Few topics have attracted as much attention on venous disease as ligation of incompetent perforator veins. Debate has intensified in the past decade because of the introduction of a new, minimally invasive technique to interrupt incompetent perforators. Subfascial endoscopic perforator vein surgery (SEPS) has advantages over open techniques of perforator ligation. Wound complications are less, hospitalization is not required and a better operation can be performed under visual control of the endoscope, placed in the subfascial space. SEPS has emerged as a useful tool to fight venous ulceration, a disabling condition, that nonoperative management has failed to control effectively.

This chapter will review evidence supporting the role of perforators in chronic venous disease. Surgical indications, preoperative patient evaluation and review of open and endoscopic techniques for interruption of perforators are discussed. Finally, available data on efficacy of perforator vein interruption is summarized.

Pathophysiology of Perforating Veins

Thorough knowledge of the anatomy of perforating veins is essential to understand their hemodynamic effects. The reader is referred to Chap. 4 for a complete review of pertinent venous anatomy. Although pathophysiology of chronic venous insufficiency (CVI) is also reviewed by Bergan and Ballard in this volume (Chap. 3), points specific to the hemodynamic effects of incompetent perforating veins will be emphasized here.

While the pathophysiology CVI at the cellular level remains controversial, and several theories have expert supporters, most authors agree that ambulatory venous hypertension is the most important factor responsible for signs and symptoms of chronic venous disease. Reflux of venous blood due to valvular incompetence and calf muscle pump failure are the two most important causes of venous hypertension. Linton, and later Cockett, emphasized the key role incompetence of calf perforating veins had in the genesis of ambulatory venous hypertension. Perforator vein incompetence can raise pressures in the supramalleolar venous network well above 100 mmHg during calf muscle contraction, a phenomenon described by Negus using the analogy of a “broken bellows.” The importance of incompetent perforators is supported by the observation, that skin changes and venous ulcers almost always develop in the gaiter area of the leg, above the medial malleolus, where large incompetent medial perforating veins are located.

Most patients with CVI have multisystem venous incompetence. In the North American Subfascial
Endoscopic Perforator Surgery (NASEPS) registry, 72% of the patients with advanced CVI had associated deep venous reflux or obstruction. In one fourth of patients, however, only perforator and/or superficial incompetence was observed, with a normal deep system. The role of the superficial system is important and it is emphasized in a much quoted report from the Middlesex Hospital, where 53% of 79 limbs with venous ulcers had normal deep veins, without any incompetence. Unfortunately, the role of perforating veins in this study was not investigated.

Presence of incompetent perforating veins in most patients with venous ulcers is acknowledged even by those who do not attribute much hemodynamic significance to them. In three reports, that included a variety of medical and surgical patients with venous ulcers, the prevalence of incompetent perforating veins, investigated with duplex, was between 56 and 63%. The presence of incompetent perforators, however, does not necessarily mean that they primarily contribute to the pathogenesis of venous ulcers; a key point of much controversy. Evidence, however, has accumulated to support those who favor perforator interruption. Using Doppler ultrasound and ambulatory venous pressure measurements to assess functional significance of incompetent perforating veins, Zukowski and Nicolaides found that 70% of incompetent perforators were of moderate or major hemodynamic significance. These authors also confirmed that hemodynamic deterioration caused by incompetent perforators correlated with the severity of CVI. Using duplex scanning, Labrapoulos in a recent report also found good correlation between the number and size of incompetent perforating veins and severity of CVI. Data on hemodynamic improvement following perforator ligation, an important aspect to prove efficacy, will be discussed later in this chapter.

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