 24–2 Trochanteric Nail for Reverse Oblique Subtrochanteric Fracture. This video demonstrates the stabilization of a reverse-oblique fracture of the proximal femur with a trochanteric nail (ITST, Zimmer, Warsaw, Indiana). Details of lateral positioning, the nail starting portal, fracture reduction, and nail insertion are shown.

Video 24–3 Blade Plate Fixation for a Russell-Taylor IA Proximal Femur Fracture. A 95-degree-angled blade plate is placed in the appropriate position in the proximal femur, and then the plate is utilized to afford the reduction. The steps in placement of a blade plate and use of the articulating tensioning device are shown.

Video 24–4 Proximal Femoral Locked Plating for Osteoporotic Subtrochanteric Femur Fracture. Advantages of a submuscularly placed locked fixator include avoidance of abductor devitalization, ability to use the plate to afford the reduction, and appropriate fixation of the osteoporotic proximal segment. Closed reduction techniques and submuscular fixator placement are shown.

Video 24–5 ORIF of Femoral Neck and Subtrochanteric Femur Fracture with Locking Proximal Femur Plate. This video demonstrates ORIF of a complex femoral neck and subtrochanteric femur fracture using the Watson-Jones approach. A systematic approach to reduction and fixation of this severe injury is demonstrated, with the use of a locking precontoured proximal femur plate to stabilize the fracture. See Video 22–3, Disk 3.

25. Femoral Shaft Fractures

Video 25–1 Tips and Tricks for Femoral Nailing. Tips and tricks to allow successful antegrade reaming of the femur are reviewed. Patient positioning, location of the piniform fossa, and nailing on a conventional table are all presented.

Video 25–2 Percutaneous Antegrade Femoral Nailing. This video demonstrates a unique percutaneous technique for antegrade femoral nailing using the piniformis start portal. The anatomy of the trochanteric region and the technique of determining the appropriate location of the skin incision are reviewed.

Video 25–3 Trochanteric Antegrade Nailing of the Femur. Intramedullary nailing of the femur using a trochanteric starting portal is demonstrated. The correct starting point and techniques of reduction are emphasized.

Video 25–4 Flexible Elastic Nail for Pediatric Femur Fracture. Although not discussed in the text, this video shows the use of stacked titanium elastic nails for stabilization of a transverse femoral shaft fracture in an 8-year-old child. Two nails are inserted retrograde, one each from the medial and lateral femoral condyles.

Video 25–5 Retrograde Intramedullary Nail for an A Type Supracondylar Femur Fracture. A 2.5-cm medial parapatellar approach is utilized for stabilization for an A type supracondylar femur fracture. Emphasis is on correct starting point and fracture reduction.

Video 25–6 Retrograde Intramedullary Nailing of the Femur. This video demonstrates the technique and principles for retrograde nailing of a supracondylar femur fracture using a tendon splitting approach. The importance of the correct starting point is emphasized.

Video 25–7 ORIF of a Femoral Neck and Shaft Fracture. A Watson-Jones approach is used to perform an open reduction and internal fixation of a femoral neck. The shaft fracture is also stabilized with an intramedullary nail.

Video 25–8 Compression Plating of a Femur Nonunion. This video demonstrates compression plate fixation of a femur nonunion with a titanium broad LCDCP. The lateral approach to the femur, as well as the importance of debridement of the nonunion and compression of viable bone fragments are stressed. See Video 5–2, Disk 1.

26. Distal Femur Fractures

Video 26–1 Minimally Invasive Percutaneous Plate Osteosynthesis of the Distal Femur. The patient in this video is treated with a DCS plate applied using MIPO techniques and bridge plating. The surgeon demonstrates tricks for success with MIPO, including judgment of length and rotation. See Video 4–2, Disk 1.

Video 26–2 Retrograde Intramedullary Nail for A Type Supracondylar Femur Fracture. A 2.5 cm medial parapatellar approach is utilized for stabilization for an A type supracondylar femur fracture. Emphasis is on correct starting point and fracture reduction. See Video 25–5, Disk 3.

Video 26–3 Retrograde Intramedullary Nailing of the Distal Femur. This video demonstrates the technique and principles for retrograde nailing of a supracondylar femur fracture using a tendon splitting approach. The importance of the correct starting point is emphasized. See Video 25–6, Disk 3.

Video 26–4 Arthroscopic-Assisted Removal of a Retrograde Nail. Removal of a retrograde intramedullary nail is remarkably facilitated by using an arthroscopic-assisted technique. The use of arthroscopy and the method of removal are demonstrated.

Video 26–5 ORIF of a C2 Distal Femur Fracture with Submuscular Locked Plating. Submuscular locked fixation is performed for a ballistic C2 distal femur fracture in a 34-year-old male. Delayed reconstruction is carried out following placement of a spanning external fixator, originally placed after repair of a vascular injury. See Video 4–4, Disk 1.

Video 26–6 Submuscular Locked Fixation of a Combined C3 Distal Femur and C3 Proximal Tibial Fracture. A modified lateral peripatellar approach is utilized for direct visualization of complex articular injuries of both the tibial plateau and distal femur. The steps of submuscularly locked fixation are emphasized.

Video 26–7 ORIF of a Periprosthetic Fracture with Submuscular Locked Plating. LISS fixation of a distal femur fracture is performed in an osteoporotic distal femur fracture above a total knee arthroplasty. Minimal exposure of the fracture and closed reduction techniques are emphasized. See Video 4–3, Disk 1.
27. Patella Fractures and Injuries to the Extensor Knee Mechanism

Video 27–1 Tension Band Wire and ORIF of a Patella Fracture with Minifragment Screws. A multifragmentary patella fracture is stabilized through use of both interfragmentary lag screws and tension band fixation. Emphasis is placed on attention to detail in placement of the tension band construct.

Video 27–2 Patella Nonunion. This video is an elderly gentleman who failed tension band wiring of his patella when he fell during the postoperative period leading to a hardware failure. A revision tension band wiring after debridement of the nonunion is demonstrated.

28. Knee Dislocations and Ligamentous Injuries

Video 28–1 Double-Bundle Inlay Posterior Cruciate Ligament (PCL) Reconstruction. This video demonstrates the anatomical PCL reconstruction technique using an Achilles tendon allograft with two femoral tunnels. We also show the tibial inlay technique through a posteromedial approach.

Video 28–2 Hamstring Anterior Cruciate Ligament (ACL) Reconstruction. This video demonstrates a case using hamstring autograft to reconstruct the ACL over a bioabsorbable pin in the femur.

Video 28–3 Posterolateral Corner Reconstruction. This video presents the modified two-tailed technique for posterolateral corner reconstruction using either tibialis anterior or tibialis posterior allograft. Methods of determining the isometric point on the lateral femoral condyle are demonstrated.

Video 28–4 Posteromedial Corner Reconstruction with Autograft. This video demonstrates reconstruction of the posteromedial corner using a semitendinosus autograft. The technique reconstructs both the deep medial collateral ligament (MCL) and the posterior oblique ligament.

Video 28–5 Posteromedial Corner Reconstruction with Allograft. This video shows posteromedial complex (PMC) reconstruction using tibialis anterior or posterior allograft using screws and washers at the isometric point on the medial femoral condyle and near the pes anserinus on the tibia.

Video 28–6 Placement of Compass Knee Hinge External Fixator. This video presents step-by-step instructions on how to place a Compass Knee Hinge external fixator. The technique for determining the isometric point on the femoral condyles is demonstrated.

Video 28–7 Bone-Patellar Tendon-Bone (BTB) ACL Reconstruction with Bioabsorbable Pins. This video demonstrates ACL reconstruction using a bone–patellar tendon–bone graft and bioabsorbable pin fixation. Advantages of this technique include perpendicular fixation of the graft and bioabsorbable pin fixation which allows easy revision if needed.

Video 28–8 Double-Bundle Anatomical ACL Reconstruction. This video reviews the concept of double-bundle ACL reconstruction, including the anatomical basis for using the double bundle technique. We then demonstrate one double-bundle ACL reconstruction technique using tibialis anterior allografts with Endobutton (Smith & Nephew Endoscopy, Memphis, Tennessee) femoral fixation and bioabsorbable screw tibial fixation.

Video 28–9 Posterolateral Bundle of the ACL Reconstruction. The posterolateral bundle of the ACL can be torn with an intact anteromedial bundle. This video shows reconstruction of an isolated PL bundle reconstruction using tibialis anterior allograft.

29. Tibial Plateau Fractures

Video 29–1 Rules of Locked Plating. This presentation reviews the rules that should be applied by surgeons employing locked plating. Included in this presentation is unicortical locked plating systems designed for minimally invasive submuscular application, as well as hybrid plating that includes mixing locked and unlocked screws. The appropriate order of application of screws is stressed. See Video 4–1, Disk 1.

Video 29–2 ORIF of a Bicondylar Tibial Plateau Fracture with the Less Invasive Stabilization System (LISS) Internal Fixator. The patient in this case sustained a comminuted bicondylar tibial plateau fracture. Minimally invasive fixation using the LISS is demonstrated. The importance of obtaining a reduction prior to placing any locked screws is emphasized. See Video 4–5, Disk 1.

Video 29–3 Submuscular Locked Fixation of a Combined C3 Distal Femur and C3 Proximal Tibial Fracture. A modified lateral peripatellar approach is utilized for direct visualization of complex articular injuries of both the tibial plateau and distal femur. The steps of submuscular locked fixation are emphasized. See Video 26–6, Disk 3.

Video 29–4 ORIF of a Medial Tibial Plateau Fracture Dislocation with Locked Plating. This video demonstrates a Shatzker IV tibial plateau fracture combined with a multiligament knee injury. Arthroscopy is combined with locked plating to treat remarkably proximal medial tibial plateau fracture.

Video 29–5 Arthroscopic-Assisted ORIF of a Tibial Plateau Fracture. This video lecture on arthroscopic-assisted ORIF of tibial plateau fractures emphasizes room setup, portal placement, and the use of ACL guides and impactors to reduce displaced tibial plateau fractures.

Video 29–6 ORIF with a Small Wire Circular External Fixator. This video reviews the principles of ORIF of tibial plateau fractures using small wire external fixation. See Video 2–2, Disk 1.

Video 29–7 Placement of Compass Knee Hinge External Fixator. This video presents step-by-step instructions on how to place a Compass Knee Hinge external fixator. The technique for determining the isometric point on the femoral condyles is demonstrated. See Video 28–6, Disk 4.
30. Tibial Shaft Fractures

Video 30–1 Intramedullary Nailing of a Tibia Fracture. Intramedullary nailing of the tibia is shown using a nail that allows nailing in extension. Placement of the starting point is emphasized.

Video 30–2 Anterolateral Percutaneous Plating of a Spiral Distal Tibial Shaft Fracture. This video shows reduction and percutaneous plate fixation of a displaced spiral fracture of the distal tibial metaphysis. The video emphasizes the use of imaging and percutaneous reduction techniques.

Video 30–3 External Fixation of the Tibia. This video shows the application of a uniplanar external fixator to the tibia of a 12-year-old child with an unstable tibia fracture and compartment syndrome. The fixator was applied after fasciotomies and wound VAC application. The stepwise construction of the frame is shown.

31. Distal Tibia Fractures

Video 31–1 Application of an Ankle-Spanning External Fixator. This video shows the application of a spanning fixator across the ankle for the initial management of a distal tibia fracture.

Video 31–2 ORIF of a Partial Articular (Type B) Pilon Fracture. This video shows the delayed reduction and internal fixation of a partial articular tibial plafond fracture in a patient that had been initially managed in an ankle-spanning external fixator. A medial periarticular plate (ACE-DePuy, Warsaw, Indiana) was applied through an anteromedial incision with percutaneous screw fixation of the distal fibula.

Video 31–3 ORIF of a Pilon Fracture with a Periarticular Nonlocking Plate. This video demonstrates the use of a periarticular plate through minimal incisions to treat a type 43B fracture. We review the approaches for treating pilon fractures, as well as key principles used in the successful treatment of these difficult fractures.

Video 31–4 Locked Plating of a Pilon Fracture. This video demonstrates ORIF of a pilon fracture using locked plating. The benefits of stabilization of the fibula as part of the treatment strategy are reviewed. We also discuss the importance of planning the location of incisions to keep all options open. See Video 4–6, Disk 1.

Video 31–5 ORIF of a Pilon Fracture Using a Posterior Approach. This video demonstrates ORIF of a pilon fracture with a severe soft tissue injury anteriorly. The posteromedial approach is used to avoid the damaged soft tissue envelope. Potential posterior approaches and the intervals the surgeon utilizes are discussed.

32. Ankle Fractures and Dislocations

Video 32–1 ORIF of an Open Ankle Fracture. This video demonstrates ORIF of a Weber B ankle fracture with an open medial malleolus fracture. Soft tissue handling, extension of the fibula fracture proximally, and fixation of the medial malleolus are discussed.

33. Foot Fractures

Video 33–1 ORIF of a Talus Fracture. This video demonstrates open reduction and internal fixation of a talus fracture using a lag screw combined with a small plate. The two-incision technique is used to allow full visualization of the reduction.

Video 33–2 ORIF of a Calcaneus Fracture. This video demonstrates open reduction and internal fixation of a comminuted intra-articular calcaneal fracture with the addition of Norion cement to supplement the fixation.

Video 33–3 Closed Reduction and External Fixation of a Cuboid (Lateral Column) Fracture. This patient sustained a “nutcracker” comminuted cuboid fracture. He was treated with external fixation to maintain the length of the lateral column and allow healing.

Video 33–4 ORIF of a Lisfranc Fracture Dislocation. This video demonstrates ORIF of a Lisfranc fracture, taking care to obtain a reduction of the keystone of the base of the second metatarsal against the middle and medial cuneiforms.

34. The Polytrauma Patient

Video 34–1 Unreamed Femoral Nailing To Treat Bilateral Femur Fractures in a Multitrauma Patient. This video shows the use of unreamed nails in a multitrauma patient with a pulmonary injury and bilateral femur fractures. Decision-making and the steps to treat this patient are reviewed. See Video 24–1, Disk 3.

Video 34–2 Application of an Ankle-Spanning External Fixator. This video shows the application of a spanning fixator across the ankle for the initial management of a distal tibia fracture. See Video 31–1, Disk 4.

Video 34–3 The Use of a Reamer-Irrigator-Aspirator in a Multitrauma Patient. This video demonstrates a new reamer that reams long bones in a single pass while aspirating the medullary contents. Animal data and transesophageal echocardiography demonstrate that this system decreases the volume of pulmonary emboli during reaming of long bones. See Video 5–3, Disk 1.