Türk Göğüs Kalp Damar Cerrahisi Dergisi
Turkish Journal of Thoracic and Cardiovascular Surgery

Case Report / Olgu Sunumu

Saphenous venous bypass graft aneurysm following femoropopliteal bypass surgery

Femoral-popliteal baypas ameliyatı sonrası safen ven baypas greft anevrizması

Jan Dieter Schmitto, Kasım Oğuz Coşkun, Sinan Tolga Coşkun, Suyog A. Mokashi, Aron Frederik Popov, Philip Ortmann, Friedrich Albert Schöndube, Masoud Mirzaie

Department of Cardiovascular Surgery, Georg-August-University of Göttingen, Germany

A 38-year-old female patient who underwent a left femoropopliteal bypass surgery 20 years ago admitted with swelling of the left thigh. In the swollen region adjacent to the implanted vein graft, an aneurysm was noted and repaired without complications. The details of the operation are delineated in the following case report.

Key words: Aneurysm; femoropopliteal bypass; vena saphena magna.

Yirmi yıl önce sol femoropopliteal bypass ameliyatı geçirmiş 38 yaşında kadın hasta sol uyluğunda şişme yakınması ile başvurdu. İmplant yapılan ven grefti yanındaki şiş bölgede anevrizma tespit edildi ve komplikasyon olmadan tamir edildi. Ameliyat ayrıntıları olgu sunumunda açıklanmıştır.

Anahtar sözcükler: Aneurysm; femoropopliteal baypas; vena saphena magna.

The choice of the greater saphenous vein (GSV) as a bypass conduit for lower extremity revascularizations has improved long-term durability and complication-free outcomes compared with the use of various synthetic materials.[1] This is especially true when performing revascularization distally, rather than proximally, to the knee joint.[2] The relationship between peripheral occlusive arterial disease and cardiovascular disease justifies the use of the GSV as the premier option for distal peripheral revascularizations. Given this, the GSV has been used in lower extremity revascularizations for several years.

One rare complication associated with the GSV is an aneurysmic extension of the vein graft. In the present case report, we describe an aneurysm in a female patient 20 years after her femoropopliteal bypass operation using the GSV.

CASE REPORT

In 1982, we performed a left femoropopliteal bypass with the ipsilateral GSV in a 38-year-old female patient. The patient had advanced peripheral atherosclerosis, classified as clinical stage 2a according to the Fontaine classification. For 20 years, the patient had an uneventful postoperative course. She then presented with remarkable left lower extremity swelling which was most prominent in the thigh region. On examination, a pulsating swelling on the medial aspect of the left lower extremity was noted without evidence of arterial insufficiency. An initial Doppler sonography to image the left lower extremity showed an extension of an aneurysm in the region of the venous bypass graft. Follow-up magnetic resonance (MR) angiography confirmed the presence of a saccular extension of the femoropopliteal bypass and 4 cm aneurysm neck extending into the medial thigh. Furthermore, while the popliteal artery was patent, the tibial artery was severely atherosclerotic, and the truncus tibioperonealis had a long, extended stenosis. The wall of the aneurysm did not show evidence of dissection (Figure 1).

The patient had a significant history of coronary artery disease. In 1998, she developed a myocardial infarction of the posterior wall and underwent percutaneous coronary angioplasty. Repeated percutaneous interventions were needed as the coronary stents re-occluded. The operation described in this case report was further complicated by the adverse risk factors presented with arterial hypertension and hyperlipoproteinemia. We preceded to remove the vein graft of the femoropopliteal bypass and then implanted

Received: July 13, 2009 *Accepted:* August 14, 2009

Correspondence: Jan Dieter Schmitto, M.D. Department of Cardiovascular Surgery, Georg-August-University of Göttingen, Germany.
Tel: +49-551-39-6012 e-mail: schmitto@med.uni-goettingen.de

Figure 1. (a, b) The femoropopliteal bypass was observed with a saccular, partially thrombotic extension, normal arteria poplitea was normal, advanced artheriosclerosis of the arteria tibialis, a serious stenosis outlet, and a long and extended stenosis of the tractus tibiofibularis.

an 8 mm polytetrafluoroethylene (PTFE) synthetic graft as the femoropopliteal bypass graft (Figure 2a, b).

Methods

Histological investigations

Under sterile conditions, segments of the bypass graft were harvested and fixed in a buffered 3.7% formaldehyde solution at 4 °C for at least 24 hours. Specimens were dehydrated in an ascending series of alcohol and embedded in paraplast using an automatic embedding machine (Histokinette 2000, Reichert-Jung London, UK). Five μm thick serial sections were cut using a Jung-Biocut microtome (Reichert-Jung Biocut; Leica, UK) veya (Leica Biosystems, Wetzlar, Germany) and mounted on glass slides coated with albumin-glycerine. Samples were then deparaffinized and finally stained by conventional techniques [hematoxylin-eosin (HE), Goldner, and van Gieson].

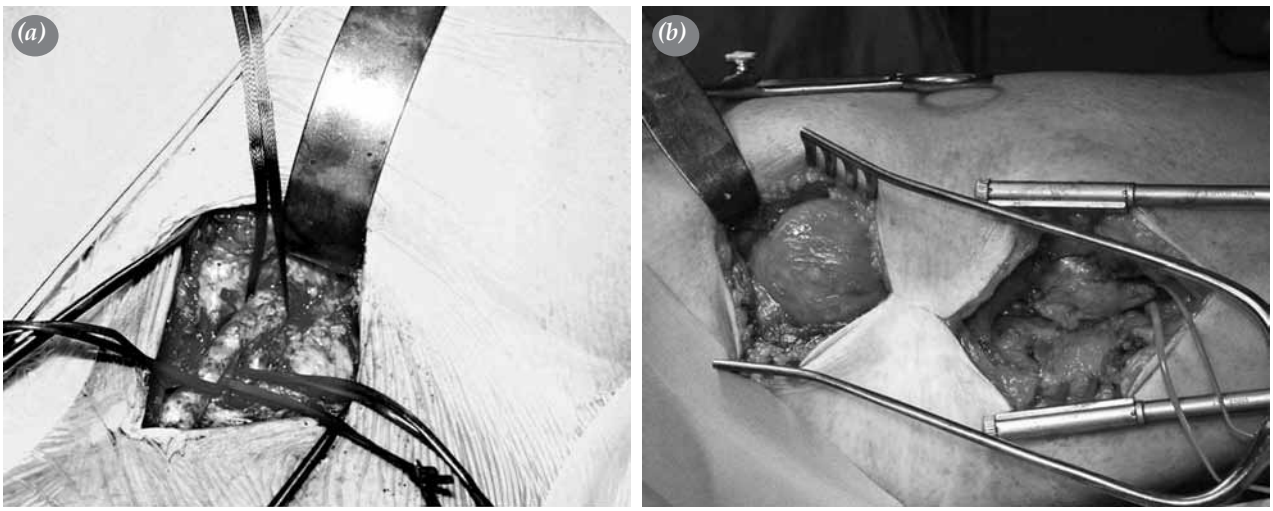

Figure 2. (a, b) Partially saccular aneurysm of the vein graft of the femoropopliteal bypass.

Scanning electron microscopy

To investigate the influence of fixation and anti-calcification methods on the ultrastructure of the vein graft, scanning electron microscopy (SEM) was used. Samples were fixed in 2.5% glutaraldehyde solution, buffered in 0.2 M cacodylate, dehydrated in an ascending series of alcohol (70-80%), and dried in a critical point drier (Polaron). The samples were then sputtered with gold-palladium in a COOL-sputterer (Polaron). The electron microscopic examination was carried out with a digital scanning microscope (DSM 960, Zeiss, Germany).

Histological results

Histologically, the venous segment had evidence of arterial-like changes. The adventitia and endothelium were clearly thickened. The tunica media had become detached from the hyaline plate, symptomatic of hyaline degeneration. Therefore, this indicates an extension of the veins in the form of an aneurysm (Figure 3).

Electron microscopical results

In the SEM, an enormous thickening of the adventitia and tunica media was generally noted which was mainly caused by collagen hyperplasia. However, hyperplasia of the endothelium was less noticeable. In some parts, luminal stenosis due to the hyaline mass was observed which corresponds to demineralised cartilage. In addition, the venous wall had degenerative changes most prominent in the region of the aneurysm (Figure 4).

DISCUSSION

We described the case of a 38-year-old female who underwent femoropopliteal bypass using the GSV 20 years ago who had Fontaine classification stage 2a peripheral arterial occlusion disease. After 20 uneventful postoperative years, the patient presented with left thigh swelling and symptoms of peripheral arterial occlusion. Clinically, Doppler imaging noted a pulsatile swelling on the medial aspect of the left side with a well perfused distal extremity. An ultrasonographic Doppler examination showed an aneurysmatic extension from the venous bypass graft. Follow-up MR angiography showed a saccular, partly thrombotic extension of the femoropopliteal bypass with the widest neck of the aneurysm measuring 4 cm. While the popliteal artery was patent, the anterior tibial artery had atherosclerosis with a prominent stenosis in the truncus tibioperonealis. The wall of the aneurysm was smooth without evidence of dissection. The patient was brought to the operating room for the removal of the aneurysmatic vein graft bypass and placement of a stented, 8 mm PTFE graft for vessel continuity.

The use of the GSV as a bypass conduit for lower extremity revascularization provides improved long-term outcomes compared with the use of synthetic grafts.[3-6] This is especially important in below-knee, lower extremity revascularizations. Greater saphenous vein grafts have been noted to have the rare complication of developing an aneurysm.[7,8] We have described a case with a GSV aneurysm which developed 20 years after the femoropopliteal bypass operation.

The progression of peripheral arterial disease is believed to result from the implanted vein grafts. We have described an alternate mechanism for the development of stenosis in the implanted venous bypass grafts.[9] The development of aneurysms in the internal carotid artery and the suprainguinal bypass as well

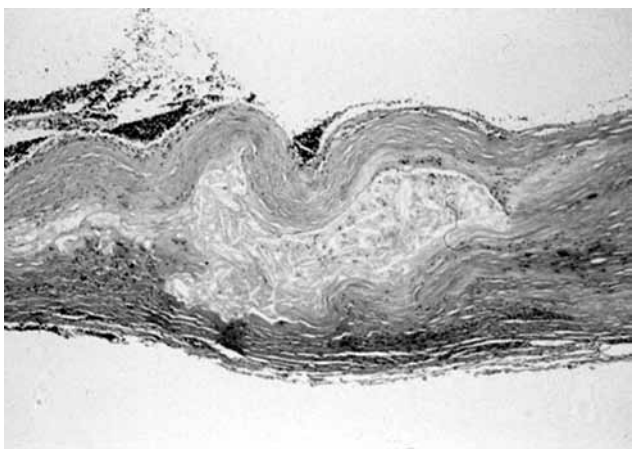

Figure 3. Arterialization of the venous segment and thickening of adventitia and the endothelium; the Tunica media had become detached from the hyaline plate. As a rule, a hyaline degeneration is found in such areas.

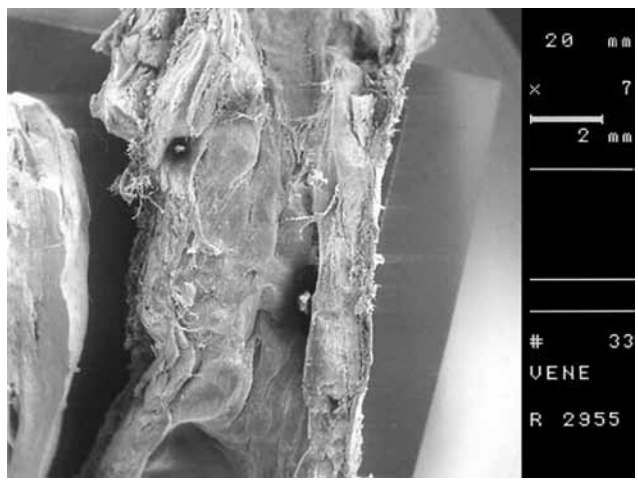

Figure 4. Enormous thickening of the adventitia and tunica media caused by a collagen hyperplasy and stenosis of the lumen due to a hyaline mass were observed.

as the infrainguinal bypass has been described. We found hyaline degeneration of the tunica media with hyperplasia of the collagenous fibers, likely an adaptation process. A clear stenosis of the lumen was present given that the hyaline mass penetrated the lumen in spite of the aneurysm. This makes operative intervention a necessity given the high risk of peripheral thrombosis or embolization. Although we have presented one case, further examination of explanted venous bypass grafts is needed to provide additional details on the etiology of bypass graft aneurysm.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

REFERENCES

1. Sala F, Hassen-Khodja R, Lecis A, Bouillanne PJ, Declemy S, Batt M. Long-term outcome of femoral above-knee popliteal artery bypass using autologous saphenous vein versus expanded polytetrafluoroethylene grafts. Ann Vasc Surg 2003;17:401-7.
2. Grundfest WS, Litvack F, Glick D, Segalowitz J, Treiman R, Cohen L, et al. Intraoperative decisions based on angioscopy in peripheral vascular surgery. Circulation 1988;78:I13-7.
3. Böhmig HJ, Zeidler G, Schwierz T, Loy E. 20 years orthograde venous bypass for infrainguinal arterial reconstruction. Chirurg 1995;66:120-6.
4. Feliciano DV, Herskowitz K, O'Gorman RB, Cruse PA, Brandt ML, Burch JM, et al. Management of vascular injuries in the lower extremities. J Trauma 1988;28:319-28.
5. Fürst G, Kuhn FP, Mödder U. Color coded duplex sonography in the diagnosis of peripheral vascular disease-applications in the evaluation of peripheral aneurysms, follow-up after arterial graft surgery and deep venous thrombosis. Acta Radiol Suppl 1991;377:7-14.
6. van Reedt Dortland RW, van Leeuwen MS, Steijling JJ, Theodorides T, van Vroonhoven TJ. Long-term results with vein homograft in femoro-distal arterial reconstructions. Eur J Vasc Surg 1991;5:557-64.
7. Staudacher M, Bardach G. Aneurysm formation, tearing of the intima and thrombosis in an autologous venous graft of 4 years duration. Vasa 1978;7:277-81.
8. Lemaitre P, O'Regan S, Herba M, Kaye M. Complications in expanded polytetrafluoroethylene arteriovenous grafts: an angiographic study. AJR Am J Roentgenol 1978;131:817-20.
9. Brinck U, Mirzaie M, Korabiowska M, Meyer T. Expression rate of vinculin isoforms in human aortocoronary saphenous vein grafts. Int J Cardiol 1997;59:125-32.