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Directional Atherectomy Versus Balloon Angioplasty for Coronary Ostial and Nonostial Left Anterior Descending Coronary Artery Lesions: Results From a Randomized Multicenter Trial

JAMES D. BOEHRER, MD, STEPHEN G. ELLIS, MD, FACC, KAREN PIEPER, MS,*
DAVID R. HOLMES, MD, FACC,† GORDON P. KEELER, MS,* DARRELL DEBOWEY, MS,
ANTHONY T. CHAPEKIS, MD, FACC,‡ FRED LEYA, MD, FACC,§
MICHAEL R. MOONEY, MD, FACC,|| RONALD S. GOTTLIEB, MD, FACC,¶
PATRICK W. SERRUYS, MD, PHD, FACC,# ROBERT M. CALIFF, MD, FACC,*
ERIC J. TOPOL, MD, FACC, FOR THE CAVEAT-I INVESTIGATORS

Cleveland and Columbus, Ohio; Durham, North Carolina; Rochester and Minneapolis, Minnesota; Maywood, Illinois; Philadelphia, Pennsylvania; and Rotterdam, The Netherlands

Objectives. We hypothesized that atherectomy would be superior to balloon angioplasty for ostial and nonostial left anterior descending coronary artery lesions.

Background. Balloon angioplasty of ostial coronary artery lesions has been associated with a lower procedural success rate and a higher rate of complications and of restenosis than angioplasty of nonostial stenoses. Directional coronary atherectomy has been proposed as an alternative therapy for ostial lesions.

Methods. In the Coronary Angioplasty Versus Excisional Atherectomy Trial (CAVEAT-I), 1,012 patients were randomized to undergo either procedure; 563 patients had proximal left anterior descending coronary artery lesions, of which 74 were ostial. We compared balloon angioplasty with directional atherectomy for early and 6-month results for ostial as well as nonostial proximal left anterior descending coronary artery lesions.

Results. Directional atherectomy led to an initially higher gain in minimal lumen diameter for ostial lesions (1.13 vs. 0.56 mm, respectively, $p < 0.001$) but a higher rate of adjudicated non-Q wave myocardial infarction (24% vs. 13%, respectively, $p < 0.001$) than balloon angioplasty and no improvement in restenosis rates (48% vs. 46%, respectively). In the nonostial proximal left anterior descending coronary artery lesions, angiographic restenosis was reduced (51% vs. 66%, $p = 0.012$), but this was also associated with a higher rate of periprocedural myocardial infarction (8% vs. 2%, $p = 0.008$ by site and 24% vs. 8%, $p < 0.001$ by adjudication) and no difference in the need for subsequent coronary artery bypass surgery (7.3% vs. 8.4%, respectively) or repeat percutaneous coronary intervention (24% vs. 26%, respectively).

Conclusions. For ostial left anterior descending coronary artery stenoses, both procedures yielded similar rates of initial success and restenosis, but atherectomy was associated with more non-Q wave myocardial infarction. In this trial the predominant angiographic benefit (increased early gain and less angiographic restenosis) of atherectomy for the left anterior descending coronary artery was in proximal nonostial lesions. However, the tradeoffs for this angiographic advantage were more in-hospital myocardial infarctions and no decrease in clinical restenosis.

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Appropriate management of patients with proximal left anterior descending coronary artery stenoses represents a formidable challenge. Because of the large amount of myocardium at risk, the proximal left anterior descending coronary artery location is associated with a worse outcome than are other lesion locations (1,2). The European Coronary Surgery Study (3) found that the presence of proximal left anterior descending coronary artery stenosis as a component of multivessel disease was the most powerful predictor of a significant benefit from early surgical revascularization. Similarly in an analysis of the determinants of outcome after multivessel angioplasty, the presence of proximal left anterior descending coronary artery stenosis was significantly correlated with a less favorable event-free survival rate (4). With the advent of new percutaneous therapies, proximal left anterior descending coronary artery stenoses have remained an important and difficult subgroup of lesions. In some studies (5) the proximal left anterior descending coronary artery seems to have a proclivity for restenosis, and complications such as abrupt closure are

From the Department of Cardiology and Center for Thrombosis and Vascular Biology, Cleveland Clinic Foundation, Cleveland, Ohio; *Department of Medicine, Duke University Medical Center, Durham, North Carolina; †Mayo Clinic, Rochester, Minnesota; ‡Riverside Methodist Hospital, Columbus, Ohio; §Loyola Medical Center, Maywood, Illinois; ||Minneapolis Heart Institute, Minneapolis, Minnesota; ¶The Graduate Hospital, Philadelphia, Pennsylvania; #Thoraxcenter, Rotterdam, The Netherlands; and participating CAVEAT sites. A complete list of the CAVEAT Co-Investigators appears in reference 8.

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Address for correspondence: Dr. Eric J. Topol, Department of Cardiology, Desk F25, 9500 Euclid Avenue, Cleveland, Ohio 44195.

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more serious because of the large amount of myocardium at risk. Ostial left anterior descending coronary artery stenoses, a subset of these proximal lesions, are thought to have unique characteristics (6). Balloon angioplasty of ostial lesions has been associated with lower rates of initial success and higher rates of procedural complications and restenosis. For these reasons atherectomy has been advocated as a superior treatment for ostial lesions including left anterior descending coronary artery ostial lesions (7). In many centers, a lesion in the ostial left anterior descending coronary artery location constitutes an empiric indication for directional atherectomy.

Using data from a large multicenter randomized trial, we compared angioplasty with atherectomy for ostial left anterior descending coronary artery lesions. Further, the results of intervention for ostial left anterior descending coronary artery lesions were compared with those of intervention for nonostial left anterior descending coronary artery lesions. We hypothesized that directional atherectomy would be a superior revascularization strategy for both segments of the proximal left anterior descending coronary artery, with fewer complications and less restenosis compared with balloon angioplasty.

Methods

Participating sites, investigators and patient population. A group of 35 participating sites enrolled 1,012 patients in the Coronary Angioplasty Versus Excisional Atherectomy Trial (CAVEAT-I) (8). Each operator was required to have performed >400 coronary angioplasty procedures with a success rate >85% and >50 atherectomy procedures with a success rate >80%. Our study group comprised all patients with a left anterior descending coronary artery target lesion who were enrolled in this trial. Details of the study protocol have been published previously (8). Briefly, eligible patients were those who had symptomatic ischemic heart disease with de novo, focal (<12 mm) coronary atherosclerotic lesions deemed suitable for either percutaneous transluminal coronary angioplasty or directional coronary atherectomy and who were willing to give informed consent for the study. These patients were assigned randomly to directional atherectomy or angioplasty. For cases in which multiple lesions were treated, a single lesion was designated as the "target lesion."

Revascularization procedures. By protocol the goal of the coronary intervention was an angiographic result with as little residual stenosis as possible; a value of 20% diameter stenosis was the stipulated objective. Technical success was defined conventionally as a residual stenosis of <50%. Cross-over to the other treatment method was strongly discouraged. At the beginning and end of each procedure a coronary angiogram of the target vessel was obtained in two orthogonal views with either a 7F or an 8F catheter. Intracoronary nitroglycerin (100 to 200 μg) was given first to standardize the quantitative coronary angiography. Systematic follow-up coronary angiography was performed at 6 months, matching the orthogonal and hemiaxial views used during the index procedure.

Each patient received aspirin and at least one dose of a calcium channel blocking agent before the procedure. Heparin was administered to maintain the activated clotting time >300 s. A 12-lead electrocardiogram (ECG) was obtained before and within 24 h of the procedure. Creatine kinase (CK) levels with myocardial isoenzymes were measured every 12 h after the procedure for a total of two samples. Aspirin (325 mg/day) and a calcium channel blocker were prescribed for at least 1 month after the procedure.

Angiographic laboratory. The cineangiograms were forwarded to the laboratory of the Cleveland Clinic Foundation for independent blinded assessment of the initial and follow-up quantitative coronary angiograms. These assessments were made from the paired initial and follow-up angiograms with the technicians unaware of the treatment assignment and with any images that showed the procedural devices removed. The most severe view of the stenosis was selected for analysis. End-diastolic cine frames were digitized with a cine-video converter and a computer-assisted edge-detection algorithm (8).

Definitions. An *ostial left anterior descending coronary artery lesion* was defined as a stenosis of at least 60% on visual assessment within 3 mm of the origin of the left anterior descending coronary artery. *Myocardial infarction (Q or non-Q)* was defined in two ways. The first was a myocardial infarction diagnosed clinically at the participating site as reported in the case report forms and source medical records. The second type of myocardial infarction was determined by an adjudication committee at the Coordinating Center with no awareness of the assigned treatment. The adjudication committee members based their diagnosis on the development of new ECG changes and elevation of CK myocardial band isoenzyme levels to at least two times normal, or elevation of CK levels at least to three times normal. *Restenosis* was defined as a ≥50% stenosis at 6 months after an initially successful procedure. Patients were excluded from the restenosis analysis if the initial procedure was unsuccessful or if they died before a follow-up catheterization could be performed.

Statistical analysis. All data are presented as median (25th, 75th percentiles) for continuous variables and number (%) for categoric variables. The 6-month rates are Kaplan-Meier survival rates (Table 6). Hypotheses of interest were specified for a select group of outcomes before data analysis. These hypotheses included the following two principal issues: 1) Ostial left anterior descending coronary artery lesions have a worse outcome than nonostial lesions, and 2) atherectomy leads to less restenosis of ostial lesions compared with balloon angioplasty. To control for the experiment-wise type I error rate, we formally tested only the prespecified set of outcomes of primary interest using appropriate statistical tests. All other comparisons were evaluated informally using descriptive statistics.

The binary outcomes of angiographic success, restenosis and the in-hospital clinical outcomes were evaluated using logistic regression modeling techniques. Models were first developed using the predictor variables of treatment, left

Table 1. Baseline Clinical and Angiographic Characteristics

	Ostial LAD		Nonostial LAD	
	DCA (n = 41)	PTCA (n = 33)	DCA (n = 250)	PTCA (n = 239)
Age (yr)	59 (48, 69)	58 (53, 65)	58 (51, 66)	59 (51, 67)
Male gender	33 (80%)	24 (73%)	190 (76%)	165 (69%)
Weight (kg)	67 (66, 85)	83 (76, 88)	82 (73, 91)	81 (71, 92)
Height (cm)	173 (165, 176)	173 (168, 177)	173 (167, 178)	173 (165, 178)
Diabetes	6 (15%)	6 (18%)	46 (18%)	51 (21%)
Current smoker	8 (20%)	9 (27%)	68 (27%)	55 (23%)
Hypertension	20 (49%)	17 (52%)	134 (54%)	135 (56%)
Hypercholesterolemia	21 (51%)	13 (39%)	113 (45%)	102 (43%)
Cholesterol (mg/dl)	222 (201, 244)	198 (181, 234)	218 (191, 252)	212 (191, 251)
History of MI	19 (46%)	12 (36%)	99 (40%)	95 (40%)
Unstable angina	26 (63%)	22 (67%)	168 (67%)	170 (71%)
Pain at rest	9 (35%)	9 (41%)	72 (43%)	73 (43%)
Pain with ECG changes	2 (8%)	5 (23%)	47 (28%)	37 (22%)
Angina after MI	6 (23%)	5 (23%)	22 (13%)	23 (14%)
Accelerating pattern	16 (62%)	12 (55%)	110 (65%)	108 (64%)
Ejection fraction (%)	58 (510, 65)	55 (50, 60)	60 (50, 65)	60 (50, 65)
No. of diseased vessels				
1	27 (66%)	23 (70%)	181 (73%)	171 (72%)
2	14 (34%)	6 (18%)	58 (23%)	63 (26%)
3	0	4 (12%)	10 (4%)	5 (2%)
Thrombus	9 (23%)	5 (15%)	45 (18%)	37 (16%)
Lesion length (mm)	7.4 (4.7, 10.3)	6.3 (4.6, 8.3)	8.8 (6.5, 11.2)	8.9 (6.6, 11.7)
Vessel caliber (mm)	2.5 (2.2, 2.9)	2.4 (2.1, 2.8)	2.6 (2.3, 3.0)	2.6 (2.3, 2.9)
% Stenosis	72 (61, 76)	61 (55, 73)	70 (63, 76)	71 (61, 78)

Continuous measures are expressed as median (25th, 75th percentiles), categoric variables as number (%) of patients. DCA = directional coronary atherectomy; ECG = electrocardiographic; LAD = left anterior descending coronary artery lesions; MI = myocardial infarction; PTCA = percutaneous transluminal coronary angioplasty.

anterior descending coronary artery lesion type and the interaction of treatment with lesion type. The importance of the interaction was tested first to determine whether the treatment effect was different for patients with ostial lesions versus nonostial lesions. This term was not significant for all models, implying that the treatment effect was statistically comparable in the two lesion groups. The final logistic models therefore, included as predictors a term for the treatment effect and one for the left anterior descending coronary artery lesion type. The p values presented for these outcomes reflect the significance of the predictor factors from these logistic models. The differences in clinical outcomes were tested for two left anterior descending coronary artery groups without categorization by treatment using chi-square analysis.

The continuous quantitative angiographic outcomes, including 6-month minimal lumen diameter, early gain and late loss, were evaluated using general linear modeling techniques. The three factors included in the model were again treatment, left anterior descending coronary artery lesion type and the interaction of the two. This interaction also was nonsignificant so the final models included the two main variables of treatment and lesion type.

The differences in event rates up to 6 months were tested using Cox proportional hazards techniques. All events were censored at 6 months, allowing a test of differences only to that time. The modeling technique used was similar to others described. The interaction of treatment with lesion type was evaluated first and again found to be nonsignificant in all cases. The final model contained the predictor variables of treatment and lesion type.

Results

Clinical and angiographic features. A total of 1,012 patients were entered and assigned randomly to directional coronary atherectomy or balloon angioplasty. A subgroup of 563 patients had left anterior descending coronary artery target lesions. Of this group 74 patients had ostial left anterior descending coronary artery lesions. In the cohort with ostial lesions, 41 patients were assigned to directional atherectomy and 33 to conventional angioplasty. A total of 489 patients had nonostial left anterior descending coronary artery lesions; 250 of these patients were randomized to directional atherectomy and 239 patients to balloon angioplasty. Baseline clinical and angiographic features of these groups are summarized in Table 1. These data show the effectiveness of randomization for this subgroup, with similar demographic and angiographic characteristics. Procedural characteristics are presented in Table 2.

Table 2. Procedural Features

	Ostial LAD		Nonostial LAD	
	DCA (n = 41)	PTCA (n = 33)	DCA (n = 250)	PTCA (n = 239)
Maximal size of equipment				
Atherectomy catheter				
5F	0		2 (1%)	
6F	19 (48%)		133 (55%)	
7F	21 (52%)		106 (44%)	
Balloon catheter (mm)				
<3.0		3 (9%)		23 (10%)
3.0–3.99		27 (85%)		199 (84%)
≥4.0		2 (6%)		13 (6%)
Use of opposite technique	11 (27%)	2 (6%)	76 (30%)	9 (4%)
Use of perfusion balloon	1 (2%)	4 (12%)	26 (10%)	28 (12%)
Stent or laser use	0	0	2 (1%)	0
Perforation	2 (5%)	0	0	1 (0.4%)

Data presented are number (%) of patients. Abbreviations as in Table 1.

The differences in use of the opposing technique (cross-over) are similar to those of the overall population in CAVEAT-I (8).

Angioplasty versus atherectomy for ostial left anterior descending coronary artery lesions. Initial procedural success rates were similar for the treatment groups (Table 3). Atherectomy resulted in a twofold larger early gain in minimal lumen diameter (1.13 vs. 0.56 mm for balloon angioplasty, with a residual stenosis of 26% for directional atherectomy versus 39% for balloon angioplasty). Despite the apparently superior initial results for atherectomy in terms of early gain and residual stenosis, other results were nearly identical for the two procedures: the rate of restenosis by the binary dichotomous definition (48% for directional atherectomy vs. 46% for balloon angioplasty), the 6-month minimal lumen diameter (1.28 vs. 1.25 mm) and the 6-month percent stenosis (49% vs. 50%) (Table 3). As shown in Table 4, there were no apparent differences in the rates of major acute complications (death, myocardial infarction or emergency bypass surgery) between the groups, although scrutiny of the cardiac enzymes revealed more non-Q wave myocardial infarction events in the directional atherectomy group.

Angioplasty versus atherectomy for nonostial left anterior descending coronary artery lesions. As seen in Table 3 initial procedural success was improved with directional atherectomy compared with balloon angioplasty (91% vs. 78%, $p < 0.001$). At 6-month follow-up there was significantly less restenosis by the binary definition in the group who had atherectomy compared with those who underwent balloon angioplasty (51% vs. 66%, $p = 0.012$). As an angiographic correlate of the lower rate of restenosis at 6 months, the minimal lumen diameter at 6 months was greater, though not significantly, for

Table 3. Angiographic Core Laboratory Results

	Ostial LAD		Nonostial LAD		p Value*	
	DCA (n = 41)	PTCA (n = 33)	DCA (n = 250)	PTCA (n = 239)	Treatment	LAD Type
Success	32 (86%)	26 (87%)	221 (91%)	177 (78%)	< 0.001	0.745
Minimal lumen diameter						
Preprocedure	0.80 (0.62, 1.05)	1.04 (0.68, 1.19)	0.80 (0.61, 1.02)	0.79 (0.60, 1.03)		
Postprocedure	1.96 (1.70, 2.18)	1.58 (1.43, 2.10)	1.83 (1.50, 2.10)	1.57 (1.33, 1.83)		
6-mo follow-up	1.28 (0.89, 1.87)	1.25 (0.93, 1.65)	1.33 (0.87, 1.70)	1.11 (0.84, 1.45)	0.679	0.026
Early gain	1.13 (0.75, 1.27)	0.56 (0.38, 0.98)	0.99 (0.61, 1.28)	0.76 (0.48, 1.04)	0.418	< 0.001
Late loss	0.66 (0.21, 1.06)	0.22 (0.02, 0.57)	0.54 (0.14, 0.93)	0.49 (0.13, 0.79)	0.409	0.045
% Stenosis						
Preprocedure	72 (61, 76)	61 (55, 73)	70 (63, 76)	71 (61, 78)		
Postprocedure						
QCA	26 (15, 35)	39 (28, 46)	33 (25, 41)	40 (33, 49)		
Site	20 (10, 25)	20 (10, 33)	15 (2, 20)	20 (10, 30)		
6-mo follow-up	49 (33, 64)	50 (35, 74)	53 (37, 68)	58 (45, 68)		
Restenosis	15 (48%)	12 (46%)	96 (51%)	100 (66%)	0.012	0.148

*Presented for only a subset of these end points; statistical tests were performed only on prespecified hypotheses. Continuous measures are expressed as median (25th, 75th percentiles), categoric variables as number (%) of patients. QCA = quantitative coronary angiography; other abbreviations as in Table 1.

Table 4. In-Hospital Outcomes for Ostial Versus Nonostial Left Anterior Descending Coronary Artery Lesions and by Treatment Assignment

	Ostial LAD		Nonostial LAD		p Value*	
	DCA (n = 41)	PTCA (n = 33)	DCA (n = 250)	PTCA (n = 239)	Treatment	LAD Type
Death	0	0	0	2 (0.8%)	0.148	0.599
MI (by site)	3 (7%)	2 (6%)	20 (8%)	5 (2%)	0.008	0.617
Q wave	1 (2%)	0	0	5 (2%)	0.008	0.927
Non-Q wave	2 (5%)	2 (6%)	15 (6%)	3 (1%)	0.021	0.527
MI by adjudication	8 (24%)	4 (13%)	54 (24%)	16 (8%)	< 0.001	0.612
Emergency CABG	2 (5%)	1 (3%)	4 (2%)	5 (2%)	0.878	0.229
Composite: Death, MI (site) or CABG	4 (10%)	3 (9%)	23 (9%)	8 (3%)	0.017	0.360

Data presented are number (%) of patients. *Treatment effect and type of lesion (ostial vs. nonostial) were evaluated using logistic modeling techniques; p values expressed are for the multivariable treatment effect and lesion type effect from these models. CABG = coronary artery bypass graft; other abbreviations as in Table 1.

those patients who underwent directional atherectomy (1.33 vs. 1.11 mm).

There was a significant difference in periprocedural myocardial infarction (Table 4) for the nonostial left anterior descending coronary artery lesions. By clinical site report, atherectomy led to a higher rate of myocardial infarction (8% vs. 2%, $p = 0.008$), mainly non-Q wave myocardial infarction (6% vs. 1%, $p = 0.02$), and this was substantiated by a twofold increase in the adjudicated myocardial infarction rate (24% vs. 8%, $p < 0.001$).

Ostial versus nonostial left anterior descending coronary artery stenoses. Table 5 compares percutaneous interventions (balloon angioplasty and directional atherectomy) for ostial versus nonostial left anterior descending coronary artery stenoses. There were no significant differences in the rates of procedural success, in-hospital complications and restenosis.

Comparison of angioplasty for 33 ostial left anterior descending coronary artery lesions and for 237 nonostial left anterior descending coronary artery lesions (Table 3) revealed a higher angiographic success rate for ostial lesions (86% vs. 78%) and less frequent restenosis in ostial lesions treated with angioplasty (46% vs. 66%), but these differences were not statistically significant.

Comparison of atherectomy for the 41 ostial left anterior descending coronary artery lesions and for 250 nonostial lesions showed similar angiographic success rates of 86% and 91%, respectively. Restenosis rates were also similar for the two locations (48% vs. 51%).

Table 5. In-Hospital Outcomes for Ostial Versus Nonostial Left Anterior Descending Coronary Artery Lesions

	Ostial LAD (n = 74)	Nonostial LAD (n = 489)	p Value
Success	58 (87%)	398 (85%)	0.69
Restenosis	27 (47%)	196 (57%)	0.16
Death	0	2 (0.4%)	1.00
MI (by site)	5 (7%)	25 (5%)	0.56
Emergency CABG	3 (4%)	9 (2%)	0.22
Death, MI (site) or CABG	7 (9%)	31 (6%)	0.32

Data presented are number (%) of patients. Abbreviations as in Tables 1 and 4.

Clinical outcomes at 6 months. At 6 months there were no significant differences between the treatment groups in the rates of death, myocardial infarction, need for coronary artery bypass surgery or need for subsequent coronary intervention (Table 6). For ostial lesions the rates were 63% for atherectomy and 58% for angioplasty. Overall for nonostial lesions, 66% of the patients in the directional atherectomy group had no adverse clinical outcome at 6 months, compared with 67% of the patients who had balloon angioplasty. For this coronary segment there was an excess of myocardial infarction (as diagnosed clinically by the sites) at 6-month follow-up in the patients who had directional atherectomy.

Discussion

Our findings provide some new insights in the approach to patients with proximal left anterior descending coronary artery disease who are candidates for nonsurgical revascularization. Contrary to expected findings, this analysis of patients with ostial and proximal left anterior descending coronary artery lesions who were randomized to treatment with either directional coronary atherectomy or balloon angioplasty shows no significant advantage for directional atherectomy. A preexisting bias that atherectomy is preferred for ostial left anterior descending coronary artery lesions is evident in the systematic exclusion of patients with these stenoses from the Canadian Coronary Atherectomy Trial (CCAT) (9). In designing the present trial, some participating investigators strongly believed that it would not be appropriate to assign patients randomly with ostial left anterior descending coronary artery stenoses.

Paradoxal findings on the ostial left anterior descending coronary artery. The initial report from CAVEAT-I supported improved 6-month angiographic outcomes for atherectomy in the subgroup of patients with proximal left anterior descending coronary artery stenoses, which included those with ostial lesions. Patients with proximal left anterior descending coronary artery lesions had a significantly lower rate

Table 6. Cumulative Outcomes at 6-Month Follow-Up for Patients With Ostial and Nonostial Left Anterior Descending Coronary Artery Target Lesions*

	Ostial LAD		Nonostial LAD		p Value†	
	DCA (n = 41)	PTCA (n = 33)	DCA (n = 250)	PTCA (n = 239)	Treatment	LAD Type
Death	1.000	1.000	0.980	0.992	0.296	0.994
MI (site)	0.902	0.909	0.916	0.971	0.022	0.264
CABG	0.902	0.818	0.927	0.916	0.380	0.085
Need for subsequent nonsurgical coronary intervention	0.683	0.697	0.757	0.740	0.704	0.238
No adverse clinical event	0.634	0.576	0.660	0.674	0.769	0.264

*All rates are Kaplan-Meier 6-month survival rates. †Differences in the treatment effect and type of lesion (ostial vs. nonostial) were assessed multivariably using Cox proportional hazards modeling techniques; p values expressed are of treatment effect and of lesion type from these models. Abbreviations as in Tables 1 and 4.

of restenosis (51 for directional atherectomy vs. 63% for balloon angioplasty, p = 0.04) and a larger minimal lumen diameter 6 months after atherectomy (1.32 vs. 1.12 mm, p = 0.008) (8). However, the present report clarifies this issue and clearly demonstrates that the patients with ostial left anterior descending coronary artery lesions had nearly identical restenosis rates and 6-month minimal luminal diameters. The rates of restenosis in this trial were high relative to previous studies, but unlike most investigators we used a worst-view quantitative angiographic standard (20). Nevertheless, the benefit of atherectomy in terms of restenosis and 6-month minimal lumen diameter is confined to proximal nonostial left anterior descending coronary artery lesions.

For the nonostial group the benefit was purely angiographic, with significant improvement in 6-month minimal lumen diameter and in the binary restenosis rate for the patients who had atherectomy. Unfortunately, this angiographic benefit did not correlate with a significant change in clinical restenosis at 6 months and was achieved at a cost of significantly increased periprocedural myocardial infarction.

Bigger is not necessarily better. It is interesting to examine the data for ostial left anterior descending coronary artery lesions in terms of the "bigger is better" hypothesis of Kuntz et al. (10–14) and Fishman et al. (15). Although few lesions were examined, atherectomy did result in a twofold greater early gain (on average) in minimal lumen diameter. Despite the larger initial gains noted with atherectomy, there was no significant difference in restenosis and the average 6-month follow-up minimal lumen diameter was identical for the two procedures. The data appear to confirm the expectation that one may achieve a superior angiographic result in the catheterization laboratory acutely with atherectomy, but in the case of ostial left anterior descending coronary artery lesions, there is a fully compensatory increase in late loss (threefold for atherectomy vs. angioplasty) and no angiographic evidence of any lasting benefit at 6 months.

Another major question addressed by this study is whether ostial left anterior descending coronary artery lesions represent a distinct group such that expected success, complication and restenosis rates would be different from those for nonostial lesions. Percutaneous therapy of ostial stenoses has been associated with lower rates of success, more procedural complications and higher restenosis rates than that for nonostial lesions (6). This study unexpectedly found none of these differences when ostial left anterior descending coronary artery lesions treated with angioplasty and atherectomy were compared with nonostial left anterior descending coronary artery lesions treated with angioplasty and atherectomy. Many of the reports associating ostial lesions with a poor outcome have been series of right coronary artery ostial lesions (16,17) or ostial vein graft stenosis (18,19), or combinations of different ostial lesions (7,21). It appears that success, complication and restenosis rates for ostial left anterior descending coronary artery lesions are relatively favorable when compared with rates for aorto-ostial lesions.

Optimizing therapy for ostial lesions. Further study is needed to determine the optimal therapy for ostial left anterior descending coronary artery lesions. Both balloon angioplasty and directional atherectomy have high rates of restenosis, which may be exaggerated in the current trial because of the use of a worst-view quantitative angiographic index (20). With only 74 patients with ostial left anterior descending coronary artery lesions in the current study, the statistical power was limited to detect even moderate differences between the treatment groups. More aggressive atherectomy, currently being assessed in a multicenter randomized trial (Balloon Versus Optimal Atherectomy Trial [BOAT]), may yield different results. Coronary artery bypass surgery should be maintained as an alternative to percutaneous therapy. A recent randomized trial of balloon angioplasty versus internal mammary artery grafting for proximal left anterior descending coronary artery stenoses (22) found that patients who had surgery had similar clinical and functional class improvement and were more likely to be free from subsequent surgical or percutaneous revascularization at 2.5 years. Recent randomized trials of elective stenting of the proximal left anterior descending coronary artery also raise the possibility that this strategy is advantageous for this important coronary artery segment (23,24).

Summary. The present study shows no advantage of directional atherectomy over balloon angioplasty for ostial left anterior descending coronary artery lesions and a higher periprocedural myocardial infarction rate with atherectomy.

For nonostial left anterior descending coronary artery lesions atherectomy was associated with a clear-cut reduction of angiographic restenosis. However, the angiographic advantage in nonostial lesions was offset by a significantly higher rate of periprocedural myocardial infarction. These findings emphasize the ability of directional atherectomy to improve angiographic outcomes in a specific coronary artery segment—the nonostial proximal left anterior descending—but there is no accompanying evidence of clinical benefit.

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