Use of Ipsilateral Superficial Femoral Vein for Common Femoral Vein Reconstruction After Trauma: A Useful Approach in Selected Cases

Boulos Toursarkissian, MD, Michael Corneille, MD, Ryan T. Hagino, MD, and Ronald Stewart, MD

The optimal management of complex proximal lower extremity vein injuries remains controversial. Ligation can be tolerated but is sometimes complicated by venous hypertension and possible limb loss. At the same time, the relatively large size of these proximal veins does not lend itself very well to the use of simple saphenous vein grafts, in cases when simple venorrhaphy is not feasible.

We describe a case where the ipsilateral superficial femoral vein (SFV) was used as an interposition graft for repair of a complex gunshot induced common femoral vein (CFV) injury. Initial ligation was not tolerated clinically. This method of common femoral vein repair offers a durable autologous conduit that is less time consuming to perform than a panel or spiral saphenous vein graft.

CASE REPORT

A 24-year-old man presented emergently with multiple gunshot wounds to the left leg and buttock. On arrival he was in shock with a systolic pressure in the 60s. A total of 4 wounds were discovered: one in the lateral distal thigh, a second in the medial distal thigh, a third in the left buttock, and the fourth in the left groin just distal to the inguinal ligament. A pressure dressing was in place on the thigh wound that when released bled torrentially. An emergent laparotomy was performed for proximal arterial and venous control and to rule out intraperitoneal injury. The groin wound was then explored while maintaining proximal and distal digital pressure. A near total transection of the CFV was identified with extensive venous destruction for approximately 4 cm (Fig. 1). A tension free repair was not possible. Because of coagulopathy and hypothermia, the CFV was ligated proximally and distally. The distal thigh injuries were explored and only a saphenous vein transection was discovered. A limited leg angiogram showed no arterial injuries and good runoff to the foot with no other injury. Four-compartment lower leg and lateral thigh fasciotomies were performed and the patient was taken to the intensive care unit (ICU) for further resuscitation. He received a total of 26 units of red blood cells, 12 units of plasma, and a 6 pack of platelets. Despite correction of the coagulopathy, there was continuous venous ooze from the fasciotomy sites requiring ongoing transfusion. In addition, despite leg elevation, he developed massive lower extremity edema from interruption of both his superficial and deep venous systems putting him at risk for venous gangrene. He returned to the operating room 8 hours after his initial surgery for CFV reconstruction. Once the ends of CFV were debrided, an approximately 8 cm gap was present starting slightly above the inguinal ligament and extending to the common femoral vein bifurcation. A segment of the ipsilateral SFV was harvested, starting at its junction with the profunda femoris vein (PFV) (Fig. 2). This segment was used as an end-to-end interposition graft between the PFV and the external iliac vein (Fig. 3). A Greenfield filter was placed at this time because of the patient’s high risk secondary to the expected immobilization after his trauma. Postoperatively his course was complicated by high narcotic requirement and ileus treated with nasogastric decompression. He was kept on heparin 5,000 units subcutaneously twice a day and aspirin orally. Follow-up duplex on postoperative day 8 revealed a patent femoral vein reconstruction. Leg edema was minimal. His fasciotomy wounds were closed with vacuum assisted closure devices and split thickness skin grafts.

DISCUSSION

The appropriate management of venous trauma remains controversial. Options for repair of venous injuries include ligation, lateral venorrhaphy, resection and reanastomosis, interposition grafting with saphenous vein or prosthetic material, and complex repairs including paneled or spiral venous grafts.
The importance of venous repair whenever feasible was emphasized by Rich et al. while analyzing data from the Vietnam vascular registry, in particular for the popliteal vein, especially in the presence of concomitant arterial injuries. Patients undergoing venous repairs appeared to have higher limb salvage rates and less edema than patients undergoing ligation. Vein ligation is currently usually indicated in unstable patients or in smaller veins such as infrageniculate tibial vessels. Regarding the common femoral vein, most current surgeons advocate repair when feasible. When this is not immediately possible, a damage control initial surgery, followed by later repair, as in our case, can be considered.

A number of studies suggest that simpler venous repairs are associated with higher patency rates. As far as the CFV is concerned, simple lateral venorrhaphy or patch angioplasty should be used whenever possible. Frequently, this is only possible with stab wounds or low velocity projectiles. High power missiles often lead to extensive vessel damage, preventing primary repair. Interposition vein grafts for vein repairs in general, mostly using the saphenous vein, have been reported to have a high failure rate. The issue is more complicated when size mismatch requires saphenous vein paneling. Pappas et al. reported a 30-day patency of only 50% when using panel and spiral vein grafts, most of which were placed in the common femoral or iliac location. In that study, failure of those grafts was uniformly associated with edema on discharge, and the authors suggested “selective use of these techniques”. The use of prosthetic grafts, while allowing a good size match for larger veins, has been associated with high occlusion rates. We considered PTFE graft use but opted against it because of its poor patency in the venous position. For a common femoral artery, PTFE would have been our preference. The concern over infection in a contaminated field must also be considered. Recent data suggests that blow-out problems in contaminated fields may actually be less likely with PTFE grafts. Our patient did not have a significant amount of contamination or any obvious infection. If PTFE is used, an externally supported (ringed) variant should be considered since it has the theoretic advantage of being less liable to external compression and resultant thrombosis.

For large venous defects, autogenous grafts of good size match are an option worth considering in those cases. At least two published reports have described the use of an internal jugular vein as an interposition graft for common femoral vein repair. However, this comes with the additional morbidity of a separate neck incision. More recently, Hagino et al. described a number of cases where the superficial femoral vein was used to repair venous injuries in various locations. Among those cases reported was one case where a common femoral vein injury was repaired using the contralateral superficial femoral vein as a graft; in that case, the profunda vein was ligated on the side of injury. An expanding published experience with arterial reconstructions using the SFV has documented a relative lack of serious morbidity associated with the harvest of that vein. Complications can, how-
ever, occur such as compartment syndrome, especially when the saphenous vein has been already harvested.

Our case is different in that we used the ipsilateral superficial femoral vein. The resulting anatomy in our patient was similar to what is seen in cases where a superficial femoral vein is harvested for any purpose, the profunda vein becoming the main venous outflow. This avoided the necessity for a contralateral thigh incision for graft harvest and was accomplished by a simple extension of the existing groin incision. Of note is that our patient had no concomitant arterial injury. There is some evidence to suggest that venous hypertension may adversely affect the patency of any ipsilateral arterial reconstructions. At least mild early venous hypertension can be expected with superficial femoral vein harvest to repair the common femoral vein. Thus, in cases of combined arterial and venous injuries, it might be preferable to use the contralateral SFV, in a manner similar to that described by Hagino et al.

A few technical points are worth emphasizing regarding the harvest of the superficial femoral vein. It is important to divide the SFV at the bifurcation of the CFV flush with the PFV. This prevents a clot from forming in the stump of the SFV with possible proximal propagation and embolization.

A couple of additional technical points are worth mentioning. Temporary indwelling shunts have been used in complex arterial injuries as a bridge to perfuse the extremity pending final arterial repair. These shunts have also been described for venous injuries, while the patient is undergoing resuscitation or extremity orthopedic repair. We did not entertain this possibility regarding our patient, as his re-exploration was not initially planned. Temporary venous shunts have been left in place and remained patent for up to 36 hours without systemic anticoagulation, although there have not been many large series. The second point relates to the use of distal arteriovenous fistulas, as adjuncts to maintain the patency of the venous repair. A fistula is felt to increase the flow through the venous graft thereby enhancing its patency. However, the fistula may increase the distal venous pressure thereby decreasing venous return and worsening the edema, and the resultant decreased distal arterial flow may worsen arterial insufficiency distally. Because of these considerations, we did not consider this added maneuver but relied instead on the use of a pneumatic compression device on the calf. This mimics exercise, which has been shown to increase flow through venous grafts. If a fistula is used, sizing of the fistula becomes crucial and should not exceed one third of the diameter of the venous repair graft. The fistula should ideally be left in place for a couple of weeks.

A final comment is needed with regard to our use of a Greenfield filter in our patient. We placed the filter because of an anticipated prolonged hospitalization and its associated independent risk for deep venous thrombosis (DVT). Temporary filters were not available at that time in our institution, but might be considered in this case. The published literature strongly suggests that thrombosis of a venous repair does not seem to be associated with any significant risk of pulmonary embolism. Thus in otherwise uncomplicated venous repairs, a filter is not necessarily indicated. Moreover, even when venous repairs thrombose early on, a significant percentage will recanalize and remain patent long term as reported by Nypaver et al. Whether this is more likely to occur with SFV use as opposed to other grafts especially prosthetic is not clear, although one might speculate that it should. In view of all this, we did not use systemic anticoagulation, especially given our patient’s initial coagulopathy. Subsequent to its resolution, we relied on aspirin, compression stockings and subcutaneous heparin. Others have suggested low molecular weight dextran to be useful, while experimental studies have failed to show intravenous heparin to be of benefit.

In conclusion, we feel that SFV use should be considered as another alternative for repair of large proximal veins. It can be harvested in a shorter time than needed for the creation of a panel or spiral saphenous graft, and does not seem to be associated with long term morbidity.
REFERENCES


EDITORIAL COMMENT

Historically, penetrating venous injuries to the extremities have been managed by primary ligation. This is a noncontroversial procedure in those patients with extensive injuries and associated hemodynamic instability as a result of severe hemorrhage. However, there are some benefits associated with venous repairs. These include (1) improved patency of associated arterial repairs with venous preservation maintaining normal distal vascular bed resistance, thus optimizing blood flow and reducing venous stagnation; and (2) reduced incidence of chronic venous insufficiency and associated postphlebitic complications. What is unique about this particular case report is the ability to perform a delayed reconstruction once the classic signs of venous hyper-tension had developed. I believe that whenever time and patient conditions permit, efforts should be made to repair the vessels critical to maintain venous return. It is documented that complex repairs have the potential for recanalization despite their high rate of early thrombosis.

In summary, this is an interesting case where the authors identify in a timely manner the deleterious effects of venous ligation and were able to perform a delayed limb saving venous reconstruction.

Eddy H. Carrillo, MD
Division of Trauma and Critical Care
Memorial Regional Hospital
Hollywood, FL

REFERENCES
