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.

Introduction

Iatrogenic femoral artery pseudoaneurysm (IFAP) is a common complication of endovascular procedures in femoral artery for therapeutic intervention. 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. Manual compression and thrombin injection are the conventional techniques to occlude the pseudoaneurysms. 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. 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 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
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.

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

**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.

**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 cavity 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.

**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. Besides discomfort and delayed hospital discharge of the patients, IFAP may be accompanied with complications, which including rupture, distal embolization and local ischemia. Once patients were considered with pseudoaneurysm, CDUS was recommended. A swirling color flow

| 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 pseudoaneurys closure (d) | 1         | 1          |
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.

**References**

1. ALTUNBAS G, SUCU M. Ultrasound guided compression for iatrogenic femoral artery pseudo aneurysms. Ann Vac Surg. 2018;49:321. https://doi.org/10.1016/j.avsg.2018.01.065.
2. WEBBER GW, JANG J, GUSTAVSON S, et al. Contemporary management of post-catheterization pseudoaneurysms. Circulation. 2007;115:2666–2674. https://doi.org/10.1161/CIRCULATIONAHA.106.681973.
3. ALPIN A, ERDOGAN MO, YUZUFOLGU K, et al. Femoral artery pseudoaneurysm due to a gunshot injury. J Pak Med Assoc. 2018;68:130–132.
4. MISHRA A, RAO A, PIMPALWARY. Ultrasound guided percutaneous injection of thrombin: effective technique for treatment of iatrogenic femoral pseudoaneurysms. J Clin Diagn Res. 2017;11:4–6. https://doj.org/10.7860/JCDR/2017/25582.9512.
5. HUSEYIN S, YUKSEL V, SIVRI N, et al. Surgical management of iatrogenic femoral artery pseudoaneurysms: a 10-year experience. Hippokratia. 2013;17:332–336.
6. SABLANI N, JAIN G, HASAN MM, et al. A novel approach to the management of carotid blowout syndrome: the use of thrombin in a case of failed covered stenting. J Neurointerv Surg. 2016;8:e49.
7. YOO T, STARR JE, GO MR, et al. Ultrasound-Guided thrombin injection is a safe and effective treatment for femoral artery pseudoaneurysm in the morbidly obese. Vasc Endovasc Surg. 2017;51:368–372. https://doi.org/10.1177/1538574417708727.
8. QCQ W, GUO W, LIU S, et al. Pseudoaneurysm diagnosed by endoscopic ultrasoundography via color Doppler flow mapping and contrast enhancement. J Dig Dis. 2018;19:112–114. https://doi.org/10.1111/1751-2980.12569.
9. BLANCO P, GODOY C, TORRE M. Common femoral artery pseudoaneurysms. Intensive Care Med. 2016;42:2087–2088. https://doi.org/10.1007/s00134-016-4274-y.