Clinical Research

Prophylactic endovascular management of peripheral artery disease in elderly candidates prior to cardiac surgery

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Background and objectives Peripherical vascular disease (PVD) is a major risk factor in candidates for cardiac surgery and can impact morbidity and mortality in the perioperative and follow-up period. Elderly patients with PVD may benefit from endovascular treatment prior to cardiac surgery. We sought to assess the common clinical settings requiring prophylactic endovascular treatment before coronary surgery in elderly patients, the results, and the mid-term impact on subsequent revascularization. Methods Between November 2002 and June 2006, 37 patients (25 males, mean age 79.9±8.3 years, mean serum creatinine 1.9±0.6 mg/dl) underwent endovascular repair of PVD before cardiac surgery. For each patient, diagnostic methods, indications for intervention, types of interventions, procedural success, and complications were recorded. Results Four clinical settings were identified: renal artery stenting prior to coronary surgery (7 patients), iliac artery angioplasty and stenting (10 patients) in order to facilitate aortic balloon pump insertion after surgery, subclavian artery angioplasty and stenting prior to utilization of ipsilateral arterial conduits bypass surgery (5 patients), and carotid artery stenting before coronary surgery (15 patients). Technical success was achieved in all patients (100%); complications included brachial artery occlusion (1 patient), minor stroke (2 patients), contrast nephropathy (1 patient), and minor bleeding at the puncture site (3 patients). All patients underwent successful coronary or valvular surgery; no patients died in the perioperative period. After a mean follow-up of 26.6±3.1 months, all patients are alive and free from anginal symptoms or valvular dysfunction without clinical or Doppler ultrasonography evidence of restenosis of the implanted peripheral vascular stents. Conclusions It is not unusual for elderly patients who are candidates for cardiac surgery to require endovascular intervention for significant PVD prior to coronary bypass or valvular surgery. The results showed a low complication rate. The cardiologists have a fundamental role, not only in the diagnosis of peripheral vascular stenosis, which was seen frequently in patients with significant CAD, but also in the appropriate endovascular management of these high-risk patients. (J Geriatr Cardiol 2006; 3(2): 73-6.)

Key Words coronary disease; catheterization; angioplasty; peripheral vascular disease

Introduction

There are various reasons why interventional cardiologists are opting for a more global approach to patients with peripheral vascular disease (PVD). Coronary artery disease (CAD) is frequently associated with extra-cardiac atherosclerosis,1–3 PVD negatively impacts the prognosis of patients with CAD and ischemic heart disease,4,5 and finally the increasing age of the population makes multiple vascular atherosclerotic distributions more likely to be found in patients who are candidates for coronary surgery.6 Whether high risk patients with PVD who are candidates for surgical myocardial revascularization or valvular surgery may benefit from endovascular treatment prior to coronary surgery is still debatable. We sought to identify the most frequent clinical settings requiring prophylactic endovascular treatment before coronary surgery, the results, and the impact on subsequent revascularization in such high risk patients.

Patients and methods

Patients

Between November 2002 and June 2006, 37 patients (25 males, mean age 79.9±8.3 years, mean serum creatinine 1.9±0.6 mg/dl) underwent endovascular repair of PVD before cardiac surgery according to specific indications (Table 1). Informed consent was obtained from all patients. For each patient, diagnostic method, indications for intervention, types
of intervention, procedural success, and complications were recorded. According to our institutional policy, non invasive screening for extracardiac atherosclerotic distributions was performed, by Doppler ultrasonography of peripheral arteries, in all patients with significant CAD. Confirmed by angiography in the same session after coronary angiography was done in 24 patients, the diagnosis was as follows: renal Doppler ultrasonography for abdominal bruit and uncontrolled hypertension (7 patients), ultrasonographic follow-up of previous iliac artery endovascular interventions (2 patients), and carotid artery Doppler ultrasonography (15 patients). In contrast, diagnosis was made at the time of coronary angiography in 13 patients by the following: subclavian artery angiography to assess LIMA suitability and detect subclavian coronary steal syndrome in 5 candidate for arterial conduits based on subclavian bruit and blood pressure differential > 20 mmHg in the 2 upper extremities; by aortoiliac angiography in 7 patients based on abdominal bruit (1 patient), on systolic >180 mmHg and diastolic > 110 mmHg blood pressure regardless of the anti-hypertensive drugs (2 patients), on flushing edema (2 patients), and on unexplained renal dysfunction (2 patients). Contrast-induced nephropathy was defined as a rise in serum creatinine of ≥ 25% from baseline. Minor bleeding was defined as bleeding that did not require blood transfusions.

Follow up was accomplished by visits at 3, 6, and 12 month and stress tests (treadmill test or nuclear stress test) at 6 and 12 month. Follow-up surveillance of the implanted stent was performed by Doppler ultrasonography examinations at 6 and 12 month.

### Interventional procedures

Renal artery stenting was performed through an ipsilateral femoral approach and standard RDC guiding catheter in 5 patients, and through a radial approach using a MPA guiding catheter in 2 patients due to the downward origin of the vessel. Direct stenting with Genesis stent (Cordis Inc, Johnson & Johnson, Warren, NJ, USA) or Driver stent (Medtronic Ave., Inc., Santa Rosa, CA, USA) was the preferred method. Protection with PercuSurge Guidewire system (PercuSurge Inc., Sunnyvale, CA, USA) was used in 1 patient.

A retrograde ipsilateral approach was used for iliac artery angioplasty and stenting with a 23 cm Bradetip 8 or 9 F introducer (Cordis Inc, Johnson & Johnson, Warren, NJ, USA) and Genesis or Simphony (Boston Scientific Europe) stents.

Subclavian and carotid artery stenting was performed using the right femoral approach and standard Sidewinder or Multipurpose 8 F guiding catheter with hydrophilic 0.018-inch guidewire to deploy a Genesis and Cordis Nitinol carotid stent (Cordis Inc, Johnson & Johnson, Warren, NJ), respectively. A protection device was used in all patients (Angioguard, Cordis Inc, Johnson & Johnson, Warren, NJ).

Hemostasis was successfully accomplished with a Vasoseal (Datascope, Montvale, NJ, USA) device in all femoral approaches. Special precautions were taken in order to have the utilized contrast amount less than 150 ml.

### Results

#### Indications for endovascular interventions of peripheral arteries

Four clinical settings have been identified: renal artery stenting prior to coronary surgery (7 patients), iliac artery angioplasty and stenting (10 patients) in order to facilitate aortic balloon pump insertion after surgery, subclavian artery angioplasty and stenting prior to utilization of ipsilateral arterial conduits bypass (5 patients), and carotid artery stenting before cardiac surgery (15 patients). The indications for endovascular intervention were as follows:

1. For renal angioplasty the main indication was to prevent in-hospital acute renal failure, worsening of renal function not due to contrast nephropathy in patient with >70% stenosis in one renal artery (5 patients), or bilateral renal artery lesions with moderate renal failure (>70% stenosis, 2 patients).

2. For iliac stenting, the indication was due to significant bilateral disease (>70% stenosis) and intervention was performed in order to facilitate access and utilization of intraaortic balloon pump.

3. For carotid artery stenting, the indication was due to significant carotid disease (>80% stenosis, 8 patients with monolateral disease, 2 patients with bilateral disease) or
symptomatic carotid disease (>60% stenosis, 5 patients with monolateral stenosis) when cardiac surgery could be reasonably delayed for 3 weeks.

4. For subclavian artery stenting, the indication was for significant left subclavian artery disease (>70% stenosis) and because of unsuitability of other arterial conduits to be used as arterial bypass grafts.

Clinical outcomes of patients

Technical success was achieved in all patients. The complications included upper limb ischemia due to brachial artery occlusion (1 patient later underwent successful percutaneous brachial artery revascularization), minor stroke (1 patient), temporary contrast nephropathy not requiring dialysis (1 patient), and minor bleeding at the puncture site (4 patients). Troponin T and CPK-MB remained at baseline after the procedure in all patients even though 10 patients experienced anginal symptoms with transient electrocardiographic changes requiring nitrate infusion, and 2 patients had supraventricular arrhythmias requiring drug administration. After the procedure, aspirin (100 mg/day) plus low molecular weight heparin (nadroparin calcium) 100 IU/kg/12 hrs for urgent needs (<72 hours) (12 patients), or aspirin plus clopidogrel (75 mg/day) for 1 month for delayed coronary surgery (25 patients), were administered. All patients underwent successful coronary surgery. Ten patients had successful intraaortic balloon counterpulsation in the preoperative period through the stented artery, while no patients had acute renal failure or worsening of previous chronic renal failure (serum creatinine from 2.11±0.15 to 2.3±0.45 mg/ml after coronary revascularization, P>0.05), a cerebral ischemic attack in the preoperative period, or acute limb ischemia; no patients died intra- or peri-operatively. After a mean follow-up of 26.6±3.1 months, all patients were alive; 30 were free from anginal symptoms and residual induced ischemia or echocardiographic signs of valve prosthesis dysfunction; 7 underwent a new coronary angiography (5 underwent coronary percutaneous revascularization). On clinical and Doppler ultrasonography examination no evidence of restenosis was seen in the implanted peripheral vascular stents.

Discussion

Patients with PVD undergoing coronary revascularization have a high rate of adverse outcomes since diabetes, chronic renal dysfunction, old age, and PVD greatly affect survival after both coronary surgery and percutaneous revascularization. Chronic renal ischemia caused by atherosclerotic renal artery stenosis (RAS) is gaining recognition as a potentially important risk factor for cardiovascular morbidity and mortality. The etiology of increased risk of cardiovascular events is multifactorial and includes direct physiological changes that increase risk as well as intermediate clinical effects that are associated with negative outcome. Even mild chronic kidney disease is associated with an increased risk of recurrent hospitalization, subsequent CABG, and mortality. Revascularization of a stenosed renal artery is associated with preservation of renal function and better control of hypertension, unstable angina, and congestive heart failure. Preventive stent placement may reduce perioperative renal deterioration in this specific group of patients, such as those at high risk described by Sullivan et al. regarding aortic aneurysm repair.

Similarly, it is important for the interventional cardiologist to recognize and treat aortoiliac disease on the basis of the observations below: 1) the long-term morbidity was higher and survival ratio was poor in patients with CAD compared to patients without CAD who underwent isolated lower extremity revascularization surgery; 2) coronary surgery is a relatively high-risk procedure in patients with severe vascular disease; 3) the limitation for future perioperative intra-aortic balloon placement.

Prophylactic angioplasty and stenting of the iliac or femoral arteries associated with severe disease or tortuosity which are contraindications for intraaortic balloon pump, may offer the cardiac surgeon an access site for IABP, if needed for patients with low ejection fraction.

Undetected proximal subclavian artery occlusive disease, associated with a patent internal mammary artery used as a conduit for coronary bypass graft procedure, may cause reversal of the internal mammary artery flow (coronary-subclavian steal) leading to myocardial ischemia. In such patients, angioplasty and stenting of the subclavian artery may prevent any subclavian coronary steal syndrome and make the internal mammary artery suitable as an arterial conduit.

Up to 12% of patients presenting for coronary bypass have critical carotid disease, and more than 50% of patients presenting for carotid endarterectomy have significant carotid disease. Patients requiring surgery for both carotid and coronary disease may be managed with carotid endarterectomy followed by coronary bypass (staged approach), with coronary bypass followed by carotid endarterectomy (reversed staged approach), or with simultaneous coronary bypass-carotid endarterectomy. There are no compelling data proving the superiority of any of these three approaches. Management of patients with advanced atherosclerosis involving the extra-cranial carotid and coronary arteries should be personalized on the basis of symptoms and disease severity. A liberal policy to identify high-grade carotid stenosis using duplex ultrasound testing prior to coronary revascularization is recommended. Carotid angioplasty with cerebral protection may be an appropriate option in "high-risk" cardiac patients, especially in vascular centers with expertise and experience in performing this procedure.

Although no definitive data can be drawn from this experience, our study suggests that endovascular treatment of PVD in elderly patients who are candidates for coronary surgery may be effective, relatively safe, and lasting with only a low dose antiplatelet regimen.

References


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