

A new approach for the surgical management of unilateral iliac artery occlusive disease: The iliofemoral crossover transposition

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Aortobifemoral bypass remains the standard therapy for aortoiliac occlusive disease. Extraanatomic revascularization has been considered as an acceptable alternative and provides reasonable long-term results. Because some of the causes for its failure are related to the prosthetic material used, a technique that uses autologous material and is applicable in patients with unilateral common iliac lesions was developed. Iliofemoral crossover transposition is a femorofemoral bypass procedure in which the external iliac artery is used as a graft. The procedure is easily performed and avoids the use of prosthetic materials, minimizing the risks of their related complications. Because its biologic behavior, including hemodynamic performance, has proven to be excellent, satisfactory long-term results can be anticipated. (*J Vasc Surg* 2002;36:404-7.)

Notwithstanding developments in technology, concepts, and methods, aortobifemoral bypass remains the standard therapy for aortoiliac atherosclerotic occlusive disease because of its high patency rates in the long term and the low morbidity and mortality rates now associated with this procedure.¹ Nevertheless, in patients at high risk, or in individuals with a hostile abdomen, axillofemoral or femorofemoral bypass procedures are also widely and successfully performed. All of these procedures involve low surgical and anesthetic risks and may be accompanied by satisfactory if not excellent patency rates.² However, the use of synthetic materials and their associated complications can lead to failure in the medium or long term.

The operation known as arterial transposition was carried out for the first time by Blalock and Taussig³ in the palliative treatment of tetralogy of Fallot (subclavian-pulmonary transposition). Transposition was later used to advantage elsewhere in reconstructive vascular surgery, particularly in the treatment of obstructive disease of the supraaortic trunks or the visceral arteries of the abdomen.

Femorofemoral bypass is the procedure commonly used in this setting. The procedure is of recognized value

and generally results in patency rates of more than 60% at 5 years.^{2,4} Because a significant percentage of failures is related to the complications associated with the prosthetic material used, we decided to perform a femorofemoral bypass with an autologous artery, in the form of a transposition, for the treatment of unilateral iliac artery occlusive disease. Herein, we describe the technique of this new approach to unilateral iliac revascularization.

OPERATION

The operation designated as crossover iliofemoral transposition consists simply of the implantation of a suprapubic femorofemoral bypass, in which the external iliac artery of the ischemic limb is used as a graft. On the preoperative angiogram, the external iliac artery is measured and its length is compared with the distance between both common femoral arteries to assure that the operation is feasible.

The femoral bifurcation and the proximal segments of the superficial and deep femoral arteries of the occluded side are first isolated. Then, through a small oblique incision at the level of the iliac fossa, the external iliac artery is approached retroperitoneally and isolated all along its length. The exposed iliofemoral segment is carefully assessed to confirm that its length is sufficient for the transposition. The origin of the external iliac artery is clamped, with care taken not to damage the pudendal plexus and to maintain the integrity of the hypogastric artery. The artery then is sectioned, and its proximal stump is closed. The external iliac artery then is completely isolated in a distal

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Competition of interest: nil.

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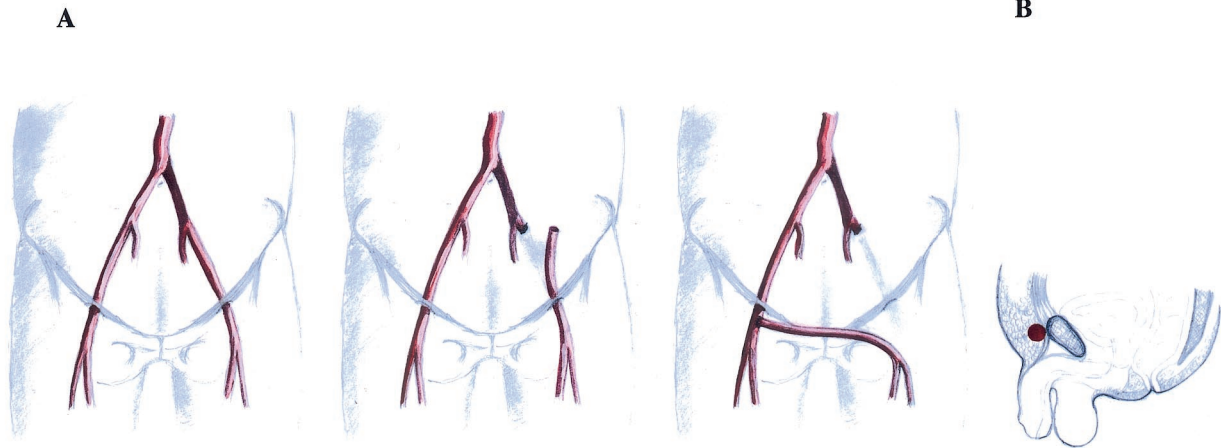


Fig 1. A, Iliofemoral transposition. B, Sagittal section shows position of graft.

direction, some collaterals being ligated, and passed beneath the inguinal arcade.

After a complete exposure of the common femoral artery of the patent side, a deep suprapubic tunnel, started immediately above the level of the common femoral vein and always at the level of the pubic bone, is created, through which the previously isolated segment of the iliofemoral artery on the occluded side is passed, to be anastomosed to the common femoral artery on the patent side, in a terminolateral fashion (Fig 1). When the anastomosis is completed and hemostasis is confirmed, the incisions are closed in layers, in a conventional fashion.

CLINICAL EXPERIENCE

From March 2000 to September 2001, eight individuals underwent this type of revascularization (Table). No blood transfusions were necessary, with the loss of blood being negligible. The operations had a mean duration of 50 minutes (range, 40 to 75 minutes). Six patients were walking at 24 hours and were discharged between the 4th and 5th days after the operation. The average in-hospital stay was 6 days. All of the patients had a significant improvement in ischemic syndromes.

With a mean follow-up period of 14.25 months, all the grafts remained patent. All grafts were assessed with duplex scanning at the time of discharge and at 30 days, 3 and 6 months, 1 year, 18 months, and now 23 months. The evaluations showed normal velocity profiles and amplitude in all the segments evaluated. No evidence of narrowing or degeneration of the arterial wall was seen. Peripheral systolic indices remained comparable with those measured at the time of discharge, except in one patient, who was submitted 1 year later to a femoroperoneal bypass, in whom the indices were further improved. The first four patients underwent a confirmatory follow-up angiogram (Fig 2).

Clinical experience

	<i>No. of patients</i>
No. of patients	8
Mean age (years; range)	48.6 (39 to 69)
Male gender	7 (87.50%)
Clinical presentation	
Disabling claudication	3 (37.50%)
Rest pain	2 (25%)
Ulceration	3 (37.50%)
Preoperative ankle/brachial indices	
<0.4	5 (62.50%)
>0.55, <0.6	3 (37.50%)
Common iliac lesion	
Occlusion	6 (75%)
Preocclusive	2 (25%)
Morbidity and mortality	
Retroperitoneal hematoma	1 (12.50%)
Perioperative deaths (30 days)	1* (12.50%)
Patency	
Immediate	8 (100%)
Medium and long-term	7
Postoperative ankle/brachial indices	
>0.65, <0.77	4 (50%)
>1.0	4 (50%)
Improvement from limb ischemia	8 (100%)
Mean follow-up (months; range)	14.25 (1 to 23)

*Died in 14th postoperative day of multiple organ failure.

DISCUSSION

Many different approaches exist for lower limb revascularization in patients with aortoiliac occlusive disease. Crossover femorofemoral bypass was first described by Freeman and Leeds⁵ in 1952. But the era of extraanatomic revascularization began in earnest in 1962 with the publication by Vetto⁶ of the first clinical series of patients who had undergone successful femorofemoral bypass. After considerable experimental evaluation and satisfactory clinical results were achieved, the indications for extraanatomic bypasses were widened and began to be used, even in individuals with low operative risk.



Fig 2. Postoperative control angiogram.

These techniques have low morbidity and mortality rates, together with simplicity and ease of execution, which makes them extremely attractive.⁷⁻¹⁰ Their hemodynamic effectiveness has been shown; although compared with conventional techniques, patency rates depend to a greater extent on the quality and possible degradation of inflow and outflow beds. However, in several published series of femorofemoral bypasses, references to failure of the graft because of progression of proximal disease are unusual (Ricco et al¹¹ quote 5.4%; Plecha and Plecha¹² report an incidence rate less than 1%). According to Da Gama,¹³ the low incidence rate of progression of obstructive disease in the donor artery is the result of the fact that because of the increased flow in this artery, resulting from the reduction in peripheral resistance, the structure of the artery adapts, leading to dilatation, which would compensate for possible future occlusive lesions, thus helping to preserve the revascularization.

A critical factor in the reduced patency rates appears to be the specific complications inherent on the use of synthetic grafts, like anastomotic fibroplasia, prosthetic infection, periprosthetic seromas, or anastomotic false aneurysms. An alternative approach intended to avoid these potential complications would be the use of autologous veins. However, in femorofemoral positions, few reported results are found. In addition, the vein frequently is not of a suitable caliber. Endovascular treatment, besides present-

ing lower medium-term and long-term patency rates in cases of complete occlusion of the common iliac artery, also has a high number of immediate failures¹⁴⁻¹⁶ and a significant rate of complications.¹⁷

Recently, when faced with a relatively young individual with critical ischemia of a lower limb as the result of occlusion of the common iliac artery, we thought to use the technique of arterial transposition, in the form of a suprapubic crossover graft. This has the advantage of not using synthetic material, it does not necessitate laparotomy and does not cause sexual dysfunction in male patients. The ideal substitute of an artery is a healthy artery of the same individual, preserving all the biochemical and biophysical properties of a normal artery and providing an excellent diameter match. It should resist thrombosis, tolerating low velocity and low flow patterns (as in the cases of a poor runoff), not cause any significant inflammatory response, and pose a negligible risk of infection, anastomotic neointimal hyperplasia, or false aneurysm. Theoretically, this approach should have a higher patency rate when compared with prosthetic bypasses. With a review of the last 200 consecutive angiograms done in our department, a study of the anatomy of the arterial tree, and measurement of the length of the iliac arteries, we found that the procedure would be feasible in about 82% of the patients, 9% of which had even excessive external iliac artery length.

In conclusion, iliofemoral crossover transposition is an often feasible and simple operation to perform and it avoids synthetic grafts and their potential complications, including medium-term and long-term failure. The morbidity associated with this operation, in our experience, has been negligible, and the single mortality recorded should not be attributed to the procedure but to the cardiac and renal impairment of the deceased patient. Although the follow-up period is short, expectation of long-term patency rates superior to those reported for prosthetic bypass, as commonly observed for transposition procedures in other locations, seems reasonable.

We propose that iliofemoral crossover transposition offers an attractive alternative method of bypass for unilateral occlusive disease of the common iliac artery. Its anticipated durability makes it particularly suited for younger individuals with a long life expectancy.

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