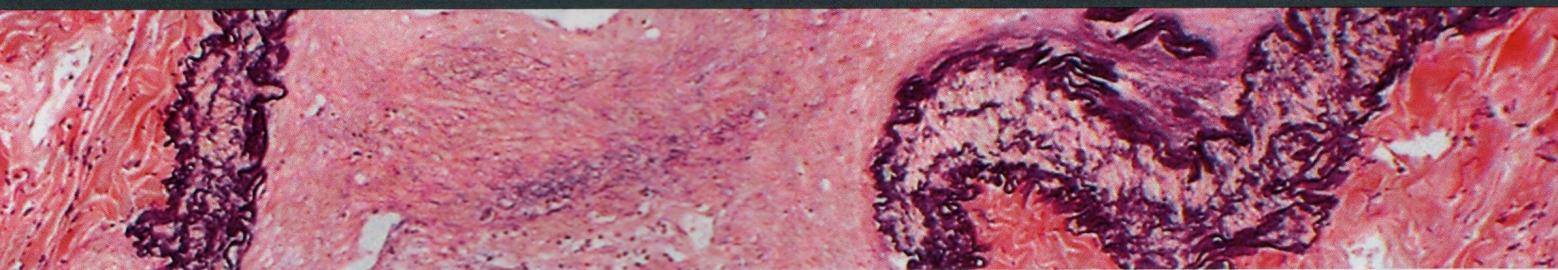


TABLE OF CONTENTS



SECTION 1: IMMUNOLOGY

- 4 **Immune Response in Organ Transplantation**
Roshini Sarah Abraham, PhD, D(ABMLI)
- 8 **Regulatory Immune Cells and Transplant Tolerance**
Roshini Sarah Abraham, PhD, D(ABMLI)
- 14 **NK Cells**
Roshini Sarah Abraham, PhD, D(ABMLI)
- 20 **Complement**
Roshini Sarah Abraham, PhD, D(ABMLI)
- 24 **Laboratory-Based Immune Monitoring in Organ Transplantation**
Roshini Sarah Abraham, PhD, D(ABMLI)

SECTION 2: HLA TESTING

- 32 **Human Leukocyte Antigen System**
Manish J. Gandhi, MD
- 34 **Histocompatibility Testing**
Manish J. Gandhi, MD
- 36 **Transplantation and HLA**
Manish J. Gandhi, MD
- 40 **ABO Blood Group Antigens and Transplantation**
Manish J. Gandhi, MD
- 42 **Apheresis and Transplantation**
Manish J. Gandhi, MD
- 44 **HLA and Transfusion**
Manish J. Gandhi, MD

SECTION 3: IMMUNOSUPPRESSIVE DRUGS

- 48 **Mechanism of Action of Immunosuppressive Drugs**
Loralie Langman, PhD and Lynn D. Cornell, MD
- 50 **Therapeutic Drug Monitoring in Transplant Patients**
Loralie Langman, PhD
- 54 **History of Immunosuppression Drugs in Transplantation**
Loralie Langman, PhD

SECTION 4: KIDNEY TRANSPLANTATION

- 58 **History of Kidney Transplantation**
Lynn D. Cornell, MD
- 60 **Pathologic Classification of Renal Allograft Diseases**
Robert B. Colvin, MD
- 62 **Evaluation of the End-Stage Kidney**
Shane M. Meehan, MBBCh
- 68 **Evaluation of Allograft Kidney**
Lynn D. Cornell, MD
- 74 **Evaluation of the Donor Kidney**
Lynn D. Cornell, MD

- 80 **Evaluation of Transplant Nephrectomy**
Shane M. Meehan, MBBCh
- 86 **Evaluation of Fibrosis**
A. Brad Farris, III, MD
- 90 **Protocol Biopsies**
Lynn D. Cornell, MD
- 94 **Accommodation**
Lynn D. Cornell, MD
- 96 **Tolerance**
Robert B. Colvin, MD

SURGICAL COMPLICATIONS

- 100 **Acute Allograft Ischemia**
A. Brad Farris, III, MD
- 104 **Urine Leak**
A. Brad Farris, III, MD
- 106 **Lymphocele**
A. Brad Farris, III, MD
- 108 **Renal Artery or Vein Thrombosis**
A. Brad Farris, III, MD
- 110 **Transplant Renal Artery Stenosis**
A. Brad Farris, III, MD

ALLOGRAFT REJECTION

- 112 **Hyperacute Rejection**
Lynn D. Cornell, MD
- 116 **Acute T-Cell-Mediated Rejection**
Lynn D. Cornell, MD and Robert B. Colvin, MD
- 128 **Chronic T-Cell-Mediated Rejection**
Lynn D. Cornell, MD and Robert B. Colvin, MD
- 132 **Acute Antibody-Mediated Rejection**
Lynn D. Cornell, MD
- 140 **Chronic Antibody-Mediated Rejection**
Lynn D. Cornell, MD

RECURRENT DISEASES

- 152 **Recurrent Diseases in the Allograft**
Anthony Chang, MD and Lynn D. Cornell, MD

DE NOVO DISEASES

- 160 **De Novo Focal Segmental Glomerulosclerosis**
Anthony Chang, MD
- 162 **De Novo Membranous Glomerulonephritis**
Anthony Chang, MD
- 166 **Anti-GBM Disease in Alport Syndrome**
Anthony Chang, MD
- 168 **Hyperperfusion Injury**
Anthony Chang, MD

TABLE OF CONTENTS

170 Engraftment Syndrome

A. Brad Farris, III, MD

174 Kidney Diseases in Nonrenal Transplant Recipients

Robert B. Colvin, MD

178 Graft-vs.-Host Glomerulopathies

Anthony Chang, MD

DRUG TOXICITIES

180 Calcineurin Inhibitor Toxicity

Shane M. Meehan, MBBCh

186 mTOR Inhibitor Toxicity

Lynn D. Cornell, MD

INFECTIONS

188 Acute Pyelonephritis

Neeraja Kambham, MD

192 Polyomavirus Nephritis

Anthony Chang, MD

200 Adenovirus, Kidney

Anthony Chang, MD

204 Cytomegalovirus Infection

Anthony Chang, MD

208 Histoplasmosis

Anthony Chang, MD

210 Candidiasis

Anthony Chang, MD

212 Cryptococcosis

Anthony Chang, MD

214 Mucormycosis

Anthony Chang, MD

216 Aspergillosis

Anthony Chang, MD

218 Coccidioidomycosis

Anthony Chang, MD

220 Paracoccidioidomycosis

Anthony Chang, MD

222 Microsporidiosis

Robert B. Colvin, MD

224 Tuberculosis

Neeraja Kambham, MD

226 Malakoplakia

Neeraja Kambham, MD

230 Nocardiosis

Neeraja Kambham, MD

SECTION 5: LIVER TRANSPLANTATION

234 Pathologic Classification of Liver Allograft Diseases

John Hart, MD and Lindsay Alpert, MD

236 Gross Evaluation of Failed Native Liver

John Hart, MD and Lindsay Alpert, MD

240 Evaluation of Failed Liver Allograft

John Hart, MD and Lindsay Alpert, MD

242 Evaluation of the Donor Liver

John Hart, MD

246 History of Liver Transplantation

Anthony Chang, MD and John Hart, MD

Islet Cell Toxicity and Islet Amyloid Deposition

Surya V. Seshan, MD

POSTTRANSPLANT SURGICAL COMPLICATIONS

248 Preservation Injury

Hanlin L. Wang, MD, PhD

250 Hepatic Artery Thrombosis

Lisa Yerian, MD

252 Portal Vein Thrombosis

Lisa Yerian, MD

254 Bile Duct Stricture, Leak, Sludge, Bileoma

Hanlin L. Wang, MD, PhD

256 Hepatic Venous Outflow Obstruction

Hanlin L. Wang, MD, PhD

260 Hyperperfusion Syndrome

Hanlin L. Wang, MD, PhD

ALLOGRAFT REJECTION

262 T-Cell-Mediated Rejection, Liver

Lisa Yerian, MD

266 Antibody-Mediated Rejection, Liver

Hanlin L. Wang, MD, PhD, Robert B. Colvin, MD, and Richard Masia, MD, PhD

270 Chronic (Ductopenic) Rejection

Matthew M. Yeh, MD, PhD

RECURRENT DISEASES IN LIVER ALLOGRAFT

272 Recurrent Hepatitis B Virus

Rish K. Pai, MD, PhD and Lindsay Alpert, MD

274 Recurrent Hepatitis C Virus

Rish K. Pai, MD, PhD and Lindsay Alpert, MD

278 Fibrosing Cholestatic HBV or HCV Hepatitis

Rish K. Pai, MD, PhD and Lindsay Alpert, MD

280 Recurrent Autoimmune Hepatitis

Rish K. Pai, MD, PhD and Lindsay Alpert, MD

282 Recurrent Primary Biliary Cholangitis

Rish K. Pai, MD, PhD and Lindsay Alpert, MD

284 Recurrent Primary Sclerosing Cholangitis

Rish K. Pai, MD, PhD and Lindsay Alpert, MD

286 Recurrent Fatty Liver Disease

Rish K. Pai, MD, PhD and Lindsay Alpert, MD

INFECTIONS

288 Cytomegalovirus

Maria Westerhoff, MD and Joseph Ahn, MD, MS, FACC

290 Herpes Simplex Virus

Maria Westerhoff, MD and Joseph Ahn, MD, MS, FACC

292 Adenovirus, Liver

Maria Westerhoff, MD and Joseph Ahn, MD, MS, FACC

294 Hepatitis E Virus

Maria Westerhoff, MD and Joseph Ahn, MD, MS, FACC

296 Epstein-Barr Virus, Liver

Maria Westerhoff, MD and Joseph Ahn, MD, MS, FACC

300 Fungal Infections, Liver

Maria Westerhoff, MD and Joseph Ahn, MD, MS, FACC

LATE-GRAFT DYSFUNCTION

302 Plasma Cell-Rich Rejection

Lisa Yerian, MD

TABLE OF CONTENTS

- 304 **Graft-vs.-Host Disease, Liver**
Lisa Yerian, MD

SECTION 6: HEART TRANSPLANTATION

- 308 **Pathologic Classification of Cardiac Allograft Diseases**
Aliya N. Husain, MD
- 310 **Evaluation of Failed Native and Transplanted Heart**
Jennifer Pogoriler, MD, PhD
- 312 **History of Heart Transplantation**
Aliya N. Husain, MD and Aarti Sharma, MD

EVALUATION OF EXPLANTED HEART

- 314 **Ischemic Heart Disease**
Aliya N. Husain, MD and Aarti Sharma, MD
- 318 **Dilated Cardiomyopathy**
Jennifer Pogoriler, MD, PhD
- 322 **Hypertrophic Cardiomyopathy**
Jennifer Pogoriler, MD, PhD and Aliya N. Husain, MD
- 326 **Congenital Heart Disease**
Jennifer Pogoriler, MD, PhD and Aliya N. Husain, MD
- 330 **Sarcoidosis, Heart**
Aliya N. Husain, MD and Aarti Sharma, MD
- 332 **Arrhythmogenic Right Ventricular Cardiomyopathy**
Jennifer Pogoriler, MD, PhD and Aliya N. Husain, MD
- 336 **Other Causes of End-Stage Heart Disease**
Jennifer Pogoriler, MD, PhD and Aliya N. Husain, MD

ALLOGRAFT REJECTION

- 342 **Acute Cellular Rejection, Heart**
Aliya N. Husain, MD and Jennifer Pogoriler, MD, PhD
- 346 **Antibody-Mediated Rejection, Heart**
Aliya N. Husain, MD and Aarti Sharma, MD
- 348 **Chronic Allograft Vasculopathy, Heart**
Aliya N. Husain, MD and Aarti Sharma, MD

NONINFECTIOUS LESIONS

- 350 **Quilty Lesions**
Aliya N. Husain, MD and Aarti Sharma, MD
- 352 **Site of Previous Biopsy**
Aliya N. Husain, MD and Vijayalakshmi Ananthanarayanan, MD

INFECTIONS

- 354 **Myocarditis**
Jennifer Pogoriler, MD, PhD and Aliya N. Husain, MD

SECTION 7: LUNG TRANSPLANTATION

- 362 **Pathologic Classification of Lung Allograft Diseases**
Aliya N. Husain, MD and Aarti Sharma, MD
- 364 **Examination of Native and Transplanted Lungs**
Aliya N. Husain, MD
- 366 **History of Lung Transplantation**
Aliya N. Husain, MD and Aarti Sharma, MD

EVALUATION OF FAILED NATIVE LUNG

- 368 **Emphysema**
Aliya N. Husain, MD
- 370 **Cystic Fibrosis**
Aliya N. Husain, MD
- 372 **Idiopathic Pulmonary Fibrosis**
Aliya N. Husain, MD and Aarti Sharma, MD
- 374 **Connective Tissue Disease-Associated Lung Disease**
Ilyssa O. Gordon, MD, PhD and Aliya N. Husain, MD
- 376 **Sarcoidosis, Lung**
Aliya N. Husain, MD
- 378 **Pulmonary Arterial Hypertension**
Aliya N. Husain, MD and Aarti Sharma, MD
- 380 **Other Causes of End-Stage Lung Disease**
Aliya N. Husain, MD and Aarti Sharma, MD

SURGICAL COMPLICATIONS

- 384 **Surgical Aspects and Complications, Lung**
Aliya N. Husain, MD and Aarti Sharma, MD

ALLOGRAFT REJECTION

- 386 **Pathologic Classification of Rejection**
Aliya N. Husain, MD and Aarti Sharma, MD
- 388 **Antibody-Mediated Rejection, Lung**
Aliya N. Husain, MD and Ilyssa O. Gordon, MD, PhD
- 390 **Acute Cellular Rejection, Grade A**
Aliya N. Husain, MD
- 392 **Acute Cellular Rejection, Grade B**
Aliya N. Husain, MD
- 394 **Chronic Allograft Dysfunction, Lung**
Aliya N. Husain, MD

NONINFECTIOUS LESIONS

- 396 **Organizing Pneumonia**
Aliya N. Husain, MD
- 398 **Microaspiration**
Aliya N. Husain, MD

INFECTIONS

- 400 **Bacterial Infections**
Aliya N. Husain, MD and Ilyssa O. Gordon, MD, PhD
- 402 **Viral Infections**
Aliya N. Husain, MD and Aarti Sharma, MD
- 406 **Fungal Infections, Lung**
Aliya N. Husain, MD

SECTION 8: INTESTINAL TRANSPLANTATION

- 412 **Pathologic Classification of Intestinal Allograft Diseases**
Sarangarajan Ranganathan, MD
- 414 **Indications and Evaluation of Explant**
Sarangarajan Ranganathan, MD
- 418 **Reperfusion Injury**
Sarangarajan Ranganathan, MD

TABLE OF CONTENTS

- 422 History of Intestinal and Multivisceral Transplantation
Sarangarajan Ranganathan, MD

ALLOGRAFT REJECTION/IMMUNOLOGICAL INJURY

- 424 Acute Antibody-Mediated Rejection, Intestine
Sarangarajan Ranganathan, MD
- 428 Acute Cellular Rejection, Intestine
Sarangarajan Ranganathan, MD
- 436 Chronic Rejection, Intestine
Sarangarajan Ranganathan, MD
- 440 Stomach Rejection
Sarangarajan Ranganathan, MD
- 444 Colon Rejection
Sarangarajan Ranganathan, MD
- 448 Graft-vs.-Host Disease, Intestine
Sarangarajan Ranganathan, MD

INFECTIONS

- 452 Bacterial and Fungal Infections
Sarangarajan Ranganathan, MD
- 456 Adenovirus, Intestine
Sarangarajan Ranganathan, MD
- 460 Rotavirus, Cytomegalovirus, and Herpes Simplex Virus
Sarangarajan Ranganathan, MD
- 464 Epstein-Barr Virus, Intestine
Sarangarajan Ranganathan, MD

SECTION 9: PANCREAS TRANSPLANTATION

- 472 Pathologic Classification of Pancreas Allograft Diseases
Surya V. Seshan, MD
- 474 Clinical Considerations in Pancreas Transplant Evaluation
Surya V. Seshan, MD
- 480 History of Pancreas Transplantation
Surya V. Seshan, MD

SURGICAL COMPLICATIONS

- 482 Surgical Aspects and Complications, Pancreas
Surya V. Seshan, MD

ALLOGRAFT REJECTION

- 488 Acute Cellular Rejection, Pancreas
Erika R. Bracamonte, MD
- 492 Antibody-Mediated Rejection, Pancreas
Erika R. Bracamonte, MD and Surya V. Seshan, MD
- 496 Chronic Allograft Rejection/Graft Sclerosis
Erika R. Bracamonte, MD

GRAFT DYSFUNCTION

- 498 Recurrent Diabetes Mellitus
Surya V. Seshan, MD
- 502 Islet Cell Toxicity and Islet Amyloid Deposition
Surya V. Seshan, MD

INFECTIONS

- 504 Intraabdominal and Opportunistic Infections
Surya V. Seshan, MD

SECTION 10: VASCULARIZED COMPOSITE ALLOTRANSPLANTATION

- 512 History of Vascularized Composite Allotransplantation
Linda Cendales, MD

ALLOGRAFT REJECTION

- 514 Acute T-Cell- and Antibody-Mediated Rejection
A. Brad Farris, III, MD, Ivy A. Rosales, MD, and Robert B. Colvin, MD
- 522 Chronic Rejection
A. Brad Farris, III, MD, Robert B. Colvin, MD, and Ivy A. Rosales, MD

SECTION 11: POSTTRANSPLANT NEOPLASTIC DISORDERS

- 526 Posttransplant Lymphoproliferative Disease
A. Brad Farris, III, MD