

The efficacy of the novel “wall PIERCE” technique for common femoral access in endovascular therapy

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July 15, 2024

Abstract

When approaching the common femoral artery (CFA), although arterial puncture is successful, inserting the sheath along the guidewire can sometimes prove challenging. This is particularly true in cases of severe CFA calcification, a history of multiple punctures due to chronic limb-threatening ischemia, or after CFA endarterectomy. Typically, attempts are made to

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DECLARATIONS

Data availability statement

Data and materials cannot be shared openly to protect the patient’s privacy.

Funding statement

The authors received no financial support for the research, authorship, or publication of this manuscript.

Conflict of interest disclosure

S.M. received speaker’s fees from companies from B.D and Terumo.

M.T. received speaker’s fee from a company from Abbott.

Y.I. received speaker’s fees from companies from Abbott, Terumo, Boston, Medtronic, and NIPRO.

The remaining author declares no conflict of interest.

Ethics approval statement

The study protocol was conducted following the tenets of the Declaration of Helsinki and was approved by the local ethics committee of our hospital.

Patient consent statement

Written informed consent was obtained from all patients.

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Not applicable.

Clinical trial registration

Not applicable.

Manuscript type : Case series with two cases

KEY CLINICAL MESSAGE

In challenging common femoral artery access scenarios, the “wall PIERCE” technique, which utilizes a larger puncture needle to pierce the vessel wall along the guidewire, facilitates sheath insertion. This method proves successful in two cases without any complications, presenting a valuable addition to strategies for addressing challenging sheath insertion scenarios.

Keywords: wall PIERCE technique, puncture, endovascular therapy, trans femoral approach, common femoral artery

INTRODUCTION

With the evolution of devices, medical procedures involving less invasive approach sites, such as transradial access, distal radial access, and tibio pedal arterial (tibio pedal arterial minimally invasive retrograde revascularization), have become preferred in percutaneous coronary intervention (PCI) and endovascular therapy (EVT).¹⁻³ However, the common femoral artery (CFA) approach remains necessary for procedures requiring large-diameter sheath, such as an 8Fr for PCI or EVT below the inguinal region. Even when successfully accessed and a 0.035-inch guidewire is inserted, inserting the sheath through the CFA can sometimes be difficult. This is particularly common in cases with severe calcification of the vessel wall of the CFA, cases with a history of multiple CFA approaches for chronic limb-threatening ischemia (CLTI), or accessing the CFA after endarterectomy. Typically, these challenges are addressed by first using a bougie with a dilator attached to the sheath, replacing the guidewire with a sturdier 0.035-inch guidewire, or replacing the sheath with a smaller-diameter sheath. If sheath insertion remains difficult, the puncture or approach site should be changed.

We have recently encountered two cases in which a sheath was successfully inserted using the “wall PIERCE” technique. This technique involves using a larger puncture needle to pierce the vessel wall along the guidewire. In this case series, we present these two cases.

CASE 1

Case history and examination

A man in his 60s presented with Rutherford class 5 lower-extremity artery disease with resting pain and an ischemic ulcer on his left fourth toe. He had a history of diabetes mellitus and was undergoing hemodialysis. A few years prior, he underwent an endarterectomy for a calcified lesion in the left CFA (Figure 1A). Duplex ultrasonography revealed a chronic total occlusion of the left distal superficial femoral artery.

Differential diagnosis, investigations, and treatment

We opted for an ipsilateral approach from the left CFA and accessed it using an 18GA puncture needle. The insertion was performed successfully, and the 0.035-inch guidewire advanced into the superficial

femoral artery. However, the sheath could not follow the guidewire owing to the hardened vessel wall resulting from the prior endarterectomy of the CFA (Figure 1B). To overcome this challenge, we employed the “wall PIERCE” technique, which involves inserting a 12GA puncture needle (BD Angiocath™ IV Catheter 12GA×3.00IN; BD Bioscience, Franklin Lakes, NJ, USA) along the guidewire to penetrate the vessel wall of the CFA, thereby facilitating the subsequent passage of the sheath (Figure 1C). After performing the “wall PIERCE” technique, the sheath was inserted successfully (Figure 1D). Figure 1E shows the BD Angiocath™ IV Catheter 12GA×3.00IN (left upper panel). A puncture needle without a catheter was used in the wall PIERCE technique (left, lower panel).

CASE 2

Case history and examination

A woman in her 70s with Rutherford class 5 lower-extremity artery disease presented with resting pain and gangrene in her left third and fifth toes. She had a history of diabetes mellitus and was undergoing hemodialysis.

Differential diagnosis, investigations, and treatment

We opted for an ipsilateral approach from the left CFA and punctured with an 18 GA puncture needle. Fluorography revealed severe calcification at the insertion site in the left CFA (Figure 2A). The artery was accessed successfully, and the 0.035-inch guidewire advanced into the superficial femoral artery. However, the sheath could not follow the guidewire, as the vessel wall was hardened owing to severe calcification (Figure 2B-D). The “wall PIERCE” technique was accordingly used to penetrate the vessel wall of the CFA, thereby facilitating the subsequent passage of the sheath (Figure 2E). After performing the “wall PIERCE” technique, the sheath was inserted successfully (Figure 2F).

DISCUSSION

In some scenarios, transfemoral access is selected when performing PCI or EVT procedures. However, dense calcifications at the puncture site or blood vessel wall stiffening after endarterectomy can hinder sheath advancements, even if the puncture needle and guidewire are successfully inserted. We believe, based on our experience, that the “wall PIERCE” technique is effective in these cases.

Nakama et al. reported an inner PIERCE technique for advancing through hard lesions such as calcifications.⁴ This method involves modifying a highly calcified lesion using a retrograde long puncture needle when the guidewire passes through the infrapopliteal lesion and a pull-through is achieved, but the balloon does not pass through. This modification is highly effective and allows the balloon to pass through, facilitating balloon expansion. We applied this technique at the CFA puncture site. A 12GA needle is used. Piercing with a 12GA needle creates a hole equivalent to 2 mm around the guidewire (Figure 1E, right panel), effectively accommodating a 4Fr sheath. Piercing the blood vessel wall with this 12GA needle facilitates subsequent sheath insertion. In addition, even if a 5Fr sheath is inserted, there is no leakage around the sheath during EVT. Another advantage of this technique is the cost-effectiveness of the puncture needle.

However, the needle is relatively bulky. Therefore, it is recommended to change the guidewire to a 0.035-inch support-type guidewire to prevent potential injury to the guidewire by the needle and its subsequent rupture. Notably, at our hospital, we used the “wall PIERCE” technique in nine cases between January 2021 and January 2024, and sheath insertion was successful in all cases, with no complications such as guidewire rupture or hematoma (Table 1).

The “wall PIERCE” technique has been mainly used only for EVT cases; however, we believe that it can also be utilized when inserting a PCI sheath. Although we exclusively used the BD Angiocath™ IV Catheter 12GA x 3.00IN, we believe the same procedure can be performed with other needles close to 12GA in size.

CONCLUSION

The “wall PIERCE” technique can be a valuable addition to strategies for addressing difficult sheath insertion, potentially eliminating the need to change the puncture or approach site.

AUTHOR CONTRIBUTIONS

Concept/design: SM, MT. Drafting article: SM, Critical revision of article: NK, Approval of article: All authors.

ACKNOWLEDGMENTS

None.

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FIGURE LEGENDS

Figure 1. **A.** Left CFA lesion before endarterectomy (arrow indicates calcification) **B.** A 0.035-inch guidewire insertion after the CFA puncture. **C.** The “wall PIERCE” technique. **D.** Successful insertion of a 6Fr sheath. **E.** BD Angiocath™ IV Catheter 12GA x 3.00IN (Left figure). The thickness of the needle measured with a caliper was 2.07 mm.

Figure 2. **A.** Severe calcification was observed in the left CFA under fluoroscopy. **B.** Puncture of the CFA with an 18GA needle. **C.** A 0.035-inch guidewire insertion. **D.** Failure of 5Fr sheath insertion. Note that the guidewire is bent. **E.** The “wall PIERCE” technique. **F.** Successful insertion of 5Fr sheath.

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