Case Report

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Extraanatomic bypass grafting in a patient with an infected femoral defect caused by a rollover accident: a case report

Dae Sung Ma, MD1,2, Dong Hun Kim, MD1,3, Jae-Wook Ryu, MD, PhD2, Sung Wook Chang, MD1,2

1Trauma Center, Dankook University Hospital, Cheonan, Korea
2Department of Thoracic and Cardiovascular Surgery, Dankook University Hospital, Cheonan, Korea
3Department of Surgery, Dankook University Hospital, Cheonan, Korea

A 59-year-old male patient presented to the emergency department after a tractor rollover accident. His Injury Severity Score was 41 points. He had multiple pelvic bone fractures and a left common femoral artery injury with soft tissue loss. The injured arteries with skin defect were initially managed with endarterectomy and primary repair. However, the sepsis secondary to the infection from a skin defect became uncontrolled. The infected wound developed massive hemorrhage from the repaired arteries. Supportive measures were initiated to achieve hemostasis but unsuccessful. We performed an anastomosis with a prosthetic graft from the common iliac artery to the femoral artery above the knee, avoiding the wound through the lateral side of the anterior superior iliac spine. After revascularization, the patient recovered uneventfully. An extraanatomic graft reconstruction should be considered early when the autologous vein is unsuitable.

Keywords: Femoral artery; Wounds and injury; Prostheses and implants; Infections; Case report

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Correspondence to
Sung Wook Chang, MD
Trauma Center, Department of Thoracic and Cardiovascular Surgery, Dankook University Hospital, 201 Manghyang-ro, Dongnam-gu, Cheonan 31116, Korea
Tel: +82-41-550-6195
E-mail: changsw3@naver.com

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Angiography revealed active bleeding of the left inferior gluteal and pudendal arteries, a cutoff sign for the left common femoral artery. After embolization, we explored the femoral artery and found a thrombus and ruptured atherosclerotic plaque. Thrombectomy through longitudinal arteriotomy (about 2 cm) with a Fogarty catheter was performed in the distal and proximal parts of the vessels, followed by endarterectomy and primary repair. After revascularization, gauze was packed onto the inguinal wound due to bleeding from a fractured acetabulum. We then performed an exploratory laparotomy. Segmental resection and anastomosis of the sigmoid colon, gauze packing, and temporary abdominal closure with a saline bag silo were done. The patient's vital signs were stable on postoperative day 1, but urine output was low. Thus, continuous renal replacement therapy was applied. We closed the abdominal and inguinal wounds 2 days later.

Exudates were observed from the inguinal wound on postadmission day 6; therefore, we irrigated the wound and applied a betadine-soaked dressing. The skin defect size increased to about 20 cm, and the repaired femoral artery was exposed (Fig. 1). In addition, he developed sustained limb edema, and his condition met the severe sepsis criteria according to the 2012 Sepsis Guidelines [2]. On postadmission day 15, the exposed vascular site was checked for integrity, and vacuum-assisted closure as primary therapy in the groin was applied after covering the exposed site with adjacent tissue.

On postadmission day 18, a massive hemorrhage occurred from the repaired femoral artery through the vacuum-assisted closure system. We repaired and reinforced the artery with a relatively fresh fasciocutaneous flap from the adjacent tissue. However, rebleeding was observed 5 days later. After bleeding control, angioplasty with a bovine patch was applied, as the previous arteriotomy edge showed friability and inflammatory changes. However, 5 days later, the sutures were reinforced with pledges due to bleeding at the patch angioplasty site. Three days after the previous operation, recurrent bleeding resulted from inflammation and infiltration at the patch angioplasty site. Ceftriaxone as an initial empirical antibiotic was administered, a combination of piperacillin and tazobactam (Zosyn; Wyeth, Philadelphia, PA, USA) was then administered as escalation before culture, and subsequently tigecycline for multidrug-resistant *Acinetobacter baumannii*, colistin for tigecycline-resistant *A. baumannii*, and vancomycin for methicillin-resistant *Staphylococcus aureus* were consecutively given based on microbiological culture results from the wound. Despite the dressing and appropriate antibiotics based on culture sensitivity, the groin infection was uncontrolled and, according to the depth of involvement (Szilagyi classification) [3], it was defined as a grade III infection with vascular graft involvement. Therefore, we decided to perform the bypass grafting via an extraanatomic pathway.

We created an anastomosis with a ringed polytetrafluoroethylene (PTFE) graft from the common iliac artery to the femoral artery above the knee on postadmission day 36. The extraanatomic graft (like a lateral femoral bypass) was placed on the lateral side of the anterior superior iliac spine to avoid cross-contamination. The final steps of the operation included local debridement, resection of the infected artery, and oversewing the deep and superficial femoral arteries.

After revascularization, the wound was managed effectively, and the infection was controlled. Vascular computed tomography showed good graft patency (Fig. 2). A split-thickness skin graft from the right thigh was applied on postadmission day 72, and he was discharged home on postadmission day 94 without any complaints (Fig. 3).

![Fig. 1. Significant soft tissue defect with an uncontrolled infection. Arrow indicates the left femoral artery.](https://doi.org/10.20408/jti.2021.0005)
DISCUSSION

The optimal treatment for a patient with multiple trauma including a torso injury is difficult. In these patients, skeletal injuries complicated by vascular injuries are potentially fatal; these cases require a multidisciplinary intervention and can lead to limb loss and mortality if they are not appropriately managed. In general, after stabilization of the critical condition, the surgical procedure is based on reversing ischemia and controlling hemorrhage [4]. As a treatment for ischemia due to vascular injury, primary repair is more feasible for minor vascular injuries, whereas interposition with an autologous venous graft is more appropriate for major injuries [4].

In this case, endarterectomy and thrombectomy via arteriotomy for reversing ischemia were performed because the injured femoral artery was grossly free and soft tissue loss was relatively small. However, despite routine antibiotic prophylaxis and using appropriate antibiotics based on culture sensitivity, severe sepsis occurred. Furthermore, reinforcement and angioplasty for hemorrhage from the repaired artery failed.

In the setting of sepsis, a prosthetic vascular graft is not commonly chosen. For patients requiring a bypass, an autologous graft is more favorable because a prosthetic graft is more susceptible to infection and thrombosis, particularly in patients with sepsis or at high risk of infection [4,5]. In addition, in cases of prosthetic infection after surgery for arterial disease, reconstruction with an autologous vein provides good potential for salvaging limbs and life [6]. Despite the risks above, in our case, a prosthetic graft was used in the setting of femoral sepsis with significant soft tissue loss because the saphenous vein had an insufficient length and diameter for graft reconstruction.

Some alternative methods exist for this condition, such as a sartorius muscle rotation flap on femoral vessels, a rifampicin-soaked graft, or a cryopreserved human allograft [7–9]. Certain studies have reported that the use of a bioactive heparin-treated expanded PTFE graft could provide more favorable outcomes, with a reduced incidence of the above-mentioned
complications such as thrombosis and amputation, making it a potential alternative if an autologous saphenous vein is unavailable [10]. Vascular reconstruction by extraanatomic bypass with a ringed PTFE graft is also favorable for patients with vascular graft infection manifesting in the groin [11]. In this situation, as with inguinal-area infections, obturator bypass would be preferred [12]. Madden et al. [13] showed that lateral femoral bypass can be an alternative approach.

Extraanatomic bypass with a prosthetic vascular graft is technically challenging in the setting of sepsis, but revascularization with a synthetic graft through an extraanatomic route can be successful. Of course, an autologous vein is more favorable for bypass to avoid thrombosis and uncontrolled infection. However, if an autologous vein is unsuitable because of the patient’s medical condition or the length of the vein, interpositioning an extraanatomic graft that avoids the infected surgical site can be considered early.

NOTES

Ethical statements
This study was approved by the Institutional Review Board of Dankook University Hospital (No. DKUH 2022-06-29) and the requirement for informed consent was waived.

Conflicts of interest
The authors have no conflicts of interest to declare.

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Project administration: SWC; Visualization: DSM; Writing—original draft: SWC; Writing—review & editing: all authors. All authors read and approved the final manuscript.

REFERENCES