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Long-term Arm Morbidity after Radial Artery Harvesting for Coronary Bypass Operation

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ABSTRACT

Background: The use of the radial artery (RA) in coronary bypass operations has become increasingly popular in recent years, but there is almost no documentation regarding the midterm and long-term arm complications.

Methods: Between January 1 and December 31, 1998, 109 patients underwent operations for myocardial revascularization employing a pedicled RA as 1 of the coronary grafts. The patients were surveyed for subjective arm morbidities at 2 times during their follow-up: short term (mean, 7 months postoperatively; range, 0.3-14 months) and long term (mean, 49 months postoperatively; range, 46-57 months).

Results: At the short-term follow-up, 33 (33.3%) of the patients had some complaints regarding the arm that was operated on, with 4 (4%) of the patients reporting arm disability with complaints that focused on pain (11, 11%), numbness (15, 15%), and parasthesias (12, 12%). At the long-term follow-up, only 9 patients (10.5%) still experienced some sort of inconvenience with the arm that was operated on, with 1 case of functional disability, 4 complaints (4.6%) of residual parasthesias, and 1 report (2.3%) each of pain or numbness. All but 2 of the patients with complaints at the short-term follow-up reported amelioration of symptoms at the long-term follow-up.

Conclusion: It appears that severe arm disability early after RA harvesting is likely to dissolve with time. Our favorable late follow-up results support the continuation of the employment of the RA as a conduit for coronary artery bypass grafting operations.

INTRODUCTION

There has been a great resurgence in the use of the radial artery (RA) as a conduit for myocardial revascularization by cardiac surgeons around the world since Acar and other researchers [Buxton 1996, Acar 1998, Possati 1998, Tatoulis 1998] reported improved results with these arterial conduits and since the acceptance and application of the total arterial revascularization concept.

Postoperative complications following the procurement of the RA are reported to occur quite frequently [Manasse 1996, Pola 1996, Arons 1999, Reddy 2002] and are mostly related to sensory loss, pain, or functional disabilities of the arm operated on. However, data regarding the long-term evolution of arm complaints are quite limited. We present a long-term follow-up report that concentrates on the arm complaints and morbidities of a group of patients who underwent coronary artery bypass grafting (CABG) operations with RA conduits.

MATERIALS AND METHODS

The study was conducted from January 1 to December 31, 1998, with a group of 109 consecutive patients who underwent CABG operations in our department with the RA as 1 of the grafts. This group represents 21.8% of the 498 CABG operations performed during this period.

All patients were administered an Allen test before the operation to ensure the competence of the ulnar artery. The RA was excised as a pedicle, skeletonization was avoided, metal clips were used for its branches, and the conduit was handled gently with minimal use of electrocautery. The wound was closed in layers with metal clips used for skin closure. Patients were discharged with oral diltiazem given for 6 months postoperatively. The study was conducted at 2 times, short term and long term, during patient follow-up. The short-term follow-up was performed at a mean of 7 months postoperatively (range, 0.3-14 months), and the long-term follow-up was performed at a mean of 49 months postoperatively (range, 46-57 months). Follow-up consisted of a review of the patients' clinical files and patient interviews that were carried out by a single observer who conducted the inquiry in the same manner with all of the patients. The inquiry comprised questions regarding hand function, such as fine and gross motor tasks (writing, eating, and lifting objects), changes in hand appearance (size, swelling, color) and sensation (pain, temperature, parasthesias, numbness), and the

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Table 1. Preoperative Clinical and Angiographic Data*

	Patients (n)
Operation Status	
Elective	60.5% (66)
Urgent	33.9% (37)
Emergent	5.6% (6)
Age >70 y	23.8% (26)
Prior CABG	5.5% (6)
Status post MI	60.5% (66)
Hypertension	49.5% (54)
Diabetes mellitus	31% (34)
Smokers	38.5% (42)
Hyperlipidemia	40.3% (44)
Prior TIA	1.8% (2)
Prior CVA	1.8% (2)
COPD	6.4% (7)
PVD	13.7% (15)
CRF (Cr >1.8 mg/dL)	3.6% (4)
Prior arrhythmia	6.4% (7)
Prior PTCA	17.4 (19)
Prior stent	0.9% (1)
EF mean (n = 89)	50.4%
EF >50%, n	39
50% > EF > 35%, n	36
EF <35%, n	14
3-Vessel disease	65.1% (71)
2-Vessel disease	11% (12)
1-Vessel disease	2.8% (3)
Left main disease	21.1% (23)

*CABG indicates coronary artery bypass grafting; MI, myocardial infarction; TIA, transient ischemic attack; CVA, cerebrovascular accident; COPD, chronic obstructive pulmonary disease; PVD, peripheral vascular disease; CRF, chronic renal failure; Cr, plasma creatinine level; PTCA, percutaneous transluminal coronary angioplasty; EF, ejection fraction.

patient's general condition, additional hospitalizations, anginotic complaints, and neurologic events.

RESULTS

The clinical statuses, risk factors, and angiographic data of all 109 patients are summarized in Table 1. Operative details are presented in Table 2. There were 4 cases (3.6%) of early mortality. Two patients died of cardiac complications. One patient died with hemodynamic deterioration and ischemic signs noted on the electrocardiograph postoperatively, which were found at surgical revision to be secondary to spasm in the RA graft. The other patient who underwent operation emergently during an extensive myocardial infarction died of cardiac failure 3 days postoperatively. The other 2 patients died of sepsis at 21 days and 19 days postoperatively.

At the short-term follow-up (mean, 7 months postoperatively), 99 of the 105 patients discharged home were available (6 patients who came from abroad for surgery were unavailable for follow-up). Thirty-three patients (33%) had some complaints regarding the arm that underwent operation, and these complaints included numbness in the thumb and forearm, pain in the thumb sometimes radiating to the scar tissue, parasthesias, and functional disability in daily activities (driving, writing, tool handling, and lifting heavy objects) (Table 3).

Table 2. Operative Data*

Distal anastomoses, n (mean no./patient)	323 (2.96)
Patients with LIMA grafts, n	96
Patients with RIMA grafts, n	1
Patients with RIMA + LIMA grafts, n	7
RA distal anastomoses, n	141
Patients with RA distal anastomoses, n	
1 Anastomosis	83
2 Anastomoses	20
3 Anastomoses	6
CPB time, min	90.9 ± 5
Aortic cross-clamp time, min	45.2 ± 3.5

*Data are expressed as the mean ± SD where appropriate. LIMA indicates left internal mammary artery; RIMA, right internal mammary artery; RA, radial artery; CPB, cardiopulmonary bypass.

At the long-term follow-up (mean, 49 months postoperatively), only 85 of the patients were available. The percentage of patients presenting any complaint regarding the arm that underwent operation was reduced significantly to 10.5% (Table 3). Only 1 patient had residual functional hand disabilities in the arm that underwent operation. All patients with arm complaints at the long-term follow-up were among those patients who were enduring arm problems at the early follow-up. Only 2 patients reported deterioration—the single patient with the functional disability and a patient with exacerbation of pain and parasthesias with a well-known vasculitis. All 4 patients with functional disabilities during early follow-up were asymptomatic at the late follow-up except for 1 patient with residual parasthesias, and the single patient with functional disabilities at the long-term follow-up had only reported complaints of arm pain and discomfort at the short-term follow-up.

All complaints at the long-term follow-up (except for 1 patient) centered in the thumb and the anatomic snuffbox region, whereas complaints regarding the forearm had almost completely disappeared. We failed to validate any preoperative risk factors for long-term arm complications, although

Table 3. Hand and Arm Complaints

	7 mo Postoperatively, (n)	49 mo Postoperatively, (n)	*P*
Patients complaining	33% (33)	10.5% (9)	.0002
Pain	11% (11)	2.3% (2)	.02
Numbness	15% (15)	2.3% (2)	.002
Parasthesias	12% (12)	4.6% (4)	.07
Functional disabilities	4% (4)	1.2% (1)	.233

we had 25 patients with diabetes and 11 patients with peripheral vascular disease in the late follow-up group.

Regarding the patients' major complications, we noted 1 patient (1.1%) who experienced a late postoperative myocardial infarction, 10 patients (11.7%) with residual anginotic complaints, and 4 patients (4.7%) with late postoperative cerebrovascular accidents.

DISCUSSION

With the reemergence of the use of the RA graft as a valued conduit for myocardial revascularization, there have been several reports regarding possible morbidities at the harvesting site. A few reports relate to the immediate postoperative arm complications regarding parasthesias, pain, altered temperature sensation [Timmons 1986], and diminished strength of the arm from which the RA was harvested [Dumanian 1998, Grossebner 1999, Serricchio 1999]. Most of these reports were based on formal neurovascular tests that attempted to reach an objective indication of arm morbidity. There is, however, only limited documentation regarding long-term arm complications from the patient's perspective. A recent report by Reddy et al [2002] described pain, numbness, and parasthesias in the arm that underwent operation as the most common patient complaints in the early and midterm postoperative period. In an attempt to identify risk factors for such morbidities, these investigators could only define an escalating risk in a small group of elderly patients with diabetes, whereas diabetes and old age by themselves showed no significant incremental risk.

A report by Saeed et al [2001] presented a midterm follow-up study of 54 patients that showed that most of the patients (74%) with early symptoms reported withdrawal of symptoms by 17.5 months postoperatively.

In our study, we have reported the outcomes at the RA harvest sites up to 57 months postoperatively in a group of 85 patients. Their early postoperative complaints of pain, numbness, and parasthesias were focused mainly in the forearm, which is supplied by the lateral antebrachial cutaneous nerve, whereas late follow-up complaints, consisting of residual parasthesias, pain, and numbness, were focused mainly in the region supplied by the superficial radial nerve—the snuffbox and thumb. We found that all complaints tended to dissolve with time, but the disappearance of complaints was more evident for pain and numbness and less so for parasthesias and severe arm disability.

The overall favorable late follow-up results in our study support the continuation of the use of the RA as an arterial conduit in CABG operations.

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