Use of an autologous artery for tibial artery bypass in a trauma patient

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Peripheral artery bypass grafting is a commonly performed procedure. The present report describes the use of an autologous artery for tibial artery bypass graft following a gunshot wound to the calf.

Peripheral arterial bypass is performed on a frequent basis in most surgical arenas. Autologous saphenous vein graft is the preferred material of choice for most bypass procedures, followed by synthetic material such as polytetrafluoroethylene (1,2). In emergent trauma cases, limb salvage may require the use of another material that is readily available to the operating surgeon (3-5). We report a case of a gunshot wound treated successfully using an autologous artery as a bypass graft.

CASE PRESENTATION

A 48-year-old police officer presented to a level 1 trauma centre (Grant Medical Center, Ohio, USA) after sustaining a gunshot wound to his right lower extremity at the level of the mid-to-upper calf. On arrival 20 min to 30 min after injury, the patient was initially hemodynamically unstable. The patient was resuscitated with 4 L of normal saline and four units of packed red blood cells. Vital signs were stable and no acute bleeding was noted. On physical examination, a Doppler dorsalis pedis pulse and a faint Doppler posterior tibial pulse were present. The patient complained of decreased sensation, coolness and swelling in the calf of the affected limb. Motor function was normal before surgical intervention. The patient was taken to the vascular and interventional radiology suite for an arteriogram to clearly delineate the vascular anatomy.

Angiography revealed a pseudoaneurysm arising from the tibioperoneal trunk secondary to the gunshot wound (Figure 1A). There was no antegrade flow in the peroneal or posterior tibial arteries. The anterior tibial artery was of normal calibre and appearance. Using 5 mm coils, the tibioperoneal trunk was embolized to acutely control bleeding (Figure 1B). Following embolization, the patient was taken to the operating suite for revascularization of his leg, as well as fasciotomy.

First, extensive venous bleeding was controlled with ligation. Four-compartment fasciotomy improved the dorsalis pedis pulse. Next, the tibioperoneal trunk artery was dissected free, along with the peroneal and posterior tibial arteries. The posterior tibial artery appeared to be minimally damaged, while the peroneal artery had an extensive blast injury. A normal portion of the peroneal artery was harvested. The decision was made to use a portion of the peroneal artery for bypass instead

Approximately 4 cm of proximal peroneal artery was harvested for use as a bypass graft. At one year postoperatively, an arterial duplex scan showed patency of the tibioperoneal trunk to the posterior artery bypass.

Key Words: Bypass graft; Limb salvage; Peroneal artery; Tibial artery

Figure 1) A Angiography revealed a pseudoaneurysm arising from the tibioperoneal trunk secondary to the gunshot wound. **B** The anterior tibial artery was of normal calibre and appearance. Using 5 mm coils, the tibioperoneal trunk was embolized

of taking a vein to expedite the case, and decrease ischemia acutely and in the long term.

Thrombectomy of the distal posterior tibial artery was then performed and back bleeding noted. The coils from the tibioperoneal trunk were then removed, followed by intraoperative fluoroscopy for confirmation of coil removal. The tibioperoneal trunk was flushed and there was excellent inflow. Approximately 4 cm of the proximal peroneal artery was harvested. Next, an end-to-end spatulated anastomosis was performed between the tibioperoneal trunk and posterior tibial artery with the harvested peroneal artery.

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A final intraoperative examination showed strong, continuous wave Doppler signals in the anterior tibial, dorsalis pedis and posterior tibial arteries. At the follow-up examination, the patient had a palpable dorsalis pedis pulse, as well as Doppler posterior tibial pulses secondary to postoperative swelling. He had full range of motion in his foot and ankle, as well as normal neurological sensations. At his 12-month examination, the ankle-brachial indexes were 1.11 for the dorsalis pedis and 1.09 for the posterior tibial arteries, with palpable pulses. An arterial duplex scan revealed patency of the tibioperoneal trunk to the posterior artery bypass graft. The skin grafts to the leg were healed. The patient denied any claudication symptoms and had normal ambulation.

DISCUSSION

Little is written about the use of native artery as bypass material in extremity salvage procedures. Native vein or prosthetic graft is generally the material of choice for planned bypass cases. However, native tissue is recommended to lessen the risk of infection with penetrating injuries. In the case of trauma, the goal is to restore flow to the injured extremity by any means necessary to preserve the limb (6).

The decision to use harvested peroneal artery for a tibioperoneal trunk to posterior tibial artery bypass was multifactorial. First, the patient had a fasciotomy (7) performed and would need as much vascular support as possible to heal the subsequent skin grafting for wound closure. Second, we chose to limit the operative time by using an available artery that was not repairable. Finally, the patient was an active individual with a large muscle mass that required increased blood flow to the limb for long-term viability. The ease of taking the portion of peroneal artery to use as a bypass graft was also part of the decision-making process. Instead of an additional dissection to harvest a vein, the autologous artery segment provided an option for a bypass graft and is recommended for use if needed for future traumatic arterial injuries.

CONCLUSION

Repair of vascular injuries secondary to trauma requires innovative strategies, not only to salvage limbs, but also to decrease morbidity and mortality. Limiting operative and ischemic time by using a native artery as a bypass graft allowed more rapid return of blood flow to an injured limb with large wounds and muscle mass. The patient recovered well and continues to have full use of his limb. At one-year follow-up, the patient's arterial duplex was normal, with an ankle-brachial index of 1.0. The patient has resumed normal activities, including returning to work.

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