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**Case Report**

# Axillary Artery Occlusion After Radiotherapy for Breast Cancer: A Case Report

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**ABSTRACT:** A 64-year-old woman was admitted for weakness and coldness in her right upper arm. She had undergone a right mastectomy for breast carcinoma 32 years before presentation and radiotherapy for clavicular metastasis of breast cancer 3 years before presentation. After thorough investigation, post-radiotherapy axillary artery occlusion was diagnosed. She underwent right external carotid-brachial artery bypass and was discharged without postoperative cerebral complications. Herein, we describe treatment for post-radiotherapy axillary artery occlusion.

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**KEYWORDS:** breast cancer, radiotherapy, vascular injury, axillary artery occlusion, external carotid artery

Axillary artery occlusion after radiotherapy for breast cancer is rare. Reported surgical treatments include common carotid-brachial artery bypass and axillary-axillary artery bypass. The present patient underwent external carotid-brachial artery bypass, which rarely results in cerebral complications.

## Case Report

A 64-year-old woman was admitted for weakness and coldness in her right upper arm. She had undergone a right mastectomy for breast carcinoma 32 years before presentation and radiotherapy for clavicular metastasis of breast cancer 3 years before presentation. Physical examination confirmed coldness of the right upper arm. The right radial artery was not palpable. The skin covering the area of radiotherapy on the right upper chest was atrophied (Fig. 1). An echogram showed complete occlusion in

an approximately 5-cm segment of the right axillary artery. The occluded section was irregular and hypertrophied. Enhanced computed tomographic angiography (CTA) showed complete occlusion of the axillary artery and no lesions in other arteries (Fig. 2). These findings were consistent with a diagnosis of radiation-induced axillary artery occlusion.

We considered percutaneous transluminal angioplasty (PTA) and bypass grafting. However, the artery could potentially be injured by catheterization, and long-term patency was not expected because of radiation-induced weakening of the artery wall. We therefore performed bypass grafting from the external carotid artery to the right brachial artery, using a graft from the great saphenous vein. The route of the bypass was from the right side of the neck, across the dorsal surface of the right clavicle to the medial side of the right upper arm. We passed the vein

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Fig. 1 The atrophied area above the right breast, where radiotherapy had been administered.



Fig. 3 Postoperative three-dimensional computed tomography shows that the vein graft has good patency from the external carotid artery to the brachial artery.



Fig. 2 Preoperative three-dimensional computed tomography shows that the artery from the right subclavian artery to the axillary artery was occluded for approximately 5 cm. The wall of the distal artery is irregular.

through a 6-mm expanded polytetrafluoroethylene (ePTFE) graft, to ensure that the vein graft could fold during movement of the upper arm. Postoperatively, all pulses and blood pressure in the right upper arm were normal. Postoperative anticoagulation and antiplatelet therapy was warfarin and aspirin for 3 months and aspirin only thereafter. The coldness and weakness resolved. Postoperative CTA confirmed vein graft patency (Fig. 3).

## Discussion

Artery damage induced by radiotherapy for breast cancer is a rare complication.<sup>1,4,5)</sup> As compared with atherosclerotic lesions, radiation-induced artery damage is localized to the area of radiation, and the other arteries are normal.<sup>1-4)</sup>

In this case, we believed that occlusion of the artery was induced by radiation because the axillary artery was occluded at the radiation site on the anterior chest and other arteries showed no evidence of lesions. The pathogenesis of radiation-induced occlusive disease includes intimal thickening and fibrosis, elastic degeneration of the media, adventitial fibrosis, and damage to the vasa vasorum.<sup>1-4)</sup>

PTA, bypass grafting, and direct surgery are potential treatments. Some case reports described the successful use of PTA as a treatment for arterial stenosis with short-segment occlusion.<sup>5)</sup> However, pathogenesis differs between these cases and atherosclerotic artery lesions. Therefore, we decided that catheterization technique would be difficult in our patient and that long-term patency was unlikely. A direct surgical approach for treatment of the lesion was complicated by the presence of skin atrophy, fibrosis, and adhesions. Nerves or vessels could potentially be injured and would healing might be slow.

Common carotid-brachial artery bypass and side-to-side subclavian bypass have been performed.<sup>1,3)</sup> Common carotid bypass increases the risks of cerebral ischemia and

cerebral infarction. It is necessary to use a shunt tube when clamping the common carotid artery, which increases the risk of cerebral infarction and complicates the procedure. In contrast, the bypass route for axillary artery-brachial artery bypass involves some subcutaneous fat after mammary resection, radiation-induced fibrosis, and adhesions. The graft may thus become occluded after bypass grafting. In this case, because proximal anastomosis involves the external carotid artery, arterial clamping does not cause cerebral ischemia and the bypass route does not involve the radiation area. The external carotid artery is sometimes used for bypass inflow during brain surgery and has been reported to result in few complications and satisfactory outcomes.<sup>6-8)</sup> In our patient, the external carotid artery and brachial artery were rather narrow, and there was a size mismatch between the vascular prosthesis and native artery. Therefore, we selected the great saphenous vein as the graft. Because of esthetic concerns, we chose the dorsal side of the right clavicle as the bypass route from the external carotid artery to the brachial artery. We passed the great saphenous vein through a 6-mm ePTFE graft, so that the vein graft could fold during movement of the upper arm.

There are no clear recommendations regarding anticoagulation and antiplatelet therapy after bypass grafting with the saphenous vein in peripheral artery disease. Aspirin is recommended for coronary artery bypass with vein grafts. Although the effects of warfarin treatment after bypass with vein grafts are uncertain, one study reported good results.<sup>9)</sup> Our anticoagulation and antiplatelet proto-

col was aspirin and warfarin for 3 months and aspirin only thereafter. In this case, this patient was done medication on this protocol because poor distal artery runoff is associated with a high risk of vein graft occlusion. Because the external carotid artery is narrower than the common carotid artery, future studies should investigate the long-term patency of this bypass graft.

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