» How to Do It «

Supraclavicular Approach for Repair of an Axillary Artery Pseudoaneurysm after Axillobifemoral Bypass

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A 61-year-old woman underwent right axillobifemoral bypass using a reinforced expanded polytetrafluoroethylene T-shaped graft for high aortic occlusion. One year later, anastomotic pseudoaneurysm of the axillary artery was noted. We performed pseudoaneurysmectomy and graft interposition at the same anastomotic site through an infraclavicular approach. Unfortunately, the pseudoaneurysm recurred four months later. Therefore, we performed a second reoperation through a supraclavicular approach, in addition to the infraclavicular one. We were able to achieve better exposure from the axillary artery to the distal part of the subclavian artery, and reconstruct the bypass with secure and safe arterial clamping and reanastomosis.

Keywords: axillary artery, pseudoaneurysm, supraclavicular approach

INTRODUCTION

Axillary artery pseudoaneurysm (AAP) occasionally develops at the anastomotic site after reconstructive surgical procedures such as axillofemoral bypass.¹⁾ The surgical approach to an AAP depends on the location of the aneurysm. In the case of an anastomotic AAP associated with axillofemoral bypass, exposure of the proximal axillary artery for clamping and anastomosis is difficult to achieve using only an infraclavicular approach, which is the usual approach for the initial axillofemoral bypass, because the location of the pseudoaneurysm is very close to the clavicle and the adhesion makes dissection around the aneurysm difficult. Herein, we describe how to repair the anastomotic AAP using the supraclavicular approach.

CASE PRESENTATION

A 61-year-old woman was referred to our hospital

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Received: January 8, 2013; Accepted: March 31, 2013
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with the major complaint of intermittent claudication. Computed tomography (CT) demonstrated abdominal aortic occlusion just distal to the bilateral renal arteries. She underwent right axillobifemoral bypass using a reinforced expanded polytetrafluoroethylene (ePTFE) T-shaped graft. One year later, follow-up CT showed an anastomotic pseudoaneurysm of the right axillary artery. During a repeated surgery using the infraclavicular approach, the same approach as the initial operation, we managed to approach the axillary artery proximal to the pseudoaneurysm without rupture. We excised the pseudoaneurysmal wall and made the reanastomosis of the new graft at the same anastomotic site as the initial operation because there was no space for a more proximal anastomosis due to the proximal clamping of the axillary artery very close to the pseudoaneurysm. Four months later, follow-up CT revealed recurrence of the AAP at the same lesion. We planned the third operation through the supraclavicular approach with lateral extension across the clavicle to achieve better exposure from the axillary artery to the distal part of the subclavian artery.

TECHNICAL APPLICATION

Under general anesthesia, the patient was placed in a supine position with the head elevated 30°. The neck was

Fig. 1 The surgical position and the skin incision for the supra-and infraclavicular approach (white arrow heads).

Fig. 2 Intraoperative photograph.

extended and turned to the left. An oblique skin incision was made from lateral border of the sternocleidomastoid muscle above the clavicle, extended toward the axilla near the previous skin incision below the clavicle (**Fig. 1**). At the supraclavicular region, the anterior scalene muscle (ASM) was dissected near the clavicle with special care not to injure the phrenic nerve. When the ASM was

retracted medially, the subclavian artery was observed behind the ASM. Further separation of the ASM as close to the clavicle as possible allowed sufficient visualization of the distal subclavian artery. The subclavian artery was dissected with special effort to avoid any injury to the brachial plexus. The thyrocervical trunk, originated from the subclavian artery, was encircled with vessel

Fig. 3 Three-dimensional contrast-enhanced computed tomography (CT) images. The patient elevated her arms over the head during the CT scan. **(A)** Preoperative image showing the anastomotic pseudoaneurysm at the right axillary artery (white arrow). **(B)** Postoperative CT image showing the interposition graft replacement of the axillary artery and pseudoaneurysm using the reinforced ePTFE T-shaped graft, which was not compressed between the clavicle and the first rib.

tape to mark the proximal end of the arterial clamping. The axillary artery was dissected at the infraclavicular region after separation of the pectoralis minor muscle. The old prosthetic graft was also exposed distal to the pseudoaneurysm (**Fig. 2**). The route of the new prosthetic graft was created between the clavicle and the first rib. After systemic heparinization, the proximal and distal clamps were made. The distal subclavian artery was cut off and a new prosthetic graft was anastomosed in an end-to-end fashion. The distal anastomosis to both the axillary artery and the old prosthetic graft was also performed in an end-to-end fashion (**Fig. 3**).

DISCUSSION

In the repair of anastomotic pseudoaneurysm at the axillary artery after axillofemoral bypass, good exposure of the proximal axillary artery is the key to success. Because infraclavicular exposure of the proximal axillary artery is difficult due to the presence of pseudoaneurysm near the clavicle, the supraclavicular approach has the advantage of better exposure of the subclavian artery to facilitate secure and safe arterial clamping and anastomosis.^{1,2)} In our case of the first redo surgery through only the infraclavicular approach, there was no other choice to perform anastomosis of the new graft to the fragile arterial lesion where the pseudoaneurysmal wall

was completely removed because there was no space to allow anastomosis to the intact proximal axillary artery other than arterial clamping, which resulted in early recurrence of the pseudoaneurysmal formation. Therefore, we selected the supraclavicular approach to expose from a more proximal portion of the unaffected axillary artery to the distal subclavian artery in the second redo surgery.

The points for consideration, regarding the supraclavicular approach, are as follows; (1) to avoid injury to the brachial plexus or the phrenic nerve, which are very close to the subclavian artery or the anterior scalene muscle, (2) whether or not to remove part of the first rib or the clavicle to obtain sufficient space for the prosthetic graft beneath the clavicle.

The most serious complications associated with the supraclavicular approach are injury to the brachial plexus and the phrenic nerve. These injuries can develop as a result of direct nerve injury or excessive nerve retraction. These complications are temporary and nerve function generally recovers within several months in most cases, with no direct injury.

Resection of the first rib or the clavicle is an issue with this operation. The prosthetic graft passes beneath the clavicle above the first rib. If there is little space between these bones, the graft may deteriorate early or become obstructed. The resection of the first rib is an option. The

other is partial excision of the clavicle, which has been reported to be effective for excellent exposure and control of the proximal axillary artery.³⁾ In our case, the space was wide enough for the 10-mm prosthetic graft to pass. Therefore, bone resection was not required to obtain satisfactory space to pass the prosthetic graft.

Reconstruction of the axillary artery can be achieved with a prosthetic graft (ringed ePTFE or Dacron) or an autologous vein graft (great saphenous vein or femoral vein). We selected the ringed ePTFE because ringed PTFE may offer some advantage in longer bypass or replacement because it resists kinking or compression when it traverses under the clavicle. Moreover, there was no clear sign of infection in our case.

CONCLUSION

The supraclavicular approach provides excellent exposure of the subclavian artery and the anastomotic

pseudoaneurysm in the redo axillofemoral bypass. We were able to perform a safe surgical procedure under this outstanding view of the pseudoaneurysm without risk of sudden rupture.

DISCLOSURE STATEMENT

The author declares no conflict of interest.

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