Deep Venous Valve Reconstruction Is Underutilized
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Background:
Blood flows from the peripheries towards the heart and from the superficial to the deep veins, maintained by unidirectional, usually bicuspid, valves which close passively. Cadaveric anatomical studies of the lower limbs suggest that venous valves are consistently located in specific sites in the common femoral vein near the inguinal ligament, in the femoral vein just distal to the deep femoral vein tributary and in the popliteal vein near the adductor hiatus of the leg. Failure of these valves in the superficial or deep veins causes retrograde blood flow, which in turn leads to venous hypertension, which damages of the microcirculation. Together with humoral factors, an inflammatory reaction is generated causing capillary damage, exudation of proteins and skin changes.

Chronic venous disease is common, affecting approximately 30% of the adult population in developed countries. Duplex studies have shown that reflux (or less commonly, occlusion) of deep veins is seen in around 40% of patients with chronic venous insufficiency. Most vascular specialists regularly manage these challenging patients. Current treatments for chronic deep venous insufficiency are limited. Conservative measures including leg elevation and compression hosiery may improve symptoms and prevent ulceration, but patient compliance is poor. For many patients compression is contraindicated, for example in the presence of concurrent peripheral arterial disease, severe peripheral neuropathy and contact dermatitis, however, for the majority of patients it remains the first line of treatment. In addition, for patient patients with occlusion, reliant on superficial venous channels, compression may not be tolerated as it exacerbates their symptoms. The use of pharmacological agents has shown promise and benefits have been demonstrated with Daflon®, Oxerutins, rutosides and other flavonoid derivatives, which have similar mechanisms of action to MPFF, as well as diuretics, naftidrofuryl, Pentoxifylline, calcium dobesilate, and prostaglandin E1 in trials. However, trials have been small and heterogeneous and their use remains limited.

There are many surgical treatment options for patients with deep venous disease. All deep vein reconstructions can lead to excellent outcomes and offer an additional treatment to those for whom the conservative treatments have failed. However, these technically challenging, highly invasive procedures are only performed in a few specialist centres by experts, thus there is a paucity of literature relating to results, and existing case series have variable outcomes. Valvuloplasty, venous transposition, valve autotransplantation and neovalve procedures have all been performed. Valve reconstruction, or valvuloplasty, aims to restore valve competence performed either by the internal method, under direct vision, which was first carried out by Kistner, or by the external method. Alternatively, external valve banding, in which an external cuff of material is applied, thus avoiding a venotomy can be used. These external techniques have the disadvantage that the valve leaflets are not repaired or replaced. Venous transplant can be performed, by relocating a segment of vein with a competent valve, commonly the axillary vein, to the incompetent deep vein.

Internal valvuloplasty can be transcomissural, supracommissural or supra-T commissural, which all consist of a suture repair and tightening of the cusp leaflet. External valvuloplasty restores competence to the valve by the external placement of a suture which allows the valve
cusps to close properly within the vein. External valve banding, restores vein diameter by applying an external cuff of material, such as PTFE, silastic, Dacron, and live fascia. There have been 2 Randomised controlled trials comparing superficial venous surgery plus valvuloplasty with superficial vein surgery alone, plus several case series reports of short, medium and longer term results of valvuloplasty. The first reported that for patients who had concurrent valvuloplasty, 86% demonstrated a significant improvement in disease severity class, compared to 24% of patients who experienced worsening in disease severity class in the superficial venous surgery alone group. The second reported that patients who underwent valvuloplasty in addition had a significantly better quality of life at the 10-year follow-up.

A venous transplant relocates a segment of size matched vein containing a competent valve, such as the axillary vein, to the incompetent deep vein. Results reported in the literature are variable ranging from 75% to 92% technical success rate at 5 years to 50% incompetence rates at 10 years.

Transposition of an incompetent segment to an adjacent competent segment has also been performed. This involves a single anastomosis between the two adjacent segments, and was first described by Kistner. Early improvement in patients symptoms was overshadowed by later recurrence of both symptoms and reflux by 3 years. This procedure is now rarely performed.

Neovalve formation involves the construction of a new valve from the patient’s own tissue. Many different techniques have been described for example Maleti’s technique describes using the vein intima to create the valve leaflets, reporting an 88% valve competence and 85% ulcer healing rate, and Plagnol’s technique uses the invaginated termination of the long saphenous vein to create the valve, reporting 90% femoral vein patency and competency. These procedures offer the advantage of using the patient’s own tissue and do not require transposition of a vein from another location, however, the follow up was short.

For several decades, attempts have been made to develop implantable bioprosthetic valves. Early prototypes which reached the stages of animal studies yielded poor outcomes due to occlusion and clinical studies conducted resulted in occlusion in 4/5 implants in one study and occlusion in 4/15 patients by 7 months incompetence in all the remaining valves at 12 months. Attempts to create a valve implant are now being revisited.

In conclusion, deep venous valve reconstruction procedures for chronic venous insufficiency are infrequently performed. Consequently, there is little in the literature on outcomes. However, from the available evidence, long term results are achievable and result in significant improvement in patients’ quality of life and should be considered as part of the treatment armoury for patients with deep venous insufficiency.

References: