CHAPTER 17
SURGICAL THERAPY FOR DEEP VALVE INCOMPETENCE

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Introduction

Deep vein valvular incompetence happens when the valves in the veins (tubes that deliver the blood from your leg back to your heart) of your leg stop working well allowing blood to run backward into the leg after it has been pushed forward. These veins run along side the major arteries (blood vessels that bring the blood from your heart to the legs) and both travel deep within the muscles of the leg. The veins split below the knee into the three paired tibial veins of the calf. Within the veins are valves at the level of the groin, near the middle of the thigh, behind the knee and in the smaller veins in the calf. When working well, venous blood flow travels in one direction towards the heart pushed forward by the muscle in the foot, calf and thigh. Valvular reflux occurs when valves quit working and allows blood to flow in the reverse direction. Venous insufficiency can cause a number of problems from leg swelling to skin changes, including ulcers. Venous valves are made of two thin leaflets lying within the leg vein which meet in the middle of the vessel for proper closing. The valves are similar in structure to a heart valve although on a much smaller and thinner scale. Generally, deep vein valve surgery is done only for those people in whom compression stocking therapy and removing the problems of the superficial veins (saphenous vein ablation) have failed to take care of symptoms. These people usually have skin changes and ulceration associated with the venous incompetence.

Diagnosis

A good history can help your doctor to know if the reflux and valvular incompetence is due to primary disease, which happens because the vein itself enlarges resulting in the valve leaflets not being able to meet or from venous thrombosis, which means the valve itself was damaged by blood clotting and scarring. Approximately one-half of the patients will be found to have either primary disease or post-phlebitic valve damage. A good physical examination shows the effect the venous incompetence is having on your leg: varicose veins are present, swelling is present, skin changes have occurred or an ulcer is present. A very detailed ultrasound study gives a road map of the entire anatomy of the leg veins. Swelling of the leg with standing and during walking using an air boot (air plethysmography) to measure the changes can give the doctor data of leg swelling and venous reflux. An evaluation of any blood clotting disorders is also useful to determine if previous venous thrombosis might be a problem during and shortly as surgery.

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Surgical Options

In general, there are three ways to fix vein valve reflux. The goal of each method is to put a working valve back into lower leg vein system and by so doing to prevent further reflux. The method used depends on what your surgeon believes is best as well as the location in the leg of valve incompetence and whether the valve leaflets are damaged or not. Several studies have shown that fixing or placing a working valve in the femoral (or groin) location works well (Figure 1). Repair of the popliteal vein valve which is located behind the knee can be a second option. First described by Dr. Kistner in 1968, directly fixing the valve is very successful and lasts a long time. Venous valve repair requires magnification to do the best job and it is a very demanding work which must be done perfectly. The direct valve repair (Figure 1) of Dr. Kistner requires opening the vein to allow the surgeon to look at the valve leaflets and then to place sutures to “cinch” or tighten up the valve. Once this is done, the vein is closed so blood can flow normally again. This tightening of the valve parts allows for proper closing. If one is familiar with sailing, it is much like the cinching of a sail to allow it to catch more wind. Fine filament sutures smaller than a human hair are used to retack or cinch the valve to the correct tightness. A simple test done by pushing blood from below to above the valve while still holding any more blood from coming from the leg and seeing if the valve now works (the “strip test”) shows that the repair is working well. The patient is given blood thinners (heparin) during the operation to make sure no blood clots occur and is continued during the short hospital stay while changing to blood thinner (warfarin) that can be taken by mouth which is continued for eight to twelve weeks. Those patients having prior venous damage from venous thrombosis (blood clotting) may need longer term anticoagulant (blood thinning) treatment.

Other ways to place a good valve into the refluxing lower leg vein system may also work. One can cut the main vein in the incompetent veins and suture it into place below one of the other veins in the lower leg that has a working valve (this is called a valve transposition and involves a vein relocation) (Figure 1). There may not be such a valve present in the lower leg making this approach impossible and there is some concern that overtime the extra work this valve must do might cause the vein to dilate causing this valve to also fail.

Axillary vein valve transfer (Figure 1) originally described by Dr. Raju in 1981 is used when direct vein valve repair or vein relocation is not possible. The axillary veins near the armpit are of similar size to the femoral veins in the thigh. A segment of vein with a good functioning valve is taken from the arm veins through a small incision in the armpit. This valve segment is then placed into the lower leg incompetent vein system by suturing it to both ends of the cut deep leg vein. Occasionally a plastic cover is placed over the valve repair site to prevent late vein dilation.

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Complications

Complications or problems occurring during the operative experience involve approximately ten percent of patients. These are most commonly hematomas or bleeding in the area of operation or collection in the wound of other bodily fluids. A re-operation to drain these fluids may be needed to make sure the valve continues to work well. Thrombosis (clotting) of the valve repair site occurs in roughly five percent of patients despite anticoagulant treatment.

Results

Improvement in symptoms including stopping pain and swelling can be found in sixty to eighty percent of patients who have venous reflux due to primary valve dysfunction. Most patients are able to stop or limit stocking use after successful operation. The results are not as good for those people who have valve surgery because of prior vein thrombosis and extensive post-phlebitic (scarring) changes. Nonetheless, two-thirds of patients can be found to have complete ulcer healing at twelve years following successful surgery. Best outcomes can be seen in those centers which have the surgeons, tools and skills needed for these demanding operations available.

Conclusions

Vein valves that do not work will cause blood to flow backward in the veins into the legs. This leads to problems with swelling, skin changes and even breakdown of the skin (ulcers). There are ways to stop this abnormal backward flow of blood by fixing the vein valves. If the valve is still present but just not meeting properly, the valve can be fixed with fine sutures. If the valve is totally damaged, one must place the refluxing system below a working valve in another part of the leg veins (transposition) or must take one from the arm as a transplant. Other techniques are being investigated but so far these are the more common ways to fix the problem.
Commonly asked questions by patients

When such I ask my doctor about deep vein valve surgery?

Not all patients with valve reflux and venous insufficiency or who have had prior episodes of venous thrombosis need deep vein valve reconstruction. More commonly done and less invasive methods such as compression stocking therapy and treatment of all superficial vein reflux is considered before recommending valve reconstruction. The majority of patients can be managed with these methods to provide for ulcer healing and reduction of leg swelling. If these methods fail, direct valve surgery would be considered. Knowing the exact cause of the venous reflux, whether it be primary valve dysfunction or secondary to venous clot damage, is important to know so that the surgeon can give the patients a good idea of the possible success and durability of the procedure. This conversation should occur after the appropriate workup and the diagnosis has been completed.

How long will I need to be on Warfarin treatment?

The length of time necessary for chronic anticoagulation (blood thinning drugs) after valve repair is dependent on the surgeon’s thoughts, type of repair, and the reason for valve incompetence in the first place. Anticoagulation for eight to twelve weeks is standard for direct open vein repair. Longer duration of therapy may be necessary for those individuals who have a history of prior clotting disorders.

What happens to the arm if the vein is taken from that location to be transplanted to the leg veins?

Removal of the axillary vein from the arm surprisingly causes little problems in most cases. There are many collaterals (small veins) within the arm that allow for continued drainage of blood from the arm without significant swelling or pain. Rarely some arm swelling is seen but is very manageable.
**Figure 1:** The artist has drawn pictures that show different ways of surgically placing a work valve in the lower leg deep veins to prevent problems with deep venous reflux. The picture of the leg shows a cut in the groin in many of these veins repairs are preformed. The picture to the left of the leg shows a direct repair of a floppy valve using very fine sutures to tighten the valve edges and make it work again (direct valve repair). The picture in the upper right shows taking a working valve from the arm and sewing it into the lower leg deep vein to prevent reflux in that system (vein transplantation). The picture in the bottom right shows placement of the non-working or incompetent major vein below a working valve in another part of the lower leg deep veins (vein relocation or transposition).