

Critical lower limb ischemia in Leriche syndrome following acute myocardial infarction: limb salvage with an axillofemoral bypass

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Received: May 22, 2015 Accepted: June 09, 2015 Published online: August 03, 2015

ABSTRACT

The aortoiliac occlusive disease, known as Leriche syndrome, primarily merits an aortobifemoral bypass graft which is the standard surgical treatment of critical limb ischemia. However, axillofemoral bypass grafting can be also used as an alternative treatment in high-risk patients. The indications include intraabdominal graft infections, older age, and worsened overall status. In this article, a successful salvage of a limb with an axillofemoral bypass surgery in a critical leg ischemia subsequently developed soon after an acute myocardial infarction was reported.

Keywords: Acute myocardial infarction; arterial occlusive disease; axillofemoral bypass grafting; Leriche syndrome; limb salvage.

Aortoiliac occlusive disease, also known as Leriche syndrome, is an atherosclerotic obstructive disease involving the distal abdominal aorta prior to the bifurcation into the common iliac arteries.^[1] It was first described by Leriche and Morel in 1948.^[1] It is a relatively rare condition compared to the infrainguinal arterial obstructions.^[2] The primary treatment is surgical revascularization. Aortobifemoral (ABF) bypass is the golden standard with a five-year patency rate of >80%.^[3] However, axillofemoral (AXF) bypass was first introduced by Blaisdell and Hall, and Louw at the same time in 1963 as an alternative bypass technique for lower limb inflow revascularization.^[3,4] Previously, use of AXF bypass for aortoiliac occlusive disease was limited due to its lower long-term patency rates, compared to ABF grafts. However, it has been, then, widely adopted as an alternative surgical treatment for aortoiliac occlusive disease more frequently with the recent improvements in structure of the prosthetic materials. With the introduction of externally supported grafts, the patency rates of AXF bypass increased up to 70% in five years.^[5] Axillofemoral bypass is considered primarily as an alternative revascularization approach in patients with high-risk laparotomy or in whom an aortic approach is troublesome due to the previous abdominal infection or surgery.^[6] It is also reserved as a more practical and relatively rapid procedure for elderly with worsened overall status and hemodynamic instability.

Coexistence of coronary artery disease and severe aortic occlusive disease is reported as 4 to 15% in

different series.^[7] In this article, we report a case of critical leg ischemia developed soon after an acute myocardial infarction and its rapid and efficient salvage with an AXF bypass surgery is presented.

CASE REPORT

A 65-year-old male patient was admitted to the emergency department with chest pain for the last four hours. No significant history was present except intermittent claudication on exertion without resting pain. Blood pressure was 113/76 mmHg. Electrocardiogram revealed tachycardia (116 bpm) without ST elevation. Blood biochemical test results were normal except increased serum troponin-T levels of 0.23 ng/mL (reference range: 0 to 0.02 ng/mL). Non-ST acute myocardial infarction (NSTEMI) was suspected and coronary angiography (CAG) was decided. On physical examination, bilateral femoral artery pulses were non-palpable. Thus, CAG was performed through the right brachial artery. It demonstrated a slow coronary flow in the left anterior descending (LAD) artery and three-vessel disease with a diffuse pattern. Left ventriculography

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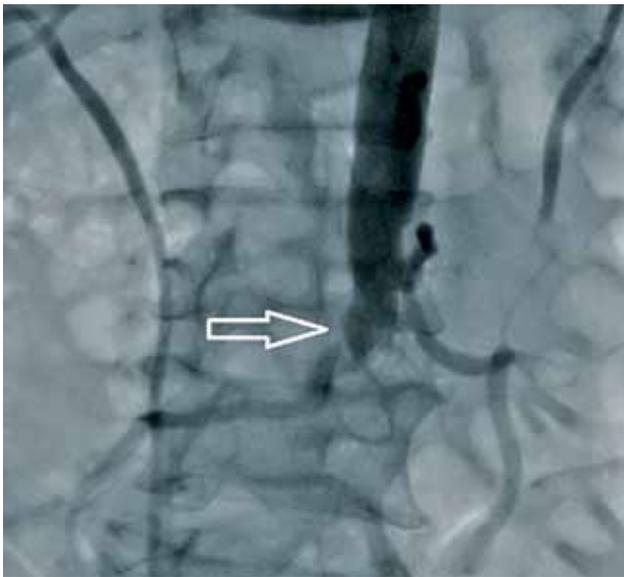


Figure 1. Aortography revealing the distal aortic occlusive disease.

showed an anterior segmental hypokinesia with slightly increased diameters and no mitral valvular regurgitation. Distal aortography demonstrated distal aortic occlusive disease (Figure 1). Coronary artery bypass graft (CABG) surgery and simultaneous aorta-distal revascularization were planned electively after troponin-T levels were decreased.

The patient was prepared for CABG and aorta-distal bypass operation in the cardiovascular intensive care unit. Low-molecular-weight heparin and coronary vasodilator treatment were initiated. During follow-up, the right lower limb demonstrated ischemic signs and symptoms on the following day after CAG. Pain and pallor progressed in a few hours to cyanosis and demarcation line below the right knee was almost settled. Blood gas analyses revealed slight acidosis (pH: 7.27) with compensatory respiratory

alkalosis (pCO₂: 23.4). Blood urea nitrogen (BUN) and creatinine levels were increased (46 mg/dL and 1.6 mg/dL, respectively). Hemodynamic variables and cardiac enzyme levels remained high and the overall status of the patient was inconvenient neither for CABG nor aorta-distal revascularization with laparotomy. As a result, an extra-anatomic bypass was planned for the limb salvage. A contrasted computed tomography (CT) was performed to investigate the distal status of the vasculature (Figure 2). Computed tomography showed a distal aortic occlusion and antegrade re-filling of the femoral arteries through the collateral circulation. A right AXF bypass was decided as the best surgical strategy.

Under general anesthesia, the right common femoral artery and right subclavian artery were explored. Both were prepared for anastomosis by circumference with elastic vascular tapes. An 8 mm diameter ringed expanded polytetrafluoroethylene (ePTFE) graft was placed subcutaneously through the inserted steel tunnel. A mid-point cutaneous incision was made. The length of the graft was adjusted by trimming the both edges. Proximal part was passed under the pectoralis major muscle. Native arteries were clamped after an intravenous injection of 5,000 IU of unfractionated heparin. Proximal and distal anastomoses were performed with 6-0 polypropylene sutures with an end-to-side manner (Figure 3). Distal femoropopliteal embolectomy was performed before the termination of distal anastomosis. Anastomosed native arteries were de-clamped and de-aired. Circulation was successfully achieved. Intraoperative distal Duplex ultrasound showed triphasic flow pattern of the anterior and posterior tibial arteries. The right brachial artery flow rate was also triphasic and not affected.

Ischemic signs and symptoms of the right leg were totally regressed and returned to normal.



Figure 2. Computed tomography showing (a) distal aortic occlusive disease and (b, c) bilateral iliac occlusion.



Figure 3. Proximal anastomosis of an expanded polytetrafluoroethylene graft to the subclavian artery.

Blood chemistry levels including blood gas analyses reversed to normal levels. The patient was followed for two weeks in hospital during the recovery period. Incision sites were recovered without any complication (Figure 4). Coronary artery bypass graft surgery was, then, performed successfully following cardiac enzymes were dropped to normal levels.

DISCUSSION

The management of distal aortic occlusive disease (Leriche syndrome) depends on surgical or non-surgical options.^[6] The surgical treatment of Leriche syndrome can be performed either as direct anatomic (ABF) bypass or extra-anatomic (AXF) bypass.^[8] Direct anatomic bypasses include aortoiliac and aortofemoral bypasses. Extra-anatomic bypasses include axillofemoral bypasses. The non-surgical treatment of Leriche syndrome mainly depends on endovascular revascularization.^[9] Patients with aortoiliac occlusive disease can be treated with percutaneous techniques, such as balloon angioplasty or peripheral stenting. However, in the presence of a diffuse disease, angioplasty remains significantly ineffective when the distal run-off would not be warranted.^[10] Therefore, these aforementioned limitations may make the AXF bypasses the primary therapeutic option for patients with significant comorbidities and diffuse aortoiliac occlusive disease.^[11]

The simultaneous presentation of coronary artery disease (CAD) and peripheral arterial disease (PAD) are not uncommon. Recent studies have reported the rate of the concomitance about 40%.^[7,12] In addition, the coexistence of aortoiliac occlusive was reported 4 to 15% in patients undergoing CABG surgery.^[13,14] The concomitance of PAD and CAD



Figure 4. Total recovery of the incision sites (postoperative seventh day).

usually deserves a combined surgical approach, in which both pathologies are treated at the same session.^[7] However, in case of deterioration in the overall status of the patient, procedural priority should be given to the more serious pathology. Briefly, life-threatening manifestation is initially treated and the other pathology is postponed, until the overall condition becomes convenient.^[7]

In the presented case, a combined procedure was initially planned; however, the limb ischemia developed instantly and prompt intervention was needed. Thus, an AXF bypass was emergently performed to salvage the right lower limb. Also, CABG operation was postponed due to worsened overall status of the patient. If the combined procedure had been performed, multiple handicaps would have occurred. In addition, STEMI and elevated troponin-T levels, determinant factors of impaired cardiac contractility, would increase the intraoperative mortality. Ischemia period would be elongated due to CABG, leading to irreversible neurological complications such as dropped-foot, or even amputation. In addition, an intraaortic balloon pump insertion would be impossible, while it becomes crucial during CABG

surgery. As a result, the strategy was primarily built over the salvage of the leg.

Regarding the etiological progression of our case, what was the reason for the instant appearance of ischemic symptoms soon after the CAG? Although the brachial artery approach was selected for the percutaneous intervention, what caused the distal impairment in tissue perfusion? Was the leg ischemia following a CAG with brachial arterial access merely a coincidence?

In this case, severe occlusive disease affecting the distal aorta and both iliac arteries was considered as the primary pathology. This knife-edge condition was probably maintained, until an unusual physiological status developed. The CAG and the preceding NSTEMI were possibly directly or indirectly responsible for all the ischemic process affecting the right leg. Immobilization during the emergency room, CAG unit and intensive care unit might precipitate the symptoms of distal circulation. An excessive consumption of the radiopaque infusion during the CAG might also precipitate glomerulopathy causing dehydration or overhydration, both of which have the potential to change the hemodynamic variables. A slight increase in BUN levels after CAG might be a predictor of the probable opaque nephropathy which altered the blood composition, as perfusion in the microvascular network can be easily affected by the minute changes in blood rheology.^[15]

In conclusion, coexistence of CAD and aortoiliac occlusive disease deserves a unique treatment strategy. Both pathologies can be treated at the same session, either by an endovascular or standard surgical approach. Regarding the surgical treatment, ABF bypass is the golden standard with high patency rates. However, if the laparotomy is unable to be performed due to various reasons, AXF bypass can be easily performed instead. With the evolution of the prosthetic vascular grafts, patency rates of AXF bypass have been also increased. Combined surgery should be considered in eligible patients with a good overall status. Otherwise, more serious pathology should primarily be treated, postponing the other entity to be considered electively.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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