Role of Femorofemoral Crossover Bypass Grafting for Unilateral Iliac Atherosclerotic Disease: A Comparative Evaluation with Anatomic Bypass

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Abstract
Purpose. To assess the role of femorofemoral or iliofemoral crossover bypass grafting, the early and late results of crossover bypasses were reviewed and compared with those of anatomic bypasses.

Methods. The clinical records of 164 patients with arteriosclerosis obliterans who underwent 99 crossover bypasses and 65 anatomic ones from 1982 to 2002 were retrospectively evaluated. The early and late results including operative mortality and morbidity, graft patency rate, limb salvage rate, and survival rate of the patients as well as backgrounds of the patients were compared between the two kinds of bypass procedures. In addition, perioperative factors including bypass procedures affecting graft patency were evaluated by a multivariate analysis.

Results. The percentage of high-risk patients was higher in the crossover bypass group than in the anatomic bypass group. The operative mortality and morbidity were similar between both bypass groups. The primary and secondary patency rates of crossover bypass grafts (93% and 97%, 83% and 92%, and 65% and 63% at 2, 5, and 10 years, respectively) were lower than those of anatomic ones (95% and 98%, 93% and 98%, and 90% and 98% at 2, 5, and 10 years, respectively). The late survival of the patients in the crossover bypass group was significantly lower than that in the anatomic bypass group. A multivariate analysis revealed the operative method, namely the crossover bypass, to be the only significant risk factor of late graft failure.

Conclusion. A crossover bypass was thus determined to be an acceptable procedure only in high-risk patients with a limited life expectancy.

Key words Femorofemoral crossover bypass · Graft patency · Anatomic bypass · Risk factor

Introduction

Since the initial description of femorofemoral crossover bypass,¹ this extra-anatomic bypass has been reserved for high-risk patients with severe ischemia. The first series of a femorofemoral crossover bypass was reported by Vetto² in 1962, and the simplicity of this technique and the good short results extended the operative indications to patients without any particular operative risks.¹

In the present study, the early and late outcomes as well as the backgrounds of 99 patients who underwent either a femorofemoral or iliofemoral crossover bypass were compared with those of the patients undergoing an anatomic bypass. In addition, a multivariate analysis with perioperative factors, including the operative method, affecting late graft failure was performed to ascertain which bypass was truly superior in patency, without any preoperative selection bias, and the present role and durability of a crossover bypass was also assessed.

Patients and Methods

Between January 1982 and December 2002, 99 patients underwent 95 femorofemoral and 4 iliofemoral crossover bypasses for iliac occlusive arteriosclerotic disease. They included 80 men and 19 women, and their age at the time of grafting ranged from 50 to 87 years with an average of 73.7 ± 7.2 years. To evaluate the backgrounds of the patients and the early results, the clinical charts were checked, while to evaluate the late results including the graft patency rate, limb salvage rate, and
survival rate of the patients, a final follow-up of these patients was done during the periods between June and September in 2003.

Before surgery, all patients underwent angiography to evaluate the sclerotic degree from the abdominal aorta to the peripheral artery of the bilateral lower limbs. Together with the findings of a computed tomography scan, an anatomic bypass is initially selected whenever possible. For a patient unsuited to undergo an anatomic bypass and the stenosis of the donor iliac artery was visualized to be less than 50% in preoperative angiography findings, crossover bypass procedures were selected. When it was more than 50% and short, the crossover bypass procedures were performed following stenting or an endarterectomy to improve the inflow of the donor artery. The grafts used were preclotted knitted Dacron graft without support in 52, an externally supported preclotted knitted Dacron graft in 33, a ringed expanded polytetrafluoroethylene graft in 12, and a sealed woven Dacron graft in 2. The diameter of the graft was 8 mm in all cases. Regarding the proximal anastomotic arteries of the grafts, 81 were the common femoral artery, 4 were the external iliac artery, and 14 were the distal portion of prior implanted suprainguinal bypass graft. Regarding the distal anastomotic arteries of the grafts, 95 were the common femoral artery, 2 the deep femoral artery, and 2 the proximal portion of the femoropopliteal bypass graft that had been previously implanted. An endarterectomy of the proximal and distal anastomoses was performed in 21 and 33 limbs, respectively. Profundaplasty of the distal anastomotic site was done in 6 cases. Concomitant peripheral revascularizations were performed in 29 including 19 femorodistal artery bypasses, 6 patch angioplasty of the superficial or deep femoral artery, and 4 thrombectomies of the distal artery. Stenting and an endarterectomy in the donor iliac artery to improve inflow were done in 12 and 1, respectively, a femoropopliteal bypass in the donor limb was simultaneously performed in 13 cases, and a thrombectomy for deep venous thrombosis in the ipsilateral limb was done in one. The configuration of the graft was an inverted C in 77 and a lazy S in 22.

Graft patency was objectively determined by a vascular laboratory examination at 3-month intervals. When some troubles were found, angiography or a three-dimensional computed tomography scan was recommended and if necessary, revision surgery was done. The definitions of patency and limb salvage were done in accordance with the recommended reporting standards of the Ad Hoc Committee on Reporting Standards, Society for Vascular Surgery/North American Chapter, International Society for Cardiovascular Surgery. 4

The 65 patients who underwent anatomic bypasses during the same periods were also retrospectively checked and the early and late prognoses, as well as the backgrounds of patients, were compared with those undergoing the crossover bypass grafting.

To assess the perioperative factors affecting late graft failure, both a univariate and multivariate analysis were performed. Assessed factors were age, sex, operative indications, complications of hypertension, diabetes mellitus, a history of ischemic heart disease, stroke, patency of superficial femoral artery, runoff score, 4 operative methods, and concomitant procedures for distal revascularization. Since the aim is to examine the risk factors of the late graft failure, two patients who died within 30 postoperative days were excluded from this analysis.

The statistical analysis regarding preoperative factors and postoperative complication rates was performed using the chi-square or unpaired t-test for the graft patency rate, limb salvage rate, and survival rate of the patients, which were calculated by the life table method using the log-rank test. In a multivariate analysis, Cox proportional hazard analysis was done. A value of $P < 0.05$ was considered to be significant.

Results

Backgrounds

In the crossover bypass group, the age of the patients, the rate of limb salvage operation, and the complication rate of preoperative pulmonary dysfunction were higher than the anatomic bypass group (Table 1).

Operative Morbidity and Mortality

General and local wound complications were encountered in 11% (ischemic heart disease 1%, stroke 1%, pulmonary complication 4%, renal dysfunction 3%, and gastrointestinal tract complications including bleeding 2%) and 7%, respectively, after crossover bypass procedures. The incidences of general and local wound complications were 18% (ischemic heart disease 5%, stroke 0%, pulmonary complication 8%, renal dysfunction 5%, and complications of gastrointestinal tract including bleeding 7%) and 2%, respectively, in the anatomic bypass group. There was no statistically significant difference either in the general complication rate or in the local wound complication rate between the groups.

Regarding the operative procedure, one patient died within 30 days after surgery and the operative mortality was 1% and 2% in the crossover bypass group and the anatomic bypass group, respectively.