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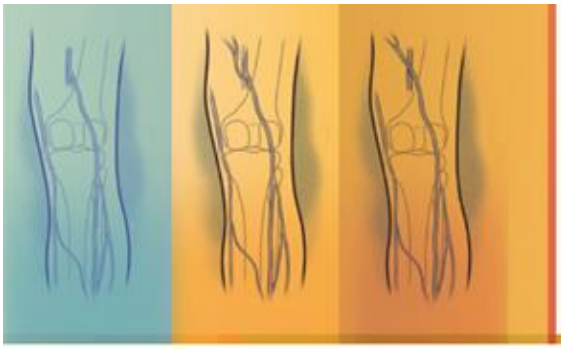


CHAPTER 1

Venous Anatomy

Jose I. Almeida

HISTORICAL BACKGROUND

Chronic venous diseases include a spectrum of clinical findings ranging from spider telangiectasias and varicose veins to debilitating venous ulceration. Varicose veins without skin changes are present in about 20% of the general population, and they are slightly more frequent in women.

References to varicose veins are found in early Egyptian and Greek writings and confirm that venous disease was recognized in ancient times. A votive tablet in the National Museum in Athens showing a man holding an enlarged leg with a varicose vein is frequently featured in many historical writings regarding venous disease.

The venous system originates at the capillary level and progressively increases in size as the conduits move proximally toward the heart. The venules are the smallest structures, and the vena cava is the largest. It is critical that all endovascular venous surgeons understand the anatomic relationships between the thoracic, abdominal, and extremity venous systems, especially from the anatomic standpoint (Fig. 1.1). Veins of the lower extremities are the most germane to this book and are divided into three systems: deep, superficial, and perforating. Lower extremity veins are located in two compartments: deep and superficial. The deep compartment is bounded by the muscular fascia. The superficial compartment is bounded below by the muscular fascia and above by the dermis. The term *perforating veins* is reserved for veins that perforate the muscular fascia and connect superficial veins with deep veins. The term *communicating veins* is used to describe veins that connect with other veins of the same compartment.

The vein wall is composed of three layers: intima, media, and adventitia. Notably, the muscular tunica media is much thinner in a vein than in a pressurized artery. Venous valves are an extension of the intimal layer, have a bicuspid structure, and support unidirectional flow (Fig. 1.2).

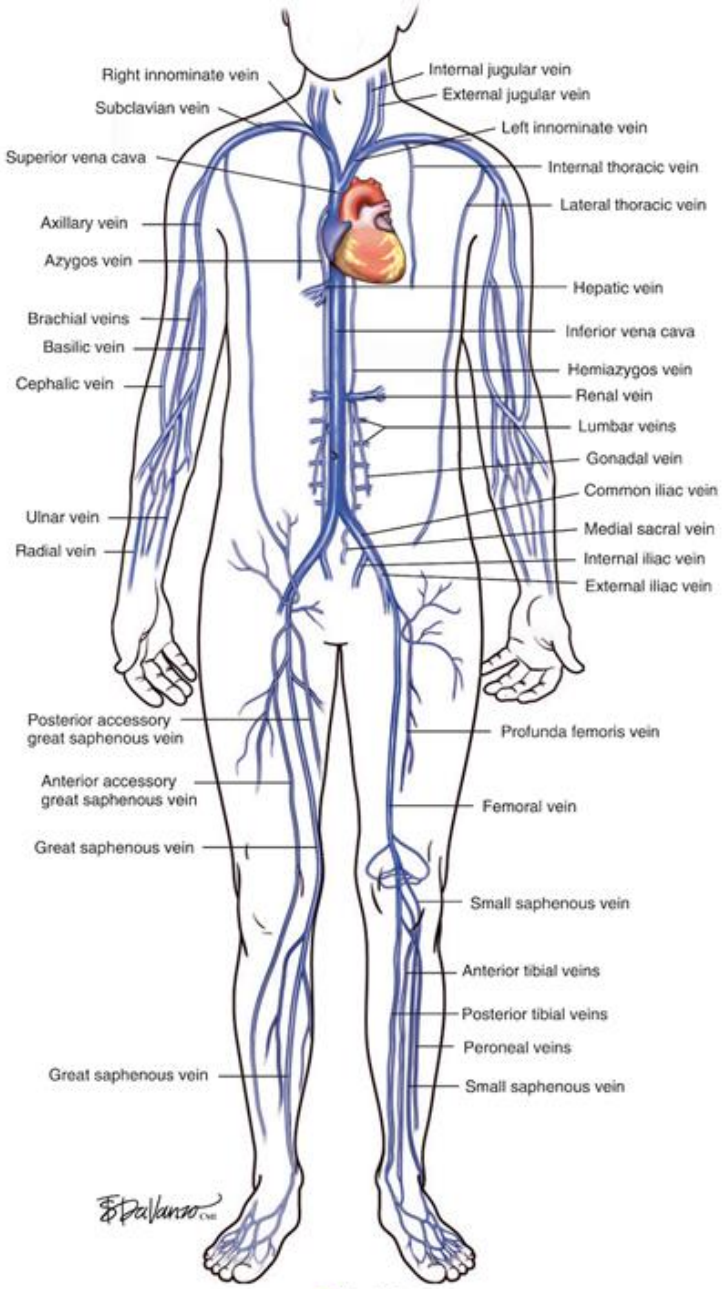
Abstract

Anatomic variation is the norm within the venous system because there are many options for the venous channels to develop and flow. Sources of venous hypertension must be investigated to determine the appropriate treatment. One should be familiar with the anatomy of the great saphenous vein (GSV), anterior accessory saphenous vein (AASV), posterior accessory saphenous vein (PASV), posterior thigh circumflex veins (PTCVs), small saphenous vein (SSV), vein of Giacomini, and perforating veins of the thigh and calf if truncal ablation treatment is under consideration. Deep venous disease treatment is also developing rapidly; therefore, a detailed understanding of deep compartment anatomy is required. It is important to understand which anatomic segments are more prone to reflux or obstruction—most of this can be sorted out with duplex ultrasound imaging. Vena cava therapy continues to expand for congenital, primary, and secondary disease indications and, therefore, knowledge of anatomic variants and collateral flow patterns becomes paramount for successful patient care. This chapter provides pictures with written supplementation of venous anatomy.

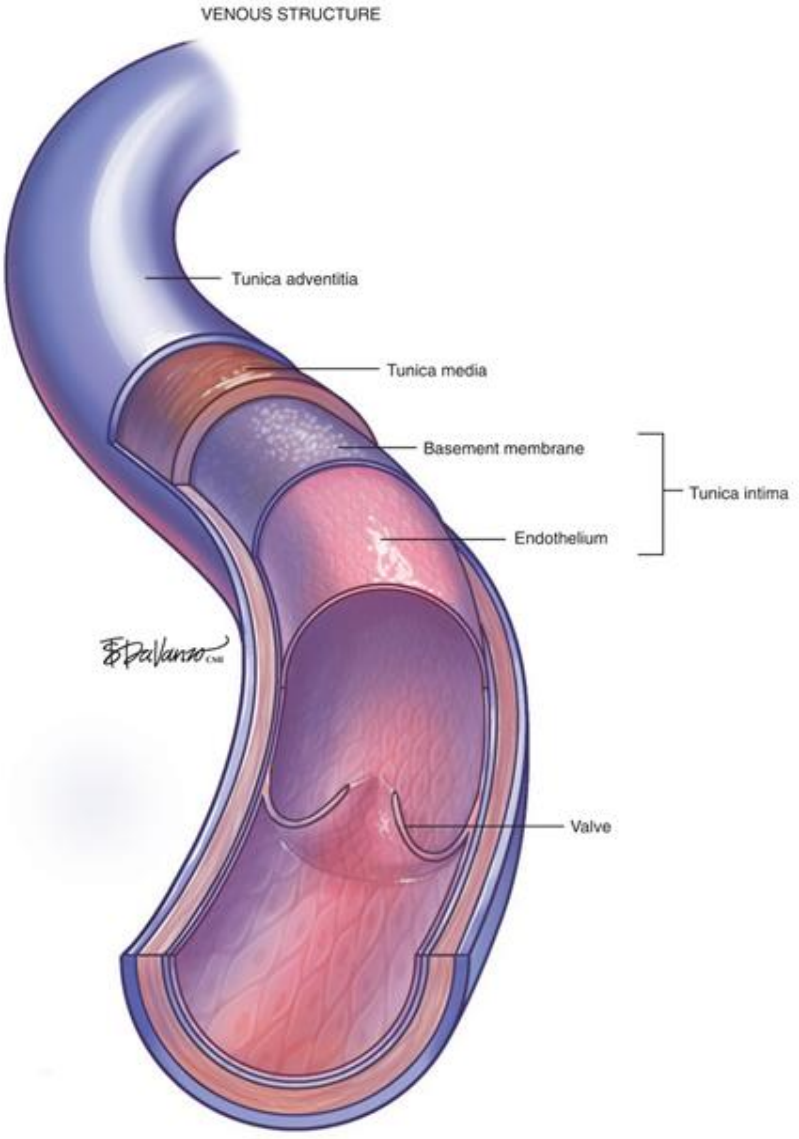
Keywords

great saphenous vein
small saphenous vein
anterior accessory saphenous vein
common femoral vein
femoral vein
profunda femoris vein
anterior and posterior thigh circumflex veins

VENOUS SYSTEM OVERVIEW



■ **Fig. 1.1**

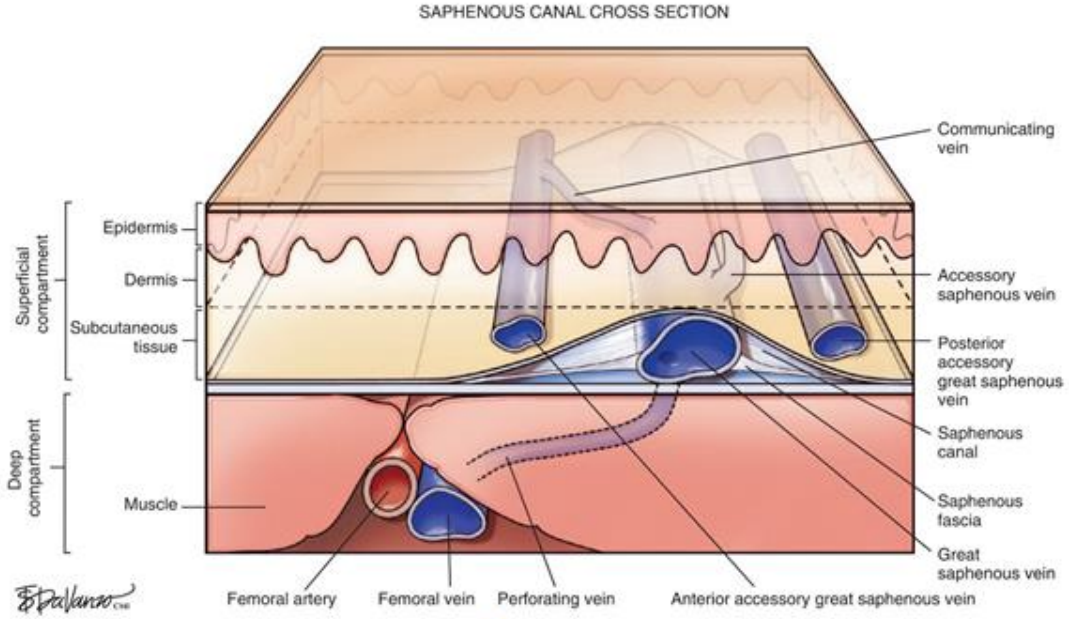

VENOUS STRUCTURE
Tunica adventitia
Tunica media
Basement membrane
Tunica intima
Endothelium
Valve

■ Fig. 1.2

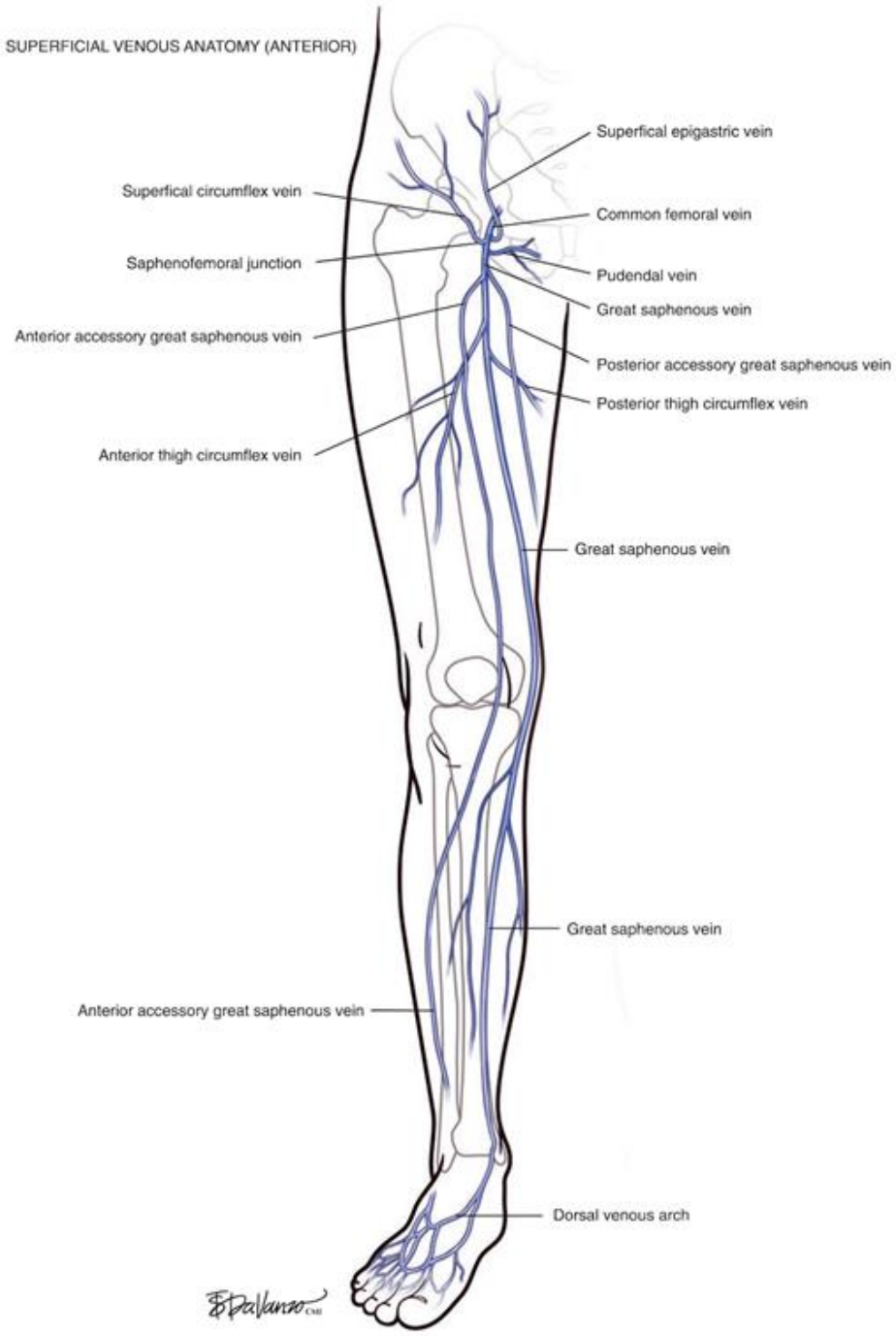
Surgeons who perform thermal or chemical ablation therapy of the great saphenous vein (GSV) and its related structures must have a good understanding of the saphenous canal. The importance of the saphenous canal in relation to B-mode ultrasound anatomy is detailed in Chapter 4. A cross section of the saphenous canal (Fig. 1.3) depicts many of the critical relationships referable to GSV treatment; the most important is how it courses atop the muscular fascia in a quasi-envelope called the *saphenous fascia*. The saphenous fascia is the portion of the membranous layer of the subcutaneous tissue that overlies the saphenous veins. Veins coursing parallel to the saphenous canal are termed *accessory veins*; those coursing oblique to the canal are called *circumflex veins*. Compressible structures superficial to the muscular fascia are potential targets for treatment, but treating those structures deep to the muscular fascia may lead to a disastrous outcome. Noncompressible structures generally represent major arteries. Perforating veins must pierce the muscular fascia as they drain blood from the superficial to deep systems.

As diagnostic and therapeutic options for venous disorders expanded, the nomenclature proposed in 2002 by the International Interdisciplinary Committee[1] required revision. The nomenclature was extended and further refined,[2] taking into account recent improvements in ultrasound and clinical surgical anatomy. The term *great saphenous vein* should be used instead of terms such as *long saphenous vein, greater saphenous vein,* or *internal saphenous vein.* The LSV abbreviation, used to describe both the *long saphenous vein* and *lesser saphenous vein,* was clearly problematic. For this reason, these terms have been eliminated. Similarly, the term *small saphenous vein,* abbreviated as SSV, should be used instead of the terms *short, external,* or *lesser saphenous vein.*

The GSV originates at the medial foot and receives deep pedal tributaries as it courses to the medial malleolus. From the medial ankle, the GSV ascends anteromedially within the calf and continues a medial course to the knee and into the thigh. The termination point of the GSV into the common femoral vein is a confluence called the *saphenofemoral junction* (SFJ) (Fig. 1.4).



■ Fig. 1.3


SUPERFICIAL VENOUS ANATOMY (ANTERIOR)
Superfical epigastric vein
Superfical circumflex vein
Common femoral vein
Saphenofemoral junction
Pudendal vein
Great saphenous vein
Anterior accessory great saphenous vein
Posterior accessory great saphenous vein
Posterior thigh circumflex vein
Anterior thigh circumflex vein
Great saphenous vein
Great saphenous vein
Anterior accessory great saphenous vein
Dorsal venous arch

■ Fig. 1.4