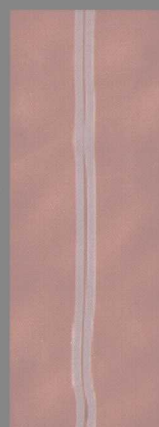
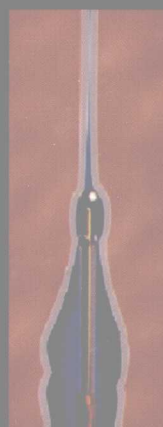
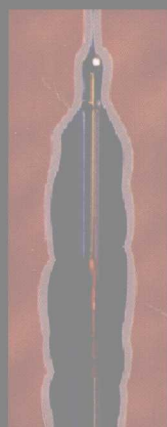




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vein diagnosis & treatment



a comprehensive approach

Vein Diagnosis and Treatment:

A Comprehensive Approach

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Dedication

This textbook is dedicated to our sons, Michael, David and Jonathan, who not only helped with some of the artwork, but who were exceptional in their ability to educate and entertain themselves during the multitude of hours we spent away from them while writing this book. Thanks and love from Mom and Dad.

Robert & Margaret Weiss

To my wife, Julie, who makes it all worthwhile, and whose illustrations grace several chapters of this textbook. Thanks and love from your husband.

Craig Feied

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The editors would like to acknowledge and express their gratitude to the following for their invaluable contributions to this book.

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Foreword

The diagnosis and treatment of venous disease is advancing each year. New developments in treating venous disease with surgical and pharmacological methods are providing patients with more efficient and cost effective care. During the last 15 years nearly one dozen medical textbooks and hundreds of peer reviewed medical articles have been published world-wide. This volume written by friends and colleagues who are all experts in Phlebology adds a great deal of practical and useful information to the field. Even though there already exists several excellent textbooks on venous disease, what differentiates this text from the rest is its practical simplicity. Useful tables and figures abound to assist the novice and improve the expert in giving care to his/her patients.

Special care has been taken to provide up-to-date information on treatment as well as classification of venous anatomy and diagnostic techniques. Although the majority of the text is written in a single style by the authors, they have chosen special colleagues to write specific chapters. One of the leaders in venous surgery, A.A. Ramelet, presents an outstanding chapter on ambulatory phlebectomy for the beginner as well as advanced surgeon. J.J. Guex provides a

practical review of sclerosing solutions presently available to the American physician with an emphasis on sclerosing solutions soon to be approved by our FDA. The chapter on venous ulcers by Andre Conu-Thenard and co-workers is simplistic, well organized and an easily understandable read.

As leaders in the field of Phlebology and former and current Presidents of the American College of Phlebology, Drs. Weiss and Feied along with their contributors are to be congratulated for spending time and effort to bring this text to fruition. Tai Tung in the 13th Century said it best in his *History of Chinese Writing*: "Were I to await perfection, my book would never be finished." The student of phlebology owes thanks to these authors for presenting their work today so that others can continue to "perfect" the art of Phlebological Medicine.

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Preface

We have found it very sad that venous disease has been relegated to the bottom of importance in American medicine. Time and time again we observe patients who have been told to live with their disease or even worse have been treated in far less than optimal medical and cosmetic fashion. Knowing that very little was taught about venous disease when we attended medical school in the 1970s, our motivation for this text has been to share the knowledge we have gained in treating over 14,000 patients over the last 16 years. The foundation of this knowledge began with the European phlebologists who have advanced the field to a science with detailed studies of physiology and treatment.

Until Mitchel P. Goldman published his textbook of sclerotherapy in the early 1990s there was no comprehensive American resource to help our understanding, not only of the importance of venous disease but the science and art behind the treatment. His textbook advanced the cause of phlebology and allowed great strides in physician comprehension of venous disease. His textbook still remains as the greatest resource integrating all the world's literature into a single English language volume. In contrast, our text has been written as a practical supplement to those wishing to practice phlebology in all of its many methods of treatment. Millions of adults experience the pain and the other manifestations of venous disease including edema, cellulitis and ulceration, yet because of the lack of practical knowledge in American medicine, these patients are not offered logical or comprehensive, multidisciplinary care.

We hope that this text will serve as a practical and frequently referenced guide to those physicians who wish to

expand upon the very basic knowledge obtained in medical school, but we also secretly hope that this text will serve as a wake-up call to the minds assembling current medical school curriculum. Phlebology must absolutely be taught in medical school. When up to 40% of the population experiences some form of venous disease and when these patients experience pain in up to 50% of cases, physicians should be knowledgeable in diagnosis and treatment. This includes the use of compression as a treatment to reduce the signs and symptoms of venous disease and to help treat venous ulcers.

Fortunately due to educational organizations such as the American College of Phlebology (formerly the North American Society of Phlebology founded in 1986), educational symposia are readily accessible to interested physicians. For dermatologists and other interested physicians, the American Society for Dermatologic Surgery offers many opportunities to learn phlebology including a practical hands-on workshop in sclerotherapy, ambulatory phlebectomy, lasers and radio-frequency occlusion. To supplement these experiences, this textbook incorporates the results of years of patient treatment and study. We sincerely hope that reading this book will help to catapult your understanding and ability to deal with venous disease to the level of our European colleagues.

Robert A. Weiss
Margaret A. Weiss
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Linked website

More information including the companion CD-ROM demonstrating many of the procedures described in this textbook can be obtained at:

<http://www.veintext.com>

Other materials such as a patient education video on vein techniques are also available through this site.

Meetings and training courses are also listed at this site.

Acknowledgments

No listing of acknowledgments can ever be complete. During the writing of a textbook many different influences come together to shape the opinions expressed, and we collectively thank each and every one of the phenomenal individuals who helped us along the way.

Phlebology is a young specialty in America, and without the patient teaching of our European colleagues, the experience that allows us to create this textbook would never have occurred. We are indebted to French phlebologists in general and to Dr. Frederic Vin and Dr. Andre Cornu-Thenard in particular, whose willingness to allow us to observe their expert practice helped us immensely. Dr. Michel Schadeck taught us many aspects of Duplex diagnosis and treatment. Dr. Jean-Jerome Guex has been a source of constant friendship and valuable clinical information. The encouragement of these physicians will always be appreciated and never be forgotten.

We are also indebted to the Swiss phlebologists and in particular to dermatologic surgeon Dr. Albert-Adrien Ramelet whose ability to critically assess and solve the most complex medical and surgical problems has benefited not only us but thousands of patients. His contributions to ambulatory phlebectomy (along with those of Dr. Muller) allow phlebologists worldwide to claim this technique as their own.

The German phlebologic community also contributed to our knowledge and experience. Our observation of Dr. Ulrich Shultz-Ehrenburg in Bochum and Berlin and his workshops at the American College of Phlebology gave us a solid foundation in Doppler diagnosis. Similarly, our understanding of the science of compression and the importance of the often-neglected lateral venous system are due to the teaching efforts of Austrian dermatologic surgeon Dr. Hugo Partsch, President of the International Union of Phlebology. We have learned much through the brilliance of Dr. Gerhard Sattler and his associate Boris Sommer, and also from Dr. Alina Fratila, presently doing very exciting work in the field of intravascular laser therapeutics.

In the Netherlands, Dr. HAM Neumann has been an inspiration and a wonderful teacher not only in phlebology, but in the grace and joy of life in general. The Italian phlebologists, Drs. Allegra, Corcos, Frullini, and Georgiev have taught us much as well. Dr. Shunichi Hoshino of Japan and others in the Asian phlebologic community have also contributed greatly to our knowledge and understanding.

Our American colleagues have also been instrumental in our learning. Without the inspiration and teaching of Dr. David Duffy, none of the subsequent interactions with our European colleagues would have occurred at all. We are grateful for the guidance and encouragement of our dear friend Dr. Walter DeGroot, whose unwavering confidence helped us to advance our understanding of the venous system. Dr. John Bergan, perhaps the most eloquent and knowledgeable vascular surgeon in venous disease of this century, has been wonderfully supportive of phlebology as a specialty, and his personal guidance to us has been invaluable through the last decade. We thank Dr. Helane Fronek for always keeping things in perspective with her level-headed focus on the patient, Dr. Neil Sadick for his assistance and his superb ability to design scientific studies, and Dr. Pauline Raymond-Martimbeau for her detailed scientific work and her tireless efforts to expose American phlebologists to international viewpoints in phlebology.

Our greatest collective personal debt, however, is to Dr. Mitchel P. Goldman, whose personal friendship and guidance is the primary driving force behind this textbook. His influence has shaped our careers as it has shaped the careers of so many American phlebologists. If not for Dr. Goldman we would not be doing what we are doing, and certainly would never have produced this textbook.

We are profoundly grateful to our families and especially to our parents, who always provided encouragement and support, making it possible for us to pursue our dreams and never to be discouraged by temporary setbacks.

The Authors

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PART I

Background

The Spectrum of Venous Disease

Epidemiology

Etiology of Varicose Veins and Spider Veins

Heredity

Environmental risk factors

Sequelae of Venous Insufficiency

Subjective symptoms

Objective signs

Goal of Treatment

Summary

From the mild burning pain of hormonally mediated telangiectasias to the hemodynamic collapse of thromboembolism, diseases of the peripheral venous system are common today. Clinicians are faced with a spectrum of venous disease that appears in various manifestations in patients of all ages. Although venous disease in its mildest forms is merely uncomfortable, annoying, or cosmetically disfiguring, severe venous disease can produce severe systemic consequences.

The visual appearance of the lower extremities is a useful, but not always reliable, guide to the peripheral venous condition. Swelling, for example, may result from acute venous obstruction or from deep or superficial venous reflux, or it may be completely unrelated to the venous system. Hepatic insufficiency, renal failure, cardiac decompensation, infection, trauma, and environmental effects can all produce lower extremity edema that may be indistinguishable from the edema of venous obstruction or venous insufficiency.

The most common form of venous disease is venous in-

sufficiency caused by valve incompetence in the deep or superficial veins. Deep venous insufficiency occurs when valves are damaged by deep vein thrombosis. Superficial venous insufficiency occurs when a high-pressure leakage develops between the deep and superficial systems or within the superficial system, followed by sequential failure of the venous valves in superficial veins. Venous insufficiency syndromes allow venous blood to escape its normal flow path and flow in a retrograde direction down into an already congested leg. Over time, incompetent superficial veins acquire the typical dilated and tortuous appearance of varicosities.

The presence and size of visible varicosities is not a reliable indicator of the volume or pressure of venous reflux, because a vein that is confined within fascial planes or that is buried beneath subcutaneous tissue can carry massive amounts of high-pressure reflux without being visible at all. Conversely, even a small increase in pressure can eventually produce massive dilatation of an otherwise normal superficial vein that carries very little flow.

Table 1-1
Prevalence of Varicosities by Age and Sex

Age	Female	Male
20–29	8%	1%
40–49	41%	24%
60–69	72%	43%

Data from the Tecumseh Health Study.⁽²⁾

Epidemiology

The prevalence of venous disease seems to be higher in westernized and industrialized countries.⁽¹⁾ Incidence and prevalence also depend on the age and sex of the population. In the Tecumseh community health study,⁽²⁾ for example, varicosities were observed in 72% of women aged 60–69, but in only 1% of men aged 20–29 (Table 1-1). As the baby boom generation ages, the incidence of venous disease per capita is expected to rise dramatically.^(2A) Incidence in Japanese women is 45%.

Small reticular varicosities occur early in life, with only a small number of new cases developing after the childbearing years. Truncal varicosities and telangiectatic webs, on the other hand, are relatively less common in youth, and continue to appear throughout life.

Serial examinations of approximately 500 children at ages 10–12 and again four and eight years later, at ages 14–16 and 18–20, showed that symptoms are experienced (and venous tests are abnormal) before any abnormal veins are visible at the surface of the skin. Abnormal reticular veins appear first, followed several years later by incompetent perforators and truncal varicosities (Table 1-2).^(3,4)

Etiology of Varicose Veins and Spider Veins

Multiple factors contribute to the development of varicose veins. Intrinsic pathological conditions combine with extrinsic environmental factors to produce a wide spectrum of

Table 1-2
Development of Varicose and Telangiectatic Leg Veins by Age

Abnormality	Age 10–12	Age 14–16	Age 18–20
Telangiectasia	0	3.7%	12.9%
Reticular	10.2%	30.3%	35.3%
Perforator	0	4.1%	5.2%
Varicose tributary	0	0.8%	5.0%
Varicose truncal vein	0	1.7%	3.3%
Saphenofemoral reflux	0	12.3%	19.8%

Data from Bochum Study I–III^(10,11)

disease. Dialysis shunts and spontaneous arteriovenous malformations give ample evidence that normal veins will dilate and become tortuous in response to continued high pressure, but some people seem to have an inborn weakness of vein walls that leads to venous dilatation even in the absence of elevated venous pressures. For example, patients with varicose veins of the legs have been found to have abnormally distensible veins in the forearms and hands.^(5,6)

HEREDITY

Although the specific genetic risk factors for varicosities are not known, heredity does play an important role, and seems to be particularly important in determining susceptibility to primary valvular failure. Reflux at the saphenofemoral junction is twice as likely when a parent had a similar condition.⁽⁷⁾ Monozygotic twins are concordant with regard to varicose veins in 75% of cases. The prevalence of varicose veins in relatives of patients with varicose veins is 43% for females, but only 19% for males.⁽⁸⁾

ENVIRONMENTAL RISK FACTORS

Occupations that require prolonged standing can lead to chronic venous distention and secondary valvular incompetence at any level. If proximal junctional valves become incompetent, the condition rapidly progresses to become irreversible. Women seem to be more susceptible to this problem, most likely because vein walls and valves periodically become more distensible under the influence of cyclic increases in progesterone.⁽⁹⁾

Pregnancy is an important risk factor that causes varicosities through several mechanisms. Most important are circulating hormonal factors that increase the distensibility of vein walls and soften valve leaflets.⁽¹⁰⁾ Another factor is the tremendous increase in venous capacity that develops to accommodate a greatly expanded circulating blood volume. Late in pregnancy, the enlarged uterus compresses the inferior vena cava, causing venous hypertension with secondary distension in the legs.⁽¹¹⁾ Depending on the relative contributions of these mechanisms, varicose veins of pregnancy may spontaneously regress after delivery. Treatment of varicose veins prior to pregnancy helps prevent progression during pregnancy.⁽¹²⁾

Age is an independent risk factor for varicosities because with advancing age the elastic lamina of the vein becomes atrophic and the smooth muscle layer begins to degenerate, leaving a weakened vein that is more susceptible to dilatation.^(13,14)

Sequelae of Venous Insufficiency

Most patients with venous insufficiency have subjective symptoms of pain, soreness, burning, aching, throbbing, cramping, muscle fatigue, and restless legs. Over time, chronic venous insufficiency leads to cutaneous and soft-tissue breakdown that can be extremely debilitating.

Table 1-3
Stages of Chronic Venous Insufficiency

Edema
Hyperpigmentation
Venous stasis dermatitis
Chronic cellulitis
Cutaneous infarction (atrophie blanche)
Lipodermatosclerosis
Ulceration
Malignant degeneration

SUBJECTIVE SYMPTOMS

Subjective symptoms are typically more severe early in the progression of disease, less severe in the middle phases, and worse again with advancing age. Varicose vein symptoms do not correlate well with the size or extent of visible varices, nor with the absolute volume of reflux. Not all symptomatic patients will complain of pain; venous symptoms may be so insidious that, after treatment, patients are surprised to realize how much chronic discomfort they had accepted as "normal."⁽¹⁵⁾

Common symptoms of telangiectasia include burning, swelling, throbbing, cramping, and leg fatigue.⁽¹⁶⁾ Pain associated with larger varicose veins is usually described as a dull ache that worsens after prolonged standing.^(17,18) In contrast to the pain of arterial insufficiency or of venous obstruction, pain caused by venous insufficiency often is improved by walking or elevating the legs. Warmth tends to aggravate the symptoms, and cold tends to relieve them.



Figure 1-1. Early changes of hydrostatic pressure with violaceous telangiectasias on the medial ankle.



Figure 1-2. Pitting edema, the first sign of venous insufficiency with early mild stasis dermatitis.

Compression stockings may ameliorate or prevent the pain of venous insufficiency.

Pain and other symptoms may worsen with the menstrual cycle, with pregnancy, and in response to exogenous hormonal therapy, including oral contraceptives. A small number of women regularly experience pain associated with their varicose veins after sexual intercourse.⁽¹⁹⁾

OBJECTIVE SIGNS

Over time, most people with chronic venous insufficiency develop some degree of "venous stasis," chronic skin and soft-tissue changes that often begin with mild swelling and progress to include discoloration, inflammatory dermatitis, recurrent or chronic cellulitis, cutaneous infarction, ulceration, and even malignant degeneration. Chronic non-healing leg ulcers, bleeding from varicose veins, and phlebitis are serious problems that are caused by venous insufficiency, which can be relieved if the problem is corrected (Table 1-3). Figures 1-1 through 1-4 highlight the clinical stages of chronic venous insufficiency.

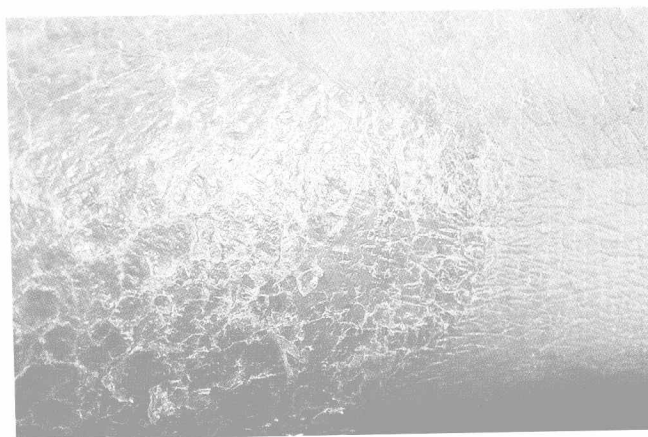
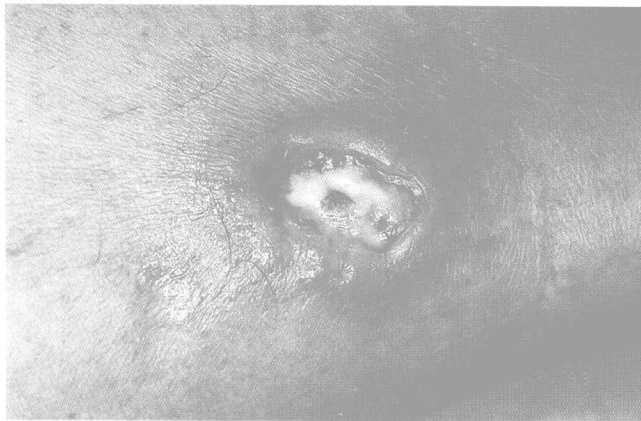


Figure 1-3. Stasis dermatitis of the medial ankle.



A



B

Figure 1-4. (A) Venous ulceration. Note the erythematous border and moist ulcer surface. This is in contrast to the typical dry arterial ulcer. Without external compression these ulcers can weep continuously. (B) After compression therapy for 3 months there is marked improvement with reduced erythema, edema, and decreased ulcer size.

Goal of Treatment

The primary goal of treatment of a varicose vein is the improvement of venous outflow by eliminating recirculating loops of reflux, in order to increase the proportion of venous blood that returns to the central circulation. In the absence of deep-system obstruction, superficial varicosities are simply the undesirable result of high-pressure flow into a normally low-pressure system. Varicosities carrying retrograde flow are hemodynamically harmful because they cause recirculation of oxygen-poor, lactate-laden venous blood back into an already congested extremity. Ablation of these varicosities is desirable and will improve the overall circulation. When explaining this to patients, it is helpful to relate the analogy of a working fuel system (the legs are getting fuel through the arteries) with a leaky exhaust system (the leaking veins).

Summary

Venous disease is extremely common and increases with age, being present in more than half of the population by age 65. The most common type is venous insufficiency, the most visible manifestations of which are varicose veins and telangiectasias, with other cutaneous and soft-tissue abnormalities developing over time. Most patients with venous insufficiency have subjective symptoms that may range from very mild to very severe. Treatment aims to correct the underlying defect, removing or closing down points of reflux that can prevent venous blood from returning to the central circulation.

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