Intraoperative Spasm of Infrainguinal Vein Grafts: Report of Two Cases

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Summary: We report for the first time two cases of vein graft spasm following distal artery bypass in the lower extremity. In the first case, graft spasm occurred in the region just distal to the proximal anastomosis and it resolved without surgical intervention. In the second case, completion angiography showed defective filling around the distal anastomosis. We considered this to be due to technical error, and created another bypass to avoid the stenotic area. However, postoperative angiography revealed that the defective filling was due to graft spasm. Native artery spasm has been reported previously, but graft spasm has not. However, we suggest that graft spasm could be more frequent than previously recognized, and could result in immediate thrombosis of the graft. (J. Jpn. Coll. Angiol., 2003; **43**: 64-66)

Key words: Saphenous vein graft, Graft spasm

Introduction

Intraoperative vasospasm is frequently observed during vascular reconstruction. Native artery or arterial graft spasm during coronary artery bypass grafting (CABG) and native artery spasm during distal artery bypass grafting in the extremities have both been reported.[1-5] There have also been reports of vein graft spasm during CABG.[6, 7] To our knowledge, however, infrainguinal vein graft spasm has not been described previously. Here we report intraoperative spasm of vein grafts in two patients who underwent crural artery bypass.

Case 1

A 53-year-old man, who had been undergoing hemodialysis for 12 years because of chronic renal failure due to glomerulonephritis, developed intermittent claudication in the right calf after walking 100 m. No pulse was palpable in the right foot, and the ankle and toe pressures were 82 and 26 mmHg, respectively; brachial pressure was 228/114 mmHg. Preoperative angiography showed localized obstructive disease in the right proximal popliteal artery (**Fig. 1A**). A diagnosis of arteriosclerosis obliterans was made, and the main cause of the claudication was thought to be obstruction of the popliteal artery. We planned bypass grafting from the superficial femoral artery to the distal popliteal artery with a reversed great saphenous vein (GSV). Under general anesthesia, with the patient supine, the required length of the GSV was harvested through a longitudinal incision in the right thigh. The distal side of the GSV was connected to a syringe with heparinized blood, and the GSV was pumped at the minimum pressure for distention. No problem was encountered with the graft, which was 2.5 to 3.5 mm in diameter. The inflow and outflow arteries were exposed only at the front surface, to avoid injuring the adventitia of the native arteries. After administration of 2000 units of heparin, Esmarch's rubber bandage was applied from the toe to the thigh to evacuate the blood, and a pneumatic tourniquet was fastened around the upper thigh at a pressure of 250 mmHg, to obtain a bloodless field. First the proximal anastomosis was carried out. After release of the tourniquet, the graft was led to the distal popliteal artery through the subsartorial route. The distal anastomosis was completed in a bloodless field obtained using the same method. Although blood flowed through the bypass graft after release of the tourniquet, severe spasm

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Figure 1
A: Preoperative angiography, B: Completion angiography, C: Repeated completion angiography about 20 minutes later.

was found in the graft just distal to the proximal anastomosis, and completion angiography also showed an area of string-like spasm (**Fig. 1B**). Therefore, we applied papaverine hydrochloride locally around the graft. About 20 minutes later, the spasm disappeared, and no stenosis was observed in subsequent operative angiography (**Fig. 1C**). The graft was followed up for 28 months, and at the time of writing it is functioning normally.

Case 2

An 86-year-old man, who had undergone right femoropopliteal artery bypass grafting 12 years previously because of arteriosclerosis obliterans, developed gangrene of the left 3rd and 4th toes. No pulse was palpable below the left knee. Ankle and toe pressures were 50 and 10 mmHg, respectively, and brachial pressure was 170/78 mmHg. As preoperative angiography showed localized 90% stenosis in the left common iliac artery, we first performed percutaneous transluminal angioplasty and stenting. Angiography also revealed multiple stenoses and obstructive disease in the infrainguinal arteries (**Fig. 2A**). We planned sequential bypass grafting from the common femoral artery to the distal popliteal artery and peroneal artery with reversed GSV. Under general anesthesia, with the patient supine, the GSV graft was harvested using the same method as that in case 1. Although the GSV showed slight post-inflammatory change, it was 2.5 to 3.5 mm in diameter and fit to be used as a bypass graft. The inflow artery was exposed circumferentially. The outflow artery was exposed only at the front surface. After administration of 2000 units of heparin, the inflow artery was controlled with vascular clamps, and the GSV was anastomosed to the common femoral artery. After release of the vascular clamps, the graft was led to the distal anastomotic site through the subsartorial route. First, we made a side-to-side anastomosis between the graft and the popliteal artery, then an end-to-side anastomosis between the distal end of the graft and the peroneal artery. After release of the tourniquet, however, the graft below the middle anastomosis was found not to be distended. Completion angiography demonstrated spasm of the graft above the middle anastomosis and tapering of the graft below it; the anastomosis to the peroneal artery was not visualized (**Fig. 2B**). Suspecting a technical flaw, we incised the graft near the middle anastomosis, and carefully investigated the lumen. As no problem in the anastomosis was evident, we closed the incision, removed the graft below the middle anastomosis, and performed re-anastomosis to the peroneal artery with the spliced GSV. However, the distal graft remained collapsed. Finally, we established another proximal to distal bypass graft with a reversed GSV harvested from the opposite leg. Angiography on the 14th postoperative day showed that all grafts were patent without any stenosis (**Fig. 2C**), and the graft has since remained patent for 19 months.

Discussion

In distal arterial bypass surgery, completion angiography occasionally shows spasm in the outflow artery, especially near the toe of the anastomosis.[2, 4] Vein graft spasm during harvesting is common, but once it is hydrostati-

cally distended and implanted, recurrent narrowing of the graft is rare. Vein graft spasm has been reported during CABG.[6, 7] However, there have been no reports of autogenous vein graft spasm immediately after implantation in the lower extremity, and we have never encountered evident vein graft spasm before these tow cases.

Surgeons need to distinguish graft spasm from technical error that requires intraoperative correction, but this is not always easy at the time of completion angiography. Even if spasm is confirmed, it is advisable to relieve the condition, as it may result in early graft occlusion. In case 1, we were able to recognize the graft spasm for what it was, and conservative treatment was adequate. In case 2, retrospectively, it is certain that there was spasm in the sequential bypass graft during the operation. Furthermore, we suspect that there was also spasm in the native distal artery, and that this increased the vascular resistance and exacerbated the findings of completion angiography. Based on this experience, we think that some abnormal findings of completion angiography may be explained by graft body spasm. Although some surgeons recommend intraoperative duplex ultrasonography for providing additional information,[5] we do not think this can enable a definitive conclusion to be reached. When completion angiography reveals distal arterial spasm, conservative therapy with heparin should be attempted initially, as this may resolve the condition within 24 hours.[8] Local application of papaverine hydrochloride may also help accelerate resolution of the spasm.

Figure 2
A: preoperative angiography, B: completion angiography, C: angiography on the 14th postoperative day. DFA: deep femoral artery, PA: popliteal artery, Per: peroneal artery, Bypass 1: sequential bypass graft from common femoral artery to distal popliteal artery and peroneal artery with reversed great saphenous vein. Bypass 2: inter-graft bypass from proximal to distal of bypass 1 with reversed great saphenous vein. Spliced: re-anastomosis between bypass 1 graft and peroneal artery.

Conclusion

Although the two cases reported here might be rare, they have prompted us to consider that the phenomenon of graft spasm may be more frequent than previously recognized and could lead to graft thrombosis. When defective filling is recognized upon completion angiography, it is worth considering the possibility of graft spasm before proceeding immediately to surgical correction.

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