Lower extremity bypass with tumescent local anesthesia

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Lower extremity bypass is most commonly performed for the treatment of critical limb ischemia. These patients often pose high surgical risk secondary to significant clinical comorbidities. These risks may be compounded when general anesthesia is considered. We present the case of a patient at high anesthesia risk with critical limb ischemia who was unable to receive general anesthesia or neuraxial blockade. An infrainguinal bypass was performed using tumescent anesthesia with minimal intravenous sedation. The patient was discharged 6 days later, and his postoperative course was complicated by a groin lymphocele. Tumescent local anesthesia is a possible alternative pain management strategy for patients undergoing lower extremity bypass surgery. (J Vasc Surg Cases 2016;2:43-5.)

Lower extremity bypass is most commonly performed to treat critical limb ischemia (CLI).[1] These patients are often high-risk clinical candidates who present challenges in operative planning, particularly in regard to anesthesia.[2] The technique of tumescent local anesthesia (TLA) involves injecting large volumes of dilute local anesthetic in a subcutaneous plane. Originally developed for liposuction, TLA is commonly used by vascular surgeons to provide analgesia during venous ablative procedures.[3]

We report a case of a patient at high anesthesia risk undergoing femoropopliteal bypass under local anesthesia and TLA with minimal adjunctive sedation. This case demonstrates several unique advantages of TLA in intraoperative pain management in CLI patients who are poor candidates for traditional methods of anesthesia. Consent was obtained from the patient for publication of relevant personal data.

CASE REPORT

An 80-year-old man presented to our clinic with a history of insulin-dependent diabetes mellitus, aortic valve replacement, congestive heart failure with automatic implantable cardioverter-defibrillator, chronic obstructive pulmonary disease, chronic kidney disease stage 4, and atrial fibrillation. His coronary artery disease was extensive, with several myocardial infarctions in the past, and he was now status post coronary bypass of two vessels. He presented with rest pain in his left leg and progressive third and fourth toe gangrene.

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Angiography revealed a severely calcified chronic total occlusion of his superficial femoral artery (SFA) with above-knee popliteal reconstitution along with stenotic one-vessel runoff to the foot through the anterior tibial artery. Several attempts were made at endovascular revascularization under local anesthesia, but they were unsuccessful. On the first attempt, the long-segment SFA occlusion was unable to be crossed; and on the second attempt, the wire was unable to re-enter the lumen (Fig 1). Because of the patient's rest pain and tissue loss, surgical bypass of the occluded SFA segment was offered.

The patient was considered at high risk for general anesthesia secondary to his significant cardiopulmonary comorbidities. A neuraxial block was considered, but the patient's concomitant use of warfarin for atrial fibrillation and mechanical aortic valve and the resulting elevated international normalized ratio precluded safe administration or discontinuation of anticoagulation, per institutional protocol. General anesthesia had been considered; however, recent echocardiography revealed an ejection fraction of 20%, severe pulmonary hypertension, moderate aortic valvular stenosis, and moderate decrease in overall left ventricular systolic function with inferoseptal akinesis. After discussion with the patient, we proceeded with the bypass using minimal intravenous sedation and administration of TLA.

Before incision, the patient received 1 mg of midazolam and 25 mcg of fentanyl intravenously. Femoral and popliteal exposures were performed with focal administration of 1% lidocaine to the groin and medial thigh soft tissue; 10 mL of 1.5% mepivacaine was injected directly into the femoral sheath.

Isolated inflow and outflow lesions were treated by direct puncture of the femoral and popliteal arteries, respectively. One external iliac stent was placed, and angioplasty of the anterior tibial artery was performed before construction of the bypass. Common femoral endarterectomy was required to establish adequate inflow.

As no suitable vein was available, a 6-mm heparin-bonded polytetrafluoroethylene graft was used as a conduit (W. L. Gore & Associates, Flagstaff, Ariz).

Tumescent adjunct. Before the tunneling of the graft, a tumescent solution consisting of 40 mL of 1% lidocaine (10 mg/mL), 40 mL of 0.25% bupivacaine (2.5 mg/mL) with epinephrine 1:200,000, and 4 mL of 8.4% sodium bicarbonate (1 mEq/mL) was prepared in 1 liter of normal saline.

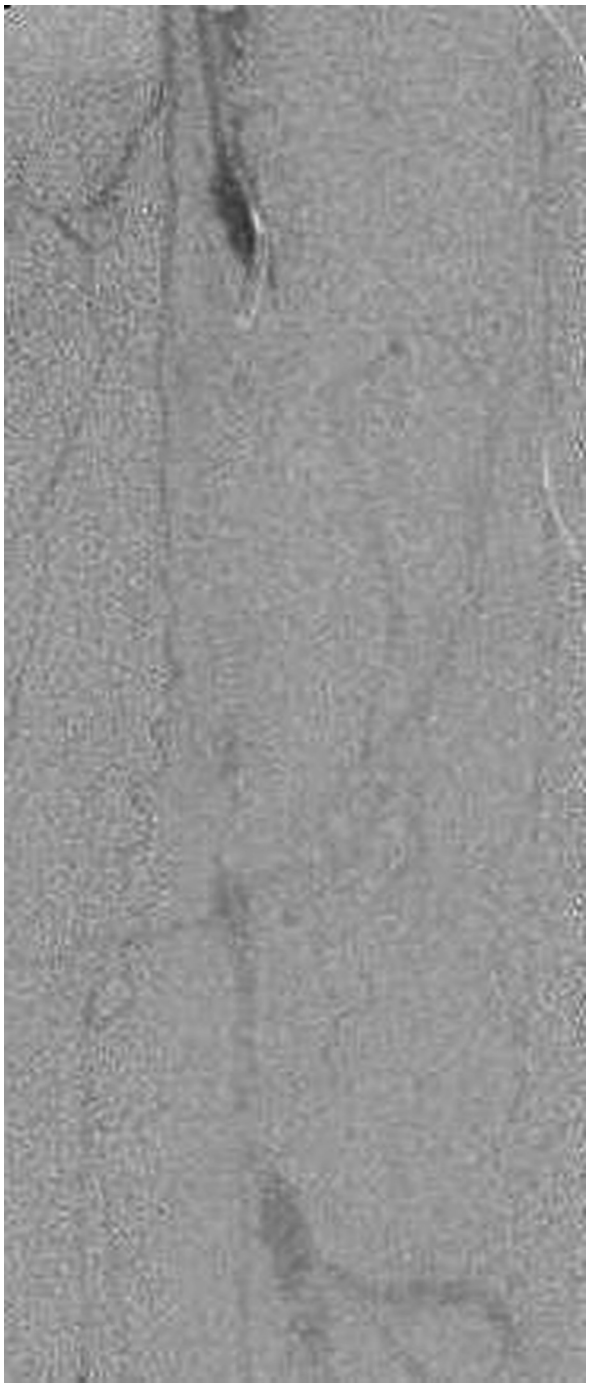

Fig 1. Angiogram demonstrating superficial femoral artery (SFA) occlusion with above-knee popliteal reconstitution.

The tumescent solution was hung and attached to a roller pump (Diomed, Cambridge, UK). Under ultrasound guidance, a 21-gauge spinal needle was used to infiltrate the soft tissue and fascial plane along the sartorius and adductor magnus muscles (Fig 2). Continuous skip injections were performed from incision to incision, using the anteromedial intermuscular septum overlying the neurovascular bundle containing SFA, femoral vein, and saphenous nerve to landmark the inferior border of infiltration. An infusion of dexmethylphenidate at 0.5 mcg/kg/h was briefly initiated before tumescence administration but was able to be discontinued immediately after.

A Gore tunneler (W. L. Gore & Associates) was used to pass the graft through the thigh underneath the fascia lata, through the adductor canal to the above-knee popliteal artery, unnoticed by the patient. The bypass was then able to be completed with minimal discomfort to the patient. A total of 4 mg of midazolam and 100 mcg of fentanyl was administered intravenously through the entirety of the procedure.

The patient was kept on telemetry after the procedure to monitor for systemic side effects of the local anesthetic. No significant changes in hemodynamics were noted. The patient remained free of significant pain postoperatively. On postoperative day 5, he underwent second and third toe amputation under selective digital block; he was discharged the next day back on therapeutic-dose warfarin. The amputation sites remain healed at 6-month follow-up.

DISCUSSION

Many patients undergoing lower extremity bypass for CLI have significant medical comorbidities.[4] Perioperative cardiac complications can occur in 4% to 6% of patients undergoing infrainguinal revascularization under general, spinal, or epidural anesthesia. Barkmeier et al reported a series of 86 patients undergoing infrainguinal bypass with monitored anesthesia care involving propofol, midazolam, and fentanyl. During tunneling or any other painful maneuvers, the dosage of intravenous sedation was increased.[5]

For patients who are poor candidates for general anesthesia, neuraxial block, or heavy sedation, we propose the addition of TLA. TLA can effectively anesthetize large areas without reaching toxic plasma concentration. When diluted in a tumescent preparation, lidocaine has been reported to be safe in doses up to 35 mg/kg.[6] In addition to providing analgesia, TLA produces expansion of the tunneling plane, which facilitates easier and less traumatic graft tunneling. Other reports using tumescence have also suggested that extensive vasoconstriction induced by large volumes of dilute epinephrine may minimize blood loss without tachycardia and hypertension.[7]

Direct administration of mepivacaine to the femoral sheath provided additional regional anesthesia. Mepivacaine is widely used for routine femoral nerve block, providing anesthesia to the upper thigh and medial leg.[8,9] Having broad surgical exposure of the femoral sheath permitted direct access to the femoral nerve, allowing additional analgesia along the distribution of the sartorius muscle. The lack of suitable venous conduit necessitated the use of polytetrafluoroethylene, which minimized the need for extensive incisions and dissection. This may have contributed to the success of the procedure in regard to the patient's comfort and minimal use of intravenous sedation.

The patient underwent revascularization and amputation in a staged fashion. Although this could have been performed in a single setting, the gangrene was free of

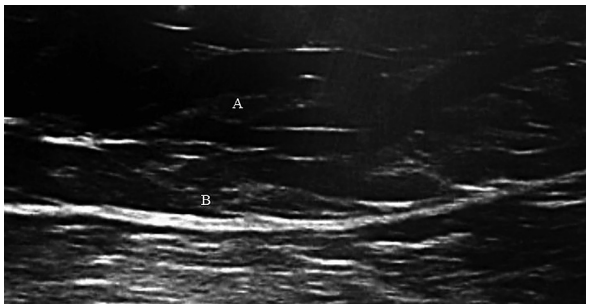

Fig 2. Ultrasound-guided tumescent injection. *A,* Soft tissue infiltration with spinal needle. *B,* Fascial border of adductor magnus muscle.

infection and limited to the third and fourth phalanges. On initial presentation, it seemed feasible that the necessary amputations could be performed with targeted digital blocks.

CONCLUSIONS

TLA and locoregional anesthesia may be useful adjuncts in patients for whom general anesthesia, neuraxial blockade, or heavy-dose monitored anesthesia care poses too high a risk. Our case describes a femoropopliteal bypass performed with minimal intravenous sedation and TLA to minimize pain, discomfort, and anesthetic exposure. Bypass with local anesthesia should be reserved for high-risk patients who can tolerate the length and complexity of the procedure. Caution should be taken with this approach in patients undergoing reoperative bypass, those with previous reaction to a local anesthetic, and those who may not be able to cooperate in maintaining position for the duration of the procedure. Conversion to general anesthesia must always be considered as backup.

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