Multidisciplinary Limb Salvage in a CLI Patient With Complex Care Coordination

A patient with critical limb ischemia undergoes multiple limb salvage procedures, complicated by logistical concerns from living in a remote location and wound healing challenges.

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CASE PRESENTATION

A man in his early 70s with critical limb ischemia presented for a second opinion after being advised to undergo amputation. His medical history was significant for type 2 diabetes mellitus (HbA1c, 8.4%), neuropathy, peripheral vascular disease, carotid stenosis, and hypertension. He was also a former smoker (2-3 packs/day for 20 years) and had stopped 1 year before presentation.

In addition to the technical aspects of the patient's care, one of the greatest challenges we faced in caring for this patient was the coordination of care and transportation. This patient lived in a rural area and had limited social support. Due to the complexity of care, he required procedures and management at our main hospital, as well as significant wound care follow-up in his local area. This required us to work jointly with the local community hospital and arrange multiple transfers, which were challenged by significant transportation complexities.

This patient was initially evaluated at his local community hospital emergency department for foot pain. He was diagnosed with cellulitis and was prescribed antibiotics, with a recommendation for outpatient podiatry follow-up. At the outpatient visit with podiatry, significant concerns arose for ischemia, and transportation was arranged for vascular testing (Figure 1). Initial toe pressure and ankle-brachial index (ABI) were 9 mm Hg and 0.3 with minimal pulsatile flow, respectively. This was an outpatient procedure, and he returned home after the test with a plan to follow-up with vascular surgery. However, dependent rubor and pain progressed significantly over the next few days.

How would you proceed?

A. Proceed with amputation
B. Continued wound care
C. Have the patient return to clinic for evaluation and an angiogram

Our Answer: C

Arrangements were made for the patient to be urgently transferred to the main hospital for admission under vascular surgery, with a plan to perform angiography. Once transferred, vascular surgery evaluated the patient, and he was diagnosed with severe chronic left lower limb ischemia with nonhealing gangrenous toes, Rutherford category 2a for acute limb ischemia. He was taken urgently for a left lower extremity angiogram, which showed multilevel disease in the superficial femoral artery (SFA) and posterior tibial artery, with occlusion of the anterior tibial (AT) and peroneal arteries. The vascular surgeon recanalized his SFA, AT artery, and peroneal artery. Angioplasty was performed using a drug-coated balloon in the SFA and popliteal arteries, and a 3-mm balloon was used in the tibial arteries. The vascular surgeon also debrided necrotic tissue from the patient's foot in the same operative room visit and left the wound open, with Dakin's solution packed into the wound.

Figure 1. Ischemic-appearing foot noted at outpatient podiatry visit.

Figure 2. Dry gangrene seen in the second and fifth toes.

Figure 3. Three weeks after TMA with necrosis of incision site.

Figure 4. Three days after TMA revision with incisional wound vac (A). Delayed wound healing of medial and lateral incision sites (B).

Figure 5. After debridement with application of a skin substitute and femoral-to-tibioperoneal trunk bypass.

His toe pressure increased to 30 mm Hg postoperatively, but his course was complicated by a non–ST-segment elevation myocardial infarction, and plans for any further lower extremity revascularization were thus aborted. Cardiology was consulted, and the patient underwent coronary angiography via right radial access, which demonstrated a 30% ostial left main coronary artery, a long 50% mid left anterior descending, a 40% proximal left circumflex artery (LCX), a 70% proximal and severe diffuse distal LCX OM1, 80% mid LCX stenoses, and a collateralized mid right coronary artery total occlusion.

After cardiac MRI revealed evidence of a left ventricular thrombus, the patient was initiated on systemic anticoagulation with subcutaneous enoxaparin sodium injections and then transitioned to intravenous unfractionated heparin while awaiting high-risk percutaneous coronary intervention (PCI). After 1 week, the patient underwent high-risk PCI using intravascular ultrasound and Shockwave IVL (Shockwave Medical, Inc.), and two drug-eluting stents were placed. He was reloaded with clopidogrel (total of 300 mg orally). He was then transitioned to apixaban (5 mg twice daily) with aspirin and clopidogrel.

How would you proceed?

A. Plan for further revascularization to increase toe pressure
B. Attempt continued wound care
C. Consider minor amputation given high cardiac risk

Our Answer: C

Third and fourth toe amputations were performed, and podiatry remained consulted for wound management. The wounds were initially packed with wet-to-dry dressings, followed by wound vac. He experienced significant lower extremity pain that improved throughout the hospital stay. Physical therapy worked with him, and he was maintained at heel-touch weight-bearing status. He was evaluated by infectious disease and discharged on a planned 6-week course of antibiotics based on bone culture data showing osteomyelitis.

Although the patient was discharged to a skilled nursing facility local to his home, he returned to the hospital emergency department 2 days later due to concerns for progression of necrosis to the wound.

On this admission, there was no clinical sign of infection; however, the dry gangrene did progress to the second and fifth toes (Figure 2). Vascular surgery and podiatry jointly determined that a transmetatarsal amputation (TMA) was indicated but was unlikely to heal without an increase in inflow. He had flow in his AT and peroneal arteries from the previous recanalization but no suitable vein for bypass. On CTA, he was noted to have plaque in the common femoral artery (CFA).

How would you proceed?

A. Proceed with amputation
B. Perform CFA endarterectomy to increase inflow
C. Perform bypass to recanalized tibial vessels

Our Answer: B

Vascular surgery performed a CFA endarterectomy while the patient remained on his antiplatelet medications, given that he did not have suitable vein and was within 1 month of his cardiac procedure. Toe pressure increased to 52 mm Hg after this procedure, and a TMA was then performed jointly with podiatry.

The patient was transferred back to his community hospital, where he was followed by the local general surgery team. Sutures were removed at 3 weeks postoperatievly, and concerns arose due to progressive necrosis at the TMA incision site and drainage (Figure 3). He was then transferred back to the mainland for evaluation for below-knee amputation.

How would you proceed?

A. Attempt limb salvage with aggressive wound care
B. Amputation

Our Answer: A

Because the patient wished to exploit all options to save his limb and he was not systemically ill from his foot, our limb salvage team reevaluated, and a joint decision was made to continue to attempt limb salvage with debridement and updated wound care. He was taken to the operating room with podiatry for surgical debridement of necrotic tissue and partial closure of the left foot TMA site, as well as application of incisional wound vac (Figure 4A). Offloading consisted of strict non–weight bearing. The infectious disease team was reconsulted and recommended extending his antibiotic course to a total of 8 weeks.

The patient was then discharged after 1 week in stable condition to the local hospital via repatriation, then transferred to a skilled nursing facility 2 weeks later. Wound healing had progressed significantly, with healing noted and no clinical signs of infection.

He was able to be discharged home and was seen for 7 months by the local outpatient podiatrist for his wounds. During this time, he was able to bear weight on his foot with a postoperative shoe and bandages. The wounds had delayed although progressive wound healing (Figure 4B).

How would you proceed?

A. Obtain a repeat angiogram to evaluate the previously recanalized tibial vessels
B. Proceed with femorodistal bypass with a polytetrafluoroethylene (PTFE) graft
C. Obtain arterial duplex ultrasound

Our Answer: B

At the 8-month mark, he continued to have unhealed wounds on the lateral and medial aspect of the foot, and

his toe pressure had decreased to 30 mm Hg. Podiatry performed a surgical debridement with application of a skin substitute (umbilical tissue) and wound vac application. The next day, vascular surgery opted to perform a femoral-to–tibioperoneal trunk bypass with a PTFE graft, as he did not have suitable vein.

Nutrition was consulted due to malnutrition and significant weight loss over the previous 8 months. The patient was placed on a regular diet and was given a daily frappe and supplements with meals. He was also treated with multivitamins, thiamine, and folic acid for 10 days in the setting of his malnutrition. After the return to his local hospital, the wound vac was continued to the foot.

We arranged an in-person follow-up visit 2 weeks after discharge with both the vascular and the podiatry teams due to the patient's high risk, need for wound evaluation, and vascular testing. This required arranging an overnight stay in our main hospital, as a roundtrip would not be possible in 1 day.

At this visit, he underwent left foot debridement, skin substitute (umbilical tissue), and negative pressure wound therapy application with podiatry. A left lower extremity ultrasound showed a patent femorodistal bypass graft, and his leg incisions had healed nicely (Figure 5).

CONCLUSION

The objectives of limb salvage encompass enhancing the patient's quality of life, maintaining optimal function, and bolstering overall health. Achieving these aims typically necessitates prolonged treatment and a series of interventions. However, facilitating the patient's ability to walk for an extended period not only preserves their quality of life but also reduces their mortality risk over the next 5 years. Our patient expressed profound gratitude toward our limb salvage team, recognizing the effectiveness of the procedures and the meticulous coordination of care. Such success would have been unattainable without the collaborative efforts of our multidisciplinary team, which included experts from vascular surgery, podiatry, infectious disease, physical therapy, nutrition, and other crucial disciplines.

An important point is the idea of constant involvement and surveillance. Limb salvage is not a "one-and-done" procedure. For example, the patient discussed in this article underwent an endovascular procedure, then a femoral endarterectomy, and then a distal bypass to serve the presentation he had at the time. Although he had a number of wound healing issues, he expressed his desire to keep his foot and was ambulating, so our team was more than willing to serve him on his journey. He is currently healing nicely, mobilizing, and in good health. ■

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