Effect of the increasing use of coronary angioplasty on outcome at one-year in patients with unstable angina

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Abstract

Objective—To determine whether the increasing use of percutaneous transluminal angioplasty in patients with unstable angina has reduced the need for bypass surgery and whether this change in the choice of treatment affected the outcome at one year in patients with unstable angina who were admitted to hospital in two different periods of time.

Design—Retrospective analysis of consecutive patients with unstable angina (angina at rest with ST-T changes during pain) who underwent coronary arteriography in two different periods of time.

Patients—158 patients were admitted to hospital between January 1988 and June 1989 (group 1) and 140 patients admitted between January 1992 and June 1993 (group 2).

Results—Coronary angioplasty procedures nearly doubled from 29% in group 1 to 56% in group 2 whereas bypass surgery decreased from 36% in group 1 to 23% in group 2 (P < 0.01). Coronary angioplasty increased and bypass surgery decreased in patients with one vessel disease (P < 0.01), two vessel disease (P < 0.05), and three vessel disease (P < 0.01). Coronary angioplasty also increased and bypass surgery decreased in refractory angina and in patients with ejection fraction < 0.50 (both P < 0.05). At 1-year follow up, 14 patients in group 1 (9%) and 10 in group 2 (7%) either died or had myocardial infarction (P = NS). Revascularisation procedures were needed in 16 group 1 patients (10%) and 27 group 2 patients (19%, P < 0.05).

Conclusions—Coronary angioplasty became more widely used in patients with unstable angina. This reduced the need for bypass surgery in patients with multivessel disease, refractory angina, and depressed left ventricular function. This change in treatment did not affect 1-year mortality or the myocardial infarction rate. More patients in the more recent group in which angioplasty was the preferred treatment required a further revascularisation procedure than in the earlier group in which bypass grafting was more often used as the initial treatment.
All patients were treated with β blockers (generally metoprolol 50–100 mg twice a day), calcium antagonists (generally nifedipine 10–20 mg three times a day or diltiazem 60–120 mg three times a day) and oral nitrates (usually isosorbide mononitrate 20–40 mg three times a day). Heparin was given intravenously or subcutaneously to maintain the partial thromboplastin time (aPTT) at twice baseline. All patients were given aspirin (325 mg/day). Refractory angina was defined as recurrent chest pain at rest with ST-T changes despite antianginal treatment.

CORONARY ARTERIOGRAPHY

Selective coronary arteriography was performed in multiple projections by the Sones or Judkins technique after premedication with 10 mg of diazepam. Significant stenosis was defined as diameter narrowing of > 50% in at least one coronary artery. Patients were classified as having one, two, or three vessel disease according to the number of vessels with significant coronary stenoses. The ejection fraction was calculated from left ventriculograms performed in 30° right anterior oblique projection.

PERCUTANEOUS TRANSLUMINAL CORONARY ANGIOPLASTY (PTCA)

Intense effort were made to stabilise patients before PTCA. The interval between the last episode of chest pain and the procedure was 4-8 days (range 0-15) in group 1 and 4-2 days (range 0-13) in group 2. PTCA procedures were performed using over the wire or monorail catheter systems with low-profile dilatation balloons. At the beginning of the procedure an intravenous bolus injection of 10 000 IU of heparin was given, followed by a bolus of 5000 IU/h of elapsed time during the procedure. In most patients with multivessel disease only the ischaemia-related vessel, identified on the basis of electrocardiographic and angiographic findings, was dilated.8 Success was defined as a final reduction in luminal diameter by > 20% to a residual narrowing of < 50% with no major complications (death, non-fatal myocardial infarction, sustained acute coronary occlusion, emergency coronary bypass surgery).8

FOLLOW UP AND STATISTICAL ANALYSIS

One-year follow up data were obtained from telephone interviews or visits. We compared demographic, clinical, and angiographic data in the two groups using Student’s t test, Chi squared, or Fisher’s exact test when appropriate. One year cardiac events (cardiac death, acute myocardial infarction, new admissions to hospital for cardiac reasons, and new revascularisation procedures) in the two groups were evaluated with the log-rank test.

Results

CLINICAL AND ANGIOGRAPHIC FINDINGS

The clinical and angiographic characteristics of the two groups were substantially similar (table 1 and 2). The only statistically significant difference (P < 0.01) was that in group 2 more patients had transient ST depression than had ST elevation during pain (68% v 32%) whereas in group 1 the types of ST-segment shifts were equally common (52% v 48%). However, there was no difference in the clinical presentation of unstable angina in the two groups. One vessel and two vessel disease were found in about one third of patients in the two periods. Triple vessel or left main disease was more common in group 2 than in group 1 (34% v 26%) but the difference was not statistically significant.

TREATMENT CHOICE

In group 1, 46 patients (29%) underwent PTCA, 53 (34%) bypass surgery, and 59 (37%) has continued medical treatment (fig 1). In group 2, 78 patients (56%) underwent PTCA, 32 (23%) bypass surgery, and 30 (21%) had continued medical treatment (P < 0.01). Table 3 shows the choice of treatment according to extent of coronary artery disease. From the first to the second period there was a significant increase in PTCA procedures and a decrease in bypass surgery in single vessel disease (P < 0.01), two vessel disease (P < 0.05), and three vessel disease (P < 0.01) (fig 2). In patients with refractory angina, PTCA procedures increased from 43% in group 1 to 63% in group 2, whereas bypass surgery decreased from 39% in group 1 to 22% in group 2 (P < 0.05). Among patients with ejection fraction < 0.50, PTCA procedures also increased and surgery decreased from group 1 (PTCA 10%, surgery 53%) to group 2 (PTCA 33%, surgery 33%, P < 0.05).

PTCA PROCEDURES

Table 4 shows the results of the procedures in the two periods. Procedures were successful in 91% of group 1 patients and in 91% of group 2
patients. A complete revascularisation procedure was accomplished in two of the 16 patients with multivessel disease in group 1 (12.5%) and in seven of the 36 patients with multivessel disease in group 2 (19%) (P = NS). There were no deaths in the two groups. The myocardial infarction rate was low in both periods (2-2% in group 1 and 2-6% in group 2). Urgent revascularisation was necessary in 22% of patients in group 1 and in no patients of group 2. Coronary stents were implanted in for bailout procedures in four patients (5%) in group 2.

Table 3 Treatment choice in the two groups in patients with clinically significant coronary disease

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Group 1 (n = 46)</th>
<th>Group 2 (n = 78)</th>
<th>Group 1 (n = 53)</th>
<th>Group 2 (n = 32)</th>
<th>Group 1 (n = 46)</th>
<th>Group 2 (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Vessel disease</td>
<td>30</td>
<td>42</td>
<td>6</td>
<td>0</td>
<td>19</td>
<td>2</td>
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<td>15</td>
<td>23</td>
<td>12</td>
<td>10</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>3 Vessel disease</td>
<td>1</td>
<td>13</td>
<td>35</td>
<td>22</td>
<td>5</td>
<td>13</td>
</tr>
</tbody>
</table>

*P < 0.01; group 1 vs group 2.
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FOLLOW UP
After a year, six patients (4%) in group 1 had died (four had bypass surgery, one PTCA, and one was on medical treatment). Thirty patients (19%) had new admissions to hospital for cardiac reasons (eight had surgery, 11 had been treated with PTCA, and 11 were on medical treatment). Myocardial infarction occurred in eight patients (5%). Six patients (4%) needed bypass surgery (four were on medical treatment and two had been treated with PTCA) and 10 underwent PTCA (two had been treated with surgery, five with PTCA, and three had been discharged on medical treatment).

In group 2, one patient (0.7%) died before scheduled surgery. Admissions to hospital for cardiac reasons occurred in 39 patients (28%): six had been treated with surgery, 25 with PTCA, and eight medically. Myocardial infarction occurred in nine patients (6%). There was no difference in one year survival or myocardial infarction rate between group 1 and group 2. Thirteen patients (9%) had bypass surgery (seven were on medical treatment and six had previously been treated with PTCA) and 14 (10%) had a new PTCA procedure (all had previously been treated with PTCA). Therefore new revascularisation procedures occurred in 16 group 1 patients (10%) and in 27 group 2 patients (19%; P < 0.05).

Discussion
Patients with angina at rest associated with transient ST-T changes are a high-risk subgroup of those with unstable angina. Olson et al found that after an average follow up of about 25 months, an ischaemic ECG during angina was associated with 40% probability of death or of acute myocardial infarction, whereas patients without ischaemic ECG changes had a 13% incidence of such unfavourable events. Cohen et al, in a study of 90 patients, found that ST segment changes during pain were a reliable predictor of adverse clinical events (recurrent ischaemia, infarction or need of revascularisation). In that study the positive predictive value for clinical events of ST deviation > 1 mm in at least 2 leads was 89%. For these reasons, early coronary angiography and revascularisation procedures without delay have been advocated in this high-risk population. In the present study, the relative impact of PTCA and bypass surgery in such patients was retrospectively analysed and compared in two different periods. The data show that over the last
years, there has been an increase in angioplasty procedures, which nearly doubled from 29% in the early period to 56% in the late period. Concomitantly, bypass surgery was performed in fewer patients (36% in group 1 and 23% in group 2). The growth of PTCA was significant both in patients with single vessel disease and multivessel disease. In group 2 nearly all patients with single vessel disease had PTCA (95%); in group 1 the comparable figure was 55% (fig 2). The proportion of patients discharged on medical treatment dropped from 35% and 5% and, those given surgical treatment from 11% in group 1 to 0% in group 2. In patients with multivessel disease, surgical treatment declined from 52% in group 1 to 36% in group 2, whereas PTCA increased from 18% in group 1 to 41% in group 2. This shift in treatment strategy reflects, on one hand, the greater experience of operators who have lately used a more aggressive approach to PTCA ischaemic heart disease. In conclusion, the data show that in recent years PTCA has become the first treatment in patients with unstable angina. This has reduced the need for bypass surgery in patients with multivessel disease, refractory angina, and depressed left ventricular function. This change in treatment strategy did not affect 1 year mortality or the myocardial infarction rate, but the need of revascularisation procedures increased in the follow up period.

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15 Cohen M, Hawkins L, Greenberg S, Fuster V. Usefulness of ST-Segment changes in > 2 leads on the emergency room electrocardiogram in either unstable angina pectoris or non-Q wave myocardial infarction in predicting outcome. Am J Cardiol 1991;67:1368-76.


