

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-phlebotic 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-phlebotic** (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).

