Peripheral Vascular Disease for Cardiologists
A CLINICAL APPROACH
To my wife Beverly Spittell,
in appreciation of her encouragement,
patience, and loyalty
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Foreword

It is a pleasure to write this Foreword for the book Peripheral Vascular Disease for Cardiologists: A Clinical Approach by John A. Spittell Jr, MD. I have known Dr Spittell since 1972 (when he recruited me to the Mayo Clinic) and I have great respect for the work that he has done in the area of peripheral vascular diseases and for his training and impact on so many clinicians interested in this field.

In the Preface, Dr Spittell has stated that the purpose of writing this book is to improve the cognitive skills of the cardiologist in the field of peripheral vascular diseases. As he rightly points out, “With the current difficulty that some patients encounter in gaining access to continuing primary care, they may call upon their cardiologist for noncardiac care, some of which may be in the peripheral vascular domain. In addition, achievement and maintenance of cardiovascular subspecialty certification will be facilitated by a working knowledge of peripheral vascular disorders . . . .” Indeed, Dr Spittell has successfully provided an excellent and simplified clinical approach to the wide variety of peripheral vascular diseases which will fulfill the interest of cardiologists, internists, other health professionals, and students.

The clinical “pearls” of this book relate to the vast clinical experience of Dr Spittell. For this reason, there are a large number of statements based on his opinion which are quite fair since we don’t have the answers yet except for the experience of great clinicians as the author of this book. Such clinical “pearls” are particularly relevant in the chapters on Leg Edema, Leg and Foot Ulcers, Vascular Clues to a Diagnosis, and Some Uncommon Peripheral Vascular Disorders, which are excellent.

Dr John A. Spittell has done more to encourage involvement of the cardiovascular community in peripheral vascular diseases than any other individual I know. This book, based on his vast experience as a clinician and present knowledge, is a valuable learning aid for cardiologists, other health professionals, and students who wish to gain practical information about the important field of peripheral vascular diseases.

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Mount Sinai Medical Center, New York
Past President AHA
President Elect World Heart Federation
There are a number of reasons for cardiologists to be knowledgeable about at least the common peripheral vascular disorders that can coexist with, or complicate the management of, their patients with cardiac disease. There are instances as well when clinical manifestations suggestive of a cardiac disease are actually due to an important vascular problem which may be overlooked unless the clinician is aware of it. Peripheral vascular findings may also alert the informed cardiologist of an otherwise significant but occult clinical problem. With the current difficulty that some patients encounter in gaining access to continuing primary care, they may call upon their cardiologist for noncardiac care, some of which may be in the peripheral vascular domain. In addition, achievement and maintenance of cardiovascular subspecialty certification will be facilitated by a working knowledge of peripheral vascular disorders since the cardiovascular subspecialty examinations have had an increasing content of peripheral vascular material.

Furthermore, the topic has been “inadequately addressed in many, if not most, training programs in internal medicine and its subspecialty of cardiology”;¹ hopefully, this will be corrected with the recent recommendation of the vascular medicine task force “that cardiologists must have adequate basic training in vascular medicine to acquire a sufficient knowledge base to care for the many patients with peripheral vascular disease.”² The importance of this area of cardiovascular disease has been emphasized further by the Atherosclerotic Vascular Disease Conference (July 2002) sponsored by the American Heart Association to outline strategies for research and educational programs in atherosclerotic peripheral vascular disease.

This book is intended to fulfill a need for those cardiovascular specialists who wish to broaden their knowledge base and clinical skills in the recognition and management of common peripheral vascular disorders that occur in cardiologic practice. Accordingly, peripheral vascular disease will be presented in a practical clinical framework rather than the usual textbook format. For rapid reference to specific disorders or findings, a detailed index has been provided. In selecting references, I have tried to cite original descriptions or those which are, in my opinion, key references or those of particular clinical value.

Many persons, colleagues, paramedical personnel, and patients have been extremely helpful to me over the past four and a half decades of my clinical practice. Obviously, they are so numerous that I cannot mention all, but several were absolutely essential to my choice of peripheral vascular disease as an area of special interest. Drs E. V. Allen, N. W. Barker, and E. A. Hines,
pioneers in the field of peripheral vascular disease, were the persons who influenced and attracted many of us in our residency and fellowship years at Mayo, by their enthusiasm, knowledge, and clinical skills in an area of cardiovascular disease that had been given little, if any, attention in our medical school curriculum. Many other colleagues (coauthors and other associates) have been important teachers, critics, and sources of “clinical pearls.” Likewise, many paramedical persons (librarians, artists, photographers, and secretaries) have been generous in their assistance to me over the years and I am grateful to them. I would be remiss if I did not credit Dr Suzanne B. Knoebel for really starting this project when she was the editor of the ACC Current Journal Review and asked me in 1993, and again in 2000, to write an article on “What the cardiologist should know about peripheral vascular disease.” The assistance of Mrs Roberta Schwartz in the Section of Publications at Mayo Clinic in getting this book-writing effort “in focus” for me in the very beginning was most helpful. Of special note is my former secretary, Mrs Debra DeCook, who in her own time has patiently typed and retyped the manuscript and all the correspondence required to produce this book.

References

CHAPTER 1

Occlusive peripheral arterial disease

Atherosclerotic peripheral vascular disease

Disorders caused by atherosclerosis head the list of peripheral vascular diseases that a cardiologist may encounter as comorbid conditions in patients with coronary artery disease. These include occlusive peripheral arterial, carotid, and renal disease, and aneurysmal disease of the aorta and the extremity arteries and their complications.

Occlusive peripheral artery disease

First of all, atherosclerotic occlusion (ASO) in the extremities, whether manifested by symptoms, absent pulses, or an abnormal ankle–brachial index (ABI),\(^1\) is associated with a more-than-four-times higher risk of cardiovascular mortality. In patients with intermittent claudication due to ASO, significant coronary artery disease is present by angiography in more than 50%.\(^2\) Clearly then, inclusion of the extremity arterial circulation in the medical history and physical examination of coronary disease patients provides prognostic information warranting aggressive risk factor management. A point worth noting here is that a decreased or absent posterior tibial pulse is the best noninvasive indication of occlusive arterial disease upstream;\(^3\) the posterior tibial artery is virtually never absent congenitally while the dorsal pedis pulse may be absent in about 12% of patients.\(^4\)

Auscultation over large arteries such as the carotid, subclavian, abdominal aorta, and renal and common femoral artery in the groin for bruits should be a part of the physical examination. The presence of a bruit usually indicates turbulence of flow due to stenosis upstream. While most bruits are systolic in timing, when the bruit flows into diastole the stenosis upstream is often in the range of 80% of the lumen (Figure 1.1), i.e. severe enough to cause a gradient and, therefore, flow in diastole – a significant clinical finding.

While on the subject of bruits, examination of the carotid artery should be considered. It is preferable to palpate for the carotid artery pulsation with the patient supine and the stethoscope over the precordium during the examination. Monitoring the heart rate during the carotid palpation helps recognize any bradycardia (as a result of carotid sinus sensitivity) promptly and cease carotid artery palpation. Also in the supine position there is less chance of the patient falling if there is any unsteadiness or loss of consciousness. It is also
helpful to have patients hold their breath while the clinician listens for carotid bruits. To minimize patient discomfort the clinician should hold his/her breath at the same time.

**Chronic ASO in the lower extremity**

While intermittent claudication may variously be described as “cramping” or “fatigue” or some other type of discomfort, it has the consistent feature of occurring while walking and being relieved by standing still. Among the musculoskeletal disorders that may mimic true intermittent claudication, pseudoclaudication due to lumbar spinal stenosis is the principal one. Differentiation clinically is usually not difficult (Table 1.1) but an exercise study gives useful confirmation (Figure 1.2). Occasionally, true claudication due to ASO and pseudoclaudication due to spinal stenosis coexist. In these cases evaluation with a noninvasive test with exercise, CT scan or MRI of the lumbar spine, and angiography may be required to determine which is the most serious problem and whether it warrants correction. Indeed, at times both the occlusive arterial disease and the spinal stenosis need treatment to restore the quality of life the patient desires.

In addition to examination and grading of the extremity pulses, elevation-dependency tests and noninvasive testing are useful to materially improve
A clinically useful maneuver, often overlooked, is elevation of the lower extremities to 60°C above the level and observing any change in the color of the skin of the soles. With this maneuver, no pallor of the skin will develop in 60 seconds if the arterial circulation in the lower extremity is normal or minimally occluded, but if definite pallor (Figure 1.3a) develops, then the occlusive arterial disease in that extremity is significant – a valuable determination that can be made in 60 seconds.

Table 1.1 True claudication vs. pseudoclaudication

<table>
<thead>
<tr>
<th></th>
<th>Claudication</th>
<th>Pseudoclaudication</th>
</tr>
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<tbody>
<tr>
<td>Onset</td>
<td>Walking</td>
<td>Erect posture, i.e. walking or standing</td>
</tr>
<tr>
<td>Discomfort</td>
<td>Cramp, ache, fatigue</td>
<td>Paresthesia, pain, weakness</td>
</tr>
<tr>
<td>Bilateral?</td>
<td>±</td>
<td>Generally bilateral</td>
</tr>
<tr>
<td>Relief</td>
<td>Stand still</td>
<td>Sit down, lean on something, flex spine</td>
</tr>
<tr>
<td>Cause</td>
<td>Occlusive peripheral arterial disease</td>
<td>Spinal stenosis</td>
</tr>
</tbody>
</table>

Figure 1.2 An office-based exercise study can be performed by determining the ankle–brachial index (ABI) before and after having the patient perform up to 50 consecutive plantar flexions in the erect posture. (a) Before plantar flexion. (b) Plantar flexion while keeping knees straight. (From McPhail I.R., Spittell P.C., Weston S.A., et al. (2001) Intermittent claudication: An office-based assessment. JACC 37: 1381–1385. By permission of the Elsevier Science, Oxford, UK.)
seconds in the office or at the bedside. After performing the elevation test for 60 seconds, the patient can then sit up and hang down his/her feet for the time required for the color to return to the skin and for the superficial veins on the dorsum of the foot to fill (Figure 1.3b). This can be a confirmatory finding of the adequacy of the circulation in the extremity (Table 1.2). When ischemia becomes severe and causes pain at rest, the patient will often hang the ischemic foot over the side of the bed to try to get relief. As a result a deep ruborous color develops along with dependent edema (Figure 1.4), indicative of critical limb ischemia.

Although careful clinical examination is reliable in diagnosing occlusive arterial disease in the lower extremity, the ABI has become the objective standard for diagnosis. The ABI is readily obtained by measuring the systolic blood pressure at the brachial and ankle levels with the patient supine; a handheld Doppler instrument is most useful for detecting the systolic blood pressure (Figure 1.5). Normally the supine systolic pressure at the ankle level exceeds that at the brachial level, while with occlusive arterial disease in the lower extremity the systolic pressure at the ankle is lower than the brachial systolic pressure, usually in proportion to the degree of arterial insufficiency. However, the ABI is not a valid measure of arterial disease in the patient with
medial calcinosis – often a diabetic – that causes the systolic pressure at the ankle level to be spuriously elevated. In the diabetic patient with ASO and medial calcinosis causing spuriously elevated systolic ankle blood pressures, toe blood pressures or transcutaneous oximetry can be used to document the

<table>
<thead>
<tr>
<th>Grade</th>
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<tbody>
<tr>
<td>0</td>
<td>No pallor in 60</td>
</tr>
<tr>
<td>1</td>
<td>Definite pallor in 60</td>
</tr>
<tr>
<td>2</td>
<td>Definite pallor in &lt; 60</td>
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<tr>
<td>3</td>
<td>Definite pallor in &lt; 30</td>
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<tr>
<td>4</td>
<td>Pallor on level</td>
</tr>
</tbody>
</table>

*Elevation of extremity at angle of 60° above level.*

**Figure 1.4** Dependent edema and an ischemic ulcer of the toe in a patient with critical limb ischemia and ischemic rest pain. Not seen in this black-and-white photograph is the deep ruborous color – so-called dependent rubor – indicative of severe ischemia.