Extra-Anatomic Axillofemoral Bypass After Failed Stenting for Aortoiliac-Occlusive Disease in a Patient with Severe Comorbidities

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Patient: Male, 59-year-old
Final Diagnosis: Chronic bilateral limb ischemia
Symptoms: Difficulty in walking
Medication: —
Clinical Procedure: Extraanatomic axilofemoral bypass
Specialty: Anesthesiology • Surgery

Objective: Unusual clinical course
Background: An extra-anatomic bypass is the choice of revascularization method for limb salvage in patients with infra-renal aortailiac occlusion accompanied by severe comorbidities.
Case Report: We report a case of aortailiac-occlusive disease in a 59-year-old man with severe cormobidities. He had complained about intermittent claudication in both lower limbs for the past 10 years. The condition had worsened over the last 5 months, making it difficult for him to walk. Three attempts had been made at percutaneous aortailiac stenting, all of which were unsuccessful. The patient had a history of coronary artery disease and complete revascularization by percutaneous coronary stenting 10 years ago. Extra-anatomic axillounifemoral bypass was performed under general anesthesia. The results were good, with improvement in the patient’s distal perfusion immediately and at 1-month follow-up.

Conclusions: After failed aortailiac stenting, when direct revascularization aortofemoral bypass and endovascular intervention could not be carried out, extra-anatomic axillofemoral bypass was effective for revascularization in a patient with aortailiac-occlusive disease and severe comorbidities.

MeSH Keywords: Coronary Vessels • Endovascular Procedures • Microsurgery

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**Background**

Extra-anatomic bypass refers to a graft bypass placed at a different site than the arterial pathway that is bypassed. In general, an extra-anatomic bypass is used in the management of patients with aortoiliac and femoral disease. Extra-anatomic routes include femorofemoral, axillofemoral, obturator, thoraco-femoral, and supraceliac-to-iliofemoral bypass [1].

Extra-anatomic bypass is chosen to avoid adverse intra-abdominal pathology and to reduce risk of transabdominal reconstruction in patients with serious visceral or systemic disease [2]. Axillofemoral bypass graft is used to revascularize the lower extremity in cases in which standard aortofemoral or aortoiliac bypass grafts cannot be used, such as when an aortic graft becomes infected [3]. Recently, extra-anatomic bypass has been used exclusively as primary treatment for patients with primary or secondary disease of the infrarenal aorta, iliac, and femoral arteries [1,4–9].

Although the surgical procedure is usually called an axillofemoral bypass, the subclavian artery is used as inflow artery or proximal anastomosis, and the distal anastomosis is used in the common, superficial, or deep femoral arteries [3]. Axillofemoral bypass is a relatively simple operation for a serious disease, as the alternative would be amputation or major aortic surgery, both of which have doubtful benefit and definite morbidity [4].

**Case Report**

A 59-year-old male was admitted for intermittent claudication in both lower limbs, which he had first experienced 10 years ago. Over the last 5 months, the condition had been getting worse, making it difficult for him to walk. He had undergone aortoiliac stenting three times, but the symptoms continued. He then consulted with the cardiothoracic surgery department.

Physical examination revealed a very weak pulse in both femoral arteries, absence of both distal pedis arteries, and numbness in both legs. The patient had a history of coronary artery disease (CAD) with complete revascularization by percutaneous coronary stenting (PCI) 10 years ago. He had no history of diabetes mellitus, stroke, or chronic pulmonary disease. He was also a heavy smoker.

Electrocardiography showed sinus rhythm with old myocardial infarction. It also revealed decreased left ventricle systolic function with an ejection fraction of 47.8%. Conventional angiography showed total occlusion of the infra-renal aorta extending to both iliac arteries, no function in the aortoiliac stent, and blood flow in the distal extremities that originated from the lumbar and sacral branches of the aorta, with good run-off (Figures 1–3).

The patient was diagnosed with chronic bilateral limb ischemia Rutherford-4, failed percutaneous aortoiliac stenting, CAD 2 vessel disease, and post PCI. From the angiographic analysis, we classified the aortoiliac disease as type D TASC II (Trans-Atlantic Inter-Society Consensus), after failure of aortoiliac stenting. Therefore, there was no site left along the aortoiliac segment with which to do a proximal anastomosis. Given the patient’s comorbidities, we decided to perform an extra-anatomic axillary-femoral bypass.
Extra-anatomic anastomosis of the right subclavian artery to the right common femoral artery was carried out with non-kinked polytetrafluoroethylene (PTFE) 7 mm 70 cm through tunneling along the right mid-clavicle inguinally along the midaxillary line, with a 5/0 monofilament non-absorbable suture (Figures 4–7). The first stage of the procedure was an axillofemoral bypass performed under general anesthesia, it will be followed by femorofemoral bypass in the second stage, with consideration for reducing the risk of surgery. Immediately after the axillofemoral bypass a pulse was palpable in the femoral and pedis arteries, and all of the patient’s symptoms disappeared 1 month after the procedure.

**Discussion**

We carried out an extra-anatomic bypass on this patient for several reasons. He was older, a heavy smoker, and he had a history of infrarenal aortoiliac occlusive disease type D TASC II...
classification, CAD with PCI, and failed previous aortic-iliac stenting. In this case, a safe and effective procedure was necessary for management of severe symptoms of chronic limb ischemia to prevent loss of limbs.

Axillofemoral bypass is a relatively simple operation for a serious disease. It is also an alternative to amputation or aortic surgery, which have doubtful benefits, not to mention associated risk of morbidity [4]. Axillofemoral bypass is usually easily tolerated by patients because there is no need to open the thoracic or abdominal cavity or to do aortic clamping [8].

For extra-anatomic bypass graft, we used a 7-mm-diameter ring PTFE, slightly smaller than the average used by others, which is 8 to 9 mm [7]. Some surgeons prefer to use an 8-mm-diameter ring for the axillofemoral component and a 6-mm femorofemoral component for axillobifemoral bypass graft [1]. In patients with severe comorbidities, it is advisable to carry out the surgery in two stages: the extra-anatomic bypass followed by removal of the infected graft [10].

The success of extra-anatomic bypass can be assessed based on disappearance of symptoms and granulation of wounds [6]. In this case, pulse was palpable immediately after the surgery in both the femoral and pedis arteries, and all of the patient’s symptoms had disappeared at 1-month follow-up. Patency tends to be better in patients with claudication than in those with critical limb ischemia (CLI). Primary patency is estimated to be 39% to 85% at 3 years and 74% at 5 years [1].

The patency of extra-anatomic bypass varies depending on the severity of the comorbid conditions [8]. Maintenance of long-term patency is difficult [11]. Various reports have estimated rates of patency of extra-anatomic bypass at 1 month and 1, 3, and 5 years at 93%, 85%, 72%, and 67%, respectively [9]. Patients who avoid amputation for a year after the procedure have an excellent chance of long-term limb salvage. Although the 3-year cumulative patency rate is 48%, the 3-year limb salvage rate is 72%, so axillofemoral graft is recommended as an option to avoid amputation in high-risk patients [12]. A comparison of 5-year patency rates between axillounifemoral and axillobifemoral bypass operations showed that they were not significantly different [13].

In this case, we performed an axillounifemoral bypass as the first stage, which will be followed by a femorofemoral bypass in the second stage, with consideration for reducing risk of surgery. Outflow artery runoff affected long-term patency. With good runoff, the rate of primary patency for axillobifemoral bypass was 92%, compared to 41% with bad runoff. For axillounifemoral bypass, the primary patency rate with good runoff was 54% compared to 0% with bad runoff [2].

Early and late mortality rates for the procedure are significantly higher in patients aged >65 years old compared to younger patients, and younger patients have significantly lower long-term patency rates [5]. Graft infections and thrombosis are some of the complications that may occur in this surgery [7].

Conclusions

The axillofemoral route for extra-anatomic bypass for aortoiliac occlusive disease is safe, simple, and beneficial to patients when direct revascularization aortofemoral bypass and endovascular intervention cannot be carried out. In patients with aortoiliac-occlusive disease and severe comorbidities in whom aortoiliac stenting has failed, extra-anatomic axillofemoral bypass is the method of choice when direct revascularization aortofemoral bypass and endovascular intervention cannot be carried out.
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