





# Atlas of Clinical Vascular Medicine

Edited by Jessica Mintz, Bruce L Mintz and Michael R Jaff





# Atlas of Clinical Vascular Medicine

# Atlas of Clinical Vascular Medicine

EDITED BY

### Jessica Mintz

Cleveland Clinic Heart and Vascular Institute Cleveland Clinic Lerner College of Medicine Case Western Reserve University Cleveland, OH, USA

#### Bruce L. Mintz

Clinical Associate Professor Internal Medicine
Director Vascular Technical Training Program
University of Medicine and Dentistry of New Jersey
Newark, NJ;
Attending Gagnon Heart Center
Director Anticoagulation Service
Morristown Medical Center
Morristown, NJ, USA

# Michael R. Jaff

Associate Professor of Medicine Harvard Medical School; Chair, MGH Institute for Heart, Vascular and Stroke Care Massachusetts General Hospital Boston, MA, USA



This edition first published 2013. © 2013 by John Wiley & Sons, Ltd

Wiley-Blackwell is an imprint of John Wiley & Sons, formed by the merger of Wiley's global Scientific, Technical and Medical business with Blackwell Publishing.

Registered office: John Wiley & Sons, Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ,

UK

Editorial offices: 9600 Garsington Road, Oxford, OX4 2DQ, UK

The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

111 River Street, Hoboken, NJ 07030-5774, USA

For details of our global editorial offices, for customer services and for information about how to apply for permission to reuse the copyright material in this book please see our website at www.wiley.com/ wiley-blackwell.

The right of the author to be identified as the author of this work has been asserted in accordance with the UK Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, except as permitted by the UK Copyright, Designs and Patents Act 1988, without the prior permission of the publisher.

Designations used by companies to distinguish their products are often claimed as trademarks. All brand names and product names used in this book are trade names, service marks, trademarks or registered trademarks of their respective owners. The publisher is not associated with any product or vendor mentioned in this book. This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold on the understanding that the publisher is not engaged in rendering professional services. If professional advice or other expert assistance is required, the services of a competent professional should be sought.

Library of Congress Cataloging-in-Publication Data

Mintz, Jessica Mintz.

p. ; cm.

Includes bibliographical references and index.

ISBN 978-0-470-65809-3 (hardback : alk. paper)

- I. Mintz, Jessica. II. Mintz, Bruce L. III. Jaff, Michael R.
- [DNLM: 1. Vascular Diseases-diagnosis-Atlases. 2. Vascular Diseases-diagnosis-Case Reports.
- Vascular Diseases-therapy-Atlases. 4. Vascular Diseases-therapy-Case Reports. WG 17] 616.8'1-dc23

2012044507

A catalogue record for this book is available from the British Library.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Set in 8/12pt Stone Serif by Toppan Best-set Premedia Limited, Hong Kong

1 2013

# **Contents**

Preface and Dedication, ix

Contributor List, x

About the Companion Web Site, xii

#### I. Arterial Disease

#### **Peripheral Artery Disease**

- **1** Peripheral Artery Disease, 2 *Joshua A. Beckman*
- **2** Elevation Pallor and Dependent Rubor, 4 *Ido Weinberg and Michael R. Jaff*

#### **Acute Arterial Occlusion**

- **3** Ischemic Toes, 6 *Ido Weinberg and Michael R. Jaff*
- **4** Severe Limb Ischemia Related to Systemic Vasopressor Use, 8 Bruce L. Mintz and Michael R. Jaff

#### **Renal Vascular Disease**

- **5** Renal Artery Stenosis: Atherosclerotic, 10 *J. Michael Bacharach*
- 6 Renal Artery Stenosis: Fibromuscular Dysplasia, 12

  I. Michael Bacharach

#### **Arterial Dissection**

**7** Aortic Dissection, 14 *Paul B. Haser* 

#### Carotid/Subclavian Artery Disease

- **8** Carotid Artery Stenosis, 16 *Paul B. Haser*
- **9** Carotid Fibromuscular Dysplasia, 18 *Heather L. Gornik and Sandra Yesenko*

#### **Subclavian Artery Stenosis**

**10** Subclavian Artery Stenosis, 20 *I. Michael Bacharach* 

#### Aneurysm

- **11** Abdominal Aortic Aneurysm, 22 *J. Michael Bacharach*
- **12** Popliteal Artery Aneurysm, 24 *Jason Q. Alexander and Timothy Sullivan*

#### Post-Traumatic Compartment Syndrome

**13** Post-Traumatic Compartment Syndrome, 26 *Ari J. Mintz and Bruce L. Mintz* 

#### **Vaso-Occlusive Arterial Disease**

- **14** Livedoid Vasculopathy, 28 *Steven M. Dean*
- **15** Digital Ischemia in Systemic Sclerosis, 30 *Peter C. Grayson and Peter A. Merkel*
- **16** Digital Arterial Thrombosis Secondary to Polycythemia Vera, 32 *Jessica Mintz, John R. Bartholomew and Heather L. Gornik*

#### **Vasospastic**

- **17** Raynaud's Phenomenon, 34 Peter C. Grayson and Peter A. Merkel
- **18** Acrocyanosis, 36 *Ido Weinberg and Michael R. Jaff*
- **19** Livedo Reticularis, 38 *Steven M. Dean*
- **20** Livedo Racemosa, 40 *Steven M. Dean*
- **21** Ergotism, 42 *Bruce L. Mintz*

#### **Vasculitis**

- **22** Giant Cell Arteritis (Temporal Arteritis), 44 *Bruce L. Mintz*
- **23** Polyarteritis Nodosa, 46 Peter C. Grayson and Peter A. Merkel

- 24 Thromboangiitis Obliterans (Buerger's Disease), 48 Raghu Kolluri
- **25** Small Vessel Vasculitis, 50 *Peter C. Grayson and Peter A. Merkel*
- **26** Henoch–Schönlein Purpura, 52 *Shane Clark*
- **27** Behçet's Disease, 54 Peter C. Grayson and Peter A. Merkel
- **28** Takayasu Arteritis, 56 *Ido Weinberg and Michael R. Jaff*

#### **Vascular Anomalies**

- **29** Marfan's Syndrome, 58 *Ido Weinberg and Michael R. Jaff*
- **30** Ehlers–Danlos Type IV (Vascular Type), 60 *Bruce L. Mintz*

#### II. Venous Disease

#### **Deep Vein Thrombosis**

- **31** Deep Vein Thrombosis, 62 *Ari J. Mintz and Bruce L. Mintz*
- **32** Upper Extremity Deep Vein Thrombosis, 64

  Bruce L. Mintz
- **33** May–Thurner Syndrome, 66 *Robert M. Schainfeld*
- **34** Phlegmasia Cerulea Dolens, 68 Steven M. Dean

#### **Anticoagulation Complications**

- **35** Heparin-induced Thrombocytopenia, 70 *Jessica Mintz, John R. Bartholomew and Heather L. Gornik*
- **36** Warfarin-induced Skin Necrosis, 72 *Bruce L. Mintz*

#### **Chronic Venous Insufficiency**

- **37** Telangiectasias, 74 *Robert M. Schainfeld*
- **38** Reticular Veins, 76 *Robert M. Schainfeld*
- **39** Venous Varicosities, 78 *Robert M. Schainfeld*

#### **Superficial Thrombophlebitis**

**40** Superficial Thrombophlebitis, 80 *Robert M. Schainfeld* 

#### **Spontaneous Venous Hemorrhage**

**41** Spontaneous Venous Hemorrhage (Benign Blue Finger Syndrome), 82 *Bruce L. Mintz* 

#### **Venous Aneurysm**

**42** Venous Aneurysm, 84 Bruce L. Mintz

#### III. Limb Edema

#### Lymphedema

- **43** Lymphedema, 86 Bruce L. Mintz
- **44** Milroy's Disease, 88

  Jessica Mintz, John R. Bartholomew, Steven M. Dean and Heather L. Gornik
- **45** Filariasis, 90 *Jessica Mintz, John R. Bartholomew and Heather L. Gornik*
- **46** Yellow Nail Syndrome, 92 *Bruce L. Mintz*
- **47** Elephantiasis Nostras Verrucosa, 94 Stephen L. Chastain and Bruce H. Gray

#### **Miscellaneous Causes of Edema**

- **48** Lipedema, 96 Bruce L. Mintz
- **49** Pretibial Myxedema (Thyroid Dermopathy), 98 Steven M. Dean
- **50** Popliteal Cyst (Baker's Cyst), 100 *Bruce L. Mintz*
- 51 Bacterial Cellulitis, 102

  Jessica Mintz, John R. Bartholomew and

  Heather L. Gornik
- **52** Gastrocnemius Muscle Rupture, 104 *Bruce L. Mintz*

#### **IV. Limb Ulcerations**

#### Venous

**53** Venous Stasis Ulcer, 106 Geno J. Merli and Taki Galanis

#### **Arterial**

**54** Arteriosclerosis Obliterans Ulcer (Arterial Ulcer), 108 *Ari J. Mintz and Bruce L. Mintz* 

- **55** Antiphospholipid Antibody Syndrome-induced Ulceration, 110 *Raghu Kolluri*
- **56** Rheumatoid Vasculitis, 112

  Cory Perugino and Raghu Kolluri
- **57** Calciphylaxis, 114 *Jessica Mintz*
- 58 Hypertensive Ulcer, 116

  Jessica Mintz, John R. Bartholomew and
  Heather L. Gornik

#### Diabetic

- **59** Neurotrophic Ulcer, 118 *Bruce L. Mintz*
- **60** Necrobiosis Lipoidica Diabeticorum, 120 *Raghu Kolluri*
- **61** Deep Foot Infection, 122 *Raghu Kolluri*

#### Hematologic

- **62** Sickle Cell Induced Leg Ulceration, 124

  Jessica Mintz, John R. Bartholomew, Michael Gironta
  and Heather L. Gornik
- 63 Thalassemia Intermedia Induced Limb Ulceration,126Jessica Mintz, John R. Bartholomew and

#### Metabolic

Heather L. Gornik

**64** Pyoderma Gangrenosum, 128 *Ido Weinberg and Michael R. Jaff* 

#### Drugs

**65** Cocaine (Levamisole) Induced Vasculitis, 130 *Peter C. Grayson and Peter A. Merkel* 

#### **Lichen Planus**

**66** Lichen Planus, 132

Georgann A. Poulos and Steven M. Dean

#### **Brown Recluse Spider Bite**

**67** Brown Recluse Spider Bite, 134 Bruce L. Mintz

#### V. Environmental Vascular Disease

**68** Frostbite, 136 *Ido Weinberg, Bruce L. Mintz and Michael R. Jaff* 

- **69** Pernio (Chilblains), 138 *Bruce L. Mintz*
- **70** Trench Foot, 140 *Bruce L. Mintz and Jessica Mintz*
- **71** Erythromelalgia, 142 *Bruce L. Mintz*
- **72** Heat-induced (Cholinergic) Urticaria, 144 *Joshua A. Beckman*
- **73** Erythema Ab Igne, 146 *Ido Weinberg and Michael R. Jaff*
- 74 Hypothenar Hammer Syndrome, 148 Jessica Mintz, Heather L. Gornik and John R. Bartholomew

#### VI. Vascular Malformations

- **75** Arteriovenous Malformations, 150 *Robert J. Rosen*
- **76** Arteriovenous Fistula, 152 *Robert J. Rosen*
- **77** Pelvic Arteriovenous Malformations, 154 *Robert J. Rosen*
- **78** Pulmonary Arteriovenous Malformations, 156 *Robert J. Rosen*
- **79** Parkes–Weber Syndrome, 158 *Robert J. Rosen*
- **80** Klippel–Trenaunay Syndrome, 160 *Bruce L. Mintz*
- **81** Lymphatic Malformations, 162 *Robert J. Rosen*

#### **VII. Vascular Tumors**

#### **Benign Vascular Tumors**

- **82** Hemangioma of Infancy, 164

  Jason Q. Alexander, Kate Zimmerman,

  Stephen C. Nelson and Timothy Sullivan
- **83** Kaposiform Hemangioendothelioma, 166 *Robert J. Rosen*
- **84** Glomus Tumor, 168 *Robert J. Rosen*
- **85** Angiomyolipoma, 170 *Robert J. Rosen*

**86** Juvenile Nasopharyngeal Angiofibroma, 172 *Robert J. Rosen* 

#### **Syndrome Associated with Vascular Lesions**

- 87 Maffucci's Syndrome, 174

  Jessica Mintz, John R. Bartholomew and Heather L. Gornik
- **88** Osler–Weber–Rendu Syndrome, 176 *Jessica Mintz, John R. Bartholomew and Heather L. Gornik*

#### **Malignant Vascular Tumors**

- 89 Lymphangiosarcoma, 178

  Jessica Mintz, John R. Bartholomew and Heather L. Gornik
- **90** Limb Ulceration Due to Malignant Melanoma, 180

  Jessica Mintz, John R. Bartholomew and

  Heather L. Gornik

- **91** Cutaneous Waldenström's Macroglobulinemia, 182 Jessica Mintz, John R. Bartholomew and Heather L. Gornik
- **92** Verrucous Carcinoma, 184 *Ido Weinberg and Michael R. Jaff*

#### **VIII. Fungal Infections**

**93** Onychomycosis (Dermatophytic Onychomycosis), 186 *Bruce L. Mintz* 

Index, 189

# **Preface and Dedication**

For those who have committed their professional careers to the diagnosis and management of vascular diseases, one of the true joys of this specialty is the broad and myriad presentations patients demonstrate. One can never get bored, nor can one assume that they have "seen it all".

Vascular medicine specialists must have a keen ability to identify subtle physical diagnostic findings, and link them to often difficult historical presentations and objective imaging tests. There are many tomes on vascular medicine; however, we felt that an easy to reference pictorial atlas would serve as a useful ready reference for practicing clinicians. We have asked renowned experts in the field to help us put together a comprehensive, organized pictorial with brief descriptions of what you see in each figure. We hope you find this a useful addition to your clinical libraries.

Each of us dedicates this *Atlas* to our families, who tolerate our hectic lifestyles. Still, the true dedication of this *Atlas* is to Jess R. Young, MD, Emeritus Chair of Vascular Medicine at the Cleveland Clinic. For those of us who were privileged to train under Dr. Young (B.L.M., M.R.J.), we have never encountered his equal. Dr. Young combined a mastery of clinical medicine with an encyclopedic fund of knowledge and a unique method of approaching patients. We use Dr. Young's approach to vascular medicine every day in our clinical practice, and attempt to pass on his acumen and diagnostic strategies to our trainees. Thank you, Dr. Young, on behalf of all of the physicians you have trained and all the patients you directly, and indirectly, touched and healed.

# **Contributor List**

#### Jason Q. Alexander, MD

Assistant Professor of Clinical Surgery, University of Minnesota Minneapolis Heart Institute, Minneapolis, MN, USA

#### J. Michael Bacharach, MD, MPH, FACC, FSCAI

Section Head, Vascular Medicine and Peripheral Vascular Intervention North Central Heart Institute Sioux Falls, SD, USA

#### John R. Bartholomew, MD

Section Head of Vascular Medicine Cleveland Clinic Heart and Vascular Institute; Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, OH, USA

#### Joshua A. Beckman, мр, мѕ

Harvard Medical School Cardiovascular Division, Brigham and Women's Hospital Boston, MA, USA

#### Stephen L. Chastain, MD

Assistant Professor of Medicine University of South Carolina School of Medicine/Greenville; Director of Inpatient Vascular Medicine Services Greenville Health System, Greenville, SC, USA

#### Shane Clark, MD

Chief Dermatology Resident Wexner Medical Center at the Ohio State University Columbus, OH, USA

#### Steven M. Dean, DO, FACP, RPVI

Program Director, Vascular Medicine Associate Professor of Medicine, Department of Cardiovascular Medicine, Wexner Medical Center at the Ohio State University Columbus, OH, USA

#### Taki Galanis, мо

Assistant Professor of Medicine
Department of Surgery
Director of Hyperbaric Therapy and Wound Care
Jefferson Vascular Center
Thomas Jefferson University Hospitals
Jefferson Medical College
Philadelphia, PA, USA

#### Michael Gironta, DO

Eastern Vascular Associates Denville, NJ, USA

#### Heather L. Gornik, MD, MHS

Medical Director, Non-Invasive Vascular Laboratory Cleveland Clinic Heart and Vascular Institute Assistant Professor Medicine Cleveland Clinic Lerner College of Medicine of Case Western Reserve University Cleveland, OH, USA

#### Bruce H. Gray, DO

Professor of Surgery/Vascular Medicine University of South Carolina School of Medicine/Greenville; Director of Endovascular Services Greenville Health System, Greenville, SC, USA

#### Peter C. Grayson, MD, MSc

Assistant Professor of Medicine – Rheumatology Vasculitis Center, Section of Rheumatology Boston University Medical Center, Boston, MA, USA

#### Paul B. Haser, MD

Associate Professor of Surgery Robert Wood Johnson Medical School University of Medicine & Dentistry of New Jersey New Brunswick, NJ, USA

#### Raghu Kolluri, MD, RVT, FACC, FACP, FSVM

Medical Director Vascular Laboratories of Prairie Vascular Institute Springfield, IL, USA

#### Peter A. Merkel, MD, MPH

Chief, Division of Rheumatology Professor of Medicine and Epidemiology University of Pennsylvania, Philadelphia, PA, USA

#### Geno J. Merli, MD, FACP, FHM, FSVM

Professor of Medicine Co-Director, Jefferson Vascular Center, Jefferson Medical School Thomas Jefferson University Hospitals Philadelphia, PA, USA

#### Ari J. Mintz, DO

Department of Internal Medicine Lahey Clinic Medical Center Burlington, MA, USA

#### Stephen C. Nelson, MD

Director, Hemoglobinopathy Program Co-Director, Vascular Anomalies Clinic Adjunct Assistant Professor Department of Pediatrics University of Minnesota Children's Hospitals and Clinics of Minnesota Minneapolis, MN, USA

#### Cory Perugino, Do

Cleveland Clinic Foundation Cleveland, OH, USA

#### Georgann A. Poulos, MD

Wexner Medical Center at the Ohio State University Division of Dermatology Columbus, OH, USA

#### Robert J. Rosen, MD

Co-Director of Endovascular Surgery Lenox Hill Heart and Vascular Institute New York, NY, USA

#### Robert M. Schainfeld, DO

Lecturer on Medicine Harvard Medical School Section of Vascular Medicine Massachusetts General Hospital, Boston, MA, USA

#### Timothy Sullivan, мо

Minneapolis Heart Institute Minneapolis, MN, USA

#### Sandra Yesenko, BS

Lead Technologist for Education Non-invasive Vascular Laboratory Cleveland Clinic Cleveland, OH, USA

#### Ido Weinberg, MD MSc MHA

Vascular Medicine Section Massachusetts General Hospital Boston, MA, USA

#### Katherine P. Zimmerman

Student Research Intern Minneapolis Heart Institute, Minneapolis, MN, USA

# **About the Companion Web Site**

There is a companion web site for this book at http://www.wiley.com/go/Jaff/Vascular

On this site you will find

• A complete set of figures from the book

# Atlas of Clinical Vascular Medicine