Contents

1 Introduction ................................................... 1
   Aims of the Book .................................................. 1
   Introduction to Renal Disease from a Pathologist’s Point of View . . . . . . 2
   The Value of a Renal Biopsy ........................................ 3
   Summary: Introduction ........................................... 3
   Further Reading: Introduction .................................... 3

2 General Points About Renal Biopsy Specimens ................. 5
   Introduction to General Points ................................... 5
   Common Things Are Common and Diseases Present
     in Characteristic Ways ........................................... 5
   Things to Remember About the General Rules .................... 5
   Importance of the Request Form to the Pathologist ............. 6
   Indications for Renal Biopsy ...................................... 6
   Complications of a Renal Biopsy .................................. 9
   Summary: General Points About Renal Biopsy Specimens ...... 9

3 Technical Handling of Renal Biopsy Specimens ............... 11
   Types of Renal Biopsy Specimen ................................ 11
   Fixation and Processing of Specimens ........................... 11
   Arrangements for Electron Microscopy of Specimens ........... 14
   Sectioning of Specimens ........................................ 15
   Staining of Specimens .......................................... 16
   Immunohistologic Study of Specimens ........................... 17
   Summary: Technical Handling of Renal Biopsy Specimens ...... 18
   Further Reading: Technical Handling of Renal Biopsy Specimens ... 18

4 How to Look at a Renal Biopsy Specimen: Preliminary Study ... 19
   Immediate Study of Initial Sections ............................... 19
   Actions After Immediate Study of Initial Sections ............... 28
   Summary: How to Look at a Renal Biopsy Specimen:
     Preliminary Study .............................................. 29
5 How to Look at a Renal Biopsy Specimen: Initial Study of the Kidney .................................................. 31
  Introduction to Initial Study of the Kidney ........................ 31
  Initial Study of Tubules ........................................ 31
  Assessment of Atrophy ........................................ 32
  A Note on Hypertension and the Kidney ......................... 35
  Initial Study of Glomeruli: Glomerular Size .................... 38
  Initial Study of Glomeruli: Distribution of Glomerular Abnormalities ........................................ 40
  Initial Study of Interstitial Tissues .............................. 44
  Initial Study of Blood Vessels .................................. 45
  Summary: How to Look at a Renal Biopsy Specimen: Initial Study of the Kidney .................................... 47
  Further Reading: How to Look at a Renal Biopsy Specimen: Initial Study of the Kidney ................................. 48

6 Indication for Biopsy: Nephrotic Syndrome ....................... 49
  Introduction to the Nephrotic Syndrome ......................... 49
  Detection and Measurement of Proteinuria ........................ 50
  Value of a Renal Biopsy in the Nephrotic Syndrome ............ 50
  Approach to the Diagnosis in the Nephrotic Syndrome ........... 51
  Initial Inspection of a Renal Biopsy Specimen in the Nephrotic Syndrome ........................................ 52
  Do Glomeruli Look Normal? Is the Diagnosis Minimal Change Nephropathy? ........................................ 55
  Diagnosis of Minimal Change Nephropathy ....................... 55
  Differential Diagnosis of Minimal Change Nephropathy ........... 56
  Are Glomeruli Abnormal? Is There Membranous Nephropathy? ...... 57
  Diagnosis of Membranous Nephropathy .......................... 59
  Differential Diagnosis of Membranous Nephropathy .............. 63
  Are Glomeruli Abnormal? Is There a Segmental Sclerosing Disorder? ........................................ 65
  Segmental Abnormalities at the Tubular Opening ................. 67
  Segmental Abnormalities Not Only at the Tubular Opening ..... 74
  Human Immunodeficiency Viral Infection and its Effects in the Kidney ........................................ 77
  Diagnosis of Collapsing Glomerulopathy ........................ 78
  Other Findings in the Kidney in Human Immunodeficiency Viral Infection ........................................ 80
  Is the Pathologist Told that the Person Biopsied Has Diabetes Mellitus? Is There Evidence of Diabetic Glomerulopathy? ...... 82
  Value of Renal Biopsy in Diabetes Mellitus ....................... 83
  Diagnosis of Diabetic Glomerulopathy ............................ 84
  Differential Diagnosis of Diabetic Glomerulopathy ............... 88
Is the Pathologist Told that the Person Biopsied Has Systemic Lupus Erythematosus? Is There a Possibility of Lupus Nephritis? ................................................................. 90
Value of Renal Biopsy in Systemic Lupus Erythematosus .......... 91
Diagnosis of Lupus Nephritis ................................................................. 92
Classification of Lupus Nephritis ............................................................. 95
International Society of Nephrology/Renal Pathology Society
2003 Classification of Lupus Nephritis .................................................. 98
Are Glomeruli Abnormal? Is There Amyloid? ...................................... 104
Diagnosis of Amyloid ........................................................................ 104
Principles of Polarising Microscopy ....................................................... 106
Determination of the Type of Amyloid ............................................... 112
Differential Diagnosis of Amyloid ......................................................... 116
Have Minimal Change Nephropathy, Membranous Nephropathy,
Segmental Sclerosing Disorders, Diabetic Glomerulopathy,
Lupus Nephritis, Amyloid, and Conditions that Could be Confused with Them Been Excluded? ........................................... 118
Differentiation Between Acute Postinfective Glomerulonephritis
and Subendothelial Membranoproliferative Glomerulonephritis .... 121
Other Findings in the Nephrotic Syndrome ........................................ 122
Summary: Nephrotic Syndrome ............................................................... 136
Further Reading: Nephrotic Syndrome ............................................... 137

7 Indication for Biopsy: Acute Renal Failure ...................................... 139
Introduction to Acute Renal Failure ..................................................... 139
Causes of Acute Renal Failure .............................................................. 141
Value of a Renal Biopsy in Acute Renal Failure ............................... 141
Acute Abnormalities in Tubules ............................................................ 142
Approach to the Diagnosis in Acute Renal Failure ......................... 145
Is There Necrosis in the Kidney? ........................................................ 145
Is There the Expected Number of Tubules in the Kidney? .............. 147
Are There Clues to the Cause of Acute Tubular Damage? .............. 148
Common Findings in Renal Biopsy Specimens in Acute Renal
Failure .................................................................................................. 148
Is There Evidence of Renal Vasculitis? .............................................. 150
Diagnosis of Vasculitic Glomerulonephritis ...................................... 151
Clinical Conditions with Renal Vasculitis ......................................... 158
If There is Renal Vasculitis, Are There Clues to Recognisable
Conditions? ......................................................................................... 164
Conditions That Can be Differentiated from Pauci Immune Vasculitic
Glomerulonephritis: 1 Henoch–Schönlein Nephritis .................... 165
Conditions That Can be Differentiated from Pauci Immune Vasculitic
Glomerulonephritis: 2 Lupus Nephritis ............................................ 170
Conditions That Can be Differentiated from Pauci Immune Vasculitic
Glomerulonephritis: 3 Goodpasture’s Disease ............................. 170
<table>
<thead>
<tr>
<th>Condition</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditions That Can be Differentiated from Pauci Immune Vasculitic Glomerulonephritis: 4 Cryoglobulinemic Glomerulonephritis</td>
<td>172</td>
</tr>
<tr>
<td>Are Glomeruli Abnormal but There Is No Evidence of Vasculitis?</td>
<td>175</td>
</tr>
<tr>
<td>Diagnosis of Acute Postinfective Glomerulonephritis</td>
<td>175</td>
</tr>
<tr>
<td>Diagnosis of Subendothelial Membranoproliferative Glomerulonephritis</td>
<td>176</td>
</tr>
<tr>
<td>Impression of Glomerulonephritis Given by Ischemic Glomeruli</td>
<td>177</td>
</tr>
<tr>
<td>Has a Glomerular Disorder Been Excluded in Acute Renal Failure?</td>
<td>177</td>
</tr>
<tr>
<td>Has a Glomerular Disorder Been Excluded? Is There a Clue in Interstitial Tissues to the Cause of Acute Renal Failure?</td>
<td>177</td>
</tr>
<tr>
<td>Diagnosis of Acute Interstitial Nephritis</td>
<td>178</td>
</tr>
<tr>
<td>Causes and Associations of Acute Interstitial Nephritis</td>
<td>181</td>
</tr>
<tr>
<td>Has a Glomerular Disorder Been Excluded? Is There a Clue in Tubules to the Cause of Acute Renal Failure?</td>
<td>183</td>
</tr>
<tr>
<td>Findings in Tubules: Myeloma Kidney</td>
<td>184</td>
</tr>
<tr>
<td>Findings in Tubules: Myoglobinuria or Crystals</td>
<td>186</td>
</tr>
<tr>
<td>Has a Glomerular Disorder Been Excluded? Is There a Clue in Blood Vessels to the Cause of Acute Renal Failure?</td>
<td>188</td>
</tr>
<tr>
<td>Changes in Blood Vessels: Vasculitis or Embolism</td>
<td>189</td>
</tr>
<tr>
<td>Acute Renal Ischemia</td>
<td>190</td>
</tr>
<tr>
<td>Diagnosis of Small Vessel Vasculopathy, also Called Thrombotic Microangiopathy</td>
<td>192</td>
</tr>
<tr>
<td>Disorders Associated with Small Vessel Vasculopathy</td>
<td>194</td>
</tr>
<tr>
<td>Summary: Acute Renal Failure</td>
<td>200</td>
</tr>
<tr>
<td>Further Reading: Acute Renal Failure</td>
<td>201</td>
</tr>
</tbody>
</table>

8 Indication for Biopsy: Chronic Renal Failure

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Chronic Renal Failure</td>
<td>203</td>
</tr>
<tr>
<td>Assessment of Chronic Renal Failure</td>
<td>204</td>
</tr>
<tr>
<td>Stages of Chronic Kidney Disease</td>
<td>204</td>
</tr>
<tr>
<td>Causes of Chronic Renal Failure</td>
<td>205</td>
</tr>
<tr>
<td>Value of a Renal Biopsy in Chronic Renal Failure</td>
<td>206</td>
</tr>
<tr>
<td>Findings in Renal Biopsy Specimens in Chronic Renal Failure</td>
<td>206</td>
</tr>
<tr>
<td>Assessment of Renal Biopsy Specimens in Chronic Renal Failure</td>
<td>206</td>
</tr>
<tr>
<td>Is There a Glomerular Disorder?</td>
<td>207</td>
</tr>
<tr>
<td>Differentiation of Types of Segmental Sclerosing Glomerular Disorders</td>
<td>207</td>
</tr>
<tr>
<td>Differential Diagnosis of Overload Changes in Glomeruli</td>
<td>214</td>
</tr>
<tr>
<td>Is There Evidence of a Glomerular Disorder Other than IgA Nephropathy, Diabetic Glomerulopathy, or a Segmental Sclerosing Condition?</td>
<td>215</td>
</tr>
<tr>
<td>Is There No Evidence of a Glomerular Disorder?</td>
<td>215</td>
</tr>
</tbody>
</table>
9 Indication for Biopsy: Hematuria .......................................................... 233
  Introduction to Hematuria ................................................................. 233
  Detection of Hematuria ................................................................. 233
  Investigation of Hematuria .............................................................. 234
  Value of a Renal Biopsy in Hematuria .............................................. 234
  Common Findings in Hematuria .......................................................... 235
  Approach to the Study of Renal Biopsy Specimens in Hematuria ......... 235
  Initial Assessment of Orthodox Light Microscopic Sections ................. 236
  Assessment of Immunohistologic Sections: Is There IgA Nephropathy? 237
  Diagnosis of IgA Nephropathy ......................................................... 237
  Henoch-Schönlein Nephritis ............................................................. 240
  If IgA Nephropathy Has Been Excluded, Is There an Abnormality on Electron Microscopy? .......................................................... 244
  Diagnosis of Thin Glomerular Basement Membrane Disease ................. 245
  Diagnosis of Hereditary Nephropathy of Alport Type ......................... 246
  Other Findings in Hematuria ............................................................ 248
  Summary: Hematuria ........................................................................... 250
  Further Reading: Hematuria ............................................................... 251

10 Indication for Biopsy: Proteinuria .................................................. 253
  Introduction to Proteinuria ............................................................... 253
  Types of Proteinuria ........................................................................... 253
  Value of a Renal Biopsy in Proteinuria .............................................. 254
  Findings in Proteinuria ....................................................................... 254
  Approach to Study of Renal Biopsy Specimens in Proteinuria .......... 255
  Is There a Segmental Glomerular Disorder? ....................................... 256
  Does the Request Form Give Information About a Systemic Disorder? 257
  Does the Specimen Appear Normal or Nearly Normal on Light Microscopy? .......................................................... 258
  The Unsatisfactory Nature of the Terms Mesangial Proliferative Glomerulonephritis and Focal or Segmental Proliferative Glomerulonephritis .......................................................... 259
  Summary: Proteinuria ......................................................................... 261
  Further Reading: Proteinuria .............................................................. 261
11 Indication for Biopsy: Renal Allograft ................................. 263
   Introduction to Renal Allograft Biopsy Specimens .................. 263
   Reasons for Biopsy of an Allograft Other than Dysfunction ...... 264
   Value of Biopsy of a Renal Allograft ................................. 267
   Technical Handling of Renal Allograft Biopsy Specimens .......... 268
   Approach to the Diagnosis in Renal Allograft Biopsy Specimens ... 268
   Is There Evidence of Acute Rejection? .............................. 269
   Antibody-mediated Rejection ........................................ 269
   Conventional Acute Rejection ....................................... 271
   Diagnosis of Acute Cellular Rejection, also Called Acute
      Tubulo-interstitial Rejection ................................. 272
   Diagnosis of Significant Acute Cellular Rejection .............. 274
   Diagnosis of Acute Vascular Rejection ............................. 277
   Summary of Acute Rejection ...................................... 277
   Is There Any Other Acute Abnormality Instead of Acute
      Rejection, or in Addition to It? .............................. 278
   Is There Evidence of Chronic Rejection? ............................ 282
   Differential Diagnosis of Late Damage in a Renal Allograft .... 285
   Is There a Glomerular Disorder? .................................. 289
   Is There Evidence of a Neoplastic Disorder, or Any Other
      Disorder? .................................................. 294
   Summary: Renal Allografts ........................................ 295
   Further Reading: Renal Allografts ................................. 304

12 Other Indications for Biopsy of Kidneys ............................. 305
   Introduction ................................................. 305
   Investigation of the Kidney in Systemic Disease ................. 305
   Investigation of Metabolic or Other Familial Disorders,
      and Disorders of Tubular Function ............................ 305
   Assessment of Effects of Treatment on the Kidney .............. 306
   Investigation of a Renal Mass .................................. 306
   Chance Finding of a Neoplasm in a Renal Biopsy Specimen ...... 308
   Summary: Other Indications for Biopsy of Kidneys ............... 309
   Further Reading: Other Indications for Biopsy of Kidneys ....... 315

Index ................................................................................. 317
Handbook of Renal Biopsy Pathology
Howie, A.J.
2008, XII, 337 p., Softcover