Open Saphenous Vein Harvest

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Open saphenous vein harvest has historically been a procedure that cardiothoracic and vascular surgeons performed on a relatively regular basis. With the introduction of endoscopic vein harvest, the decreasing volume of open vascular procedures, and with most general surgery residents spending little to no time on cardiac surgical services, facility with open saphenous vein harvest has diminished in recent years. However, general and trauma surgeons do occasionally need to harvest veins in a safe and expeditious manner to obtain a high quality vein for vascular reconstruction.

A technique known as "the no-touch technique" to harvest vein grafts, in which the perivascular fat adherent to the vein is left in place and direct contact of the instruments with the vein is avoided, has shown improved graft patency compared with conventional handling techniques.[1-4] Handling the vein by the perivascular fat avoids injury to the vein, and distension of the vein is also minimized so that the luminal endothelium is protected and the vasa vasorum is preserved to supply oxygen and nutrients to the graft.[5,6] Perivascular fat is also thought to protect the graft against some of the stress of arterial pressure and may even provide some protection against kinking.[7]

Surgical technique

The first step in procuring a quality vein for bypass surgery of any kind is to elicit a good history from the patient. There are many patients who have had blood clots, varicose veins, or vein stripping. Therefore, when feasible, questions about these issues should be asked to be sure that there is not some fairly easily discernible reason that a particular saphenous vein cannot be used.

The patient's leg should be inspected preoperatively to evaluate the suitability of vein for harvesting. The first step in examining the vein is to ensure that the patient does not have the scars that would be associated with vein stripping, even if he or she has not confided that previous vein surgery has occurred. Often, these are small incisions at the ankle and the groin, with smaller incisions along the leg where varicosities might have been present. The next step is to ensure that the patient has adequate blood flow to heal a saphenous harvest site. The best gauge of the ability of a leg to heal is its temperature. If the legs are warm, the skin will probably heal. This assessment should be supplemented by checking for pedal pulses. If they are present, the harvest site will likely heal well. One should also look for areas of injury to the lower medial leg that might have resulted in injury to the saphenous vein. Finally, one can assess the saphenous vein itself by compressing it over the posterior edge of the tibia in the lower leg and tapping on the more distal portion of the vein when it distends to see if an impulse is transmitted to the finger that is occluding the vein over the tibia. If this is the case, at least this portion of the vein is likely to be of reasonable quality.

Some surgeons like to have the saphenous veins mapped preoperatively, when feasible. This mapping can be done with a Doppler. When these studies are done by a skilled vascular technician, in addition to localizing the vein (which can be marked), an assessment of the size and quality of the vein can be performed.

In the operating room, when a saphenous vein is to be harvested with an open technique, it is usually harvested from 1 leg. When more vein is needed, substantial segments can be harvested from both legs, with the goal of avoiding an incision that crosses the knee joint, because of the difficulty in the healing of an incision that is going to be subjected to frequent bending. Therefore, both legs are prepped properly.

After chlorhexidine has been properly applied circumferentially to the legs and the feet, a stockinet is rolled over both legs. Adhesive plastic drapes on the leg are avoided because these drapes seem to make it harder to find the vein, and these drapes seem to lock the leg into a position that might not be optimal for harvest. The operating room team should be familiar with how to set the legs up on foam blocks for optimal exposure for the vein harvest.

Once the preincision time-out has been conducted, one can begin to optimize the work area for vein harvest, ensuring that the medial portion of the leg is rolled up a bit, so that the area of the vein is a bit more horizontal than vertical, as viewed by the procuring surgeon. Also, there needs to be a separate Bovie for the leg so that the

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leg Bovie and the chest Bovie are not interchanged. Keeping the supplies for the primary operation separate from the lower leg is done because of the presumption that the leg may not be not be quite as controlled an environment from the standpoint of sterility as is the chest or other operative sites. Furthermore, those who harvest the vein should change gown and gloves before going to help in the primary operative field.

The stockinet is then cut on top of the leg to expose the area of the vein. This stockinet is then folded down into the area between the legs, and a blue towel is placed slightly under the right leg, as the right leg is where the harvest usually begins. This creates a controlled workspace so the instruments are not lost and so that all the supplies that will be needed can be seen and managed efficiently. A rolling table with a tray on it for the vein harvest instruments can be placed right below the feet so those harvesting the vein can get instruments from the tray. A trash can be placed just beyond that so that suture remnants can be thrown away instead of throwing them on the floor, which is not optimal for maintaining a proper operating room environment and is somewhat disrespectful of those who have to clean up at the end of the case.

The next step in the procedure involves marking the leg with a marking pen. One should put a mark on the medial malleolus and another on anterior compartment tendons that run more anteriorly on the leg. The vein will run about halfway between these two spots. Usually, one can see the vein at that point. If it's not visible, it can be occluded with a finger across the tibia, as noted earlier, which makes the vein distend somewhat. Sometimes the vein can be palpated. Next, a mark is put where the ankle bends. One should not make an incision distal to that site if possible, in order to enhance healing. The next mark is placed on the back of the tibia about 10 cm above the first mark. The vein will generally be about 1 cm anterior to the back of the tibia. One can confirm these relationships and landmarks on one's own leg or on other patients being examined to become familiar with these methods of localizing and evaluating the vein.

The next stage of the operation will require the use of a scalpel (with a #10 blade), a Bovie, and a pair of forceps. A 5-cm incision is made at the site just anterior to the posterior edge of the tibia marked earlier, and the incision is carried through the skin. Meticulous hemostasis should be maintained throughout the vein harvest. This fastidiousness limits blood loss, not only during the harvest, but also after heparinization. Furthermore, a dry field allows identification of both the vein and the accompanying saphenous nerve. Given that procurement of the internal mammary artery is happening concurrently if a coronary bypass operation is being done, there is almost always plenty of time to get the vein out without hurrying. This not only allows for optimal hemostasis, but also allows the vein itself to be protected.

Many will assert (and most have been taught) that one should not handle skin edges except with toothed pickups. However, this admonition is a myth. The vascular DeBakey forceps are used for handling tissues as delicate as the internal mammary artery and coronary vessels. Surely, then, the much more resilient skin edges can be lifted with similar forceps when used with care. One will not need to crush the skin as might be the case with a locking clamp. The more skin that is held by the forceps, the less likely injury is because the force is spread over a larger area. Also, these DeBakey forceps are ideal for working with the vein branches and other structures encountered, such as the saphenous nerve. Therefore, the toothed pickups (such as Adson's) can be reserved for closure of the wound.

Saphenous vein harvest is best carried out when there are 2 people available to help. It can be done by people who know what they are doing working alone, but almost always there is an extra pair of hands somewhere, whether it is a scrub technician, a medical student, or especially, another surgeon.

The skin is lifted after the initial incision is made, and the Metzenbaum scissors should be used to cut tissue between the skin and the deeper tissues. One should usually come down onto the saphenous vein fairly early. It lies in the deeper planes just anterior to the tibia. Once the vein is identified, the Metzenbaum scissors can be placed under the more superficial tissue, which often has many small blood vessels, and the Bovie can be used to cut through this tissue to further expose the vein. Care must be taken at this point not to injure the vein itself. That is, in looking for the vein, there is a period of time when its exact location is uncertain, and care must be taken not to injure it. Once the vein is identified, it will extend proximally in a predictable way, maintaining about the same relationship to the tibia (1 cm anterior to the posterior edge) to a point about 15 cm below the knee joint. The skin and subcutaneous tissue can be pulled up on each side of the wound, while pulling these tissues down toward the foot and, simultaneously, up and away from the tibia so that the tissues are under tension.

The Metzenbaum scissors can be used to create a tunnel in the potential space just on top of the vein heading proximally. The saphenous vein has an area of relatively loose areolar tissue around it. There are planes like this that surround all vessels, veins, and arteries throughout the body. Some have called this loose areolar tissue the "plane of Leriche" (though that designation may be most appropriately applied to the perivascular plane around the