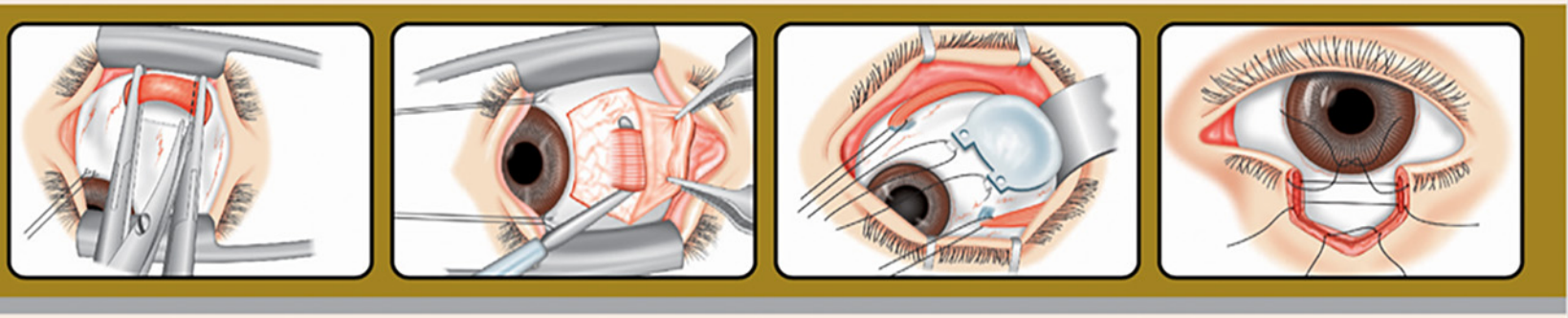
JAYPEE

Get Full Access
with added features at

www.emedicine360.com

MASTER TECHNIQUES IN OPHTHALMIC SURGERY



Editor
Frederick Hampton Roy

Co-editor
Renee Tindall

2nd EDITION

Contents

Section 1: Anterior Chamber

1. Cyclodialysis Cleft in Anterior Chamber Area **3**
Evan Benjamin Dreyer, Norman M Aquino
- Indications and Contraindications 3
- Preoperative Evaluation 3
- Surgical Techniques 3
- Evaluation 5
- Management 5

2. Epithelial Downgrowth **8**
J James Rowsey
- Indications and Contraindications 8
- Recognition and Diagnosis of Epithelium in the Anterior Segment 8
- Predisposing Factors to Epithelial Downgrowth 9
- Factors Opposing Epithelial Downgrowth 9
- Endothelial Inhibition 10
- Epithelial Downgrowth after Eye Surgery 10
- Surgical Techniques: Epithelial Downgrowth 10
- Eighteen Millimeter Corneoscleral Transplants for Epithelial Downgrowth 13
- Technical Alternatives and Pitfalls: Surgery for Epithelial Downgrowth 17
- Rehabilitation 17
- Results 17
- Discussion 18

3. Foreign Body of Anterior Chamber **20**
Majed Alkharashi
- Clinical Thought Processes 20
- Indications and Contraindications 22
- Surgical Techniques 22
- Closure Technique 24
- Technical Alternative and Pitfalls 25
- Rehabilitation 25

4. Intraocular Epithelial Cysts **27**
F Hampton Roy
- Clinical Considerations 27

- Indications and Contraindications 28
- Surgical Techniques 28
- Photocoagulation Technique 30

5. Postoperative Flat or Shallow Anterior Chamber 32
Lama A Al-Aswad, George A Cioffi
- Wound Leaks 32
- Glaucoma Surgery 33
- Choroidal Detachments 33
- Pupillary Block 34
- Malignant Glaucoma or Aqueous Misdirection Syndrome 34
- Indications and Contraindications 35
- Surgical Techniques 35

Section 2: Choroid

6. Angioid Streaks 41
F Hampton Roy
- Indications and Contraindications 42
- Surgical Techniques 42
- Technical Alternatives and Pitfalls 43
- Rehabilitation 44

7. Choroidal Detachment 47
Carlos W Arzabe, Sulaiman M Alsulaiman, Abdulaziz Adel Al Rushood, Carmen Demetrio, J Fernando Arevalo
- Medical Management 47
- Postoperative Management 51
- Complications 51
- Uveal Effusion Syndrome 52
- Differential Diagnosis 52
- Treatment 52
- Prognosis 53

8. Choroidal Neovascular Membranes 55
Abdulaziz Adel Al Rushood, Sulaiman M Alsulaiman, Carlos W Arzabe, J Fernando Arevalo
- Indications and Contraindications 55
- Fluorescein Angiography 55
- Optical Coherence Tomography 56
- New Techniques for Treating Choroidal Neovascular Membrane 59
- Diagnosis and Initiation of Therapy 59
- Role of Optical Coherence Tomography in Antiangiogenic Treatment Protocols 60

9. Expulsive Suprachoroidal Hemorrhage **63**
Sulaiman M Alsulaiman, Carlos W Arzabe, Abdulaziz Adel Al Rushood, Carmen Demetrio, J Fernando Arevalo
- Etiology 63
- Clinical Features 64
- Prevention 64
- Surgical Techniques 66
- Medical 67

10. Posterior Uveal Melanoma **69**
Connie J Chen, James T Handa
- Surgical Application of Radioactive Plaque 69
- Charged Particle Radiation 71
- Local Resection 73
- Enucleation 73
- Orbital Exenteration 74
- Nonsurgical Approaches 74

Section 3: Conjunctiva

11. Conjunctival Lacerations **79**
F Hampton Roy
- Indications and Contraindications 79
- Surgical Techniques 80
- Alternatives and Pitfalls 81
- Rehabilitation 82

12. Conjunctival and Corneal Melanotic Lesions **83**
Woodford S Van Meter, Douglas G Katz, Arpan Bachhawat
- Clinical Thought Processes 83
- Indications and Contraindications 83
- Surgical Techniques 86
- Postoperative Care 87
- Technical Alternatives 87

13. Pterygium **90**
Italo M Astudillo, Kenneth R Kenyon, Peter A Rapoza
- Indications and Contraindications 90
- Surgical Techniques 91
- Surgical Anatomy of the Conjunctiva 91
- Pterygium Resection Techniques 91
- Conjunctival Grafts and Flaps 92

- Adjunctive Therapy 94
- Complications 95
- Future 97

Section 4: Cornea

14. Band Keratopathy 101

Nicholas J Butler, Yassine J Daoud

- Pathogenesis 101
- Disease Associations 102
- Indications and Contraindications 103
- Complications 105

15. Bullous Keratopathy in Pseudophakia 107

Vikas Mittal

- Preoperative Assessment and Contraindications 107
- Procedure 107
- Postoperative Medications 112
- Complications and Management 113

16. Chemical and Thermal Burns of the Ocular Surface 114

Dasa V Gangadhar, Kenneth R Kenyon, Sundeep K Kasi

- Pathophysiology 114
- Classification of Severity 114
- Medical Management 115
- Surgical Therapy 115
- Adjunctive Therapies 118
- Surgical Variations and Alternatives 118
- Keratoplasty and Keratoprosthesis 119

17. Conjunctival and Corneal Intraepithelial Neoplasia 121

Frederick W Fraunfelder

- General Features 121
- Indications and Contraindications 121
- Technical Alternatives and Pitfalls 123

18. Corneal Laceration or Perforation 125

Vikas Mittal

- Evaluation 125
- Management 126
- Technical Alternatives 129
- Rehabilitation 129

19. Corneal Cysts **132**
Jim Liu
- Clinical Presentation 132
- Indications and Contraindications 132
- Surgical Techniques 134

20. Descemet's Membrane Detachment **136**
F Hampton Roy
- Overview 136
- Indications and Contraindications 136
- Surgical Techniques 136
- Dressings and Immediate Postoperative Care 138
- Technical Alternatives 138
- Potential Pitfalls 138

21. Keratoconus **140**
John D Au, Thomas L Steinemann
- Clinical Background 140
- Surgical Indications and Contraindications 140
- Treatment of Corneal Hydrops 146

22. Pellucid Marginal Degeneration **148**
Rory Meyer, Yassine Daoud
- Indications and Contraindications 148
- Technical Alternatives and Pitfalls 150
- Rehabilitation 151

23. Recurrent Corneal Erosion **152**
Tayyeba K Ali, David B Warner
- Clinical Findings 152
- Medical Management 152

24. White Cornea **158**
Peter R Kastl
- Differential Diagnosis of the White Cornea 158
- Diagnosis of Hidden Pathology 158
- Indications and Contraindications 159
- Surgical Techniques 159

25. Anterior Stromal Opacity **160**
Lesile T Pham, Dasa V Gangadhar, Kenneth M Goins, Michael D Wagoner, Kenneth R Kenyon
- Indications and Contraindications 160
- Surgical Techniques 163
- Technical Alternatives and Pitfalls 164

Section 5: Extraocular Muscles

26. Abducens (Sixth Nerve) Paralysis **171**
Derek T Sprunger, Kathryn M Haider
- Indications and Contraindications 172
- Surgical Techniques 173
- Technical Alternatives and Pitfalls 174
- Rehabilitation 175

27. Acquired Nonaccommodative Esotropia **177**
Arun Verma
- Indications and Contraindications 177
- Surgical Techniques 177
- Recession of the Medial Rectus Muscle 179
- Resection of the Lateral Rectus Muscle 181
- Postoperative Care 183
- Rehabilitation 183

28. A-Pattern Esotropia **185**
Stephen P Christiansen
- Indications and Contraindications 186
- Surgical Techniques 186

29. A-Pattern Exotropia **191**
Julia L Stevens
- Clinical Findings 191
- Indications and Contraindications 191
- Surgical Techniques 192
- Technical Alternatives 195

30. Basic Exotropia **197**
F Hampton Roy
- Etiology 197
- Evaluation 197
- Therapy 197
- Precautions 198
- Surgical Choices 199
- Anesthesia 199
- Surgical Techniques 200
- Surgical Complications 203

31. Brown's Syndrome **206**
F Hampton Roy
- Clinical Background 206

- Indications and Contraindications 206
- Choice of Procedure 207
- Surgical Technique 207
- Operative Procedure 207
- Pitfalls and Pearls 209

32. Congenital Fibrosis of the Extraocular Muscles 211

F Hampton Roy

- Indications and Contraindications 211
- Surgical Techniques 211

33. Convergence Insufficiency 214

Malcolm L Mazow

- Diagnosis 214
- Pitfalls of Diagnosis 215
- Nonsurgical Treatment 215
- Indications and Contraindications 215
- Technical Alternatives and Pitfalls 218
- Rehabilitation 218

34. Dissociated Vertical Deviation 221

Brita S Deacon, K Camille Dimiceli

- Indications and Contraindications 221
- Surgical Techniques 221

35. Double Elevator Palsy 227

Edward L Raab

- Case Identification 227
- Indications and Contraindications 230
- Choice of Operation 230
- Surgical Technique 230
- Technical Alternatives and Pitfalls 232

36. Duane's Retraction Syndrome 235

A Henry Thomas

- Indications and Contraindications 235
- Etiology 235
- Treatment 236
- Surgical Techniques 236

37. Congenital 'Essential' Infantile Esotropia 238

Eugene Helveston

- Terminology 238
- Timing of Onset of the Esodeviation 238
- Etiology 239

- The Clinical Picture 239
- The Significance of Nystagmus 239
- Patient Presentation 240
- Work-Up 240
- The Role of Glasses 241
- Amblyopia 241
- The Oblique Muscles 242
- The Treatment of Congenital Esotropia 243
- The Timing of Surgery 243
- Surgical Technique 244
- For the Future 249

38. Intermittent Exotropia 253

Brita S Deacon, K Camille Dimiceli

- Expectations 253
- Indications and Contraindications 253
- Surgical Techniques 253
- Undercorrections 255
- Overcorrections 256

39. Nystagmus 258

F Hampton Roy

- Classification of Nystagmus 258
- Diagnostic Evaluation of a Patient with Nystagmus 261
- Treatment of Nystagmus 261

40. Oculomotor (Third-Nerve) Paralysis 263

F Hampton Roy, Helena Roy

- Indications and Contraindications 263
- Surgical Techniques 264
- Technical Alternatives and Pitfalls 266
- Rehabilitation 266

41. Restrictive Strabismus 268

Mary Ellen Hoehn

- Case Identification 270
- Indications and Contraindications 271
- Choice of Operation 271
- General Surgical Guidelines for Restrictive Strabismus 272
- Approach to the Extraocular Muscles with a Discussion of Alternatives and Pitfalls 272

42. Superior Oblique Myokymia 276

Earl A Palmer

- Indications and Contraindications 276

- Surgical Techniques 276
- Rehabilitation 278

43. Superior Oblique Palsy 280

David A Plager

- Thought Processes 280
- Making the Surgical Plan 281
- Indications and Contraindications 282
- Surgical Techniques 282
- Technical Alternatives and Pitfalls 285

44. V-Pattern Esotropia 287

F Hampton Roy

- Clinical Findings 287
- Indications and Contraindications 287
- Surgical Techniques 288
- Technical Alternatives 290

45. V-Pattern Exotropia 292

F Hampton Roy

- Clinical Thought Processes 292
- Indications and Contraindications 292
- Surgical Techniques 293
- Myectomy 295
- Technical Alternatives and Pitfalls 296
- Surgical Techniques 296
- Complications 297

Section 6: Eyelids

46. Ankyloblepharon 301

Gary S Lissner, Amy Lin

- Thought Processes 301
- Indications and Contraindications 302
- Surgical Techniques 302
- Pitfalls 304

47. Blepharophimosis 306

Wade Brock

- Clinical Features 306
- Indications and Contraindications 306
- Technical Alternatives and Pitfalls 310

48. Chalazion **313**
F Hampton Roy, Jan Logan Eyre
- Clinical Thought Process 313
- Indications and Contraindications 313
- Surgical Techniques 313
- Technical Alternatives and Pitfalls 315
- Rehabilitation and Postoperative Treatment 315

49. Dermatochalasis **317**
John Nguyen, John Pemberton, Abraham Park, Jie Gao
- Patient Evaluation 317
- Surgical Techniques 319

50. Ectropion **326**
Alejandra A Valenzuela
- Physiopathology and Clinical Examination 326
- Surgical Techniques 326
- Involutional Ectropion 326
- Mechanical Ectropion 329
- Paralytic Ectropion 329

51. Entropion **331**
Eric A Steele, Roger A Dailey
- Indications and Contraindications 331
- Surgical Techniques 331
- Technical Alternatives and Pitfalls 332
- Rehabilitation 332

52. Epicanthus **334**
Alejandra Valenzuela
- Indications and Contraindications 334
- Surgical Techniques 335

53. Everted Punctum **340**
John D Pemberton, Maria Hester
- Nonsurgical 340
- Surgical Techniques 340

54. Eyelid Coloboma **343**
John D Bullock, Ronald E Warwar
- Indications and Contraindications 343
- Surgical Techniques 343

55. Floppy Eyelid Syndrome **346**
F Hampton Roy
- Indications and Contraindications 347

- Surgical Techniques 347
- Anatomic Considerations 348
- Procedure 348

56. Lagophthalmos 352

Inci Dersu

- Indications and Contraindications 352
- Selection of Patients 353
- Surgical Techniques 353

57. Lid Laceration and Avulsions 357

Bradley Thuro, F Hampton Roy

- Indications and Contraindications 357
- Anatomy 357
- Surgical Techniques 358
- Procedure Specifics 359
- Alternatives and Pitfalls 363
- Rehabilitation 363

58. Lid Retraction 365

F Hampton Roy

- Evaluation 365
- Eyelid Anatomy 365
- Indications and Contraindications 366
- Treatment Alternatives and Pitfalls 369

59. Lid Tumors 372

Bradley A Thuro, F Hampton Roy

- Surgical Techniques 372

60. Madarosis 377

Herbert J Glatt, Allen M Putterman

- Indications and Contraindications 377
- Therapy 377
- Surgical Techniques 378

61. Marcus Gunn Jaw-Winking Syndrome 380

F Hampton Roy

- Indications and Contraindications 380
- Surgical Techniques 381

62. Melanocytic Lesions of the Eyelids 387

Joshua Hardin, Thomas C Cannon

- Indications and Contraindications 387
- Benign Nevus 387

- Surgical Techniques 388
- Malignant Melanocytic Lesions 390

63. Orbital Fat Herniation 401

F Hampton Roy

- Preoperative Evaluation 401
- Indications and Contraindications 401
- Surgical Techniques 401
- Technical Alternatives 404
- Technical Alternatives and Pitfalls 405
- Rehabilitation 406

64. Ptosis 407

Roxana Rivera-Michlig, Uma M Sachdeva

- Congenital Ptosis 407
- Myogenic Ptosis 408
- Aponeurotic Ptosis 409
- Neurogenic Ptosis 409
- Mechanical Ptosis 409
- Apparent Ptosis 409
- Indications and Contraindications 409
- Surgical Techniques 410

65. Kohn-Romano Syndrome (Blepharophimosis Syndrome) 417

John Pemberton, Eddie Mengarelli

- Surgical Techniques 417

66. Symblepharon 423

David B Warner

- Pathogenesis and Indications for Repair 423
- Nonsurgical and Surgical Prevention 423
- Reconstruction Techniques 424

67. Trichiasis 429

Kasra Eliasieh

- Indications and Contraindications 430
- Surgical Techniques 430
- Indications and Contraindications 432

68. Xanthelasma 438

Inci Dersu

- Histology 438
- Lipid Biochemistry 438
- Associated Diseases 439
- Indications and Contraindications 439

Section 7: Globe

69. Anophthalmos **443**
Fatemeh Rajaii, Roxana Rivera-Michlig
- Congenital Anophthalmos 443
- Acquired Anophthalmos 446
- Orbital Implant Migration, Extrusion and Exposure 448
- Socket Contracture 450

70. Combined Anterior and Posterior Segment Trauma **454**
Ferenc Kuhn, Robert Morris, C Douglas Witherspoon
- Evaluation 454
- Surgical Planning 455
- Postoperative Care 461
- Technical Alternatives 461
- Complications and their Management 461
- Prognosis and Results 461

71. Blind-Painful Eye **463**
Jessica Chang, Farhan Merali, Fang Ko, Valliammai Muthappan, Nicholas Mahoney
- Modes of Treatment 463

72. Endophthalmitis **473**
Robert E Morris, Charles L Clark, Mathew R Sapp, Matthew H Oltmanns, Ferenc Kuhn
- Indications and Contraindications 476
- Surgical Techniques 477
- Technical Alternatives and Complications 482
- Rehabilitation 483

73. Global Traumatic Rupture **485**
F Hampton Roy
- Indications and Contraindications 485
- Specific Diagnostic Clinical Clues 486
- Tests that Aid in Diagnosis 487
- Prognosis 487
- Surgical Techniques 488

74. Severe Ocular Surface Trauma **489**
Christina R Prescott
- Preoperative Considerations 489
- Surgical Options 489
- Surgical Techniques 490
- Alternative Therapy 494
- Rehabilitation 494

Section 8: Intraocular Pressure

75. Encapsulated Filtering Bleb **499**
Paul N Schacknow
- Indications and Contraindications for Restoration of Filtration through Encapsulated Bleb 500
- Therapy 500
- Surgical Techniques 501

76. Childhood Glaucoma **506**
Sarwat Salim
- Preoperative Considerations for Goniosurgery 508
- Goniotomy 508
- Trabeculotomy 510
- Complications of Goniosurgery 511
- Immediate Postoperative Care after Goniosurgery 511
- Rehabilitation and Extended Postoperative Care after Goniosurgery 511
- Trabeculectomy 511
- Nonpenetrating Surgery 512
- Glaucoma Drainage Devices 512
- Cyclodestructive Procedures 512

77. Primary and Secondary Closed-Angle Glaucoma **515**
Manuel José Justiniano, José Justiniano Talavera, Carlos Walter Arzabe
- Classification 515
- Primary Closed-Angle Glaucoma 515
- Secondary Closed-Angle Glaucoma 517

78. Primary and Secondary Open-Angle Glaucoma **522**
Manuel José Justiniano
- Open-Angle Glaucoma 522
- Laser Trabeculoplasty 522
- Indications and Contraindications 523
- Preoperative Care 523
- Postoperative Care 524
- Filtering Surgery for Open-Angle Glaucoma 524
- Indications and Contraindications 525
- Preoperative Care 525
- Surgical Techniques 526
- Final Steps 530
- Complications 531

79. Elevated Intraocular Pressure after Filtering Surgery **534**
Sarwat Salim, Sean Lanchulev
- Elevated Intraocular Pressure and Deep Anterior Chamber 534
- Elevated Intraocular Pressure and Shallow or Flat Anterior Chamber 538

80. Cataract in the Glaucomatous Eye **543**
Malik Y Kahook, Joel S Schuman
- Indications and Contraindications 543
- Special Considerations 543
- Surgical Options 543
- Surgical Techniques 544
- Postoperative Care 547

81. Glaucoma Surgery with Fugo Blade **551**
Daljit Singh, Kiranjit Singh
- The Myth of Guarded Surgery 551
- An Ideal Bleb 552
- Fugo Blade 556
- Microtrack Filtration According to Kiranjit 560
- Fugo Blade Glaucoma Surgery in Different Situations 566

Section 9: Iris and Ciliary Body

82. Iris Cysts **573**
F Hampton Roy
- Preoperative Considerations 573
- Indications and Contraindications 573
- Surgical Techniques 574

83. Iris Laceration and Iridodialysis **581**
F Hampton Roy
- Indications and Contraindications 581
- Surgical Techniques 581
- Surgical Techniques 583

84. Iris Melanoma **586**
F Hampton Roy
- Indications and Contraindications 586
- Surgical Techniques 586
- Fine-Needle Aspiration Biopsy 587
- Management of Secondary Glaucoma 588

85. Iris Prolapse **590**
Stephen S Lane
- Postoperative Iris Prolapse 590
- Indications and Contraindications 591
- Surgical Techniques 591
- Intraoperative Iris Prolapse 593

86. Intermediate Uveitis/Pars Planitis **595**
Eric Singman, Theresa Gan Leung
- Overview of Therapy 595
- Ocular Therapy 595
- Systemic Therapy 597
- Surgical Therapy 597

87. Rubeosis Iridis **601**
F Hampton Roy
- Clinical Aspects 601
- History and Physical Examination 601
- Indications and Contraindications 601
- Laboratory Evaluation 602
- Indications and Contraindications for Treatment 602
- Postoperative Course 603

88. Irregular Pupil **605**
Joshua Ney, Robert P Liss
- Surgical Indications and Contraindications 605
- Surgical Techniques 606

Section 10: Lacrimal System

89. Congenital Lacrimal System Anomalies **615**
R Scott Lowery
- Background and Embryology 615
- Signs and Symptoms 616
- Indications and Contraindications for Treatment 616
- Surgical Techniques 616

90. Dacryoadenitis **619**
R Scott Lowery
- Presentation 619
- Frequency 619
- Differential Diagnosis 619
- Evaluation 620
- Indications, Contraindications and Treatment 620

91. Dacryocystitis **622**
Grant D Gilliland, John N Harrington
- Epidemiology 622
- Anatomy 622
- Clinical Manifestations 623
- Etiology 624
- Histology 625
- Diagnosis 625
- Differential Diagnosis 625
- Indications and Contraindications 626
- Anesthesia 626
- Surgical Techniques 626
- Postoperative Care 627
- Contraindications for Surgery 628
- Prognosis 628

92. Dacryolith **631**
F Hampton Roy
- Indications and Contraindications 631
- Surgical Techniques 632
- Alternatives and Pitfalls 634
- Rehabilitation 635

93. Lacrimal Gland Tumors **637**
F Hampton Roy
- Clinical Evaluation 637
- Indications and Contraindications 637
- Surgical Techniques 638

94. Lacrimal Hypersecretion **641**
Chris Thiagarajah, Jay M Lustbader
- External Diseases 641
- Eyelid Malpositioning 642
- Lacrimal System Abnormalities 642
- Indications and Contraindications 642
- Surgical Techniques 643

95. Lacrimal Hyposecretion **646**
Aruoriwo M Oboh-Weilke, Jay M Lustbader
- Classification of Dry Eye 646
- Indications and Contraindications 647
- Medical Management 647
- Surgical Techniques 647
- Punctal Occlusion 648

96. Lacrimal Laceration **653**
R Patrick Yeatts, Andrew Ting
- Anatomy 653
- Mechanism of Injury 653
- Diagnosis 653
- Indications and Contraindications 654
- Bicanalicular-Nasal Stent Placement 655
- Bicanalicular-Annular Stent Placement 655
- Monocanalicular Stent Placement 658
- Mucosal Anastomosis 658
- Stent Materials 658
- Stent Removal 658
- Complications 659

Section 11: Lens

97. Adult Cataracts and Planned Extracapsular Cataract Surgery with Manual Expression of the Lens Nucleus **663**
F Hampton Roy
- Adult Cataracts 663
- Decision-Making Processes 663
- Indications and Contraindications 663
- Surgical Techniques 664
- Phacoemulsification 666
- Technical Alternatives and Pitfalls 668
- Pitfalls 669
- Planned Extracapsular Cataract Surgery with Manual Expression of the Lens Nucleus 672
- Intracapsular Cataract Surgery 674

98. Posterior Capsular Opacification after Cataract Surgery **677**
Jerre Minor Freeman
- Management 677
- Indications and Contraindications 678
- Surgical Techniques 678

99. Congenital and Infantile Cataracts **681**
F Hampton Roy
- Evaluation of Patient with Lens Abnormalities 681
- Management of Infantile Cataracts 681
- Conservative Management 683
- Indications and Contraindications 683

- Unilateral Lens Abnormalities 683
- Bilateral Lens Abnormalities 684

100. Dislocation of the Lens 693

Devin Gattey, Steven Bailey

- Etiology 693
- Therapy 694
- Indications and Contraindications 694
- Surgical Techniques 695
- Technical Alternatives and Pitfalls 695

101. Dislocation of Intraocular Lenses 697

Michael E Snyder, Mauricio A Perez

- Preoperative Evaluation 697
- Intraocular Lens Explantation 697

102. Foreign Body of the Lens 705

F Hampton Roy

- Indications and Contraindications 705
- Clinical Presentation 705
- Surgical Techniques 705
- Technical Alternatives and Pitfalls 706
- Rehabilitation 706

103. Microincision Cataract Surgery Technique 707

Pawel Klonowski, Jorge L Alió

- Surgical Inquiry 707
- Why Microincision? 707
- Microincision Cataract Surgery Concept 708
- BiMICS Technique 708
- CoMICS Technique 716
- Microincision Cataract Surgery Intraocular Lenses 716
- Microincision Cataract Surgery Results 719
- Microincision Cataract Surgery Expectation 722

104. Femtosecond Laser Cataract Surgery 725

Gregory D Parkhurst, Stephen G Slade

- Inclusion and Exclusion Criteria 725
- Patient Education 726
- Preoperative Examination 727
- Positioning the Patient in the Operating Room 730
- Postoperative Follow-up 732
- Complications 732

Section 12: Optic Nerve

105. Optic Nerve Pit Maculopathy **739**
Eric Zavaleta, Robert Morris C, Douglas Witherspoon, Ferenc Kuhn, Mathew Sapp
- Preoperative Considerations 741
- Indications and Contraindications 744
- Surgical Techniques 744
- Technical Alternatives and Pitfalls 746

106. Optic Nerve Sheath Hematoma **749**
Fang Ko, Uma Sachdeva, Valli Muthappan, Prem Subramanian
- Preoperative Considerations 749
- Indications and Contraindications 750
- Surgical Techniques 751
- Technical Alternatives and Complications 753

107. Papilledema **754**
Thomas L Walsh
- Indications and Contraindications 755
- Surgical Techniques 755

108. Giant Cell (Temporal) Arteritis **759**
Eric S Ahn, Neil R Miller
- Epidemiology 759
- Indications for and Contraindications to a Temporal Artery Biopsy 761
- Temporal Artery Biopsy 762

Section 13: Orbit

109. Enophthalmos **771**
Frank A Nesi, Javier Servat
- Enlargement of the Orbital Space 771
- Poor Orbital Bone Development 773
- Reduction of Orbital Contents 777

110. External Orbital Fracture **780**
Richard D Lisman, Gary J Lelli
- Clinical Evaluation—Zygomaticomaxillary Complex Fracture of the Orbit 780
- Classification of Zygomaticomaxillary Complex Fractures 780
- Signs and Symptoms of Zygomaticomaxillary Complex Fractures 782
- Indications and Contraindications 782
- Surgical Techniques 782

- Alternative Surgical Procedures and Sites 785
- Rehabilitation 786
- Delayed Complications 787

111. Internal Orbital Fracture 788
Ralph E Wesley, Kimberly A Klippenstein
- Indications and Contraindications 788
- Surgical Techniques 791
- Alternative Techniques and Pitfalls 793
- Rehabilitation 794

112. Preseptal and Orbital Infectious Disease 795
Mira M Sachdeva, Roxana Y Rivera-Michlig
- Clinical Features 795
- Epidemiology 798
- Management 798
- Surgical Techniques 801
- Acute Fulminant Invasive Fungal Sinusitis 802

113. Intraorbital Foreign Body 804
Kasra Eliasieh
- Indications and Contraindications 804
- Surgical Techniques 806

114. Orbital Graves' Disease 808
J Scott Kortvelesy
- Surgical Therapy 808
- Indications and Contraindications 808
- Technical Alternatives and Pitfalls 813
- Rehabilitation 814

115. Orbital Hemorrhage 817
F Hampton Roy
- Etiology 817
- Classification by Location 818
- Symptoms and Signs 818
- Indications and Contraindications 819
- Surgical Techniques 821

116. Orbital Tumor 825
Devron H Char
- Indications and Contraindications 825
- Surgical Techniques 825
- Fine-Needle Aspiration Biopsy 826

- Conventional Orbital Surgery 827
- Lateral Orbitotomy 828
- Superior Orbitotomy 831

117. Pseudotumor Cerebri 835

Brinda Muthusamy, Prem S Subramanian

- Epidemiology 835
- Pathology 835
- Clinical Manifestations 836
- Investigations 836
- Medical Treatment 837
- Surgery 837
- Venous Sinus Stenting 841

Section 14: Refractive Disorders

118. The Surgical Correction of Astigmatism 847

Jonathan B Kahn, Peter A Rapoza, R Bruce Grene, Kenneth R Kenyon

- Types of Astigmatism 847
- Measuring Astigmatism 847
- Nonsurgical Correction of Astigmatism 848
- Surgical Correction of Astigmatism 849
- Surgical Astigmatism: A Stepladder Approach 852
- The Future 852

119. Hyperopia and Myopia 854

Michael J Taravella, Brad Gustave, Jamison Engle

- Surgical Correction of Hyperopia 854
- Patient Work-Up 854
- Special Testing 854
- Historical Methods of Hyperopic Correction 855
- LASIK for Myopia and Hyperopia 863
- PRK versus LASIK 867
- Clear Lens Extraction for Hyperopia 871

120. Myopia (Posterior Segment) 877

F Hampton Roy

- Indications and Contraindications 877
- Posterior Staphyloma 877
- Macular Holes 881
- Posterior Retinal Detachment 881
- Macular Degeneration 885
- Cataract 885

121. Presbyopia **888**
Mounir Bashour
- Clinical Thought Process 888
- Indications and Contraindications 889
- Preoperative Evaluation 889
- Immediate Postoperative Care 896
- Rehabilitation 896
- Technical Alternatives and Pitfalls 896

Section 15: Retina

122. Neovascular Age-Related Macular Degeneration **901**
Ninel Z Gregori, Philip J Rosenfeld
- Treatment Options 901
- Pitfalls 907

123. Branch Retinal Vein Occlusion **911**
Adeel H Shaikh, Robert E Foster
- Pretreatment Considerations 913
- Treatment Indications and Contraindications 915
- Medical Treatment 916
- Laser Treatment 916
- Surgical Treatment 918

124. Central Serous Chorioretinopathy **923**
James Landers, Kent Zocchi
- Pathophysiology 923
- Clinical Characteristics 924
- Risk Factors and Associations 924
- Imaging 925
- Treatment 925
- Other Treatments 927

125. Coats' Disease **930**
Eric J Sigler, John C Randolph, Barrett G Haik, Jorge I Calzada
- Clinical Management 932
- Surgical Techniques 933

126. Cystoid Macular Edema **938**
Wayne E Fung
- Nonsurgical Approaches to Treating Cystoid Macular Edema 938
- Indications and Contraindications 942
- Surgical Techniques 942

127. Diabetic Retinopathy **945**
Suresh R Chandra, Amol D Kulkarni
- Natural History 945
- Epidemiology 946
- Management 946
- Photocoagulation Technique 948
- Nonclearing Vitreous Hemorrhage 949
- Tractional Retinal Detachment 950
- Anterior-Segment Neovascularization 950

128. Diffuse Unilateral Subacute Neuroretinitis **956**
Elizabeth A Verner-Cole, Stephanie K Cramer, Andreas K Lauer
- Indications and Contraindications 956
- Symptomatic Treatment 957
- Surgical Techniques 957

129. Eales Disease **960**
David Poon
- Epidemiology 960
- Clinical Features 961
- Treatment 962

130. Giant Retinal Tears **966**
F Hampton Roy
- Preoperative Evaluation 966
- Indications and Contraindications 966
- Surgical Techniques 967
- Typical Surgical Procedure 968
- Postoperative Care 969
- Ancillary Techniques 970
- Proliferative Vitreoretinopathy 970
- Heavy Perfluorocarbons 970
- Fellow Eye 971

131. Idiopathic Macular Hole **973**
Kent Zocchi
- Findings on Examination 973
- Natural History 974
- Risk of Development of Bilateral Macular Holes 976
- Surgery 976
- Anatomical Closure of the Macular Hole 978
- Indications for Surgery 978
- Results of Surgery 978

- Internal Limiting Membrane Peeling 979
- Growth Factors 981
- Face Down Positioning 981
- Simultaneous Cataract Surgery and Macular Hole Surgery 981
- Reoperation for Macular Holes 982
- Complications 982
- Retinal Detachment 983
- Paracentral Retinal Holes 983
- Visual Field Defects 983
- The Future 983

132. Macular Pucker **987**

F Hampton Roy

- Clinical History and Examination 987
- Clinical Features 987
- Preoperative Evaluation 987
- Indications and Contraindications 988
- Surgical Techniques 988
- Complications 989
- Postoperative Course 989

133. Peripheral Retinal Breaks and Degeneration **991**

F Hampton Roy

- Indications and Contraindications 994
- Technical Alternatives 997
- Rehabilitation 997

134. Retinal Tears **1000**

Velimir Petrović, William Mabrey

- Surgical Techniques 1002

135. Rhegmatogenous Retinal Detachment **1006**

F Hampton Roy

- Indications and Contraindications 1006
- Surgical Techniques 1008
- Special Considerations 1013
- Complications 1014
- Postoperative Care 1015
- Alternative Therapy 1016

136. Retinal Vein Obstruction **1019**

George E Sanborn

- Clinical Evaluation 1019
- Indications and Contraindications 1021

- Treatment Techniques 1022
- Clinical Alternatives and Pitfalls 1023
- Rehabilitation 1024

137. Retinoblastoma 1027

F Hampton Roy

- General Considerations 1027
- Enucleation 1027
- Episcleral Plaque Radiotherapy 1030
- Cryotherapy 1031
- Photocoagulation 1032
- Exenteration 1033
- Combined Therapeutic Modalities 1034
- Assessment of Treatment Response 1034
- Follow-Up Procedures 1034

138. Retinopathy of Prematurity 1036

F Hampton Roy

- International Classification of Retinopathy of Prematurity 1036
- Indications and Contraindications 1037
- Surgical Techniques 1038
- Indications and Contraindications 1039
- Surgical Techniques 1040
- Indications and Contraindications 1042
- Surgical Techniques 1042

139. Retinoschisis 1046

Ian Han, David Barañano

- Indications and Contraindications 1047
- Surgical Techniques 1047
- Special Considerations 1049

140. Subretinal Neovascularization 1053

Michael R Pavlica

- Pharmacologic Treatment 1053
- Injection Technique 1054
- Surgical Management 1055

Section 16: Sclera

141. Scleral Laceration 1063

Steve Charles, Eric J Sigler

- Fibrovascular Proliferation 1063
- Endophthalmitis 1063

- Sympathetic Uveitis 1064
- Presurgical Evaluation 1064
- Indications and Contraindications 1065
- Surgical Techniques 1065
- Scleral Buckling 1066
- Vitrectomy 1066
- Infusion Cannula Placement 1067
- Lensectomy 1067
- Anterior Loop Traction 1067
- Posterior Vitreous Cortex Dissection 1067
- Retinopexy 1067
- Surface Tension Management 1068

142. Anterior Scleral Staphyloma 1069

Ferenc Kuhn, C Douglas Witherspoon, Robert Morris

- Classification 1069
- Preoperative Considerations 1069
- Indications and Contraindications 1070
- Surgical Techniques 1070
- Technical Alternatives and Pitfalls 1072
- Rehabilitation/Long-Term Follow-Up 1073

143. Scleritis 1074

Theresa Gan Leung

- Indications and Contraindications 1075
- Surgical Techniques 1077
- Technical Alternatives and Pitfalls 1077
- Rehabilitation 1078

144. Scleromalacia Perforans 1080

James V Aquavella

- Indications and Contraindications 1080
- Surgical Techniques 1081
- Selection of Anesthesia 1081
- Harvesting of Autologous Periosteum 1081
- Site Preparation 1082
- Application of the Onlay (Patch) Graft 1082
- Alternative Tissues 1083
- Pitfalls and Complications 1084

Section 17: Vitreous

145. Intraocular Foreign Body in the Posterior Segment 1087

Ferenc Kuhn, Robert Morris

- Preoperative Considerations 1087

- Indications and Contraindications 1090
- Surgical Technique 1091
- Technical Alternatives and Pitfalls 1093

146. Persistent Hyperplastic Primary Vitreous 1095

James H Antoszyk, Andrew N Antoszyk

- Indications and Contraindications 1096
- Technical Alternatives and Pitfalls 1099
- Rehabilitation 1100

147. Vitreous Hemorrhage 1103

F Hampton Roy

- Indications and Contraindications 1103
- Other Causes of Vitreous Hemorrhage 1104
- Preoperative Evaluation 1104
- Surgical Techniques 1104
- Technical Alternatives and Pitfalls 1107
- Rehabilitation 1107

148. Proliferative Vitreoretinopathy 1109

Steve Charles, Eric J Sigler

- Indications and Contraindications 1110
- Surgical Techniques 1110
- Results 1115
- Complications 1115

149. Vitreous Wick Syndrome 1118

Jessica Chang, Shameema Sikder, Divya Srikumaran

- Indications and Contraindications 1120
- Surgical Techniques 1121

Index 1125

3

Foreign Body of Anterior Chamber

Majed Alkharashi

JAYPEE BROTHERS

CLINICAL THOUGHT PROCESSES

Initial Considerations

Anterior chamber foreign bodies result from perforating ocular injuries. Injuries that result in an anterior chamber foreign body should be considered ocular emergencies: immediate evaluation and treatment are warranted. Prompt evaluation to determine the extent of the injury, a decision regarding surgical intervention to remove the foreign body and meticulous attention to re-establish the integrity of the globe are necessary. If there is a posterior chamber foreign body or extensive damage to the cornea or intraocular structures that make removal of the anterior chamber foreign body secondary to a more severe problem, the situation may require the equipment and experience appropriate for a posterior chamber procedure. If a posterior chamber foreign body is present, removal of both the anterior chamber and the posterior chamber foreign bodies can be accomplished during one operation. Failure to delineate the nature of the foreign body and the extent of the injury can lead to vision-threatening complications postoperatively, if initial treatment is delayed or inadvertently misdirected.

The extent of injury often depends on four factors: (1) the size and composition of the foreign body; (2) the force at which the foreign body enters the eye; (3) the location of the entrance wound; and (4) the final resting place of the foreign body.[1]

The nature, size and location of the foreign body help to decide whether or not surgical intervention is needed. Foreign body that is small, inert, embedded in the iris and not causing any inflammation could be observed with frequent follow-ups, photos, pachymetry and specular microscopy.

Many surgeons have described small intraocular metallic foreign bodies after phacoemulsification. As phacoemulsification is a widely used technique for cataract extraction today, these fragments have recently attracted more concern. There are few studies that looked at the cause and nature of these foreign bodies. Dunbar et al. stated they are more likely to be caused by cavitation erosion at the phaco tip, while Braunstein et al. suggested when the second instrument touches the phaco tip during phacoemulsification, it causes these fragments.[2,3] Davis and Mastel observed that new titanium phaco tips had adherent metal fragments on their lathed surface on scanning electron microscopy (SEM). However, no fragments were found on used phaco tips. They suggested the ultrasonic activation of a new phaco needle with metal fragments annealed to its surface causes them to release and embed in the iris. As a result, they recommend running all new tips for 2 minutes to shake off the loose fragments.[4] Köse et al. tried to reproduce these fragments in vitro by using new and used phaco tips in glass bottles filled with saline without introducing a second instrument. Fragments were only found with the new phaco tips and composed mainly from titanium.[5] It is mostly agreed that these fragments are well-tolerated when small and not mobile.

The composition of a foreign body after phacoemulsification is important; there is a risk of toxic anterior segment syndrome if it is composed of elements such as sodium, chlorine, phosphorus, sulfur and calcium. Such foreign bodies are thought to be chemically altered fragments of ophthalmic viscosurgical device and appear opaque white.[6] In contrast, the titanium fragments from a phacoemulsification tip are made of Ti 6AL-4V ELI (Grade 5) alloy, which is considered to be inert. Future magnetic resonance imaging (MRI) compatibility is another key clinical issue, especially with the current 3–4 Tesla magnets being used for imaging. The Ti 6AL-4V ELI (Grade 5) has no known magnetic properties and is commonly used in orthopedic and dental implants.[7,8]

Another foreign body that might be found after a cataract surgery is ophthalmic ointment. Several reports have described complications associated with intraocular ointment in the anterior chamber after cataract surgery especially with clear corneal incisions. It might cause inflammation, corneal edema, or high pressure. Shukla et al. reported a case presented 2 years after clear corneal incision cataract surgery with small ointment globule in the superior angle and blurry vision due to cystoid macular edema, after anterior chamber washout, the edema was resolved and the vision improved.[9]

Patient History

A careful history is necessary to determine the type of foreign body and the mechanism of injury. Knowledge of the probable material comprising the foreign body, whether iron, copper, steel, etc. is important in anticipating complications such as siderosis or chalcosis after removal. The type of situation that caused the foreign body injury, such as hammering on metal, a grinding-wheel accident, shrapnel from an explosion, or glass from motor vehicle accident, is also helpful in determining the extent of the injury.

Greven et al. demonstrated that the patient's presenting visual acuity was the strongest predictor of final visual outcome. Prognostic factors for improved visual outcome also included hammering metal on metal as the mechanism of injury. Predictors of poor outcome included a poor presenting visual acuity, the presence of an afferent papillary defect, and vitreous hemorrhage.[10]

The elapsed time following the injury has clinical ramifications. A perforating injury with an anterior chamber foreign body carries an inherent risk of infection because of the introduction of outside material into the eye. In patients with an open eye seen immediately following a perforating ocular injury with an anterior chamber foreign body, additional foreign bodies in the posterior chamber or orbit should be ruled out. Computed tomography (CT) is helpful in localizing a foreign body and ruling out additional foreign objects in the eye. Cuts through the orbit, which should be made at a minimum of 2 mm apart, may still miss a small intraocular foreign body. Glass, wood or plastic foreign bodies will not appear on a conventional X-ray or CT scan: location of these materials may require MRI. The opacity of glass on standard X-ray film depends on the lead content of the glass. Radiographs or CT of the orbit should precede MRI, and if they reveal no metallic foreign body. Magnetic resonance imaging can be performed safely without intraocular damage from movement of an occult metallic object.[11,12] Ultrasound biomicroscopy, scheimpflug imaging, and anterior segment optical coherence tomography help to identify a foreign body in the anterior chamber and assess the integrity of the lens capsule and zonules.[13]

Preoperative Preparation

Topical and systemic antibiotic treatment should be started at the time of initial evaluation, even if the patient is not taken directly to the operating room. In general, wounds severe enough to require surgical intervention also require systemic antibiotic coverage for the foreign body. Intravitreal antibiotics should be considered in the setting of open globe with vitreous loss or involvement of the posterior segment. A large prospective randomized controlled trial of 346 eyes with penetrating eye injury showed development of endophthalmitis in 0.3% (1/179) of eyes in the group receiving intracameral or intravitreal antibiotic injection compared with 2.3% (8/167) of eyes in the control group.[14] Although there are no "gold standard" guidelines for endophthalmitis prophylaxis, the most widely accepted regimen includes a combination of topical, systemic, and intravitreal antibiotics depending on the degree of clinical suspicion of subsequent infection. Antifungal prophylaxis is generally not recommended in the absence of clinical or microbiological evidence of fungal infection.[15]

The decision of whether or not to repair a self-sealing corneal laceration is a clinical one that should be made at the time of evaluation. Acute injuries involving an anterior chamber foreign body should be repaired in the operating room. Closure of the corneal entrance wound, removal of the foreign body, and prevention of infection or additional trauma from the foreign body in the eye are considerations that direct treatment. A small corneal perforation that is self-sealing and Seidel negative even with pressure does not require sutures. A small anterior chamber foreign body that by history and examination has been present for several months or years can be observed if there is no evidence of inflammation, corneal edema, or other trauma to the inside of the eye caused by the foreign body. A foreign body that is lodged in the angle or iris often can be followed by serial biomicroscopic examinations, whereas foreign bodies that are not secured in the anterior chamber should be removed (Fig. 1).

The rationale for treatment of an anterior chamber foreign body is as follows:

- Remove the foreign body
- Re-establish the integrity of globe
- Control infection

JAYPEE BROTHERS

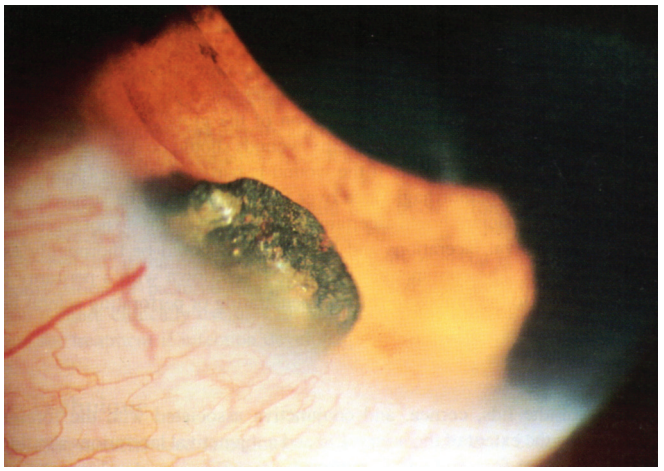


Fig. 1: Anterior chamber foreign body embedded in angle noted on routine eye examination. The patient history revealed that a foreign body injury had occurred several months previously and was never evaluated. Because the vision is good and the eye is quiet, the correct treatment of this foreign body is observation.

- Control ancillary damage to other structures in the eye.
- Visual rehabilitation, which may include the following:
  - Glasses or contact lens
  - Cataract extraction
  - Penetrating keratoplasty for corneal scar or decompensated corneal edema.

INDICATIONS AND CONTRAINDICATIONS

Small foreign bodies that perforate the cornea and enter the anterior chamber may leave a self-sealing corneal wound. If the anterior chamber is deep, if the wound edges are well-approximated, sealed, and Seidel negative, and if the intraocular pressure (IOP) in both eyes is normal, the wound may not need suture closure. The main risk of injury from those cases is infection from the foreign body. Glass, plastic, and small mineral foreign bodies can otherwise be tolerated in the eye without serious side effects. Iron and copper foreign bodies should be removed because of the additional risk of siderosis and chalcosis, respectively.

If the foreign body is large, a limbal approach must be used to remove the foreign body. Removal of the anterior chamber foreign body through the corneal entrance wound often can macerate the wound edges, increase endothelial cell damage, and slow healing by roughening the wound edge. Because it is usually difficult to grasp and remove a foreign body through the entrance wound, a limbal approach with forceps is familiar to most surgeons and allows more control over the eye once the entrance wound is closed.

SURGICAL TECHNIQUES

Anesthesia

In patients with an open eye, the wound should be repaired in the operating room as soon as possible. General anesthesia is the anesthesia of choice, although retrobulbar, peribulbar injection can be used judiciously if the perforation is self-sealing. A retrobulbar injection may increase IOP and causes extrusion of the intraocular contents. Topical anesthesia could be used as well with self-sealing wound in cooperative patients without the risk of increasing the posterior pressure.

Although general anesthesia is the most desirable choice, patients with an open eye requiring emergency surgery often have a full stomach, and succinylcholine is the anesthetic agent of choice for such emergency cases. The use of succinylcholine is believed to raise IOP and is contraindicated in patients with an open eye, although studies have shown no additional complications with this type of anesthesia.[16] The use of nondepolarizing agents prior to administration of succinylcholine will diminish the increased IOP effect.[17] Nevertheless, the use of succinylcholine should be avoided in patients with open eye.

Surface Anatomy

The extent of the wound should be surveyed under the operating microscope. Careful inspection of the lids and conjunctiva for entry-wound sites is easier when the patient is anesthetized and no longer experiences discomfort from manipulation of the globe. Examination of the upper and lower fornices for other foreign bodies or entry wounds should be done at this time. Corneal wounds should be explored to determine if the wound is partial thickness (penetrating) or full thickness (perforating). Any hemorrhagic area over the sclera should be suspected as a site of perforation. All conjunctival lacerations and hemorrhages should be thoroughly explored to rule out a perforation site. The conjunctiva should be taken down with a peritomy to explore wound edges that extend to the limbus to rule out penetrating or perforating scleral lacerations.

Incision

The first consideration in treating the globe is to address the corneal wound. Small, self-sealing corneal wounds that are Seidel negative with pressure need not be sutured. Manipulation through the corneal wound other than establishing the extent of the wound should be limited to minimize scarring and maceration of the corneal tissue

JAYPEE BROTHERS

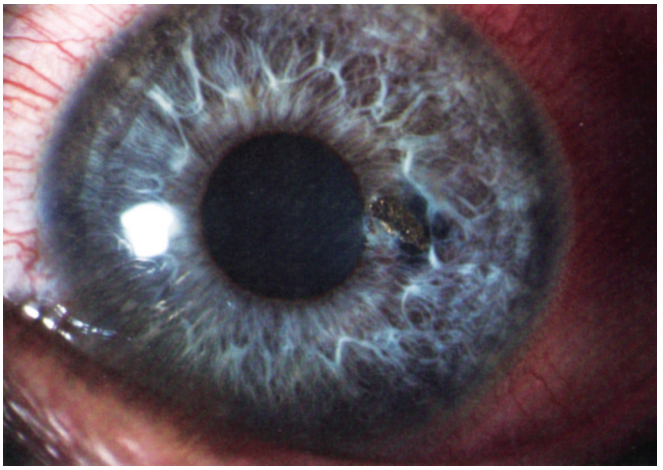


Fig. 2: Metallic foreign body embedded in iris is "tip of the iceberg". Only 25% of the foreign body is visible on slit-lamp examination.

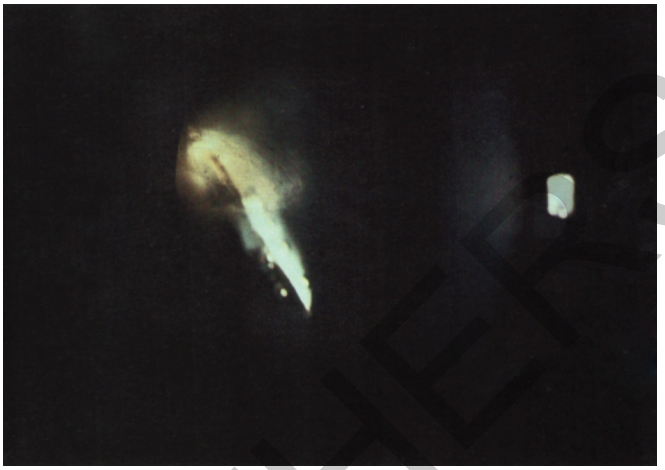


Fig. 3: Foreign body embedded in lens has already caused localized cataract. The cataract and foreign body should be removed to reduce the risk of phacolytic glaucoma or phacoanaphylaxis.

around the wound. The corneal wound should be sutured with interrupted 10-0 nylon to make the anterior chamber "watertight". When in doubt about whether to suture the wound, the wound should be sutured. Care should be taken to use deep bites with a cutting needle for good tissue opposition. Stellate wounds may require a purse-string suture. The knots are secured with a 3-1-1 closure and then trimmed very close with a microsharp blade and buried in the corneal stroma on the side of the wound away from the visual axis. Care should be taken to minimize sutures across the visual axis to reduce postoperative scaring. Sutures in general should stay in place for 6–8 months. Sutures in young patients with macerated corneas and in patients with wounds near the limbus can be removed as soon as 4–6 months; sutures in elderly patients with little fibrosis or reaction may need to stay in place for 12 months or more.

After the corneal wound has been closed, the second consideration is the removal of the foreign body. An incision similar to that for small-incision cataract surgery permits removal of most anterior chamber foreign bodies. The paracentesis incision should be made 90° away from the main incision to facilitate manipulation of the foreign body. The installation of miochol will result in miosis, which protects the lens when the foreign body is in front of the iris. Viscoelastics are used to form or maintain the anterior chamber and prevent the foreign body from moving in the anterior chamber. Hyaluronic acid is preferable to methylcellulose or chondroitin sulfate because of its greater space-maintaining ability and ease of removal.[18] The incision should be made over or near the foreign body to avoid passing it over the pupil which increases the risk of touching the lens.

Specifics of Procedure

The foreign body can be grasped with a forceps and removed from the eye. Diamond-blasted platforms make purchase on the foreign body easier than smooth platforms. An intraocular magnet could be used to remove a metallic foreign body if it is not significantly adherent to the ocular structure or after the adhesion has been severed.[19]

Impacted foreign bodies may require extensive manipulation or even sharp dissection to free them from the surrounding tissues. Meticulous attention to minimize manipulations in the anterior chamber is important. The size of an anterior chamber foreign body may not be determined until the foreign body is removed and the appearance of a foreign body in the iris or lens is often the "tip of the iceberg" (Fig. 2).

If the foreign body has lacerated the anterior lens capsule, cataract extraction is required within days for progressive lens opacification and to prevent phacoanaphylactic glaucoma (Fig. 3). Inflammation from lens proteins released into the anterior chamber is an indication for cataract extraction.

The anterior chamber foreign body should be extracted from the eye as atraumatically as possible to avoid fragmenting it inside the eye. Histopathologic identification of the foreign body can be helpful; if the nature of the foreign body material is unknown, identification for clinical composition or bacterial culture or both should be

JAYPEE BROTHERS

performed, depending on which information is more clinically useful. Cultures taken at the time of surgery may provide useful information for treatment if infection develops postoperatively.

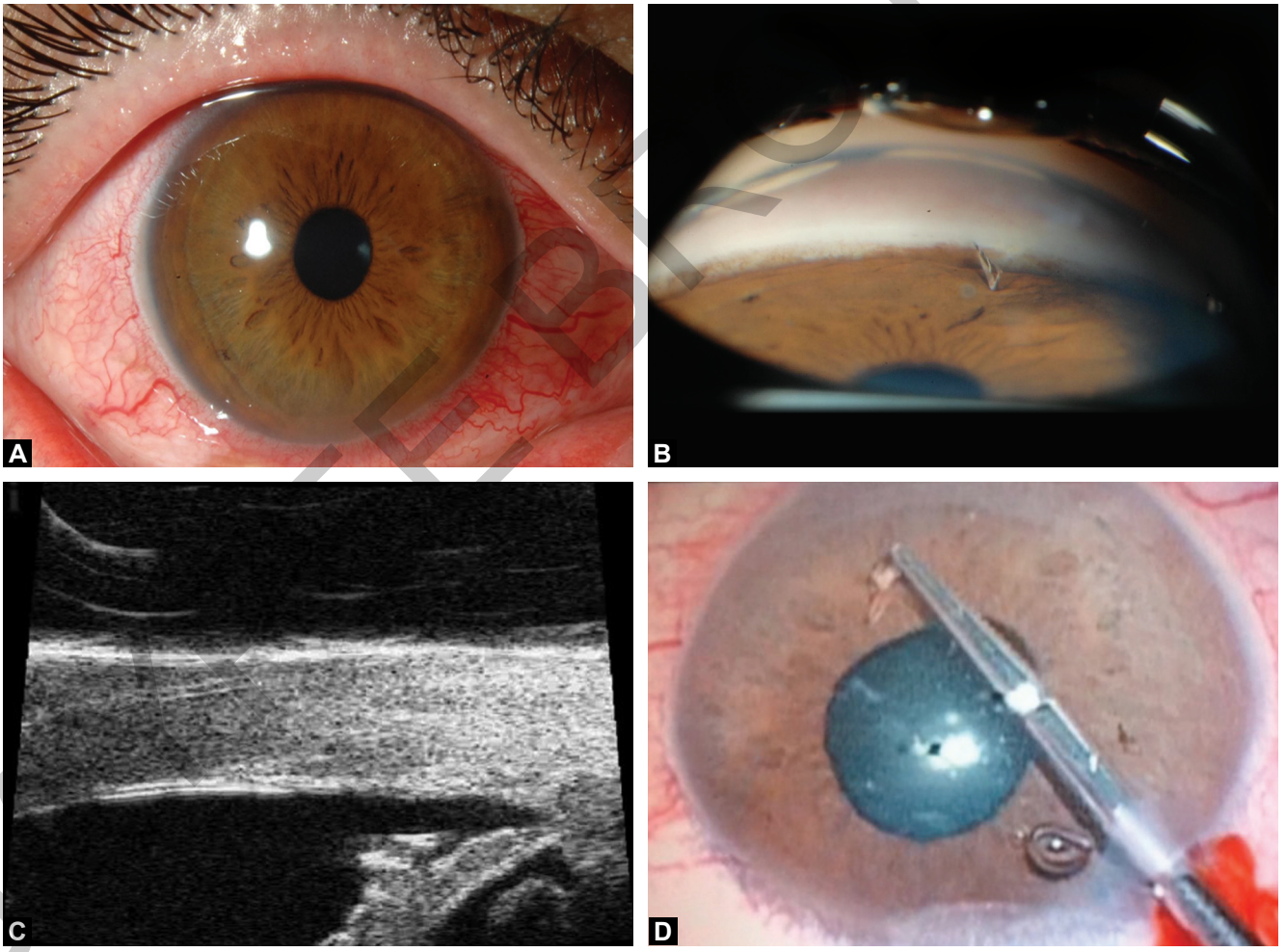
CLOSURE TECHNIQUE

The viscoelastic material used to maintain the anterior chamber is either irrigated from the eye or removed by a simultaneous irrigation-aspiration handpiece before the eye is closed.

The anterior chamber is reinflated with balanced salt solution (BSS) Plus and the wound is closed with interrupted 10-0 nylon sutures. Sutures could also be preplaced before taking out the viscoelastic to prevent shallowing of the anterior chamber then tied after it has been removed. Balanced salt solution Plus should preferably be used over BSS whenever possible for endothelial protection. The suture knots are tied securely in a 3-1-1 fashion and the loose ends are cut short with a microsharp blade on the knot. The knots are pulled to the scleral side of the wound to facilitate subsequent suture removal without destabilizing the wound. The conjunctiva can be reapproximated by cautery or closed with suture.

In cases of delayed presentation of open globe or organic foreign body an intracameral antibiotic could be used. An intravitreal antibiotic should also be considered when there is vitreous loss (Figs. 4A to D).

Subconjunctival antibiotic could be given to help prevent infection. Topical and subconjunctival corticosteroid injections at the time of surgery for a foreign body should



Figs. 4A to D: A 32-year-old male with history of recurrent anterior uveitis for 8 years, detailed history and exam revealed a piece of glass embedded in the iris from a car accident that occurred 8 years earlier. The foreign body is not clearly visible on slit-lamp photo, (A) but it is obvious on gonioscopy; (B) and ultrasound biomicroscopy; (C) After removing the foreign body; (D) the inflammation was resolved.
Source: Courtesy of Dr Abdullah Alkharashi

JAYPEE BROTHERS

be avoided because of the risk of fungal endophthalmitis. Antibiotic ointment is applied to the eye, and the eye is patched and taped closed. A rigid shield is helpful to prevent any additional pressure or trauma on the eye during the postoperative period.

TECHNICAL ALTERNATIVE AND PITFALLS

The leading concern in removal of an anterior chamber foreign body is removing the foreign body atraumatically and completely. Fragmenting of the foreign body into many small pieces should be avoided, and care should be taken to remove all foreign bodies present.

Foreign bodies that involve the lens (Fig. 3) require special consideration. Re-establishing the integrity of the globe should be accomplished first and cataract extraction, if possible, should electively follow. Patients should be monitored carefully for progressive lens opacity, inflammation, and phacoanaphylactic glaucoma.

If the foreign body is central and embedded in the lens nucleus, cataract surgery can be almost routine. An anterior capsule tear caused by the foreign body can be incorporated inside the anterior capsulotomy tear, and the foreign body can be removed with the nucleus. Tears of the posterior capsule should always be suspected and may not be revealed until the posterior capsule is manipulated during cortex removal. Cataract extraction following an anterior chamber foreign body can proceed smoothly until the cortex is removed from the area in the lens of densest opacification, which often corresponds to the area of injury. Extension of a capsular rupture occurs most often in this area. Often, a posterior chamber lens can still be implanted in the presence of a large posterior capsule tear, if sufficient posterior capsular remnants or anterior capsular remnants remain to guide the lens in the sulcus.

REHABILITATION

Visual rehabilitation can begin immediately following the procedure. Patients may use the injured eye as much and as soon as is comfortable. Eyeglass prescriptions may need to be changed after 4–6 weeks because of astigmatism or refractive error caused by the incisions.

Patients should be carefully followed postoperatively for cataract formation, corneal edema and infection. Corneal edema present during the immediate postoperative period may clear, whereas corneal edema that insidiously starts after several weeks may necessitate subsequent penetrating keratoplasty. The integrity of the lens capsule should be evaluated carefully in younger patients who develop a clinically significant cataract before routine cataract surgery is attempted.

Systemic antibiotics started in the preoperative period should be continued for at least 5 days or until the clinician is certain that the patient is free from infection. Topical antibiotics can be administered for 7 days but may then be discontinued. The efficacy of topical antibiotic therapy is questionable after this elapsed time, if there is no sign of any infection. Topical corticosteroid drops (prednisolone acetate 1% eye drops or equivalent) are started 1 or 2 days postoperatively, as long as there is no open wound or any sign of infection. Corticosteroid drops are continued for several weeks to minimize scarring around the corneal perforation site and to reduce intraocular inflammation. Topical corticosteroids can be reduced or stopped sooner if the wound is outside the visual axis.

A traumatic cataract that results from a foreign body in the anterior chamber should be monitored and treated when patient and clinician feel appropriate. Blunt trauma from the foreign body can also cause a cataract, which may not occur for months. If there is laceration of the lens capsule, opacification may occur within days.

If the corneal perforation leaves a scar in the visual axis, penetrating keratoplasty may be required. Corneal astigmatism that is outside the realm of spectacle correction should be treated first with a contact lens and, if unsuccessful, patients may be candidates for astigmatic keratotomy or excimer laser keratorefraction. Even if the keratotomy or laser keratorefraction does not completely eliminate the corneal irregularity, it may make a contact lens more comfortable and feasible where it previously was not possible.

OUTCOMES

Removal of an anterior chamber foreign body is rewarding because, in the absence of additional trauma to the eye and subsequent cataract formation, corneal scarring, or infection, the procedure is generally successful. The outcome can range from extremely good vision during the immediate postoperative period with a small foreign body that has perforated the peripheral cornea with a self-sealing wound to more serious complications such as cataract formation, corneal edema, glaucoma or even posterior segment pathology from a larger foreign body that has perforated the cornea and the lens in or near the visual axis.

Useful data for large series of anterior chamber foreign bodies are difficult to obtain and even more difficult to interpret because of the wide variation in each injury.[20]

JAYPEE BROTHERS

In general, if the structures within the patient's visual axis are undisturbed, patients recover well. Problems may arise if the foreign body perforates the lens capsule (cataract formation), causes infection or corneal edema, or enters the cornea through the visual axis and with central corneal scarring. The clinician is advised to fully assess the extent of the injury, treat the patient immediately, and carefully monitor postoperative complications to achieve optimum clinical results.

Note: Originally written in 1995 by Woodford S Van Meter. Re-edited by Majed Alkharashi in 2012.

REFERENCES

1. Greven CM, Engelbrecht NE, Slusher MM, et al. Intraocular foreign bodies: management, prognostic factors, and visual outcomes. Ophthalmology. 2000;107(3):608-12.
2. Dunbar CM, Goble RR, Gregory DW, et al. Intraocular deposition of metallic fragments during phacoemulsification: possible causes and effects. Eye (Lond). 1995;9(Pt 4):434-6.
3. Braunstein RE, Cotliar AM, Wirostko BM, et al. Intraocular metallic-appearing foreign bodies after phacoemulsification. J Cataract Refract Surg. 1996;22(9):1247-50.
4. Davis PL, Mastel D. Anterior chamber metal fragments after phacoemulsification surgery. J Cataract Refract Surg. 1998;24(6):810-3.
5. Köse S, Menteş J, Uretmen O, et al. The nature and origin of intraocular metallic foreign bodies appearing after phacoemulsification. Ophthalmologica. 2003;217(3):212-4.
6. Mathys KC, Cohen KL, Bagnell CR. Identification of unknown intraocular material after cataract surgery: Evaluation of a potential cause of toxic anterior segment syndrome. J Cataract Refract Surg. 2008;34(3):465-9.
7. Niinomi M. Recent metallic materials for biomedical applications. Met Mater Trans A. 2002;33:477-86.
8. Yab S, Khetpal V, Fay P, et al. Retained metallic foreign bodies after phacoemulsification. Clin Experiment Ophthalmol. 2011;39(7):713-4.
9. Shukla AN, Daly MK, McKnight CJ, et al. Intraocular ophthalmic ointment following anterior segment surgery. J Cataract Refract Surg. 2011;37(12):2218-21.
10. Greven CM, Engelbrecht NE, Slusher MM, et al. Intraocular foreign bodies: management, prognostic factors, and visual outcomes. Ophthalmology. 2000;107(3):608-12.
11. Smiddy WE, Stark WJ. Anterior segment intraocular foreign bodies. In: Shingleton BJ, Hersh PS, Kenyon KR (Eds.). Eye Trauma. St. Louis: Mosby; 1991. pp. 169-74.
12. Williams S, Char DH, Dillon WP, et al. Ferrous intraocular foreign bodies and magnetic resonance imaging. Am J Ophthalmol. 1988;005:398-401.
13. Arora R, Mehta S, Goyal JL, et al. Pattern of Scheimpflug imaging in anterior segment foreign bodies. Eye. 2010; 24(7):1304-6.
14. Soheilian M, Rafati N, Mohebbi MR, et al. Prophylaxis of acute posttraumatic bacterial endophthalmitis: a multicenter, randomized clinical trial of intraocular antibiotic injection, report 2. Arch Ophthalmol. 2007;125(4):460-5.
15. Ahmed Y, Schimmel AM, Pathangay A, et al. Endophthalmitis following open-globe injuries. Eye. 2012;26(2):212-7.
16. Libonati MM, Leahy JJ, Ellison N. The use of succinylcholine in open eye surgery. Anesthesiology. 1985;62(5):637-40.
17. Choi WW, Gergis SD, Sokoll MD. Controversies in muscle relaxants. In: Katz RL (Ed). Muscle Relaxants. Orlando: Erone and Stratton; 1985. pp. 271-83.
18. Lane SS, Lindstrom RL. Viscoelastic agents: Formulation, clinical applications, complications. Ophthalmol Clinics NA. 1991;4(2):313-29.
19. Davidson RS, Sivalingam A. A metallic foreign body presenting in the anterior chamber angle. CLAO J. 2002;28(1): 9-11.
20. Williams DF, Mieler WF, Abrams GW, et al. Results and prognostic factors in penetrating ocular injuries with retained intraocular foreign bodies. Ophthalmology. 1998;95(7):911-6.

JAYPEE BROTHERS

MASTER TECHNIQUES IN
OPHTHALMIC SURGERY

The first edition of this surgical text was warmly received. With the updates and new procedures added as well as the drawings have been redone in color, I feel the second edition will be a valuable text also.

Frederick Hampton Roy MD FACS is a private practice ophthalmologist. He has written over 44 books and 375 articles.



Renee Tindall is an RN who has worked with Dr Roy for many years, and assisted in writing and publication of most of his works.



Available at all medical bookstores or buy online at www.jaypeebrothers.com

JAYPEE BROTHERS
Medical Publishers (P) Ltd.
www.jaypeebrothers.com

Join us on facebook.com/JaypeeMedicalPublishers

Shelving Recommendation
Ophthalmology

ISBN 978-93-5152-501-1

9 789351 525011