Contents

Part I History

1 Osteonecrosis: Historical Perspective ............................................................... 3
   Marvin E. Steinberg and David R. Steinberg

Part II Anatomy and Blood Flow

2 Vascular Anatomy and Blood Supply to the Femoral Head ......................... 19
   Marcin Zlotorowicz and Jaroslaw Czubak

3 Ischemia and Reperfusion Injury in Bone ....................................................... 27
   Howard Winet

Part III Epidemiology

4 The Prevalence of Osteonecrosis in Different Parts of the World .................. 35
   A.C. Gosling-Gardeniers, W.H.C. Rijnen, and J.W.M. Gardeniers

5 Epidemiology of Osteonecrosis in the USA ..................................................... 39
   Sameer M. Naranje and Edward Y. Cheng

6 The Epidemiology of Osteonecrosis in Japan .............................................. 47
   Takuaki Yamamoto, Ryosuke Yamaguchi, and Yukihide Iwamoto

7 Epidemiology of Osteonecrosis of the Femoral Head in South Korea .......... 51
   Joon Soon Kang and Kee Hyung Rhyu

8 Current Trends of Osteonecrosis of the Femoral Head in Taiwan and China ................................................................. 55
   Fang-Tsai Lee, Tso-Chiang Ma, and Mel S. Lee

Part IV Etiology

9 Genetic Studies in Osteonecrosis of the Femoral Head .................................. 61
   Shin-Yoon Kim and Tae-Ho Kim

10 Osteonecrosis and Intravascular Coagulation Revisited .............................. 71
    Lynne C. Jones and Deborah McK. Ciombor

11 Glucocorticoids (as an Etiologic Factor) ..................................................... 81
    Eun Young Lee and Yun Jong Lee

12 Corticosteroid Usage and Osteonecrosis of the Hip .................................... 91
    Jeffrey J. Cherian, Bhaveen H. Kapadia, Samik Banerjee, Julio J. Jauregui, and Michael A. Mont
13 Alcohol ................................................................. 95
   Wakaba Fukushima and Yoshio Hirota

14 Traumatic Avascular Necrosis of the Femoral Head .................. 101
   Simon Damian Steppacher, Pascal Cyrill Haefeli,
   Helen Anwander, Klaus Arno Siebenrock,
   and Moritz Tannast

15 Posttraumatic Osteonecrosis of the Femoral Head .................. 113
   Taek Rim Yoon and Ha Sung Kim

16 Osteonecrosis in Sickle-Cell Disease .................................. 125
   Philippe Hernigou and Gildasio Daltro

17 Autoimmune Disease (SLE, Antiphospholipid Syndrome),
   Posttransplantation (Kidney, Liver, Heart, Bone Marrow),
   and Other Risk Factors (Chemotherapy, Caisson Disease,
   Radiation, Pancreatitis, Gaucher’s Disease) .......................... 133
   Jeong Joon Yoo

Part V  Pathology

18 Pathophysiology of Ischemic Diseases of the Hip: Osteonecrosis,
   Borderline Necrosis, and Bone Marrow Edema Syndrome .......... 143
   Kyung-Hoi Koo, Young-Kyun Lee, and Yun Jong Lee

19 The Pathology of Osteonecrosis of the Femoral Head .............. 151
   Takuaki Yamamoto

Part VI  Clinical Manifestation

20 Natural History of Osteonecrosis ........................................ 161
   Samik Banerjee, Bhaveen H. Kapadia, Julio J. Jauregui,
   Jeffrey J. Cherian, and Michael A. Mont

21 Causes of Pain in Early and Advanced Stage Osteonecrosis ..... 165
   Vivek S. Jagadale and Edward Y. Cheng

22 Accumulation of Necrotic Fatty Marrow in Osteonecrotic
   Hips Mimicking Septic Arthritis ....................................... 173
   Tae-Young Kim, Kyung-Hoi Koo, and Javad Parvizi

Part VII  Imaging Diagnosis

23 Radiography, MRI, CT, Bone Scan, and PET-CT .................... 179
   Kyung Nam Ryu, Wook Jin, and Ji Seon Park

Part VIII  Staging and Classification

24 Ficat Staging System .................................................. 199
   Kyung-Hoi Koo

25 The University of Pennsylvania Classification of Osteonecrosis .. 201
   David R. Steinberg and Marvin E. Steinberg
<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Natural Course and the JIC Classification of Osteonecrosis of the Femoral Head</td>
<td>Nobuhiko Sugano and Kenji Ohzono</td>
<td>207</td>
</tr>
<tr>
<td>27</td>
<td>Modified Kerboul Classification System of Necrotic Extent Using MRI</td>
<td>Yong-Chan Ha, Young-Kyun Lee, and Kyung-Hoi Koo</td>
<td>211</td>
</tr>
</tbody>
</table>

**Part IX  Differential Diagnosis**

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Subchondral Stress Fracture of the Femoral Head</td>
<td>Hee Joong Kim, Jeong Joon Yoo, and Pil Whan Yoon</td>
<td>221</td>
</tr>
<tr>
<td>30</td>
<td>Bone Marrow Edema Syndrome of the Hip</td>
<td>Young-Kyun Lee and Kyung-Hoi Koo</td>
<td>231</td>
</tr>
<tr>
<td>31</td>
<td>Distinguishing Bone Marrow Edema Syndrome from Osteonecrosis</td>
<td>Marc W. Hungerford and Kyung-Hoi Koo</td>
<td>235</td>
</tr>
</tbody>
</table>

**Part X  Non-surgical Treatments**

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>The Role of Coagulopathy in the Pathogenesis and Prevention of Corticosteroid-Induced Osteonecrosis</td>
<td>Takuaki Yamamoto, Goro Motomura, Ryosuke Yamaguchi, and Yukihide Iwamoto</td>
<td>249</td>
</tr>
<tr>
<td>34</td>
<td>Lipid-Lowering Agents and Their Effects on Osteonecrosis: Pros and Cons</td>
<td>Abdurrahman Kandil and Quanjun Cui</td>
<td>255</td>
</tr>
<tr>
<td>35</td>
<td>Is There a Role for BMPs in the Treatment of Osteonecrosis?</td>
<td>Philipp Leucht and Stuart B. Goodman</td>
<td>261</td>
</tr>
<tr>
<td>36</td>
<td>Alendronate in the Prevention of Collapse of the Femoral Head in Nontraumatic Osteonecrosis</td>
<td>Chung-Hwan Chen and Gwo-Jaw Wang</td>
<td>265</td>
</tr>
<tr>
<td>37</td>
<td>New Therapies of Bone Necrosis</td>
<td>Wolf Drescher, Matthias Knobe, Wolfgang Wagner, and Thomas Pufe</td>
<td>273</td>
</tr>
</tbody>
</table>

**Part XI  Surgical Treatments**

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Principles of Core Decompression for Osteonecrosis of the Hip</td>
<td>Bhaveen H. Kapadia, Samik Banerjee, Jeffrey J. Cherian, Julio J. Jauregui and Michael A. Mont</td>
<td>279</td>
</tr>
<tr>
<td>39</td>
<td>Stem Cells in Osteonecrosis: Cons</td>
<td>Anjan P. Kaushik, Anusuya Das, and Quanjun Cui</td>
<td>285</td>
</tr>
</tbody>
</table>
40 Cement Techniques in Hip Osteonecrosis with Collapse: From Traditional Methyl Methacrylate to Bone Substitutes and Stem Cells .......... 291
Philippe Hernigou and Gildasio Daltro

41 Impaction Bone Grafting ........................................................................................................ 297
Seung-Hoon Baek and Shin-Yoon Kim

42 Principles of Bone Grafting for Osteonecrosis of the Hip ........................................ 307
Julio J. Jauregui, Samik Banerjee, Bhaveen H. Kapadia, Jeffrey J. Cherian, Kimona Issa, and Michael A. Mont

43 Vascularized Pedicle Iliac Bone Grafting for Osteonecrosis of the Femoral Head .......................... 315
Mel S. Lee

44 The Vascularized Fibular Graft in the Treatment of Osteonecrosis: Data, Dogma, and Controversies .................................................. 321
Will Eward

45 Transtrochanteric Rotational Osteotomy for Femoral Head Osteonecrosis ...... 325
Yong-Chan Ha, Jae-Hwi Nho, and Kyung-Hoi Koo

46 Posterior Rotational Osteotomy for Severe Femoral Head Osteonecrosis ....... 331
Takashi Atsumi

47 Transtrochanteric Curved Varus Osteotomy for the Treatment of Osteonecrosis of the Femoral Head .......................................................... 339
Takuaki Yamamoto, Satoshi Ikemura, and Yukihide Iwamoto

48 Total Hip Arthroplasty Using Ceramic-on-Ceramic Articulation .................. 345
Young-Kyun Lee, Ki-Choul Kim, Bun Jung Kang, and Kyung-Hoi Koo

49 Highly Crosslinked Polyethylene Liners in Patients with Osteonecrosis of the Femoral Head in the United States and Europe ............................................ 349
Patrick O’Toole and Javad Parvizi

50 Alumina Ceramic-on-Highly Cross-Linked Polyethylene Bearing in Cementless Total Hip Arthroplasty in Young Patients with Osteonecrosis of Femoral Head .................................................. 355
Young-Hoo Kim

51 Hip Arthroplasty for Osteonecrosis of the Femoral Head ........................................... 363
Harlan C. Amstutz, Michel J. Le Duff, and Mariam Al-Hamad

52 Resurfacing Arthroplasty for Osteonecrosis of the Femoral Head .................... 375
Bernard N. Stulberg and Jayson D. Zadzilka

Part XII Osteonecrosis in Bones Other than the Hip

53 Multifocal Osteonecrosis ..................................................................................................... 383
Samik Banerjee, Bhaveen H. Kapadia, Jeffrey J. Cherian, Julio J. Jauregui, and Michael A. Mont

54 Osteonecrosis of the Humeral Head ............................................................................. 389
Nobuhiko Sugano

55 Knee Osteonecrosis .......................................................................................................... 395
Karthik E. Ponnusamy, Savyasachi Thakkar, and Harpal S. Khanuja
56 Osteonecrosis of the Talus ................................................................. 403
Kyoung Min Lee, Sung Hun Won, and Moon Seok Park

57 Kienböck’s Disease of the Lunate ......................................................... 411
Dawn M. LaPorte and Thomas J. Kim

Part XIII Legg-Calvé-Perthes Disease

58 The Epidemiology and Etiology of Perthes’ Disease ......................... 419
Daniel C. Perry

59 Legg-Calvé-Perthes Disease: Pathology, Pathophysiology, and Pathogenesis of Deformity .............................................................. 427
Harry K.W. Kim

60 Legg-Calvé-Perthes Disease: Diagnosis, Imaging, and Classifications .......... 437
Benjamin Shore and Harry K.W. Kim

61 Legg-Calvé-Perthes Disease: Treatments ........................................... 451
Benjamin D. Martin and Harry K.W. Kim

62 Developing Medical Therapy for Legg-Calvé-Perthes’ Disease ............... 469
Harry K.W. Kim and David G. Little

63 Corticosteroid-Associated Osteonecrosis in Children ....................... 479
Scott Rosenfeld and Harry K.W. Kim

Part XIV Animal Models

64 Animal Models of Corticosteroid-Associated Bone Diseases ................ 493
Lynne C. Jones, Michelle A. Tucci, Azeb Haile, and Dongqing Wang

65 Animal Models of Bone Necrosis: An Overview .................................. 507
Wagner Drescher, Matthias Knobe, Wolfgang Wagner, and Thomas Pufe

Index ........................................................................................................... 511
Osteonecrosis
Koo, K.-H.; Mont, M.A.; Gordon, M. (Eds.)
2014, XVIII, 514 p. 183 illus., 63 illus. in color.,
Hardcover
ISBN: 978-3-642-35766-4