

# Coronary Artery Bypass Grafting Using the Rama Technique, A Method of Coronary Stabilization: Short-Term Results

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## INTRODUCTION

Direct coronary revascularization on the beating heart is supposed to decrease medical costs and morbidity related to extracorporeal circulation and is now more currently performed than before. Mechanical stabilization allows the surgeon to perform coronary anastomoses, as well, with conventional bypass surgery [Poirier 1999]. In our unit, we use a particular method of coronary stabilization, which is inexpensive and easy to perform. This study summarizes the short-term results of this method, called the "Rama technique", in 78 patients.

## MATERIALS AND METHODS

From May 1997 to July 1998, 78 patients underwent off-pump coronary artery bypass grafting (CABG) using a particular coronary stabilizer. Patients with acute myocardial infarction, acute coronary angioplasty failure, cardiogenic shock, or prior CABG were excluded. Patients with diffuse atheromatous disease, intramyocardial left anterior descending artery (LAD), or heavily calcified coronary arteries were also excluded. The preoperative characteristics of the patients are listed in Table 1 (©). Echocardiographic data were recorded in 44 patients. The mean left ventricular end-diastolic diameter was  $52.5 \pm 6.6$  mm.

### Rama Technique

All patients were operated on by median sternotomy. Exposure of the distal branches of the right coronary artery was obtained by minimal traction on stitches passed through the inferior wall of the right ventricle. Exposure

of the circumflex distal branches was obtained by traction on stitches passed through the left ventricular myocardium, below the coronary artery target. Placing the patient in a Trendelenburg position avoided hypotension as shown by Gründeman [Gründeman 1997].

Cardiac wall stabilization was achieved by stitches passed through the myocardium and knotted on a patch of Dacron® (see Figure 1 ©). A hole made in the middle of the patch exposes the target artery. A temporary coronary shunt was most often used for the distal anastomoses. Proximal venous anastomoses were performed using a single partial occlusion clamp application.

Measurements of serum levels of cardiac troponin IC were obtained six hours after surgery and daily for the next two days by an enzyme immunoassay. The limit of detection is 0 ng/mm. Transesophageal echocardiogram was recorded immediately after surgery and repeated when necessary. Perioperative myocardial infarction was diagnosed in the presence of one or both of the following criteria: the development of new Q waves on the electrocardiogram, the appearance of a new abnormality in segmental wall motion on the echocardiogram, or a troponin IC level more than 3 ng/ml.

### Follow-Up and Statistical Analysis

The mean follow-up was 18 months (range: 10 months to 2 years). Follow-up information was obtained by contacting patients and referring cardiologists. Clinical outcome, exercise testing, and coronary arteriography were assessed. All data are presented as percentages or as mean  $\pm$  standard deviation.

## RESULTS

Twelve patients received 1 graft, 32 received 2 grafts, 30 received 3 grafts, and 4 received 4 grafts. There was an average number of 2.33 grafts per patient (see Table 2 ©). The left internal mammary artery (LIMA) graft was used in 68 patients, the right (RIMA) graft in 5 patients, both LIMA and RIMA grafts in 2 patients, and the gastroepiploic branch in 1 patient.

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Table 1. Preoperative Characteristics of Patients

	N	%
Sex		
Male	63	80.8
Female	15	19.2
Stable angina	65	83.3
Unstable angina	13	16.7
Previous myocardial infarction	20	25.6
Diabetes mellitus	16	20.5
One-vessel disease	12	15.4
Two-vessel disease	21	26.9
Three-vessel disease	45	57.7
Left main trunk	17	21.8
Left ventricular ejection fraction		
<35%	11	14.2
35%–50%	19	24.3
>50%	48	61.5

Mean troponin IC level was 1.7 ng/ml at 6 h and 1.4 ng/ml at 24 h. There were no perioperative myocardial infarctions. Ten of the patients (12.8%) needed inotropic support during the first postoperative day. No neurological complication occurred. Excessive bleeding occurred in only two patients.

Operative mortality was 1.3%. One patient died of hemodynamic failure. Two patients were lost to followup. Two patients died, one of aortic dissection and one of sudden death. We now follow 73 patients and 71 are symptom free.

Exercise tests were performed on 60 patients and revealed no ischemia. Coronary angiography was performed systematically during the first postoperative month in 20 patients. All internal mammary grafts were patent (Table 3 ◉).

## DISCUSSION

Coronary artery bypass grafting on the beating heart requires optimal anastomotic site stabilization and good

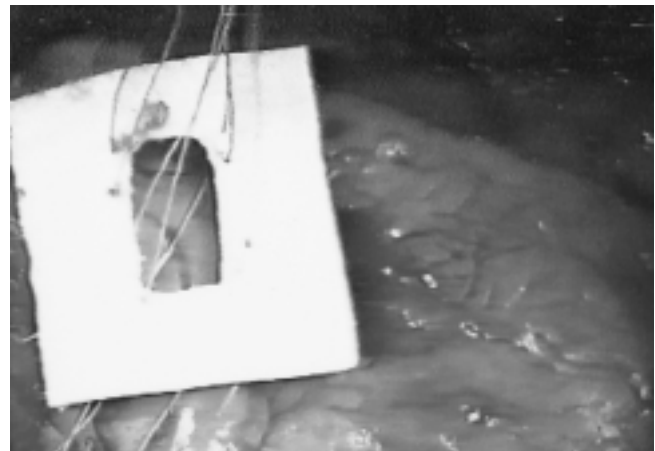


Figure 1. The patch of Dacron® is sewn on the myocardium, parallel to the coronary artery.

exposure of the left ventricular posterolateral wall. Coronary stabilization can be achieved by several devices (as described by several authors): silicone rubber tape around the coronary arteries [Grundry 1998], a pulling-pushing device [Cartier 1998], and the Octopus® [Jansen 1998, Spooner 1998, Hart 1999].

The technique described here is easily performed, inexpensive, and efficacious. The exposure of the posterolateral wall, which was very difficult to obtain at the beginning of this type of surgery, is now feasible. One can use pericardial traction as described by Cartier [Cartier 1998] or traction on stitches passed below the target area, as with our procedure. The Trendelenburg maneuver avoids drop in stroke volume when lifting the beating heart, as shown by Gründeman [Gründeman 1997] and is widely used. The inferior wall is more easily exposed. These artifices make bypasses of the circumflex branches and of the right coronary distal branches possible, and more complete revascularization is now achieved. Tasdemir [Tasdemir1998] reported 22 grafts of the circumflex branches and seven of the distal branches of the right coronary artery among 2,052 patients operated on between 1993 and 1996. In our data on 78 patients, 40

Table 2. List of Grafted Coronary Arteries

Coronary Artery	LAD	Diagonal	Marginal Branch	RCA	Right Posterior Descending Artery	Posterior Lateral Branch
Number of grafts	75	21	40	30	14	2

Table 3. Angiographic Controls (20 patients)

	Normal	Occluded	Stenose <50	Stenose >50
Mammary grafts (20)	19		1	
Saphenous grafts (41)	37	1	2	1

grafts on the obtuse marginal branch, two grafts on the posterolateral branch and 14 grafts on the right posterior descending artery were performed. The average number of grafts per patient is 2.33 in this data, 2.7 in Cartier's report [Cartier1998], and 1.8 in Spooner's report [Spooner1998].

Some limitations remain, however. We think that patients with intramyocardial LAD or diffuse atheromatous disease are not good candidates for off-pump grafting. As for patients with cardiomegaly and/or prior bypass surgery, we need more data to determine if the technique would be beneficial. Such patients have been excluded in this report. No postoperative myocardial infarction occurred in these selective patients. Serum troponin IC concentration increased in all the patients, as after every cardiac operation [Katus 1991, Pelletier 1994] but the peak release was lower than 3 ng/ml in all 78 patients.

The current quality of anastomoses seems excellent. From July 1989 to July 1990, Grundry [Grundry 1998] reported a 34% patency rate for off-pump grafts versus a 72% rate for traditional CABG grafts. However, newer stabilization devices have enhanced anastomotic quality as shown by Jansen [Jansen 1998] and Poirier [Poirier 1999]. In this data, 19 mammary grafts were normal on early angiographic controls. The short-term clinical results are good with 71 patients symptom free.

The technique of coronary stabilization described in this data, called "Rama technique", which is inexpensive and easily performed, has good short-term results.

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