CHAPTER 4
VARICOSE VEINS

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As was described in the first two chapters, the veins of the body carry the blood back to the heart. Like the tree, the smallest twigs of the branches are the capillary vein branches in the top layer of skin. As they join together, they get larger and travel through the deeper layers of skin. When these small superficial veins become enlarged and visible, we call them spider veins (telengiectasias and reticular veins). These veins drain into larger veins in the fat layer beneath the skin and are typically called "tributaries" or "branch veins." And these in turn, drain into the main trunks of the superficial venous system, the saphenous veins (FIGURE 4-1). Although doctors generally mention the great saphenous vein and the small saphenous vein (FIGURE 1-6, page 5), the superficial venous system is much more complex and has other named branches (FIGURES 4-2 and 4-3). The most important of these are the anterior accessory and posterior accessory saphenous veins high in the thigh. These can also be involved in the development of varicose veins (by definition greater than 3mm or 0.12 inches in diameter) and require treatment. Through a direct junction and connecting perforator veins, the superficial veins drain into the deep venous system among the muscles of the leg. The deep veins are the most important veins in the leg as they carry approximately 90% of the total venous blood flow from the leg. That is why the superficial veins can be removed or closed through various treatment methods without putting the leg at risk. As these veins leave the leg and enter the abdomen, they become the largest vein in the body, the vena cava, which delivers the blood back directly to the heart. This is the usual anatomy of the venous system of the legs, meaning that it occurs in the majority of people. However, like anything else in the human body, variation can occur relatively commonly in the leg veins in terms of the number, location, and connections.

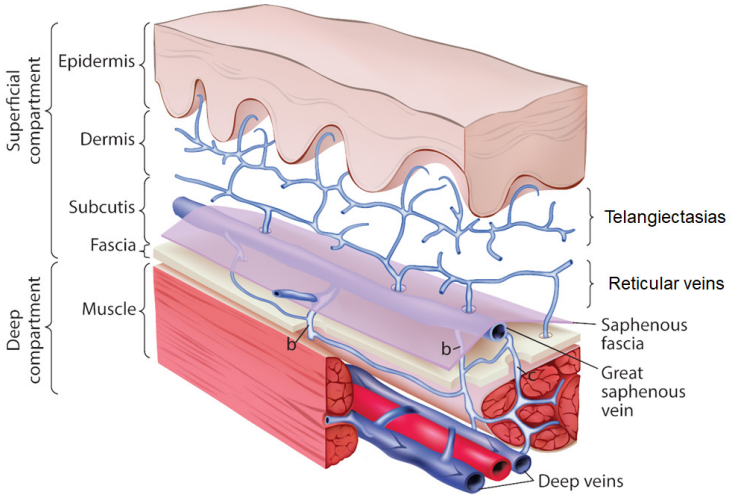

FIGURE 4-1. A cut-away view of the veins of the legs. Starting from the skin at the top, small capillaries in the dermis (if enlarged they are seen as red telangiectasias) join together in the reticular layer (if enlarged they are seen as blue reticular veins) which then go deeper to join the named superficial system, the saphenous veins. The saphenous veins and their branches give rise to varicose veins. Through connecting perforator veins (b), the superficial veins drain into the deep venous system which returns the blood to the heart.

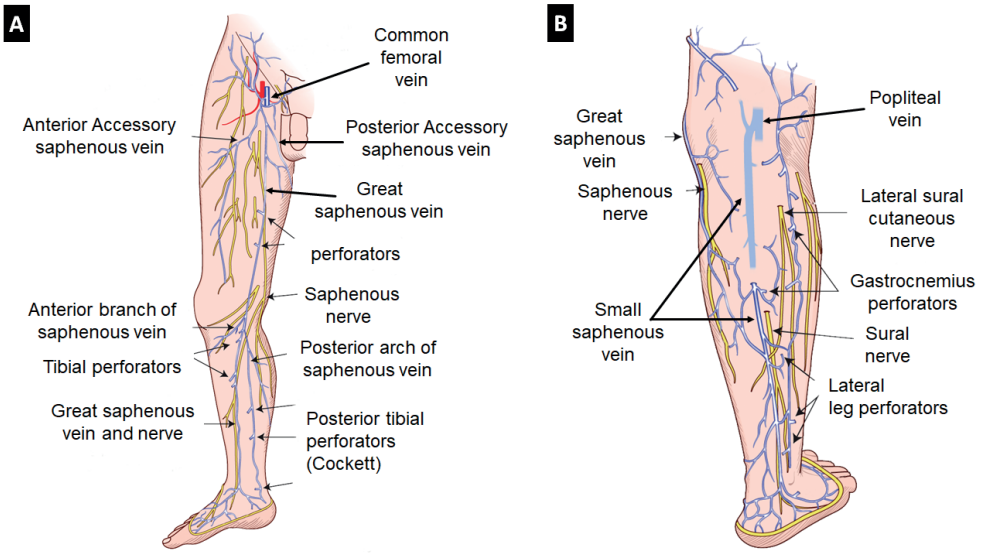

FIGURE 4-2. A. The superficial venous system of the inside of the right leg. Along with the great saphenous vein (the small saphenous vein is behind the calf and not seen in this illustration) multiple named branches and perforator veins connect to the deep system. The anterior accessory and posterior accessory saphenous veins can also be involved in the development of varicose veins and require treatment. Note the close location of the saphenous nerve to the great saphenous vein below the knee. This can be injured during treatment of the vein. B. The small saphenous vein at the back of the calf showing its drainage into the deep popliteal vein behind the knee. Multiple nerves are close to the vein and perforator branches connect to the deeper veins in the calf.

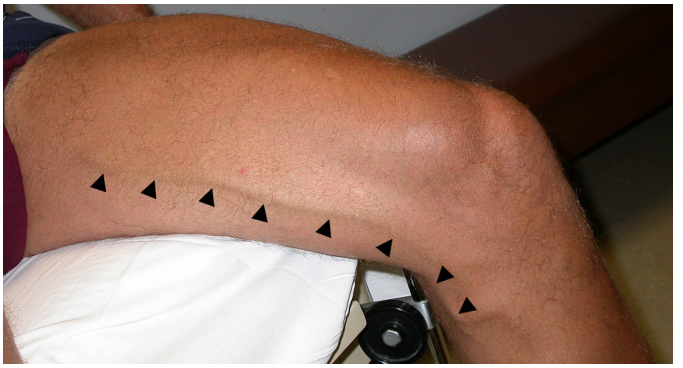

FIGURE 4-3. The great saphenous vein of the left leg is visible in the thigh because of a dysfunctional valve that allows downward flow of blood and increased pressure within the vein.

Blood normally travels through the venous system from the legs by a combination of the squeezing of the muscles and the one-way valves, which ensures that blood goes in only one direction back to the heart. Breathing also helps move the blood as it in turn decreases the pressure in the abdomen and then the chest, helping to pull the blood in the proper direction. The leg has 3 muscle groups that help push blood out of the leg toward the heart: the foot pump, the calf muscle pump, and the thigh pump. The foot pump fills the lower leg veins; the calf muscle pump generates most of the push to drive the blood out of the leg; and the thigh pump is least powerful and mostly provides support to the venous piping. Normally, when the calf muscles contract or walk, they produce a lot of force, which pushes the blood through the veins, up against gravity, and back toward the heart. When the muscles relax, the pressure in that space decreases and draws blood from the superficial system into the deep system through the connecting perforating veins. The calf muscle pump is very efficient forcing about 70% of the blood out of the calf as we walk. If this system of muscle pumps, the veins, or the vein valves are not working properly, it has been described as "venous insufficiency."

Two major contributors to venous insufficiency are obstruction and reflux. Obstruction of blood flow out of the legs can be caused by many problems, which are described in later chapters of this book. Reflux is the medical term for failure of the valve to close efficiently and the backward flow of blood toward the foot of the leg. The valves are made of two very thin flaps of tissue which meet in the middle to stop the backward flow of blood within the veins. If the valves have been injured or are not functioning normally, reflux develops. Reflux may occur in the superficial veins, the deep veins or the perforating veins. This results in increased pressure within the veins. In the superficial saphenous system, this leads the veins and their branches to stretch and bulge, causing the unsightly varicose veins that people see and complain about (FIGURES 4-4–4-6). But the venous system can be funny sometimes. A person can have significant varicose veins on one leg and the other leg can be entirely normal. A person can have big bulging varicose veins and no spider veins. Many times, particularly in women, only red or blue spider veins are apparent without the bulging varicose veins. There is a tremendous range of problems with venous insufficiency, from very mild to severe.

Figure 4-4. A long varicose vein originating as a branch of the great saphenous vein in the mid-portion of the right thigh (arrowhead). It continues in a snake-like fashion across the knee until joining and enlarging the posterior branch of the great saphenous vein in the calf (arrow).

Figure 4-5. A large group of varicose vein branches of the great saphenous vein just above the knee (arrowhead) continue and involve multiple branches of the great saphenous vein and anterior branches below the knee (arrow).

Figure 4-6. Varicose vein branch of the anterior accessory saphenous beginning in the mid-thigh of the left leg and extending across the knee and affecting branch vessels in the lower leg.

Questions:

What causes the veins to not work well?

In many cases, veins may wear out because of a family trait (inherited) passed on to you. If you have a family history of varicose veins, they may not be avoidable. After a blood clot in the superficial or deep veins, the vein valves may no longer function efficiently. Trauma or injury to the vein is another cause for the veins not to work well. Increased blood volume in legs, such as with pregnancy, heart failure, tumors, or compression of the veins may also cause stretching of the veins and valve dysfunction leading to the development of varicose veins.