

Contents

1. Surgical Anatomy	1
<i>Cristian Fernández-Martínez, José Juan Martínez-Toldos</i>	
Introduction	1
Anatomy of the Vitreous	1
Vitreous Base and Vitreoretinal Interface	2
Anatomical Distances in Vitrectomy	4
Crystalline Lens	4;
Extraocular Muscles	4;
Ciliary Body	5;
Blood Vessels	5
2. Presurgery Examination	9
<i>Manolo Baeza Díaz, José Juan Martínez-Toldos</i>	
Medical History	9
Visual Acuity	9
Pupil Reflexes	9;
Color Perception	10;
Vascular Entoptic Test	10;
Slit Lamp Microscopy	10;
Tonometry	10
Examining the Fundus	11
Indirect Ophthalmoscopy	11;
Biomicroscopy of the Retina	11
Ultrasonography	11
Vitreous Disorder	12
Fluorescein Angiography	16
Electrophysiology	17
Electroretinography	17;
Evoked Visual Potentials	17
3. Vitrectomy and Optical Coherence Tomography	19
<i>David Salom, Patricia Udaondo, Manuel Díaz Llopis, José Juan Martínez-Toldos</i>	
Introduction	19
Optical Coherence Tomography in Macular Holes	20
Optical Coherence Tomography in Epiretinal Membranes	21
Optical Coherence Tomography in Vitreoretinal Traction Syndrome	22
Intraoperative	25
4. Anesthesia	28
<i>Manuel Baeza, José Juan Martínez-Toldos</i>	
Introduction	28
Types of Anesthesia	29
General Anesthesia	29;
Local Anesthesia	30;
Retrobulbar Block	33;
Peribulbar Anesthesia	35;
Sub-Tenon's Anesthesia	36
5. Instrumentation	43
<i>José Juan Martínez-Toldos, Cristian Fernández-Martínez</i>	
Operating Room	43
Introduction	43
Requirements	43

Step by Step Vitrectomy

Ophthalmologic Surgery Table 43; Instrument Column 45; Integrated Vitrectomy Systems 45; Image Recorder 45; Operating Microscope 46

Visualization Systems 49

Introduction 49

Upright Image Contact Lenses 50

Landers Biconcave Lens 50; Machemer Magnifying Lens 51; Peyman Wide-angle Lens 52; Machemer Plano-concave Lens 52; Tolentino Twenty Degree Prism Lens 52; Tolentino Thirty Degree Prism Lens 52; Woldoff Biconcave Prism Lens 52

Wide-Angle-Viewing Systems 52

Use of the Erect Indirect Binocular Ophthalmic System 56

Other Visualization Systems 58

Combined Procedures 61

Endoillumination 65

Introduction 65

External Systems 65

Internal Systems 65

Chandelier System 67

Infusion Pressure 71

Introduction 71

Hydrostatic Pressure 71

Infusion Pump or Gas Forced Infusion 72

Pressure Control 75

Low Intraocular Pressure 75; High Intraocular Pressure 75

Infusion Devices 76

Twenty-Gauge Incisions 76

Opening the Conjunctiva 76

Twenty-Gauge Transconjunctival Vitrectomy 78

Suction and Cutter Systems 79

Introduction 79

Active Aspiration 79

Passive Aspiration 83

Vitrectomy Probes 84

Constellation Vision System 85; Stellaris PC Vision Enhancement System 88

Diathermy 90

Introduction 90

Retinopexy 93

Introduction 93

Laser Endophotocoagulation 93

Argon Laser 96; Diode Laser (810 nm) 96; Green Diode Laser (532 nm) 96;

Yellow Laser (577 nm) 97

Phacoemulsification 99

Introduction 99

Ultrasonic Fragmentation 102

Introduction 102

Forceps and Scissors 104

Introduction 104

Vitreous Substitutes: Manipulators 109

Introduction 109

Hyaluronic Acid 109

Perfluorocarbon Liquids 109

Vitreous Substitutes: Tamponades 113

Introduction 113

Intraocular Gases 113

Silicone Oil 115

*Silicone Solvent 116; Heavy Silicone Oil 117; Densiron 119***6. Basic Vitrectomy****121***Cristian Fernández-Martínez, José Juan Martínez-Toldos*

Check List 121

Positioning the Patient 122

Visualization Systems 122

Contact Systems 122; Noncontact Systems 122

Conjunctival Incisions 123

Sclerotomy 124

Pupil Management 127

Phacoemulsification 128

Surgical Technique 128; Special Cases 129

Removing The Vitreous Humor: Basic Concepts 129

Aspiration Systems 131

Active Aspiration 131; Passive Aspiration 132

Peeling Membranes in Vitrectomy 132

Segmenting Membranes 134; Delaminating Membranes 135; Staining Membranes 136

Perfluorocarbon Liquids 140

Uses of Perfluorocarbon Liquids 141; Intraoperative Management of Perfluorocarbon Liquids 142; Potential Problems during the Use of Perfluorocarbon 146

Fluid-Air Exchange 146

Use of Gas in Vitrectomy 147

Nonexpanding Gas 147; Expanding Gas 148; Clinical Indications of Gases 148; Air-Gas Exchange 148; Postoperative Management of Patients Receiving Intraocular Gas 149

Silicone Oil in Vitrectomy 149

Injection of Silicone Oil 149; Emulsification of the Silicone Oil 150; Indications of Silicone Oil Tamponade 150; Inferior Peripheral Iridectomy 151; Removal of Silicone Oil 151

Closure After Surgery 152

7. Pars Plana Lensectomy**156***Carlos Mateo, Anniken Burés*

Introduction 156

Surgical Technique 156

Advantages of Pars Plana Lensectomy 158

Pars Plana Lensectomy Indications 159

Vitreoretinal Proliferation 159; Perforating Ocular Trauma with or without Intraocular Foreign Body 160; Proliferative Diabetic Retinopathy 162

8. Basic Endoscopic Vitrectomy

164

Vicente J Chaqués-Alepuz, Enrique V López-Sánchez

Basic Equipment for Endoscopy 164

Technical Aspects: Visualization 166

Image Rotation 167; Image Artifacts 168; Technical Tips for the Beginners 169

Endoscopic Posterior Vitrectomy: Basic Concepts and Indications 170

Surgeon's Position 170; Image Size and Lighting 171; Blurred Image 171

Complications of Vitreoretinal Surgery that can be Avoided by Endoscopy 171

Vitreous Incarceration 171; Controlling Intraoperative Bleeding 172

Techniques and Maneuvers of Vitrectomy and Endoscopy 173

Vitrectomy 173; Membranectomy 174; Fluid-Air

Exchange 174; Endophotocoagulation 174; Pars Plana Lensectomy 175

Capsulectomy 175; Introducing Silicone Oil 175; Introducing

Perfluorocarbon Liquid 176; Diabetic Retinopathy and Endoscopic

Vitrectomy 176; Vitreous Hemorrhage 177; Neovascularization of the

Iris with Opacity of the Media 177; Retinal Detachment Surgery 177;

Proliferative Vitreoretinopathy 178; Endoscopic Vitrectomy for Crystalline

Lens Fragments Luxated in the Vitreous Cavity 180; Endoscopic Vitrectomy in Endophthalmitis 181

9. Minimal Incision Vitrectomy Surgery: Twenty-Three, Twenty-Five and Twenty-Seven Gauge

184

José Juan Martínez-Toldos, Javier A. Montero-Moreno, José M Ruiz-Moreno, Félix Armadá-Maresca, Natalia Pastora-Salvador, Anna Grabowoska, María Granados-Fernandez, Beatriz Manzano Muñoz

Twenty-Three Gauge Vitrectomy 184

Introduction 184

Incision Construction 185

Vitrectomy 186

Closing the Incision 187

Benefits of Twenty-Three Gauge Surgery 187

Complications 187

Twenty-Five Gauge Vitrectomy 189

Introduction 189

Benefits of Microincision Vitrectomy 192

Drawbacks of Microincision Vitrectomy 192

Complications 192

Future Perspectives 193

Twenty-Seven Gauge 196

Introduction 196

Instrumentation 196

Indications 199

10. Vitrectomy in Anterior Segment Surgery Complications

202

José Juan Martínez-Toldos, Juan Carlos Elvira-Cruaños

Introduction 202

Ocular Perforation in Retrobulbar Anesthesia 202

Transconjunctival Sub-Tenon's Anesthesia 203; Ocular Perforation 203; Treatment 204

Retrobulbar Hemorrhage 205

Anterior Vitrectomy	205
Vitrectomy Following Vitreous Loss	206
Retained Lens Fragments	209
Surgical Indications	211; Associating Surgery at the Time of Lens Dislocation 211; Surgical Technique 212
Intraocular Lens Dislocation	216
Surgical Technique	219; Late Intraocular Lens Dislocation with the Capsular Bag 222; Mechanisms 223; Prevention 223; Treatment 224
Endophthalmitis	225
Etiology	226; Treatment 227; Vitrectomy 228; Late-Onset Endophthalmitis 229
11. Eye Trauma Vitrectomy	235
<i>Joséfin Bañuelos Bañuelos, Patricia Martínez-García, Javier Orduña-Azcona, Ana Orive-Bañuelos</i>	
Introduction	235
Vitrectomy in Open Traumatism	235
Clinical History and Initial Examination	235; Presurgical Considerations 236; Surgical Technique 237
Special Situations	240
Trauma and Dense Vitreous Hemorrhage	240; Trauma and Retinal Detachment 241; Trauma and Intraocular Foreign Body 241; Trauma and Endophthalmitis 244
Vitrectomy and Complications of the Ocular Trauma	246
Macular Hole	246; Ocular Hypotony and Bulb Phthisis 247
12. Basic Vitrectomy in Diabetic Retinopathy	250
<i>Jose Garcia-Arumi, Anna Boixadera, Laura Distefano, Vicente Martinez-Castillo, Miguel Angel Zapata</i>	
Introduction	250
Surgical Approach	251
Vitrectomy for Diabetic Macular Edema	257
13. Macular Surgery	261
<i>Amparo Navea, Elena Palacios, Carmen Desco, Jorge Mataix</i>	
Surgery on the Surface of the Macula	261
Preliminary Considerations	261
Interview with the Patient	262
Surgery Preparation	263
Technical Requirements	263; Human Requirements 263; Patient Preparation 263; Surgeon Preparation 263
Vitrectomy	264
Specific Technical Points in Macular Hole	265
Surgery in the Subretinal Macular Space	267
Severe Submacular Hemorrhage Located into the Macular Area	267
Masive Subretinal Hemorrhage that also Affects the Macula	269
Subfoveal Perfluorocarbon Bubbles	270
14. Vitrectomy for Retinal Detachment with and without Proliferative Vitreoretinopathy	272
<i>J Fernando Arevalo, Reinaldo A Garcia, Veronica Oria</i>	
Introduction	272
Combined Vitrectomy and Scleral Buckling	273

Step by Step Vitrectomy

Scleral Buckling Technique 273; *Encircling Explants* 275
Scleral Suture Technique 277
Primary Vitrectomy 277
Basic Operative Steps in Primary Vitrectomy 277
Intraocular Tamponade 283
Small-Gauge Pars Plana Vitrectomy 283
Sclerotomies with 23-Gauge Vitrectomy 284; *Sclerotomies with 25-Gauge Vitrectomy* 284
New Considerations in Fluid Dynamics During Small-Gauge Vitrectomy 285
Increasing Safety 286; *Wound Closure* 286; *Retinal Tears* 287; *Hypotony* 288; *Endophthalmitis* 288
Vitrectomy for Retinal Detachment with Proliferative Vitreoretinopathy 288
Risk Factors for the Development of Proliferative Vitreoretinopathy 289
Diagnosis of Proliferative Vitreoretinopathy 290
Classification of Proliferative Vitreoretinopathy 290
Type 1 291; *Type 2* 293; *Type 3* 293; *Type 4* 293; *Type 5* 295
Surgery for Proliferative Vitreoretinopathy 295
Timing of Surgery 295; *Scleral Buckling in Proliferative Vitreoretinopathy* 296; *Lensectomy and Intraocular Lens* 296
Vitrectomy for Proliferative Vitreoretinopathy 297
Removal of Posterior Epiretinal Proliferation 298; *Removal of Anterior Epiretinal Proliferation* 298; *Removal of Subretinal Proliferation* 298; *Relaxing Retinotomies and Retinectomies* 299; *Creating a Chorioretinal Adhesion* 302; *Intraocular Tamponade* 302; *Removal of Silicone Oil* 303; *Reoperations for Recurrent Retinal Detachment from Proliferative Vitreoretinopathy* 304
Adjunctive Treatment in Proliferative Vitreoretinopathy 304
Giant Retinal Tears 305
Postoperative Complications 306
Summary 306

15. Current Indications of Antiangiogenics in Vitrectomy

313

Mauricio Maia, Fernando M Penha, J Fernando Arealo

Antiangiogenics: Overview 313
Introduction: Vascular Endothelium Growth Factor 313; *Role of Bevacizumab and Ranibizumab in the Angiogenesis Process* 313
Intraoperative Bleeding During Pars Plana Vitrectomy In Proliferative Diabetic Retinopathy 315
Introduction 315; *Vitreoretinal Bleeding* 315
Preoperative Procedures to Minimize the Possibility of Intraoperative bLeeding 316
Blood Pressure Control 316; *Antiplatelet and Anticoagulants—Is it Necessary to Discontinue Them before Surgery?* 316; *Intravitreal Injection of Anti-VEGF Inhibitors in Proliferative Diabetic Retinopathy* 317
Intravitreal Injection of Anti-Vegf Before Surgery in Proliferative Diabetic Retinopathy 317
Rationale 317; *Intravitreal Bevacizumab Before Pars Plana Vitrectomy in Proliferative Diabetic Retinopathy* 317; *Intravitreal Ranibizumab before Pars Plana Vitrectomy in Proliferative Diabetic Retinopathy* 319; *Technique of Preoperative Intravitreal Anti-VEGF Injection* 319;

<i>Care During Preoperative Intravitreal Anti-VEGF Injection Before Pars Plana Vitrectomy in Proliferative Diabetic Retinopathy</i>	320
<i>Conclusion of Intravitreal Injection of Anti-VEGF Before Proliferative Diabetic Retinopathy</i>	320
<i>Techniques of Intraoperative Posterior Segment Bleeding Control</i>	320
<i>Rising the Intraocular Pressure</i>	321;
<i>Fluid-Air Exchange</i>	322;
<i>Perfluorocarbon Liquids</i>	323;
<i>Endodiathermy and Cauterization</i>	323;
<i>Laser Photocoagulation</i>	325;
<i>Combination of Techniques</i>	326
16. Use of Sustained Drug Release Implants in Vitrectomized Eyes	331
<i>Jose Maria Ruiz-Moreno, Javier A Montero</i>	
Introduction	331
Clinical Case	334
17. Enzymatic Vitrectomy	337
<i>Patricia Udaondo, David Salom, Salvador Garcia-Delpech, Manuel Díaz-Llopis</i>	
Introduction	337
Concept of Enzymatic Vitrectomy	339
Methods and Mechanism of Action	339
18. Posterior Vitrectomy Complications	343
<i>Carme Guardia, Jaume Catalá, Jairo Hoyos-Chacón</i>	
Introduction	343
Intraoperative Complications	343
Sclerotomy Complications	343
Visualization Problems	346
<i>Retinal Tears</i>	352;
<i>Retinopexy Complications</i>	354
Postoperative Complications	354
<i>Corneal Complications</i>	354;
<i>Ocular Hypertension and Glaucoma</i>	355;
<i>Vitreous Hemorrhage</i>	357;
<i>Retinal Detachment</i>	358;
<i>Proliferative Vitreoretinopathy</i>	359;
<i>Intraocular Inflammation and Fibrinoid Reaction</i>	360;
<i>Tamponade and Manipulator Agents Complications</i>	360;
<i>Endophthalmitis</i>	364;
<i>Cataract</i>	364
To Prevent Vitroretinal Surgery Complications	365
Index	369