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The role of cross-over bypass graft in the treatment of acute ischaemia of the lower limb

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SUMMARY: The role of cross-over bypass graft in the treatment of acute ischaemia of the lower limb.

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Introduction. The Authors reports their experience with the use of femoro-femoral cross-over bypass graft in the management of acute lower limb ischaemia.

Patients and methods. Fourteen femoro-femoral bypass graft were performed for acute lower limb ischaemia due to unilateral thrombosis of iliac and femoral artery in 8 cases, late unilateral occlusion of a branch of previous aortobifemoral bypass in 3 cases, acute thrombosis of abdominal aorta in 2 cases and in the last one for an injury of common iliac artery during urological procedure.

In all the cases the operations were carried out under local anaesthesia and a subcutaneous bypass with "C" shape type configuration with 8 mm Dacron prosthesis were performed. The first and second year primary and secondary patency rates and limb salvage rates were evaluated.

Results. One and two year patency rate was 83.3 (10/12) and 70% (7/10) respectively. Secondary patency rate and limb salvage rate was 91.6% (11/12) and 80% (8/10) respectively.

A tight amputation had to performed in 3 failed reconstruction (3/12, 25%). Two patient died within 30 days after surgery from acute myocardial infarct. In 1 case infection occurred and re-do femorofemoral cross-over bypass with saphenous vein was carried out (8.3%).

Conclusions. Cross-over bypass is an attractive technique, especially in case of acute ischemia because of its simplicity, low morbidity and mortality, and good long term results.

RIASSUNTO: Il ruolo del bypass femoro-femorale nel trattamento dell' ischemia acuta degli arti inferiori.

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Introduzione. Gli Autori riportano la propria esperienza nell'impiego del bypass femoro-femorale cross-over nel trattamento delle ischemie acute degli arti inferiori

Pazienti e metodi. Quattordici pazienti sono stati sottoposti ad un intervento di bypass femoro-femorale per la comparsa di un'ischemia acuta dovuta a occlusione trombotica dell'asse iliaco-femorale in 8 casi, a occlusione trombotica unilaterale di una branca protesica di un pregresso bypass aortobifemorale in 3 casi, a trombosi aortica in 2 casi e a lesione dell'arteria iliaca in corso di intervento urologico in 1 caso.

In tutti i pazienti è stato eseguito un bypass cross-over, in anestesia locale, con protesi in Dacron 8 mm, con configurazione a "C" e a decorso sottocutaneo. È stata valutata la pervietà primaria e secondaria a 1 e 2 anni e la percentuale di salvataggio dell'arto.

Risultati. La pervietà primaria ad 1 e a 2 anni è stata rispettivamente dell'83.3% (10/12) e del 70% (7/10), con una pervietà secondaria ed un tasso di salvataggio dell'arto rispettivamente del 91.6% (11/12) e dell'80% (8/10). La percentuale di amputazione è stata del 25% (3/12). La mortalità postoperatoria a 30 giorni è stata del 14.2% (2/14). In 1 caso (8.3%) si è evidenziata un'infezione protesica tardiva che ha necessitato di un nuovo bypass cross-over in materiale venoso autologo.

Conclusioni. Il bypass femoro-femorale cross-over appare come una soluzione ottimale nella gestione delle ischemie acute in relazione alla sua semplicità, alla bassa morbi-mortalità e ai buoni risultati a distanza.

KEY WORDS: Femoro-femoral cross-over bypass graft - Iliac artery disease.
Bypass femoro-femorale cross-over - Patologia arterie iliache.

Introduction

The femoro-femoral bypass graft procedure was introduced in the clinical practice to treat the ischaemic limb due to severe monolateral involvement of iliac artery, especially in poor condition patients not suitable for a direct aortic approach inflow or in case of local

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contraindications for an anatomic revascularization (1, 2). Femoro-femoral cross-over bypass procedure is still an optimal technical solution in cases of emergency operations for acute ischemia of the lower limb due to occlusion of aorto-femoral bypass graft, thrombosis of iliac artery, aortic dissection, groin trauma, or in case of bleeding following anastomotic disruption due to aorto-femoral bypass infection (3).

Aim of this paper is to evaluate, on the basis of our experience and literature review, the role of cross-over bypass graft in the treatment of acute ischemia of the lower limb.

Patients and methods

Between January 2003 and May 2006, 14 femoro-femoral bypass graft were carried out at our institution for acute lower limb ischaemia (8 men and 6 women, with average age of 71 years and range 45-82 years). In 8 cases the ischemia was due to an acute unilateral thrombosis of iliac and femoral artery, in 3 cases for late unilateral occlusion of a branch of a previous aorto-bifemoral bypass, in 2 cases for an acute thrombosis of abdominal aorta, and in the last one for an injury of common iliac artery during urological procedure.

The clinical presentation was characterized in all patients by acute ischemia involving the right lower limb in 10 cases and left lower limb in 4 cases. Eight patients was ASA III, 3 patients ASA II, 3 patients ASA IV. In 3 cases an urgent angiographic examen was performed, while in 11 cases a duplex ultrasound examination was carried out.

No endovascular procedure to correct the inflow or the outflow were associated. In all the cases the operations were carried out under local anaesthesia with sedation in cases of time-consuming procedure. In all cases a subcutaneous bypass route and "C" shape type configuration with radially supported 8 mm Dacron prosthesis were used. The inflow site was common femoral artery in all cases, while the outflow site was the common femoral artery in 10 cases (71.4%) and the profunda femoral artery in 4 cases (28.5%).

Results

No patients was lost at follow up. Two patient died of an acute myocardial infarct at 1 and 3 postoperative days after surgery (14.2%). Two patients died 2 years after surgery for ischemic heart disease.

One and two year (range 1-28 months) patency rate was 83.3% (10/12) and 70% (7/10) respectively. Secondary patency rate and limb salvage rate was 91.6% (11/12) and 80% (8/10) respectively. A thigh amputation had to be performed in 3 patients (3/12, 25%).

In two cases an acute thrombosis of bypass occurred at 1 and 2 postoperative day due to an inadequate run-off. In 1 case a below the knee popliteal artery bypass graft with reversed saphenous vein by pass was carried out. In the last one a thigh amputation was carried out. In three cases a late occlusion at 2 years oc-

curred and thigh amputation were carried out for no possibility to attempt an arterial reconstruction after angiography in 2 cases.

In 1 case (8.3%) a late infection, with minimal bleeding at anastomotic site, occurred and a re-do femoro-femoral cross-over bypass with autologous saphenous vein was performed.

At the follow-up by means of color-duplex scan examination, no stenosis or occlusion of donor iliac artery, anastomotic site, bypass graft and outflow vessels occurred, and no secondary endovascular or surgical procedure were carried out.

Discussion

The femoro-femoral cross-over bypass is a safe procedure with a low complications rate and no systemic impact and seems to be indicated especially in case of monolateral iliac involvement in high risk patients for systemic or local contraindications for a in line aortic reconstruction.

In case of acute ischemia of lower limb, the femoro-femoral bypass presents several advantages. This type of reconstruction can be carried out under local anaesthesia, by two vascular team for any side, with an important reduction of the operative time, avoiding a general anaesthesia in patients usually in poor conditions (4).

At present preoperative angiography can be more selective and progressively replaces by non invasive ultrasonography techniques. In our experience the angiography was performed only in the cases of ischemia due to late branch occlusion of previous aorto-bifemoral bypass. In fact, in this cases, determination of the cause of graft occlusion and evaluation of the inflow and the outflow status are not demandable and the less severity degree of ischaemia due to collateral pathways permit an angiographic evaluation (5). In our experience an extensive preoperative use of duplex scan examination and a scrupulous evaluation of contralateral femoral pulse are mandatory and seems to be sufficient to give a correct surgical indication to perform femoro-femoral bypass, avoiding the time consuming and the worse of ischemia due to delay of preoperative angiographic examination.

The operative technique is simple and safe. After the femoral vessels were exposed with longitudinal incision, the first anastomosis was performed on the donor side, then the graft was tunnellized in subcutaneous tissue, and the second anastomosis was performed on the recipient femoral artery. The end-to side anastomosis angle can be effectuated in "C" or "S" shaped configuration; that seems not to be important to obtain a long term patency results (6). Normally the

graft is tunnellized in prepubic subcutaneous tissue but, in case of irradiation, scarring tissue or infection a retrofascial route. Through the Retzius or perineal space are preferred. A radially external supported Dacron vascular prosthesis was preferred, while we reserved the use of the saphenous vein only in case of infection.

The critical scepticism regarding this procedure is due to the risk of development of a steal of blood from the donor limb by the bypass and regarding the low patency rate. The steal phenomenon has been widely discussed and several haemodynamic studies have been carried out, showing that the development of ischaemia or rest pain at donor side is really infrequently seen (7, 8). Although, in occasional patients with limb-threatening ischemia, femoro-femoral grafting has been associated with severe donor limb ischemia, especially in cases of concomitant femoro-popliteal obstructive disease and sub-critical donor iliac artery stenosis (9). In our experience an extensive examination of iliac artery and femoro-popliteal vessels of donor limb by means of color-duplex scan examination was carried out and in cases of iliac stenosis major of 50% or severe involvement of donor femoro-popliteal vessel another vascular reconstruction was performed. In fact the femoral steal is due to incorrect evaluation of concomitant non hemodynamic iliac stenosis and high outflow resistance at donor side that exceeds the recipient limb (10). A second challenging question regards the natural history of non critical stenosis in the iliac artery in the donor side. The progression of non haemodynamic stenosis on the donor side presents low incidence and, for some authors, the increasing flow through the stenosis has a protective role (11).

In our experience a scrupulous pre-operative examination of the pulses status of contralateral limb and

extensive evaluation by means of duplex scan of the iliac and femoro-popliteal arteries have been carried out and no thrombosis due to iliac misleading stenosis or steal phenomenon were observed.

Long term results of cross-over reconstructions are very good and comparable with anatomic unilateral reconstruction, with cumulative five years patency rate of 56-70% and low incidence of complications, like infection or thrombosis (12). In our experience we observed the similar good patency rates at 1 and 2 years with low incidence of complications, and in all cases the graft thrombosis was due to inadequate run-off status and no occlusion related to donor iliac artery stenosis progression occurred. The low incidence of infective complications seems to justify a primary use of prosthetic materials, preserving the saphenous vein for secondary leg reconstruction or re-do procedure.

Conclusion

The advantages of femoro-femoral graft in the treatment of acute ischaemia seems to be due to surgical simplicity, minimal surgical demands, low morbidity and mortality, and good long term results with low incidence of complications. The operation is safe respect an aorto-iliaco femoral reconstruction, with better patency in contrast with an axillo-femoral bypass. Sexual function is better preserved.

In cases of acute ischemia due to iliac obstruction, we think that the cross-over bypass graft can be a good, safe and simple procedure to achieve a good inflow, especially in cases of intraoperative impossibility to obtain a good run-in to the iliac artery.

References

1. Benedetti Valentini F, Irace L, Faraglia V, Suampo R, Costa PL, Marchetti T, Siani A. Extra-anatomic bypass graft procedures. In: L. Battaglia, Vascular Emergencies – Pathophysiology and Surgical Treatment, Luigi Pozzi, Roma 1998: pp. 341-349.
2. Rutherford RB, Patt A, Pearce WH. Extra-anatomic bypass: a closer view. *J Vasc Surg* 1987;6:437-446.
3. Plecha FR, Plecha FM. Femoro-femoral bypass grafts. Ten-years experience. *J Vasc Surg* 1984;1:555-561.
4. Criado E, Burnham SJ, Tinsley EA Jr, Johnson G Jr, Keagy BA. Femoro-femoral bypass graft: analysis of patency and factors influencing long term outcome. *J Vasc Surg* 1993;18: 495-505.
5. Towne JB. Acute limb ischemia following aortic surgery. In: J.J. Bergan, J.S.T. Yao, Aortic Surgery. W.B. Saunders Company 1989: pp. 511-538.
6. Lye CR, Sumner DS, Stradness DE Jr. Hemodynamic of the retrograde cross pubic anastomosis. *Surg Forum* 1975;26:298-9.
7. Vogt KC, Rasmussen JG, Schroeder TV. The clinical importance and prediction of steal following femoro-femoral cross over bypass: study of the donor iliac artery by intravascular ultrasound, arteriography, duplex scanning and pressure measurements. *Eur J Vasc Endovasc Surg* 2000;19(2):177-83.
8. Lee RE, Baird RN. A haemodynamic evaluation of the femoro-femoral cross-over bypass. *Eur J Vasc Endovasc Surg* 1990; 4(2):167-72.
9. Trimble IR, Stonesifer GL, Wilgis EFS, Montague AC. Criteria for femoro-femoral bypass from clinical and hemodynamic studies. *Ann Surg* 1972;175:985-93.

10. Brief DK, Brener BJ, Alpert J, Parsonnet V. Crossover femoro-femoral graft followed up five years or more. An analysis. *Arch Urg* 1975;110(11):1294-9.
 11. Hill DA, Lors RSA, Tacy GD. Haemodynamic consequences of cross femoral bypass. In: *Extra-anatomic and secondary arterial reconstruction*, R.M. Greenhalgh Pitman, 1982: pp. 142-52.
 12. AURC and Ricco JB, Bouin-Pineau MH, Demarque C, Fossier JB. Late results of femoro-femoral crossover bypass surgery - a randomized study. In: Branchereau A, Jacobs M, Long term results of arterial interventions, Futura Publishing Company 1997: pp. 167-74.
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