Radiology Case Reports 18 (2023) 1277–1281

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journal homepage: www.elsevier.com/locate/radcr

Case Report

Contralateral brachial arterial access for endovascular treatment of recurrent axillofemoral bypass graft stump syndrome: A case report ☆

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ARTICLE INFO

Article history:
Received 20 December 2022
Accepted 29 December 2022

Keywords:
Axillofemoral bypass grafting
Brachial artery
Arterial catheterization, Peripheral
Arterial occlusive diseases

ABSTRACT

Axillofemoral bypass graft stump syndrome is an uncommon complication of axillofemoral bypass graft surgery. The traditional treatment is open surgical repair; however, endovascular recanalization can be achieved. Interventional treatment by approaching the brachial artery contralateral to the lesion site has rarely been reported in acute upper extremity ischemia. We report a case of recanalization through the left brachial artery due to embolic occlusion of the right brachial and axillary arteries and suspected axillofemoral bypass graft stump syndrome in a 71-year-old man. Access through the common femoral artery was impossible because the patient underwent reoperation of the left axillofemoral bypass and femorofemoral bypass due to occlusion of the right axillofemoral bypass and femorofemoral bypass surgery. Furthermore, bilateral radial arteries were occluded, allowing access to the left brachial artery. Two self-expandable stents were inserted into the occlusion of the right brachial and axillary arteries, and the stump area was covered. Aspiration thrombectomy was performed for embolism in the ulnar artery. Axillofemoral bypass graft stump syndrome can also be treated with interventional management. If access to the bilateral common femoral and radial arteries is not possible, an upper extremity arterial procedure through the contralateral brachial artery may be considered in cases of steno-occlusion of the upper extremities.

Introduction

Acute limb ischemia of the upper extremity is an uncommon disease, and the cause is mostly cardioembolic [1]. Axillofemoral bypass graft stump syndrome is a rare condition in which the upper extremity is obstructed by thromboembolism from an occluded axillofemoral bypass graft [2,3]. Reportedly, most cases were treated with surgical correction, and endovascular treatment was rarely performed [3]. In particular, endovascular treatment was performed by approaching the ipsilateral arterial access, and no cases of approaching the upper extremity of the contralateral access have been re-

☆ Competing Interests: There are no conflicts of interest to declare.

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https://doi.org/10.1016/j.radcr.2022.12.067

Fig. 1 – The maximal intensity projection image of CT angiography (A) shows total segmental occlusions at the right brachial artery. The maximal intensity projection image of CT angiography (B) acquired 4 months later after surgery reveals segmental occlusion at the right axillary, brachial, and ulnar arteries. The stump of the residual proximal right femorofemoral bypass graft was also noted (arrow).

ported. In addition, no cases of treatment through the opposite upper extremity in acute upper-limb ischemia have been reported. In this case, aortoiliac occlusive disorder and bilateral radial artery occlusion prevented bilateral femoral and radial access. We report a case of recurrent acute upper limb artery occlusion caused by axillofemoral bypass graft stump syndrome treated by approaching left brachial artery access and recanalizing acute right upper limb artery occlusion with stent placement and aspiration thrombectomy with a literature review.

Case report

A 71-year-old man visited the hospital due to pain in his right arm and decreased sensation 15 days prior to presentation. Right axillofemoral bypass and femorofemoral bypass surgery were performed 8 years ago with aortoiliac occlusive disorder; however, left axillofemoral bypass and femorofemoral bypass surgery were redone 6 years ago due to occlusion. Three years prior, he had a cerebral infarction and was administered antiplatelet drugs (aspirin; Aspirin Protect tab 100 mg; Bayer Korea, Seoul, Korea; clopidogrel, Plavixtab 75 mg; Sanofi, Bridgewater, NJ). Computed tomography (CT) angiography performed at the hospital revealed occlusion of the right brachial artery (Fig. 1A). The right brachial artery was approached, surgical embolectomy was performed, and whitish thrombi were removed. After surgery, the brachial and ulnar arteries were palpated, the symptoms improved, and the patient was discharged. Four months after surgery, he re-visited the hospital with pain in his right hand and skin color changes 1 day prior. The patient's right brachial artery was not palpable. CT angiography revealed embolic occlusion in the right axillary, brachial, and ulnar arteries.

Axillofemoral bypass stump syndrome was suspected (Fig. 1B). Evidence of an aortic arch and intracardiac thrombus was not identified on previous echocardiography and CT angiography.

Surgery had been performed, but embolic occlusion recurred in a short time, and reoperation was believed to be difficult due to a history of stroke; therefore, an intervention procedure was planned. The femoral and right radial arteries were blocked, making them inaccessible. After approaching the left brachial artery, a 6Fr sheath (guiding sheath; Flexor Ansel; Cook Medical, Bloomington, IN) was inserted retrogradely. Using a 5Fr Simmons 1 & 3 catheter (SIM1 and SIM3; Cook Medical, Bloomington), the right brachiocephalic artery and subclavian artery were entered and successfully passed through the 0.035″ angled guide wire(Radifocus; Terumo Corporation, Hatagaya, Shibuya-ku, Tokyo, Japan). The guiding sheath was introduced several times into the right subclavian artery; however, it escaped to the aortic arch area, making it impossible to enter (Fig. 2A). Therefore, it was replaced with

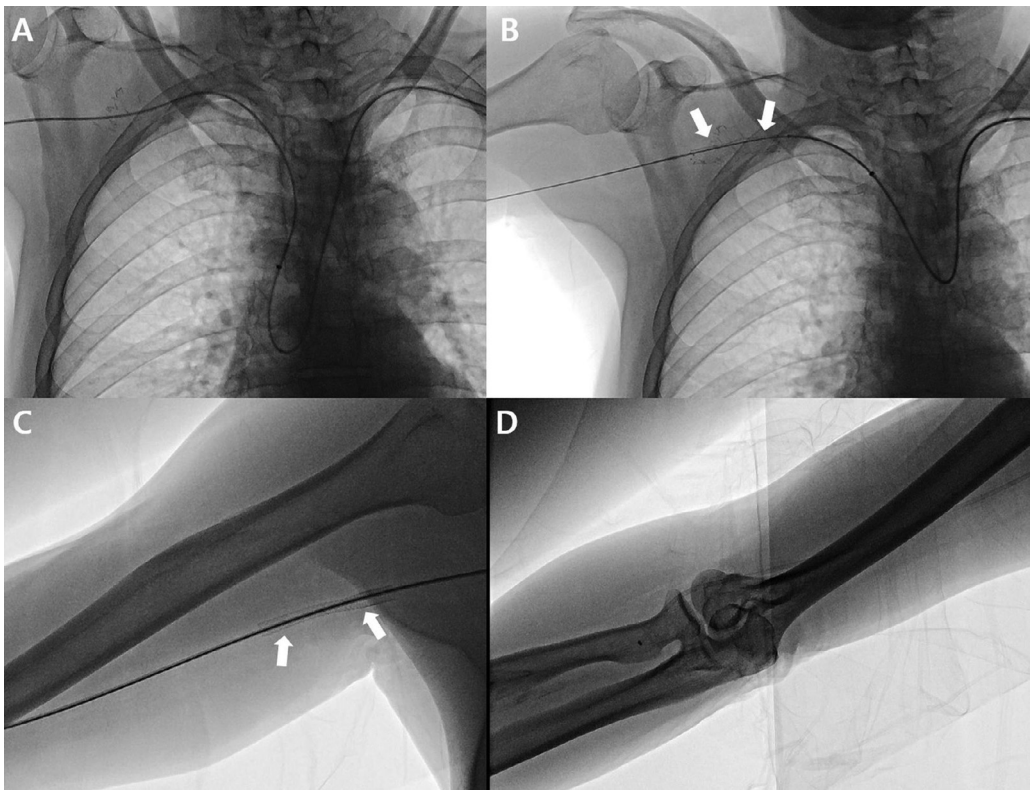

Fig. 2 – After approaching left brachial artery access, the vascular sheath was difficult to enter due to angulation in the aortic arch (A). As the stiff guide wire was deeply inserted and supported, the vascular sheath could be inserted. The self-expandable metallic stent measuring 8 mm × 4 cm was deployed in the right axillary artery (B), and the self-expandable metallic stent measuring 5.5 mm × 4 cm was deployed in the right brachial artery (C). Aspiration thrombectomy for embolism in the right ulnar artery using 6Fr guiding catheter (D), balloon angioplasty using 3 mm × 10 cm balloon catheter and intra-arterial infusion of nitroglycerin was performed.

0.035″ stiff guide wire (Radifocus; Termo Corporation). After entering the area as far as possible, the sheath was inserted successfully. Removal of the embolism of the right axillary and brachial arteries with a 6Fr guide catheter (Guider Softip XF; Boston Scientific, Marlborough, MA) was unsuccessful. Owing to the difficulty in maintaining the sheath and catheter for a long time, thrombolysis was not performed. The primary stent placement was planned. An 8 × 40 mm self-expandable stent (self-expandable vascular stent; SMART Control; Cordis Corporation, Bridgewater, NJ) was placed in the right axillary artery, and a 5.5 × 40 mm self-expandable stent (self-expandable stent; Supera; Abbott Vascular, Redwood City, CA) was placed in the right brachial artery (Figs. 2B and C). Embolic occlusion was observed in the right ulnar artery, which was removed with a 6Fr guiding catheter (Guider Softip XF; Boston Scientific), and the white thrombi were removed (Fig. 2D). After the procedure, spasms and stenosis of the right ulnar artery were observed. Angioplasty was performed using a 3 mm × 10 cm balloon catheter (Mustang; Boston Scientific). Additionally, 5 mL of 50 mg/50 mL of nitroglycerin (Nitroglycerin; G. Pohl-Boskamp & Smolkmine) was mixed with 95 mL of isotonic sodium chloride solution, and 3 mL of it (nitroglycerin: 150 μg) was injected over 10 minutes.

Angiography performed immediately after the procedure revealed recanalization of the right axillary, brachial, and ulnar arteries (Fig. 3). After the procedure, warfarin sodium was started. Seven days after the procedure, there was no significant stenosis or occlusion of the right axillary, brachial, or ulnar arteries on CT angiography performed due to edema in the right lower arm (Fig. 4). However, hematoma and bleeding were observed in the lower arm; therefore, anticoagulant administration was stopped, and bleeding was stopped by compression. Subsequently, the patient was discharged from the hospital with improved symptoms, and there was no recurrence of symptoms during outpatient follow-up for 2 years.

Discussion

Embolic occlusion after axillofemoral bypass therapy can be divided into the early and late periods. Embolic occlusion, which appears early after surgery, is mainly due to technical surgical errors [4]. However, there are several hypotheses if it occurs several months after surgery. The presence of a blind pouch containing thrombotic content is one of the causes. In

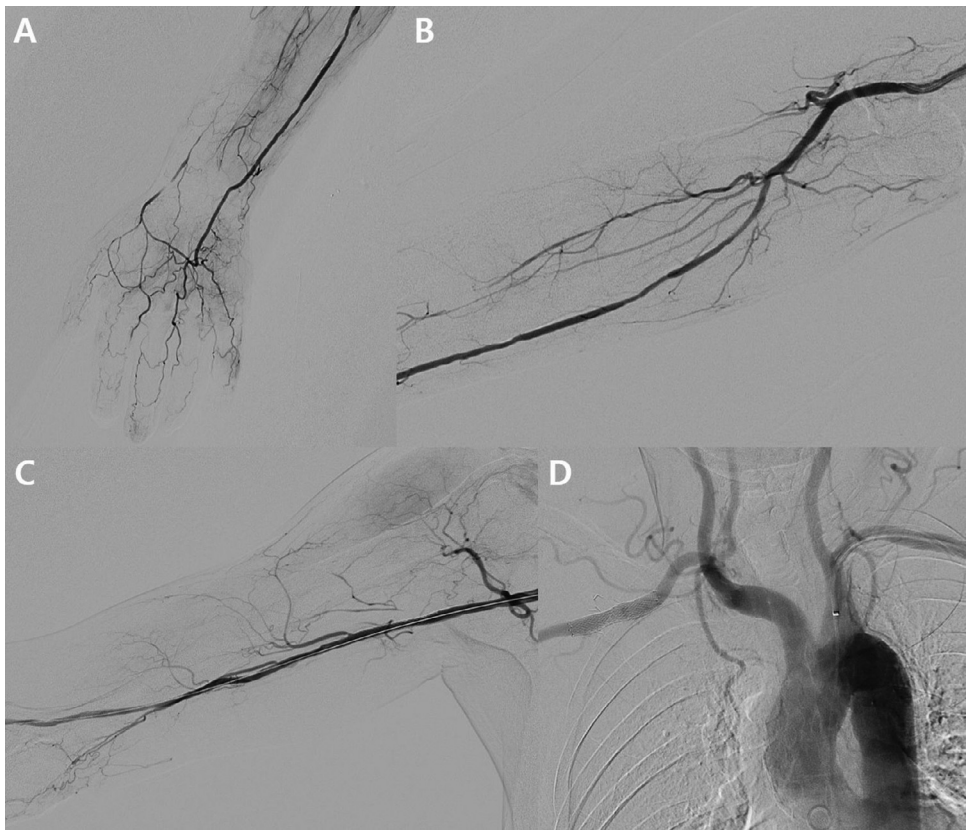

Fig. 3 – (A-D) After interventional treatment, right ulnar, brachial and axillary arteries shows good patency without significant stenosis.

addition, after surgery, the anastomosis of the graft and axillary armature changes into a Y-shape due to excessive tension, which may cause distal embolism [3,4]. In this case, a graft stump was observed but no Y-deformation of the anastomosis site was observed. The graft stump was confirmed on 2 CT angiography performed before the procedure. When comparing the 2 images, the stump shape changed, suggesting migrating thromboembolism.

In axillofemoral bypass graft stump syndrome, a thrombosed graft can cause embolism; therefore, surgical removal of the bypass is necessary [2]. In previous reports, most patients with axillofemoral bypass graft syndrome underwent surgery. However, an example of treatment using surgical embolectomy and obliterating the stump with a stent graft has also been reported [3]. There have been no reports of the use of intervention treatment alone. In addition, in this case, there was no stent graft of an appropriate size; therefore, the procedure was not possible. Accordingly, a bare-metal stent was used to cover the graft stump. The stump area was excluded on CT angiography performed a few days later. There was no recurrence of symptoms during the outpatient follow-up for several years. A bare metal stent was placed instead of a stent graft; however, it is thought that a relatively large thromboembolism occurring in the graft pump can be sufficiently prevented. Additionally, if the stent is located in the area where the clavicle and first rib meet, compression may cause complications such as stent fracture or dislocation; therefore, care should be taken [5]. Moreover, long-term follow-up is necessary because the long-term patency of stents is unknown.

According to previous reports, endovascular procedures through the brachial artery were used in the ipsilateral upper extremity, aorta, lower extremities, visceral/renal arterial procedure because of unfavorable native aorto-iliac anatomy, parallel graft placement, or infected groins or all possible consideration [6,7]. However, no procedure has been reported for the contralateral upper extremity. In addition, brachial artery access has a complication rate of up to 11%; therefore, care should be taken [6]. Among them, vascular complications such as pseudoaneurysm, hematoma, or thrombosis are the most common [6]. In this case, no complications occurred at the access site after the procedure.

During upper limb endovascular procedures through the opposite brachial artery, access may be limited if there is a variation in the aortic arch. If there is an aberrant right subclavian arch or right-side arch, the right subclavian artery joins the aorta distal to other great vessels compared to other arches so that an unfavorable course can be observed [8]. Shuford et al. classified the morphology of brachiocephalic artery origin relative to the aortic arch apex [8,9]. Furthermore, there are reports that distal catheterization is difficult when great vessel tortuosity is severe, especially during neurointervention [8].

In this case, the aortic arch variation or great vessel tortuosity showed relatively idealized or mild tortuosity. Because

Fig. 4 – CT angiography performed 7 days later after interventional management showed no evidence of steno-occlusion in the artery of the right arm and disappearance of the stump.

the regular guidewire did not support well, a sheath was inserted using a stiff guidewire. Only the guide wire passes, whereas the intervention device does not pass well through the lesion due to severe resistance. Thorough techniques can be considered using antegrade and retrograde approaches [10].

In conclusion, axillofemoral bypass stump syndrome can occur months or years after the procedure. In addition to surgical treatment, it can be treated with intervention procedures such as aspiration thrombectomy and bare metal stent or stent-graft placement for stump exclusion. In particular, if both radial and feminine access are impossible, it can be accessed with contralateral brachial access; as in this case, the procedure should be performed considering aortic arch variation or tortuosity.

Patient consent

This retrospective study was approved by the Institutional Review Board of Jeju National University Hospital (IRB No. 2022-11-006), and written informed consent for the publication of this case report was obtained from the patient.

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