

CORONARY, PERIPHERAL, AND STRUCTURAL INTERVENTIONS

CLINICAL CASE

Pain Relief During Recanalization of Chronic Femoropopliteal Artery Occlusions With Use of a Crossing Catheter



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ABSTRACT

BACKGROUND Demographic shifts have increased the complexity of endovascular therapy, often resulting in painful procedures. Local anesthesia (LA) has become a viable alternative to general anesthesia for high-risk patients undergoing endovascular therapy.

CASE SUMMARY A 76-year-old woman presented with severe claudication due to a heavily calcified chronic total occlusion of the superficial femoral artery. After initial subintimal guidewire passage, re-entry into the distal true lumen was achieved using a BeBack crossing catheter. During consecutive balloon inflation, the patient experienced severe discomfort. To improve patient compliance and facilitate balloon dilation of adequate diameter, local infiltration of lidocaine and iodinated contrast medium was administered via the BeBack crossing catheter in the perivascular space along the superficial femoral artery. The procedure was then successfully completed.

DISCUSSION The injection of LA via the BeBack crossing catheter provided targeted pain management, ensuring patient compliance without extending procedure duration or requiring additional percutaneous LA administration.

TAKE-HOME MESSAGES LA is a feasible alternative to general anesthesia for high-risk patients undergoing lower limb revascularization of complex lesions and total occlusions. In clinical cases where a BeBack crossing catheter is already in use, using the catheter for perivascular anesthesia injection offers effective pain management peri-interventionally. (JACC Case Rep. 2025;30:104638) © 2025 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

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**ABBREVIATIONS
AND ACRONYMS**

CTO = chronic total occlusion
EVT = endovascular therapy
GW = guidewire
ICM = iodinated contrast medium
LA = local anesthesia
SFA = superficial femoral artery

HISTORY OF PRESENTATION

A 76-year-old female patient presented with severe claudication in the right extremity (Rutherford classification 3) and a pain-free walking capacity of 100 m in February 2025.

PAST MEDICAL HISTORY

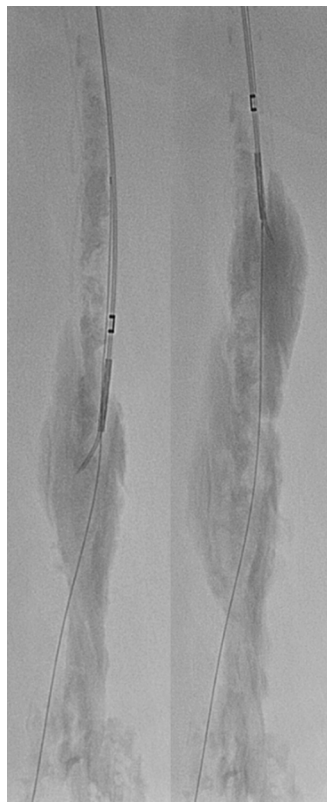
The patient's medical history included hypertension, type 2 diabetes mellitus, and hyperlipidemia. On admission, laboratory investigations revealed suboptimal low-density lipoprotein cholesterol control at 1.9 mmol/L, exceeding the target level of <1.4 mmol/L recommended by the European Society of Cardiology guidelines, despite ongoing high-intensity lipid-lowering therapy.¹ The patient's type 2 diabetes was well controlled with oral antidiabetic therapy (glycosylated hemoglobin 6.4%).

TAKE-HOME MESSAGES

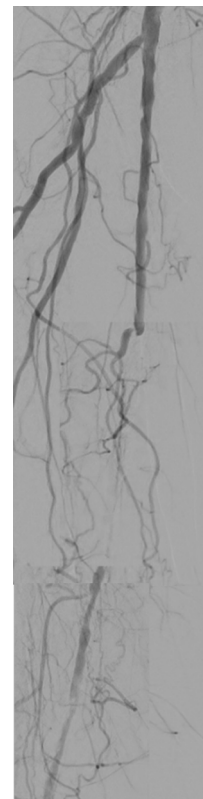
- Local anesthesia is a feasible alternative to general anesthesia for high-risk patients undergoing lower limb revascularization of complex lesions and total occlusions.
- In clinical cases where a BeBack crossing catheter for perivascular anesthesia injection offers effective pain management peri-interventionally.

INVESTIGATION

Previous angiography identified an occlusion of the superficial femoral artery (SFA), and the patient was scheduled for repeat angiography, followed by endovascular recanalization. Local anesthesia (LA) was administered under ultrasound guidance at the puncture site before the intervention. Angiography revealed a heavily calcified (Peripheral Artery

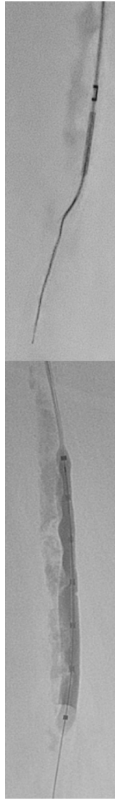
VISUAL SUMMARY Perivascular Anesthesia Using 2% Lidocaine and Iodinated Contrast Medium via a BeBack Crossing Catheter

Fluoroscopy image of the superficial femoral artery (SFA) after local infiltration along the SFA with 2% lidocaine and iodinated contrast medium via a BeBack crossing catheter.

FIGURE 1 Preinterventional Angiography

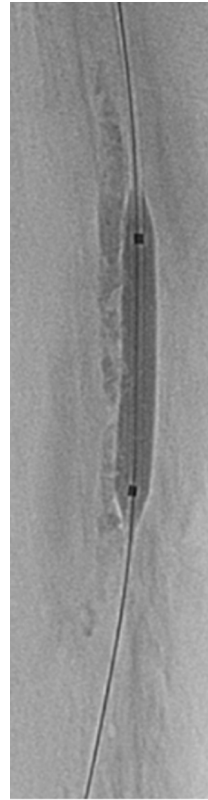
Fluoroscopic image of the superficial femoral artery before the intervention.

FIGURE 2 Intraluminal Re-entry With BeBack Crossing Catheter After Subintimal Guidewire Passage and Balloon Angioplasty With Lithotripsy Balloon of the Superficial Femoral Artery



Fluoroscopic image of the superficial femoral artery with initial lithotripsy balloon angioplasty under which the patient reported severe discomfort.

FIGURE 3 High-Pressure Balloon Angioplasty of the Superficial Femoral Artery



Fluoroscopic image of the superficial femoral artery with high-pressure balloon angioplasty after perivascular injection of lidocaine, under which the patient reported no discomfort.

Calcification Scoring System 4)² chronic total occlusion (CTO) of the medial part of the SFA and high-grade stenosis of the distal SFA (Figure 1).

MANAGEMENT

Guidewire (GW) passage could only be achieved subintimally. A 4-F, 120-cm BeBack crossing catheter (Bentley) was subsequently used to facilitate re-entry into the distal true lumen. This device incorporates a steerable, length-adjustable 21.5-gauge nitinol needle specifically designed for controlled vessel crossing and targeted re-entry. The directional catheter allows for precise control of needle orientation and deployment, offering adjustable throw lengths of 3, 7, or 11 mm. A lithotripsy balloon with a diameter of 5.0 mm was inserted for vessel preparation. However, the balloon did not fully expand during

inflation to 4 atm and, furthermore, was not tolerated because of pain (Figure 2). To improve patient compliance and enable the dilatation with balloons of sufficient diameter, anesthesia along the SFA was achieved through local injection via the BeBack crossing catheter. For this purpose, a 0.035-inch diagnostic catheter was introduced over the GW distal to the lesion to load a second 0.018-inch GW in a parallel fashion. Over this second GW, the BeBack catheter was loaded to the distal portion of the CTO. After removing this second GW, the needle of the BeBack catheter was pushed into the arterial wall or perivascular tissue to inject lidocaine 2% mixed with iodinated contrast medium (ICM) in a ratio of 4:1 (Video 1). Two additional injections were administered at 3 to 4 cm intervals during the pullback of the BeBack catheter, achieving circumferential and longitudinal distribution within the perivascular space. This facilitated puncture of less calcified vessel



segments and resulted in immediate and complete pain relief. The procedure was then completed after predilatation, with lithotripsy (Shockwave) of the entire lesion, high-pressure balloon angioplasty (Athletis; Biotronik), and drug-coated balloon angioplasty (Luminor; iVascular), all 6.0 mm in diameter (Figure 3). Because of significant residual stenosis, 2 Supera stents (Abbott) with a 5.0 mm diameter were implanted, followed by consecutive high-pressure angioplasty.

OUTCOME

The final angiography showed an excellent procedural result (Figure 4). The puncture site was successfully closed with a percutaneous closure device (FemoSeal; Terumo). Postinterventional duplex ultrasound revealed a favorable outcome, with no puncture-related complications. The patient reported no significant discomfort before discharge and

required no additional analgesia. Dual antiplatelet therapy was prescribed for at least 3 months after stent implantation, and lipid-lowering therapy was adjusted before discharge.

DISCUSSION

Endovascular therapy (EVT) for symptomatic peripheral arterial disease has gained substantial momentum in recent years, largely owing to its minimally invasive approach, which promotes quicker recovery and lowers the risk of perioperative complications.³ As the population ages and cardiovascular risk factors become more prevalent, there has been a noticeable rise in the occurrence of more complex and heavily calcified lesions, categorized under the Peripheral Artery Calcification Scoring System.^{2,4}

For heavily calcified lesions and CTOs, vessel preparation is crucial, because these lesions are often characterized by longer lengths and dense, thick calcified plaque, making them particularly difficult to treat. Consequently, the use of Supera stent implantation or the “crack-and-pave” (as described previously⁵) technique may be required, which has shown high technical success rates and low complication incidences in complex femoropopliteal lesions.⁵ This technique necessitates aggressive ballooning with oversized balloons, which can cause significant patient discomfort and, in some cases, may be intolerable. Therefore, effective pain management is essential to ensure patient compliance on the operating table and successful outcomes during EVT.

LA with lidocaine has been established in patients with high risk for general anesthesia for over 2 decades and has found widespread appliance in clinical practice.^{6,7} When pain is anticipated due to severe calcification or occurs periprocedurally, nerve blocks or local tumescent anesthesia administered percutaneously over the entire length of the calcified segment has become standard practice at our center.⁵ However, both techniques often lead to patient discomfort due to the need for additional percutaneous injections.

In this case study, the patient reported significant discomfort during vessel preparation, which was effectively alleviated by the perivascular injection of lidocaine. When a BeBack crossing catheter has been previously used for intraluminal re-entry, this approach may serve as a viable alternative to percutaneous local anesthetic injection, offering the potential to further reduce patient discomfort peri-interventionally. The additional use of ICM under

angiographic guidance allowed for precise application and helped to rule out intravenous injection of the LA. Although additional vessel injury may increase the risk of rupture, no reports have indicated a heightened risk of perforation associated with the use of the BeBack crossing catheter for re-entry or crossing to date.⁸ Based on our clinical experience, complications are unlikely, and the small puncture size does not lead to bleeding, as early thrombosis typically seals the vessel opening. Overall, this novel technique offered immediate and effective analgesia, facilitating the smooth continuation of the procedure with excellent patient compliance.

CONCLUSIONS

In this case report, LA with 2% lidocaine combined with ICM, administered via a BeBack crossing catheter, provided precise analgesia during complex EVT of a CTO of the SFA, ensuring patient compliance without prolonging procedure time. When a BeBack crossing catheter is already in use, using it for LA

injection offers an effective alternative to subcutaneous anesthesia or nerve blocks.

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KEY WORDS anesthesia, atherosclerosis, peripheral vascular disease, x-ray fluoroscopy

APPENDIX For a supplemental video, please see the online version of this paper.