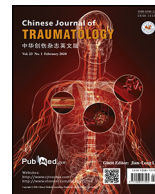


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## Case Report

# Percutaneous suture technique with ProGlide to manage vascular access pseudoaneurysm after percutaneous coronary intervention procedure: A case report

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## ABSTRACT

Iatrogenic femoral artery pseudoaneurysm is a common complication of the endovascular procedures. Manual compression and thrombin injection are the conventional techniques to occlude the pseudoaneurysms. However, there are still some failed cases that applied these treatment options. The aim of the study is to seek a potential and alternative method with ProGlide system to close the pseudoaneurysm. During April 2018 to February 2019, 2 patients with iatrogenic pseudoaneurysm of the superficial femoral were treated with the suture-base closure device—ProGlide. After punctured the pseudoaneurysm and placed a 6-F sheath, the guide wire was placed in the right femoral artery via the access of the pseudoaneurysm neck. Then the pseudoaneurysm neck was sutured by ProGlide to occlude the blood supply to the pseudoaneurysm. These 2 patients were cured with no complications and complaints, which revealed that percutaneous suture technique with ProGlide at the neck level of pseudoaneurysm provides a novel method for the management of vascular access pseudoaneurysm, especially in those with a wide and short neck.

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## Introduction

Iatrogenic femoral artery pseudoaneurysm (IFAP) is a common complication of endovascular procedures in femoral artery for therapeutic intervention.<sup>1</sup> It is reported that the incidence rate of IFAP is 2.0%–7.7% among peripheral interventions, due to the frequent use of anticoagulant therapy, and the utilization of larger sheaths.<sup>2</sup> Manual compression and thrombin injection are the conventional techniques to occlude the pseudoaneurysms.<sup>3,4</sup> However, there are still some unsuccessful cases applied to these treatment options, due to the complications such as intra-arterial thrombosis. Particularly, the pseudoaneurysm with a large cavity or a wide neck is difficult to be occluded by compression treatment and thrombin injection. And for the open surgical repair, the prolonged hospital stay and wound healing, and increasing rate of wound infection should be considered.<sup>5</sup> Therefore, to seek alternative method to close the pseudoaneurysm is desirable.

The percutaneous suture device ProGlide (Abbott Vascular, Redwood City, CA, USA) may be an adequate method to occlude the pseudoaneurysm. The aim of our study is to examine the feasibility and safety of ProGlide at the pseudoaneurysm neck under fluoroscopy for the occlusion of the pseudoaneurysm sac.

## Case report

Between April 2018 and February 2019, 2 patients with the iatrogenic pseudoaneurysm of the superficial femoral were treated with this suture-base closure device. Firstly, a 62-year-old male patient underwent coronary stenting via right femoral artery access. During the piercing, a fist-sized lump was quickly appeared with no obvious pain at his right groin. And the lump had no significant change in size but apparent pulsation after pressure bandaging. Color Doppler ultrasonography (CDUS) clearly indicated a pseudoaneurysm connecting with right superficial femoral artery, approximately 5 cm in diameter. And it also showed an arteriovenous blood flow signals with a symbol of mural thrombus within the lumen.

The patient was sent to the interventional radiology unit for percutaneous suture of the pseudoaneurysm neck with ProGlide. In

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**Fig. 1.** A pseudoaneurysm sac with a short neck was exhibited by right lower extremity angiography, which was communicating with the superficial femoral artery.

view of a close relationship between the pseudoaneurysm sac and the parent artery, right lower extremity angiograms via left femoral artery access showed a pseudoaneurysm sac with a short neck communicating with the superficial femoral artery (Fig. 1). Percutaneous suture with ProGlide at the neck level of the pseudoaneurysm under the guide wire was planned.

After the placement of 6-F sheath (Terumo, Tokyo, Japan) over left femoral artery access, the guide wire was inserted by the access of the right superficial femoral artery. Meanwhile, another guide wire was placed in the pseudoaneurysm sac via another 6-F sheath. Subsequently, arterial suture device, ProGlide, was inserted at the level of the pseudoaneurysm neck in order to close the blood supply of the pseudoaneurysm and seal it (Fig. 2). Control angiogram showed no pseudoaneurysm sac or neck in the superficial femoral artery of the right lower extremity (Fig. 3). A total of 5000 units of heparin was given during the interventional procedure to prevent thrombogenesis. The patient was hospitalized overnight and discharged from hospital the following day with a recommendation of bed rest. The post-procedure examination of CDUS was conducted 2 weeks later, which revealed no blood flow signals within the lumen and the absence of pseudoaneurysm sac.

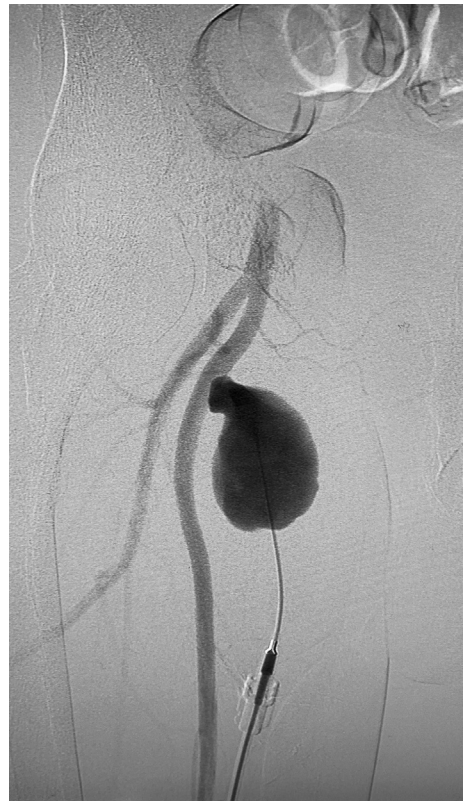


**Fig. 2.** Control angiogram showed that the guide wire was inserted by the access of the right superficial femoral artery, while another guide wire was placed in the pseudoaneurysm sac for the percutaneous suture with ProGlide to seal the pseudoaneurysm.



**Fig. 3.** The angiogram revealed no pseudoaneurysm sac or neck in the right superficial femoral artery.

Secondly, a 41-year-old male patient underwent coronary radiofrequency ablation via right femoral artery access. The skin bruises and wound pain appeared at the right inguinal area after operation, accompanied with a fast-emerging fist-sized lump. And the lump had no significant change in size but apparent pulsation after pressure bandaging. CDUS showed a pseudoaneurysm connecting with right superficial femoral artery, 5.1 cm in diameter. And an arteriovenous blood flow signals with a symbol of mural thrombus was also detected in the lumen. Then a modified method with ProGlide closure device was used. The pseudoaneurysm was

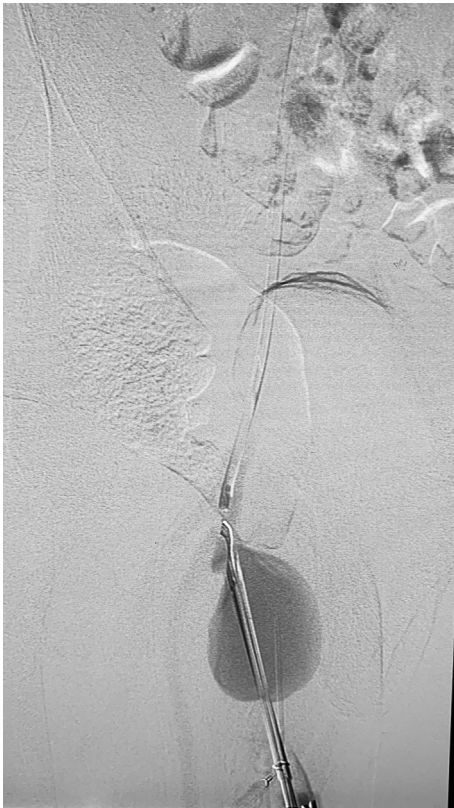


**Fig. 4.** A pseudoaneurysm sac with a wide neck was exhibited by right femoral sheath angiography, which was communicating with the superficial femoral artery.

punctured while the 6-F sheath was placed (Fig. 4). Subsequently, the guide wire was placed in the right femoral artery via the access of the pseudoaneurysm neck. Then the pseudoaneurysm neck was sutured by ProGlide, with a reservation of the guide wire (Fig. 5). After the confirmation of the existence of the fist-sized lump, another closure device ProGlide was used and the following procedure was consistent with the former one. Angiography via the sheath indicated that there was the retention of contrast agents in the pseudoaneurysm cavity (Fig. 6). Similar with the first one, the patient was hospitalized overnight and discharged from hospital two days later with a recommendation of bed rest. The re-examination of CDUS at 2nd week, which revealed the favorable prognosis of patient without any complaints of local ache.

The ProGlide closure device was successfully used to occlude the blood supply of the pseudoaneurysm in these two patients with no complications and complaints. And the clinical characteristics of the two patients were exhibited in Table 1. The prothrombin time before operation was 13.4 seconds and 13.7 seconds, respectively. The puncture site was the superficial femoral artery in these two patients with 6-F sheath. The fluoroscopy time of these two patients was 33 mins and 31 mins, respectively, while the procedure time was 58 mins and 50 mins, respectively. In addition, the contrast medium amount was 37 mL and 28 mL. The length and width of pseudoaneurysm of the first patient were 4.5 mm and 2.2 mm, while the second one is 5.4 mm and 3.0 mm. And the pseudoaneurysm captivity volume was 9.3 mL and 14.7 mL, respectively. The hospital stay post pseudoaneurysm closure was both 1 day with an ultrasonic examination of no blood flow signal.

All the procedures performed in the case report were approved by the patients and ethics committee.



**Fig. 5.** The guide wire was placed in the right femoral artery via the access of the pseudoaneurysm neck. And the pseudoaneurysm neck was sutured by ProGlide, with a reservation of the guide wire.



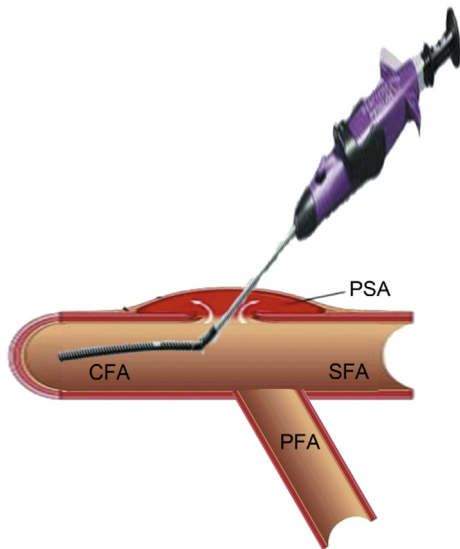
**Fig. 6.** After another closure device ProGlide was used to close the blood supply of the pseudoaneurysm, the angiography via the sheath indicated that there was the retention of contrast agents in the pseudoaneurysm cavity.

## Discussion

IFAP usually occurs when the vascular puncture site has a fistula, resulting in a pulsatile hematoma formation connecting with a parent artery. It refers to the puncture of common femoral artery or superficial femoral artery, and the patients were admitted in order to provide access for interventional procedure. There are plenty of risk factors affected the incidence of IFAP, such as obesity, hypertension and antithrombotic treatment.<sup>6</sup> Besides discomfort and delayed hospital discharge of the patients, IFAP may be accompanied with complications, which including rupture, distal embolization and local ischemia.<sup>7</sup> Once patients were considered with pseudoaneurysm, CDUS was recommended. A swirling color flow

**Table 1**  
The basic clinical characteristics of the two patients.

Parameter	First one	Second one
Prothrombin time (s)	13.4	13.7
Sheath size	6-F	6-F
Puncture site (Superficial femoral artery)	positive	positive
Fluoroscopy times (min)	33	21
Procedure time (min)	58	50
Contrast medium amount (mL)	37	28
Pseudoaneurysm "neck" length (mm)	4.5	5.4
Pseudoaneurysm "neck" width (mm)	2.2	3.0
Pseudoaneurysm "cavity" volume (mL)	9.3	14.7
Ultrasonic examination post pseudoaneurysm close	negative	negative
Hospital stay post pseudoaneurysm closure (d)	1	1



**Fig. 7.** Schematic model for percutaneous suture technique with ProGlide on the management of femoral pseudoaneurysms. CFA: common femoral artery; SFA: superficial femoral artery; PFA: profunda femoral artery; PSA: pseudoaneurysm.

in a pulsatile mass and a color flow communicating the mass with the femoral artery are the criteria of CDUS for IFAP diagnosis.<sup>8</sup>

There are several alternative treatments for IFAP. Operative repair is the classical way to treat femoral pseudoaneurysms, especially for the unstable types, such as those secondary to major trauma or injection. For the past few years, a number of non-surgical treatment options have been applied, including ultrasound-guided compression treatment, thrombin injection as well as covered stent insertion.<sup>9</sup>

In the case report, due to the location of the pseudoaneurysm was close to the femoral artery bifurcation, the covered stent was not recommended. And the size of the pseudoaneurysm is too large to apply coil embolization to the sac. Furthermore, the large size and the short sac limited the use of thrombin injection and increased the risk of embolic complication.

Considering the conditions, we adopted a dual approach strategy. First, use the contralateral access for radiography and alternative balloon occlusion. In view of the swirling of blood flowing in the pseudoaneurysm sac, the neck may not have a clear positioning in the imaging process. To avoid the situation above, pseudoaneurysm sac was directly punctured in order to gain an adequate exposure of the pseudoaneurysm neck. And then, the guide wire was inserted to pass the neck (Fig. 7). Subsequently, percutaneous suture with ProGlide at the neck level was applied as the treatment of pseudoaneurysm. The presented technique showed great superiority in treating incompressible post-interventional pseudoaneurysms. Firstly, the modified closure technique may only cause one puncture of the pseudoaneurysm, which reduced the incidence rate of severe complications. Secondly, pseudoaneurysms with wide and short necks is more suitable to be treated by this interventional closure technique, insist of manual compression and thrombin injection.

Nevertheless, percutaneous suture technique with ProGlide has several limitations. (1) With the new technique, it is difficult to locate the neck of the pseudoaneurysm for the access of the guide wire. It also may prolong the time under fluoroscopy. (2) It is difficult to visualize the puncture site of the pseudoaneurysm with a massive sac even with the ultrasonic investigation. (3) The pseudoaneurysm with a broad neck may unable to be completely sutured by one ProGlide suture device. Therefore, large scale further studies are needed to support this clinical application.

Percutaneous suture technique with ProGlide at the neck level provides a novel method for the management of the pseudoaneurysm, especially in those with a wide and short neck. However, more extensive and multicenter studies are needed for the further research.

## Funding

Nil.

## Ethical Statement

All the procedures performed in the case report were approved by the patients and ethics committee.

## Declaration of Competing Interest

The authors declare no conflicts of interest.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cjtee.2019.11.002>.

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