Percutaneous transluminal coronary angioplasty of the very proximal left anterior descending coronary artery lesions

Teguh Santoso

Abstract

To assess the result of percutaneous transluminal coronary angioplasty (PTCA) of the very proximal left anterior descending (LAD) lesions, 153 consecutive patients undergoing PTCA of LAD were analyzed. The distance of the lesion from the origin of LAD was measured in the right anterior oblique angiogram. Twenty-two patients (group I) had very proximal lesion (0.5 cm from the origin), 39 patients (group II) had intermediate proximal lesion (0.5 cm from the origin, but still before the first septal branch) and 92 patients (group III) had more distal lesion. Tandem lesions necessitating multiple balloon inflation were observed in 9 (40.9%) patients of group I, 11 (28.2%) patients of group II (excluding those already included in group I) and 23 (25%) patients of group III (excluding those already included in groups I and II). Success rates were 20 (90.9%); 38 (97.4%) and 82 (89.1%) respectively, in group I, II and III. Differences were statistically not significant. Extent of disease as well as degree and morphologic severity did not influence success. No complications occurred in any patient of group I. Dissection of the main stem has not observed. One patient of group III developed acute infarction and one patient of group III died. We failed to cross chronic total occlusion in, respectively; 2, 1 and 9 patients of group I, II and III. PTCA of the very proximal LAD can be performed safely with a high success rate.

Keywords: PTCA, left anterior descending coronary artery.

INTRODUCTION

Proximal left anterior descending (LAD) coronary artery disease is generally considered as a high risk lesion associated with an increased rates of death and myocardial infarction. However, treatment of such lesion has remained controversial. Compared to medical therapy, coronary artery bypass surgery has not been conclusively demonstrated to improve survival or prevent myocardial infarction in this setting.1-3 The dilemmas are renewed by the increasing use of internal mammary bypass grafting, which long term patency and low perioperative infarction and mortality has made the procedure an effective therapy.4-7 The recent advent of percutaneous transluminal coronary angioplasty (PTCA) and particularly the ever increasing angioplasty operator experience and continued improvement in methods and equipment have changed the approach substantially. Currently PTCA has emerged as an alternative effective treatment for proximal LAD disease with a high success rate, low incidence of procedural complication and excellent long term result.8-12 However, the risk of PTCA of a lesion in a very close proximity to the left main coronary artery is less well defined.12
This study was undertaken to determine the immediate success rate and procedural complication of PTCA of the very proximal LAD lesion.

METHODS

Patients
The study groups included 153 consecutive patients undergoing PTCA of the LAD. Their ages ranged from 31 to 72 years and 118 were male. A history of prior myocardial infarction was noted in 37 (24.2%) patients. The left ventricular function, as assessed by contrast ventriculography was normal (EF 55%) in 101 (66.0%) patients, impaired (EF >30-55 %) in 43 (28.1%) patients and poor (EF <30%) in 9 (5.9%) patients. Patients who had angioplasty for treatment of an acute evolving myocardial infarction were excluded.

The distance of the lesion from the origin of LAD was measured in the right anterior oblique angiogram. The proximal LAD lesion was defined as extending from the vessel origin to the take-off of the anatomic first septal perforator branch.

The patients were divided into 3 groups depending to the site of the LAD stenosis. Group I comprised of patients with very proximal lesion, that was less than 0.5 cm from the vessel origin but still before the first septal branch. Group II consisted of patients with proximal lesion of greater than 0.5 cm from the origin. Group III had more distal lesion. Patients with tandem lesions were classified according to their proximal stenosis.

Definitions
Extent of coronary artery disease was defined as the number of epicardial vessel (or major branches) with ≥70% stenosis by visual estimation. Single vessel disease referred to ≥70% stenosis of the LAD.

Severity of lesion was classified as type A, B, or C according to the recommendation of the American College of Cardiology/American Heart Association Task Force.

Successful coronary dilatation was defined as less than 50% residual stenosis with ≥20% reduction of the original stenosis in the absence of infarction, urgent bypass surgery or death.

Angioplasty Procedure
Unless contraindicated, medications given before PTCA usually consisted of nitrates, calcium channel blocker, aspirin and ticlopidine. Angioplasty was attempted first to dilate the most severely disease vessel supplying the greatest amount of jeopardized myocardium. If this primary target vessel was the LAD and the lesion were multiple, PTCA was started from the most distal vessel upstream. During balloon inflation, care was taken not to obstruct the left main coronary artery. However, to achieve an optimal result occasionally dilatation had to be performed with part of the balloon in the left main coronary artery; an attempt that was only possible if the size of the left main coronary artery was big enough to allow unhindered flow to the left circumflex coronary artery. A good flow to the left circumflex coronary artery after contrast injection in the absence of a sudden drop of blood pressure secured that this artery was not compromised. In no instance was a double guide wire technique used. During the procedure, intravenous heparin and intracoronary nitrates were used. After PTCA patients were maintained on heparin for ≤24 hours, and continued to receive nitrates for ≥24 hours, a calcium channel blocker for ≥6 months and antiplatelet indefinitely. No stents, lasers or atherectomy devices were used in this study.

Statistical Analysis
Univariate analyses between groups were performed by using the t-test.

RESULTS
Twenty-two patients belonged to group I, 39 patients to group II and 92 patients to group III. Tandem lesions necessitating multiple balloon inflations were observed in 9 (40.9%) patients of group I, 11 (28.2%) patients of group II (excluding those already included in group I) and 23 (25%) patients of group III (excluding those already included in group I and II).

All groups of patients were similar with respect to the extent and degree or morphologic severity of coronary artery disease (Table 1).

Success rates were 90.9% ; 97.4% and 89.1% in, respectively, group I, II and III. No complications occurred in any patients of group I. Dissection of the left main coronary artery was not noted. One patient of group III developed an acute infarction and one patient of group III died. None required emergency bypass grafting and no patient experienced a stroke. We failed to cross chronic total occlusions in, respectively, 2, 1 and 9 patients of group I, II and III.
Table 1. Extent and morphologic severity.

<table>
<thead>
<tr>
<th>Vessels involved</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single (LAD)</td>
<td>16 (72.73 %)</td>
<td>27 (69.23 %)</td>
<td>66 (71.74 %)</td>
</tr>
<tr>
<td>Double</td>
<td>5 (22.73 %)</td>
<td>11 (28.21 %)</td>
<td>22 (23.91 %)</td>
</tr>
<tr>
<td>Triple</td>
<td>1 (4.54 %)</td>
<td>1 (2.56 %)</td>
<td>4 (4.35 %)</td>
</tr>
<tr>
<td>Stenosis severity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A</td>
<td>7 (31.82 %)</td>
<td>15 (38.46 %)</td>
<td>37 (40.22 %)</td>
</tr>
<tr>
<td>Type B</td>
<td>12 (54.54 %)</td>
<td>20 (51.28 %)</td>
<td>44 (47.83 %)</td>
</tr>
<tr>
<td>Type C</td>
<td>3 (13.64 %)</td>
<td>4 (10.26 %)</td>
<td>11 (11.95 %)</td>
</tr>
<tr>
<td>Success</td>
<td>20 (90.9 %)</td>
<td>38 (97.4 %)</td>
<td>82 (89.1 %)</td>
</tr>
</tbody>
</table>

DISCUSSION

A proximal LAD stenosis is respected by cardiologists and cardiac surgeon because of its distinctive negative influence on morbidity and mortality. The LAD supplies the anterior part of the interventricular septum and the anterior wall of the left ventricle. This constitutes 40% of the left ventricular myocardium. LAD disease is a common finding in autopsy studies of patients who die of acute myocardial infarction. Proximal LAD stenosis occurred in 21% of patients who died of non cardiac causes and 23% of patients who died of acute myocardial infarction. In contrast, acute thrombotic coronary events in the proximal LAD accounted for 61% of fatal myocardial infarction, in comparison with 8% of acute lesions occurring in the mid or distal segments. Also, the incidence of acute thrombotic events in other coronary arteries was much lower, being 6% in the left circumflex, 7% in the left main and 18% in the right coronary artery.

In survivors of myocardial infarction, the mortality rate at 30 months was 27% in patients with proximal LAD and only 4% in those without proximal LAD disease. In another study of survivors of myocardial infarction, it has been shown that at 3 years, the mortality rate from cardiac causes and the incidence of recurrent myocardial infarction in patients with LAD disease was similar to that in patients with multivessel disease.

Because of these reason, another alternatives to medical treatment are chosen. These are coronary artery bypass surgery and PTCA or related procedures such as stenting, atherectomy and lasers. The Coronary Artery Surgery Study reported a 10-year survival advantage in operated patients with proximal LAD coronary stenosis ≥ 70% and an ejection fraction of <0.50. Although PTCA is another alternative for coronary revascularization, randomized trial comparing bypass grafting and PTCA is lacking. Furthermore the results of a non matched patient series in which heterogeneous patient groups undergo PTCA or bypass surgery based on physician and patient preference are not conclusive. In a randomized trial comparing PTCA and medical therapy in the treatment of single vessel disease, PTCA is reported to offer earlier and more complete relief of angina than medical therapy and is associated with better performance on the exercise test. However PTCA treatment involves a small immediate risk of acute myocardial infarction and acute coronary occlusion leading to bypass surgery and a later need for readilatation to treat restenosis. The relatively small number of patients recruited in this trial does not allow analysis to be done on the impact of PTCA on the LAD.

Earlier studies of PTCA for LAD stenosis reported clinical success rates of only 84.5% to 90.6%, whereas the incidence of myocardial infarction was higher (5.7%) and a greater proportion of patients required in hospital bypass surgery (7.7% to 8.3%). The lower success rates and the greater number of in-hospital events reflect the time period of the studies. In both studies no particular attention was paid on lesion in the very proximal part of the LAD. Recent studies showed that a higher success rate (around 95%) and a lower procedural complication (less than 3%) can be achieved.

In the present study we specifically analyzed the results of PTCA of the very proximal LAD lesions, which may carry a higher risk if the procedure result in occlusive dissection with involvement of the mainstem. Regardless of number of vessels involved and the degree or morphologic severity of the lesion, the success rate of in patients with very proximal stenosis did not differ with those having more distal narrowing (s). In this small series of patients we did not observe any complication including dissection of the left main stem. Comparison with other recent reports yields similar findings. Technical improvements with stents, lasers, atherectomy (DCA, rotablator, TEC device) may offer better results for specific lesions, i.e. DCA appears well suited for stenosis which are eccentric, ulcerative or contain small-moderate amounts of thrombus. The rotablator may be of benefit when moderate angulation or calcification is present, but should be avoided when clot is evident.

There has been considerable discussion regarding the relatively high restenosis rate (up to 40%) of the proximal LAD, in comparison with other locations in
the same vessel or in the other vessels. However, such as rate is based on incomplete angiographic follow-up and reflects the higher probability of restudy in symptomatic patients. The number of patients requiring a second revascularization procedure is also a clinically relevant measure of long term success. In one study it was reported to be 19 %. In our study many of the patients did not undergo repeat cardiac catheterization, so no data can be provided regarding long term results.

The available data in the literature suggest that both PTCA and bypass surgery can provide excellent long term results with low risk of cardiac death and myocardial infarction. Regardless of the initial revascularization strategy employed, it appears that the 5-year survival rate without cardiac death or myocardial infarction has an upper limit that borders on 95 %. In conclusion, in most patients with very proximal lesion of the LAD, PTCA can be performed with a very high overall success rate and low risk. However, the procedure has to be performed with the full understanding that a second revascularization procedure may be required for recurrence.

Acknowledgement

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REFERENCES

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