Research Article

E Journal of Cardiovascular Medicine

EJCM 2022;10(3):110-113

DOI: 10.32596/ejcm.galenos.2022.2021-12-074

Reconstruction of a Prosthetic Vascular Graft Infections in the Femoral Region with Gracilis and Sartorius Muscle Flaps

Cengiz Ovalı, Tarık Taştekin

Eskişehir Osmangazi University Faculty of Medicine Hospital, Clinic of Cardiovascular Surgery, Eskişehir, Turkey

Abstract

Objectives: To present early and midterm results of our patients treated using gracilis muscle flap for prosthetic vascular graft (PVG) infections located the femoral region.

Materials and Methods: Eight patients admitted to our clinic between January 2012 and August 2016 and treated using gracilis muscle flap owing to PVG infection in the femoral region were included in the current study. Contents of hospital files of the patients with PVG infection were thoroughly evaluated and recorded. Additionally, routine biochemical tests, Doppler ultrasonography, computed tomography; angiography wound site and blood culture results pertaining to the patients were also evaluated in detail.

Results: In the present study, we treated 8 patients (5 males and 3 females) using gracilis muscle flap. Their average age was 58±8.9 (39-67) years. All the patients showed graft infections spreading to the subcutaneous tissues (Szilagyi grade III). While the prosthetic grafts used in 6 patients were Polytetrafluoroethylene (PTFE), they were Dacron in 2 patients. Moreover, 6 infections occurred in the early period while 2 infections occurred in the late period. The pathogens causing graft infections were identified to be staphylococcus aureus in 3 patients, staphylococcus epidermidis in 1 patient and polymicrobial in 4 patients. Furthermore, while graft occlusion was noted in one of the patients, a 2 cm opening was noticed distal to the skin incision in another patient. There was no loss of limb and mortality in any of the patients we presented here and they were fully recovered.

Conclusion: The present results indicate that gracilis muscle fiber reconstruction in PVG infections is an effective and feasible alternative in order to covering the area exposed to infection and rescuing prosthetic graft material.

Keywords: Prosthetic graft, infection, gracilis, vascular, flap

Address for Correspondence: Tarık Taştekin, Eskişehir Osmangazi University Faculty of Medicine Hospital, Clinic of Cardiovascular Surgery, Eskişehir, Turkey

Phone: +90 505 468 04 56 **e-mail:** tariktastekin@gmail.com **ORCID:** orcid.org/0000-0003-4919-9981

Received: 17.12.2021 **Accepted:** 17.08.2022

Cite this article as: Ovalı C, Taştekin T. Reconstruction of a Prosthetic Vascular Graft Infections in the Femoral Region with Gracilis and Sartorius Muscle Flaps. EJCM 2022;10(3):110-113.
DOI: 10.32596/ejcm.galenos.2022.2021-12-074

Introduction

In patients presenting with peripheral arterial disease, prosthetic grafts have a critical place in cases where medical and endovascular treatments are insufficient[1]. Pringle first reported the use of vein grafts in vascular surgery in 1913[2]. In the last 50 years, the use of grafts has become widespread with the development of surgical techniques and the increase in graft quality. Synthetic grafts such as dacron and polytetrafluoroethylene (PTFE) are widely used in vascular surgery. we also preferred these grafts in our clinic. The widespread use of grafts in vascular surgery has resulted in mortal complications such as graft infection[3]. After prosthetic vascular graft (PVG) infection, patients may continue to be hospitalized for a long time. Operations such as debridement, vacuum-assisted closure (VAC), graft removal, amputation may be needed. The clinical classification of PVG infections was first revealed by Szilagyi et al.[4] (Table 1).

The most common site of graft infection, particularly in overweight patients, is the inguinal region. The patient's skin flora contamination and postoperative wound care difficulties cause it. It shows that the incidence of PVG infection is between 3% and 6%[5]. The most common pathogen in these infections is *Staphylococcus aureus*. Other pathogens include *Staphylococcus epidermidis, Escherichia coli, Pseudomonas, Klebsiella, Proteus, Enterobacter*[5]. In cases where conservative treatments such as antibiotic therapy, debridement, and VAC are insufficient, muscle flaps are one of the most effective methods for fighting an infection. It increases blood supply in the graft area and shortens the recovery period. We present the early and mid-term results of patients we treated with sartorius and gracilis muscle flaps in PVG infections in the femoral region[6].

Table 1. Szilagyi classification in prosthetic graft infections

Grade 1	Infection only in the dermis
Grade 2	No graft involvement, infection in the subcutaneous area
Grade 3	Graft infected

Materials and Methods

Between January 2012 and January 2021, 14 patients treated with muscle flap (gracilis muscle flap in 11 patients, sartorius muscle flap in 3 patients) due to PVG infection in the femoral region in our clinic were included in the study. Additionally, routine biochemical tests, Doppler ultrasonography, computed tomography; angiography wound site and blood culture results about the patients were also evaluated in detail.

Muscle flaps preparation and surgical procedure

First, the periphery of the infected graft and the inguinal region are debrided. The medial circumflex femoral artery, which supplies the gracilis muscle, is preserved. the gracilis muscle is then dissected. The distal gracilis muscle is excised and released. The proximal pedicle was preserved and placed over a prosthetic graft. The same procedure is performed for the sartorius muscle while preserving the superficial femoral artery branch that feeds it.

Results

In this study, we treated 14 patients (9 males and 5 females) using muscle flap. Their average age was 59±8.7 (39-69) years. All the patients showed graft infections spreading to the subcutaneous tissues (Szilagyi grade III). The prosthetic grafts used in 6 patients were PTFE, Dacron was used in 8 patients. Moreover, 11 infections occurred in the early period while 3 infections occurred in the late period. The pathogens causing graft infections were identified to be staphylococcus aureus in 5 patients, staphylococcus epidermidis in 2 patients, and polymicrobial in 7 patients. Furthermore, graft occlusion was noted in a patient, a 2 cm opening was noticed distal to the skin incision in another patient. In two of our patients, the infection continued despite the treatment and graft had to be removed. In one of our patients trans-obturator iliofemoral bypass was performed with a PTFE graft due to the development of critical leg ischemia. There was no loss of limb and mortality in any patient we presented here and they were fully recovered (Table 2).

Discussion

It is critical to attach importance to sterility in operations using PVGs. If the graft is infected, the eradication of the infection is a very difficult process. At the end of this process, post-sespsis mortality, removal of the graft and limb amputation may result. Our first goal in treatment is to start the antithiotherapy appropriate for the wound culture and to clean the wound site by debriding[2,3]. Calligaro et al.[7] achieved 71% success by using debridement, antibiotic and povidone-iodine wound care dressings in patients with prosthetic graft infection and reported a mortality rate of 12% and amputation of 4%.

VAC, which we frequently use in our clinic, is a very effective type of treatment[8]. In particular, we treat many patients with Szilagyi I-II infections through the application of VAC without the need for any other intervention. In the application of negative-pressure wound therapy to patients with Szilagyi III infection, Pinocy et al.[9] reported that the treatment alone was successful in all patients in the study. In the negative pressure wound treatment method, complications that should be considered due to the pressure applied to the arterial system are bleeding and the development of pseudoaneurysm[8]. Although it is unsuccessful in treatment, it can be used to encourage granulation tissue before the muscle flap is applied.

There are many studies advocating the use of muscle flaps for treating patients with Szilagyi III infection[10]. Muscles that can be used as muscle flaps include the sartorius, rectus abdominis, rectus femoralis and gracilis muscles. A pedicled muscle flap provides a favorable environment for vascularization in the infected graft site, increases the oxygen pressure and increases the ability of macrophages to fight infection. The increased blood flow allows antibiotics to be transported more easily to the site of infection.

Creating a gracilis muscle flap is more difficult than creating a sartorius flap. However, there are some advantages of using the gracilis muscle flap[11] (Table 3).

Before being used as a muscle flap, the presence of stenosis or occlusion in the artery feeding this muscle should be evaluated with CT angiography or angiography. Necrosis develops in the muscle flap with blood supply

Table 2. Operational data

	n	%
Previous operation and prosthetic graft used	14	100
Aorta-femoral graft bypass, dacron	4	28.5
Femoro-popliteal graft bypass, dacron	4	28.5
Femoro-popliteal graft bypass, PTFE	6	43
Pathogenic microorganism		
Staf. Aureus	5	36
Staf. Epidemidis	2	14
Polymicrobial	7	50
According to Szilagyi calcification presence of grade III infection	14	100
Treatments before the procedure		
Antibiotic and debridement	14	100
Negative pressure wound therapy	14	100
Use of the gracilis muscle as a graft	11	79
Use of the sartorius muscle as a graft	3	21
Complications	4	28
Graft occlusion	1	7
Wound dehiscence	1	7
Continuation of infection	2	14
Limb loss	0	0
Treatment success	12	85
Mortality	0	0

Table 3. Comparison of gracilis and sartorius muscle flaps

Gracilis muscle flap	Sartorius muscle flap
It is more difficult to prepare.	It is easier to prepare.
The gracilis muscle is supplied by the profunda femoral artery. The profunda femoral artery is more protected from atherosclerosis than the superficial femoral artery. Meanwhile high oxygenation accelerates wound healing.	The sartorius muscle is supplied by the superficial femoral artery. Atherosclerosis can impair the nutrition of the muscle flap.
When used as a flap, it does not reduce extremity movements much.	It causes difficulty in lower extremity flexion movement.

disorder and treatment fails. We believe that these evaluations, which we have done preoperatively in our clinic, are of great importance in the success of treatment.

Conclusion

Because of this study, we see that sartorius and gracilis muscle flap reconstruction is a successful method in eliminating the infection and accelerating wound healing in cases resistant to negative pressure wound treatment with antibiotherapy and debridement after PVG infection.

Ethics

Ethics Committee Approval: Ethics committee approval was not obtained for our study.

Informed Consent: Consent of the patients included in the study was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Ovalı C, Taştekin T, Concept: Ovalı C, Taştekin T, Design: Ovalı C, Taştekin T, Data Collection and/or Processing: Ovalı C, Taştekin T, Analysis of Interpretation: Ovalı C, Taştekin T, Literature Search: Ovalı C, Taştekin T, Writing: Ovalı C, Taştekin T.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: No financial resources have been used for this article.

References

1. Rychlik IJ, Davey P, Murphy J, O'Donnell ME. A meta-analysis to compare Dacron versus polytetrafluroethylene grafts for above-knee femoropopliteal artery bypass. J Vasc Surg 2014;60:506-15.
2. Fletcher JP, Dryden M, Sorrell TC. Infection of vascular prostheses. Aust NZ J Surg 1991;61:432-5.
3. Lorentzen JE, Nielsen OM, Arendrup H, et al. Vascular graft infection: an analysis of sixty-two graft infections in 2411 consecutively implanted synthetic vascular grafts. Surgery 1985;98:81-6.
4. Szilagyi DE, Smith RF, Elliott JP, Vrandecic MP. Infection in arterial reconstruction with synthetic grafts. Ann Surg 1972;176:321-33.
5. Saleem BR, Meerwaldt R, Tielliu IF, Verhoeven EL, van den Dungen JJ, Zeebregts CJ. Conservative treatment of vascular prosthetic graft infection is associated with high mortality. Am J Surg 2010;200:47-52.
6. Graham RG, Omotoso PO, Hudson DA. The effectiveness of muscle flaps for the treatment of prosthetic graft sepsis. Plast Reconstr Surg 2002;109:114-5.
7. Calligaro KD, Veith FJ, Sales CM, Dougherty MJ, Savarese RP, DeLaurentis DA. Comparison of muscle flaps and delayed secondary intention wound healing for infected lower extremity bypass grafts. Ann Vasc Surg 1994;8:31-7.
8. Verma H, Ktenidis K, George RK, Tripathi R. Vacuum-assisted closure therapy for vascular graft infection (Szilagyi grade III) in the groin-a 10-year multi-center experience. Int Wound J 2015;12:317-21.
9. Pinocy J, Albes J.M, Wicke C, Ruck P, Ziemer G. Treatment of periprosthetic soft tissue infection of the groin following vascular surgical procedures by means of a polyvinyl alcohol-vacuum sponge system. Wound Repair Regen 2003;11:104-9.
10. Armstrong PA, Back MR, Bandyk DF, Johnson BL, Shames ML. Selective application of sartorius muscle flaps and aggressive staged surgical debridement can influence long-term outcomes of complex prosthetic graft infections. J Vasc Surg 2007;46:71-8.
11. Taylor SM, Weatherford DA, Langan EM 3rd, Lokey JS. Outcomes in the management of vascular prosthetic graft infections confined to the groin: a reappraisal. Ann Vasc Surg 1996;10:117-22.