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Indication to Monolateral Versus Bilateral Aorto-Femoral Reconstruction and Long-Term Post-Operative Results

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Aorto-femoral reconstruction using a bypass bifurcation graft is perhaps the most successful procedure in the treatment of lower limb ischemia ever performed by vascular surgeons and the long-term results are most satisfactory.

The notable improvements in vascular prostheses, operative techniques and instrumentation has progressively increased the results of this procedure, whereas the related surgical morbidity and mortality has greatly decreased.

We are therefore able to consider bilateral aortofemoral grafting as the treatment of choice of aorto-iliac occlusive and aneurysmal disease.

Furthermore, the knowledge of the natural history of the atherosclerotic disease, as well as of the connected risk factors have ameliorated the correct indication to the bypass procedure, producing in such way better results.

Nevertheless, the vascular surgeon, when dealing with the single clinical case, should always think in an eclectic way, without rejecting prior alternative surgical procedures. In addition to this, other technical procedures such as iliofemoral, femoro-femoral (cross-over) bypass or axillo-femoral grafting, and more recently the radiologic interventional procedures such as percutaneous transluminal angioplasty (PTA), laser, atherectomies, etc., represent other options as surgical solutions for aorto-femoral steno-obliterative lesions.

If we have to state the correct indication to monolateral rather than bilateral aorto-femoral reconstruction, we should take into consideration the advantages and the disadvantages of the two techniques.

First of all there are some conditions that undoubtedly require a single sided reconstruction, such as a previous amputation of one limb, or an aneurysmal disease involving a single iliac artery.

Doubt can arise in case of a symptomatic lesion of one iliac artery with unaffected contralateral vessel (Table 1). As a matter of fact truly unilateral iliac disease is uncommon, whereas atherosclerosis is well known as a systematic process, generally diffused and more often bilateral. Moreover, the disease is progressive and the deterioration of flow in the aorta or in the contralateral iliac artery will necessitate later a bilateral revascularization.

The adequacy of the flow on the opposite side should therefore be checked not only by angiographic visualization and by non invasive study, but also with a papaverine test. The arterial pressure in the femoral and brachial arteries is measured at the same time; in basal condition the pressure gradient between brachial and femoral arteries should not exceed 15 mm of mercury. A drop of more than 10 mm Hg or 20% of the initial value after 20 mg papaverine injection means a significative disease in the iliac artery^{15, 17}. Furthermore the arterial lesion should not be amenable to percutaneous transluminal angioplasty. The PTA technique has to be addressed only to focal stenotic lesions; a surgical procedure may be required in case of complications and long-term results of PTA seems not to be so good, even with the use of stents¹⁷.

Table 1 - Indications for single sided aorto-femoral bypass

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- Previous amputation of one limb
 - Monolateral iliac artery aneurysm
 - Symptomatic steno/occlusive lesion of one iliac artery with unaffected contralateral vessel.
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In retrospective reviews higher patency rates follow bilateral bypass procedures, with a percentage of long-term patency of about 80% up to 99%^{6, 12}. When a unilateral aortofemoral or aorto-iliac bypass is carried out, the figures suggest that thrombosis is at least twice as common as it is for the limbs of aortobifemoral bypass, and may occur in over 40% of unilateral bypasses^{2, 13}. Moreover, if the operation is carried out for arteriosclerosis on one side only, between 20 and 50% of patients require a second operation on the contralateral side². On the contrary some Authors report similar late patency rates for single sided reconstructions (87%) with lower incidence of evolution of atherosclerotic lesions in the contralateral iliac artery (12%)¹².

Other factors in favour of bilateral reconstruction are the little added morbidity and mortality associated with a bilateral rather than a unilateral repair and the technical ease of performing the second side at the same time⁷. If we consider also the technical problems associated with the possible need for a later operation on the contralateral side, caused by difficulties in approaching the aorta due to extensive scarring, which usually follows a previous prosthetic implantation, we should give our preference to a bilateral procedure.

Besides this we should also take into account other alternative procedures such as iliac endoarterectomy and femoro-femoral cross-over bypass.

The endarterectomy procedure can be easily performed with an extra-peritoneal approach; it may also be accomplished with a ring-stripper, semi-closed technique, which avoids extensive exposure of the artery and does not necessitate the use of alloplastic material, thus excluding extensive scarring and unfavourable complications related to infection, and especially stimulation of diffuse and extensive intimal hyperplasia.

On the other hand there are contraindications to this procedure, such as extensive calcification of the vessels and possible post-operative sexual malfunction in males. The use of the technique of femoro-femoral grafting has progressively increased because of the ease of the procedure, which avoids abdominal incision and is consequently indicated also in poor-risk patients⁸.

Long-term results of cross-over grafting are also good and approach those of aorto-bifemoral grafting^{9, 11}. Relative contraindications are exposure of the unaffected femoral artery and the possibility of infection involving the prosthesis, although infection in a superficial graft is less threatening than that involving an abdominal implant.

Here we have to remember also the possibility of axillo-femoral bypass, but this procedure has not as good long-term results and has a different indication, in fact it is reserved to high risk patients in which the controlateral side cannot offer a good flow, or if the abdomen cannot be approached owing to infection.

On the other hand the single sided grafting procedure gives some advantages: it is amenable using a safer unilateral extraperitoneal approach with minimal dissection, and consequent minimal post-operative sexual malfunction problems. The inflow vessel may be the lower aorta, with a side anastomosis or the same common iliac artery if still patent. The superior portion of the infrarenal aorta, most often free of disease, may remain untouched and easily accessible for a secondary bifurcation grafting procedure should it become necessary^{16, 19} (Table 2).

Table 2 - Criteria of choice for monolateral aorto-femoral bypass

PROS

- Unilateral extraperitoneal approach
- Rare post-operative sexual malfunction problems
- Patent common iliac artery used as inflow vessel
- Large diameter inflow vessel, with low angled anastomoses and short and straight anatomic pathway (as compared to femoro-femoral bypass)

CONS

- Focal stenosis lesions amenable to PTA
 - Lower patency rates (as compared to bilateral bypass procedures)
 - Little added morbidity and mortality associated with bilateral repair
 - Progression of atherosclerotic disease with deterioration of flow in the controlateral iliac artery, requiring a second operation
 - Difficult approach to the aorta for scarring due to previous prosthetic implant
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Having discussed the advantages and the disadvantages of monolateral and bilateral aorto-femoral reconstructions, we should compare the results of the different procedures, in order to state the indications.

Several inappropriate experiences using the different surgical techniques have been reported with varying results, but the frequent lack of documentation regarding general conditions of patient, risk factors, inflow and outflow vessels and individual indications for surgery make a reliable comparison quite impossible.

Besides, the aorto-femoral monolateral by-pass procedure is now rarely performed (and consequently reported) by most Vascular Surgical Centers.

We reviewed the literature in search of comparative techniques and found few articles²⁴ comparing aorto-bifemoral, femoro-femoral and iliofemoral by-pass procedures. Examining their experiences these Authors conclude that aorto-bifemoral by-pass is preferable to femoro-femoral by-pass whenever aortoiliac atherosclerosis is accompanied by unilateral occlusion in good-risk patients with a reasonable life expectancy. They reserve femoro-femoral by-pass to patients at prohibitive risk, or with abdominal disease presenting serious technical difficulties, while iliofemoral by-pass, because of poor long-term results, is no longer considered an appropriate option.

Based on our own experience we came practically to the same conclusion: during the course of the years we have slightly modified our indication delaying the insertion of an aortobifemoral graft. Considering the natural history of the atherosclerotic disease and the clinical observation that, mostly in case of unilateral iliac disease, with appropriate control of risk factors and physical exercise, the onset of claudication may be reduced or even disappear owing to the increased collateral blood flow.

We therefore reserve aortobifemoral grafting to the disabling claudication and have nearly completely abandoned unilateral procedures such as ileofemoral endarterectomies or by-pass procedures.

Femoro-femoral grafting is performed by us only in poor risk patients with short life expectancy.

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