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CASE REPORT

Rapid hemostasis of the residual inguinal access sites during endovascular procedures: A case report

Hyangkyoung Kim, Kwangjin Lee, Sungsin Cho, Jin Hyun Joh

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Hyangkyoung Kim, Department of Vascular Surgery, Kyung Hee University Hospital at Gangdong, Seoul 05278, South Korea

Kwangjin Lee, Sungsin Cho, Jin Hyun Joh, Department of Surgery, Kyung Hee University Hospital at Gangdong, Seoul 05278, South Korea

Corresponding author: Jin Hyun Joh, MD, PhD, Professor, Department of Surgery, Kyung Hee University Hospital at Gangdong, 892 Dongnam-ro, Gangdong-gu, Seoul 05278, South Korea. jhjoh@khu.ac.kr

Abstract

BACKGROUND

In endovascular procedures including total percutaneous endovascular aneurysm repair (pEVAR), percutaneous access through the common femoral artery is most commonly performed. Access-site bleeding is a major concern in percutaneous techniques. Herein, we present a case of successful control of continuous oozing using a vascular closure device (VCD) and the application of Surgicel (Johnson & Johnson, United States) over the access tract.

CASE SUMMARY

An 82-year-old man presented with an unruptured abdominal aortic aneurysm measuring 83 mm × 75 mm. The patient had a medical history of atrial fibrillation and was receiving rivaroxaban (15 mg/d). Routine pEVAR was performed using the preclose technique with ProGlide (Abbott, Santa Clara, CA, United States). Significant amount of bleeding was observed at the end of the procedure after the deployment of the closure device at the access site. A sheet of Surgicel was applied to the suture thread using a surgical needle. Surgicel was applied to the surface of the artery along the access tract using a pusher, and hemostasis was immediately attained.

CONCLUSION

This simple technique is an excellent adjunct to control residual bleeding from the access site following VCD use.

Key Words: Endovascular procedures; Punctures; Hemostasis; Hemostatic techniques; Femoral artery; Case report

Core Tip: Endovascular procedures, including percutaneous endovascular aneurysm repair, usually involve vascular access through the common femoral artery. Vascular closure devices (VCDs) are being increasingly used to achieve hemostasis. When continuous oozing is observed after the application of the VCD, Surgicel can be applied to the arterial surface along the VCD suture thread using a pusher. Surgicel is a simple and cost-effective hemostatic adjunct.

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INTRODUCTION

Vascular surgery has radically shifted from traditional open surgery to percutaneous endovascular intervention in recent decades. In most endovascular procedures, including percutaneous endovascular aneurysm repair (pEVAR), the common femoral artery is the most commonly used vascular access site. Vascular closure devices (VCDs) are often used to avoid open closure of the puncture site, particularly when the procedure is associated with a larger sheath. During pEVAR, the preclose technique, which usually entails using two Perclose ProGlide closure devices (Abbot Vascular, Santa Clara, CA, United States), is widely used[1]. With successful and rapid hemostasis, the potential benefits of successful and rapid hemostasis include a shorter surgical duration, less need for transfusions, better management of patients on anticoagulants, a decrease in patient recovery time, and reduced wound exposure[2]. However, residual access-site bleeding is commonly encountered when using the suture-based closure mechanism.

The oxidized regenerated cellulose, Surgicel (Johnson & Johnson, New Brunswick, NJ, United States) is commonly used to control bleeding in various open vascular surgeries. Herein, we report a simple technique to achieve rapid hemostasis in residual access-site bleeding by using a Surgicel-assisted technique.

CASE PRESENTATION

Chief complaints

An 82-year-old man presented with a fist-sized pulsating mass in the periumbilical region.

History of present illness

Symptoms appeared 1 mo before presentation.

History of past illness

The patient had moderate-to-severe stenosis of both internal carotid arteries, stable angina, and atrial fibrillation. He was receiving rivaroxaban 15 mg/d and cilostazol 200 mg/d. He had recently developed cerebral infarction in the region supplied by the middle cerebral artery.

Personal and family history

The patient had no family history of abdominal aortic aneurysms.

Physical examination

On physical examination, the patient's vital signs were stable. A pulse was palpable over both the common femoral and pedal arteries.

Laboratory examinations

All coagulation parameters were within the normal ranges.

Imaging examinations

Contrast-enhanced abdominopelvic computed tomography (CT) revealed an unruptured abdominal aortic aneurysm measuring 83 mm × 75 mm (Figures 1A and B).

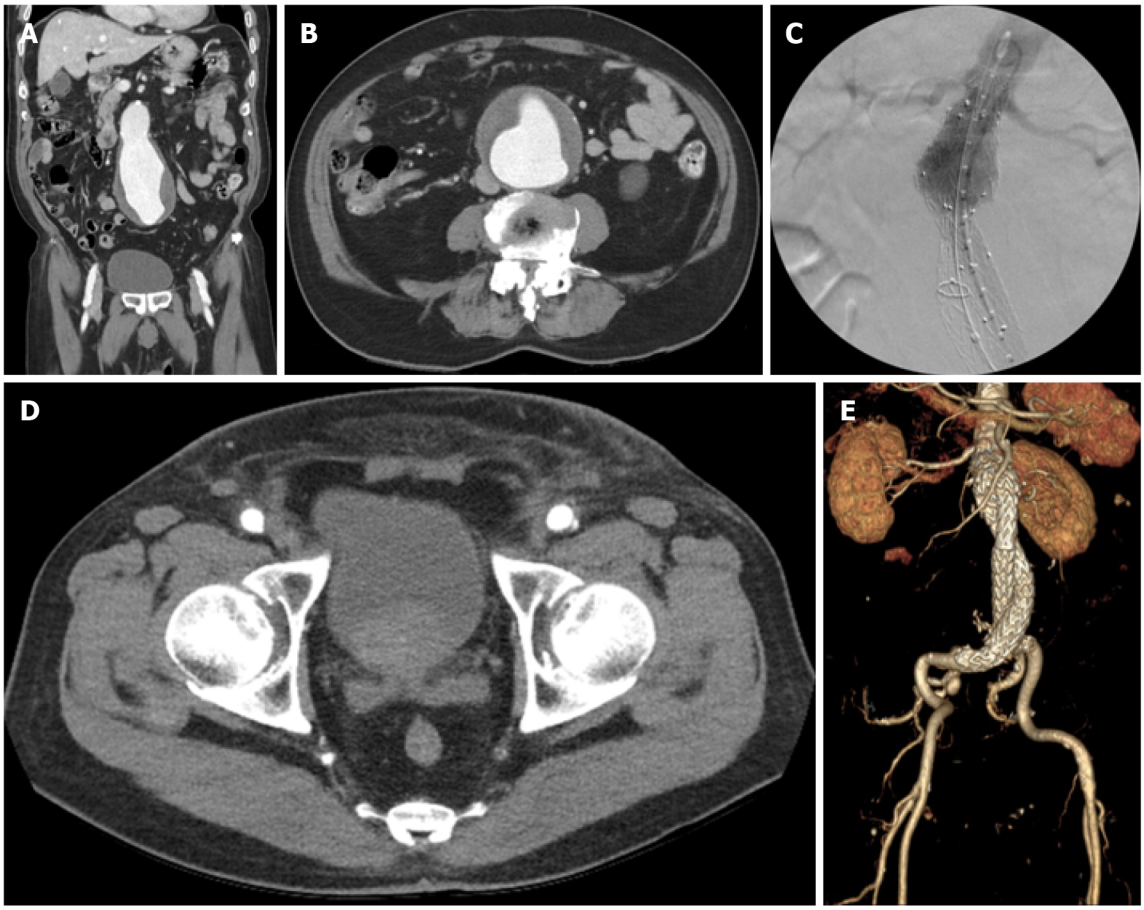

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Figure 1 computed tomography scan of the patient with an abdominal aortic aneurysm. A: Coronal view of the preoperative computed tomography (CT); B: Cross-sectional view of the preoperative CT; C: Intraoperative completion angiogram of the aortic neck; D: Cross-sectional view of the bilateral access sites of the postoperative CT scan: E: Volume-rendered image of the postoperative CT scan.

FINAL DIAGNOSIS

The final diagnosis was an unruptured abdominal aortic aneurysm.

TREATMENT

Under general anesthesia, the bilateral common femoral arteries were accessed using a micropuncture set under ultrasound guidance. Two close ProGlides were applied to each common femoral artery, and heparin 3000 IU was administered after successfully implementing the preclose technique. The activated clotting time was 332 s. Routine EVAR was performed using an Endurant II (Medtronic Cardiovascular, Minneapolis, MN, United States) main body endograft measuring 36 mm × 14 mm × 103 mm. The main body was introduced through the left common femoral artery. A 16 mm × 20 mm × 124 mm Endurant II limb endograft was subsequently inserted *via* the right femoral artery after successful cannulation of the contralateral gate. Finally, a 16 mm × 20 mm × 156 mm Endurant II limb endograft was inserted through the left common femoral artery. Following molding balloon angioplasty using a Reliant balloon catheter (Medtronic Cardiovascular, Minneapolis, MN, United States), a completion angiogram revealed a type Ia endoleak. A 36 mm × 36 mm × 49 mm Endurant II aortic cuff was used to control the endoleak. Eventually, EVAR was successfully performed (Figure 1C). The total procedure time was 59 min.

At the end of the procedure, residual access-site bleeding persisted on the patient's right side. We applied a gel-foam sponge for several minutes; however, bleeding persisted. Therefore, we implemented Surgicel-assisted hemostasis (see Video core tip). The detailed steps of this technique are illustrated in Figure 2. During compression, proximal to the access site, small pieces of Surgicel were sutured onto the suture thread of the ProGlide device using a surgical needle. Surgicel was inserted into the access tract opening using surgical forceps and pushed further onto the surface of the arterial wall using a pusher. Immediate postoperative hemostasis was achieved.

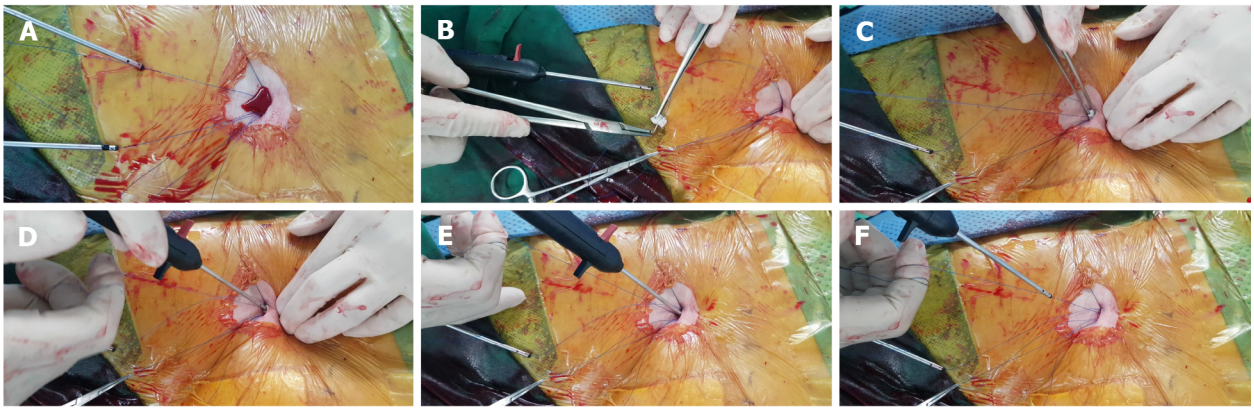

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Figure 2 Surgical-assisted hemostasis technique. A: After the successful deployment of the 2 ProGlide, substantial oozing was observed at the access site; B: Small piece of rolled Surgicel was sutured over the ProGlide suture thread through the empty needle; C: The attached Surgicel was placed at the access-site opening; D: The Surgicel was inserted onto the arterial wall along the suture thread with the pusher, E: Mild compression was applied with the pusher; F: Complete hemostasis was achieved.

OUTCOME AND FOLLOW-UP

A postoperative CT revealed no hematoma or other complications (Figures 1D and E). One month postoperatively, the patient exhibited no access-site complications.

DISCUSSION

EVAR is associated with lower perioperative mortality and early recovery[3,4], reinforcing its use as a primary treatment modality for abdominal aortic aneurysms. EVAR traditionally requires the cut-down of both common femoral arteries. The introduction of pEVAR using a VCD has further reduced the invasiveness of EVAR and is currently the preferred option for treating patients with aortic aneurysms at many centers[5]. However, the failure of closure devices after percutaneous access increases the risk of complications associated with pEVAR[6]. Similar to pEVAR, in other percutaneous peripheral interventions performed *via* access through the common femoral artery, perioperative complications are predominantly related to the access sites. Vascular surgeries are frequently performed under systemic heparinization, which may contribute to intraoperative bleeding or postoperative complications. In cases of VCD failure following percutaneous access, the currently used adjunctive procedures are external manual compression, additional VCD, fascial closure, or cut-down. These maneuvers are associated with patient and physician discomfort, increased medical costs, and potential complications [7,8].

Surgical, an oxidized cellulose, is a widely used hemostatic material. Cellulose acquires hemostatic and bactericidal properties after oxidization, and its low pH stimulates vessel constriction and platelet activation to stimulate the formation of a temporary platelet plug[9]. It is biodegradable and is completely absorbed within 4-8 wk[2]. Due to these characteristics, it is often used in open vascular surgery. However, it is not commonly used in percutaneous endovascular procedures because the vessel is not exposed.

In our case, preoperative anticoagulation with rivaroxaban, intraoperative heparin administration, and a short procedure time failed to achieve complete hemostasis after pEVAR. The reversal of heparin's effect using protamine sulfate was considered inappropriate because of the patient's history of recent cerebral infarction and atrial fibrillation. External manual compression with a gel-foam sponge was attempted; however, it was ineffective. Significant bleeding was observed, and we used a novel Surgicel-assisted hemostasis method to achieve focused compression and activate the local hemostatic cascade. Because a suture-based closure device was used, the suture thread and pusher were available, which could guide the Surgicel toward the arterial wall. Immediate hemostasis was successfully achieved, and removal was not required.

A previous literature review reported the use of a polytetrafluoroethylene pledget (CR Bard, Tempe, Ariz, United States)[10]. This method involved subcutaneous dissection and placement of an 18-gauge needle to allow the pledget to slip toward the arterial puncture site. However, in our case, the conformability of Surgicel allowed its delivery only with a pusher when attached to the suture thread. Moreover, Surgicel is an excellent choice owing to its bactericidal properties and biodegradability. It is more economical than other hemostatic materials or additional use of VCDs. Thus, Surgicel application at the access tract provides several potential benefits in endovascular procedures.

Some safety issues are associated with the use of Surgicel. Surgicel has the potential to swell and absorb 7-10 times its weight; therefore, it should not be used in closed spaces[2]. In our case, only a 5 mm × 25 mm piece was adequate. Another potential safety concern is the risk of hypersensitivity reactions, although it has rarely been reported[11]. The limitation of this technique is that it can only be used to reinforce suture-based closure devices and is unsuitable for clip- or plug-based closure devices. Furthermore, it requires a successful initial VCD deployment. However, we believe that this technique is a promising adjunct for percutaneous endovascular procedures.

CONCLUSION

Surgicel-assisted hemostasis is a simple and excellent adjunct for controlling residual access-site bleeding after VCD deployment.

FOOTNOTES

Author contributions: Kim H and Joh JH contributed to manuscript writing, editing, and data collection; Lee K and Cho S contributed to critical review; Joh JH contributed to conceptualization and supervision; and all authors have read and approved the final manuscript.

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ORCID number: Hyangkyoung Kim 0000-0002-2021-815X; Kwangjin Lee 0000-0002-9788-6762; Sungsin Cho 0000-0003-2502-4204; Jin Hyun Joh 0000-0002-8533-6755.

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