Coronary angiography and outcome following acute myocardial infarction

See page 740 for the article to which this Editorial refers

The appropriate use of coronary angiography following acute myocardial infarction remains controversial. Moreover, the large geographic variation in its utilization underscores the divergence of opinion and the availability of resources for the implementation of such an approach on a ‘routine’ basis. Several recent studies, including the intriguing study by Marrugat et al.[1], have attempted to shed light on this issue. The study by Marrugat et al. compared the angiographic use patterns in two similar regions in western Europe with distinctly different rates of coronary angiography following acute myocardial infarction. In Toulouse, France, coronary angiography was used in 93% of patients surviving the first hour following admission to hospital, compared with only 6% of patients in Gerona, Spain. The 28-day all-cause mortality was nearly twice as high in Gerona (9.3% vs 4.3%, P<0.0003) with a relative risk of 1.90 (95% CI 1.17–3.07). The magnitude of the mortality difference is striking and provides ammunition for those of us who believe that an aggressive invasive approach is the preferred method of treatment in acute myocardial infarction, particularly in patients without contraindications to acute reperfusion therapy.

The theoretical rationale for primary PTCA is based upon its superiority in achieving early and complete reperfusion, and data such as those provided by Marrugat et al. are seductive, but one must be mindful of one caveat. Retrospective studies are valuable but they cannot withstand the rigorous scrutiny of randomized controlled trials. The limitation of the latter, however, lies in the lack of generalizability to the population at large[2,3]. Nonetheless, in randomized trials of PTCA vs thrombolytic therapy, the benefits of the aggressive approach, while statistically significant, are in general modest. This applies not only to the overall population undergoing reperfusion therapy but also to patients in cardiogenic shock[4]. Intuitively, one would have expected an even greater mortality difference among this high-risk group. These results shift the focus of attention in another direction, towards the multiplicity of factors other than treatment received, which may exert a marked impact on the outcome of acute myocardial infarction. These variables are difficult to quantify according to the criteria of evidence-based medicine, but the lack of tangibility, or even objectivity, should not diminish their importance. Indeed, it has been shown that pet ownership, and in particular the ownership of dogs as opposed to cats, are significant predictors of survival, independent of the effects of other psychosocial factors and physiological status in post-myocardial infarction patients discharged from hospital[5].

Important limitations of the retrospective review by Marrugat et al. are the potential differences between study groups that were not measured that
may have significantly altered the outcome, including differences in the geographic region, regional physicians, and medical systems. The two geographic regions clearly have two distinct ethnic populations, but may also have differences in time to presentation and pre-hospital care. Moreover, differing ethnicity between the populations may significantly affect the response to illness and the subsequent course. The type of physician, cardiologist or primary care giver, may have been different between the two regions\[6]. Other studies have shown an improved outcome when patients were cared for by a sub-specialist rather than a generalist, perhaps with less extensive experience and fund of knowledge in the area of acute coronary syndromes. The types of infarcts, Q wave vs non-Q wave or ST elevation vs non-ST elevation, as well as their treatment may have affected the outcome. The use of thrombolytic therapy and beta-blockers were significantly higher in the Toulouse population. The use of manoeuvres known to improve outcome, such as angiotensin-converting enzyme inhibitors, hypolipidaemic therapy, or tobacco cessation may have been different between study groups. Important differences may also exist in the two medical systems with regard to pre-hospital, emergency room, CCU, and follow-up care. If resources are rare for coronary angiography, they may also be rare for other important components of the medical system. Even the time frame of the study for the two populations was different (1989–1991 in Toulouse and 1990–1992 in Gerona).

Despite the limitations in the retrospective study, the marked improvement in outcome in an area with a routine angiographic practice following acute myocardial infarction is intriguing. Clearly, coronary angiography can only improve outcome following acute myocardial infarction when it is linked to an appropriate coronary revascularization strategy using percutaneous or surgical methods. As such, it is useful to consider the classification scheme of PTCA in acute myocardial infarction proposed by Topol (see Table 1) and the appropriateness of revascularization based on randomized controlled clinical trials\[7]. Primary PTCA, immediate, and delayed PTCA have clearly established roles, but only the former approach has been demonstrated to be beneficial in controlled trials. Even less is known about the appropriateness of bypass surgery following acute myocardial infarction, although bypass surgery certainly seems appropriate for patients with severe coronary artery disease (three-vessel or left main disease). The timing and method of revascularization was not examined in the study by Marrugat et al.

Prior studies of the use of coronary angiography in pre-discharge survivors following acute myocardial infarction have been inconclusive. Regional differences in the use of coronary angiography have been demonstrated between countries both in Europe and North America and between regions in the United States. Extensive comparisons of the use of angiography in the United States and Canada have been performed from the GUSTO trial\[8,9]. These studies have shown a 2-5-fold higher rate of angiography in the United States (71 vs 27%) along with higher rates of coronary angioplasty (29 vs 11%) and bypass surgery (14 vs 3%). The more aggressive approach in the United States led to fewer physician visits at 1 year with a reduced prevalence of chest pain and dyspnoea and a slightly higher survival after adjustment for all available prognostic factors. Perhaps surprisingly, the more restrictive strategy for coronary angiography in Canada did not improve the efficiency of diagnosing severe multivessel coronary artery disease. The same rate of severe coronary disease was seen in both catheterization populations, making the identification of severe disease almost three times more common in the United States. In both countries, there was an apparent paradox in that the patients most at risk for severe coronary disease (elderly, diabetics, prior myocardial infarction, congestive heart failure) were least likely to undergo coronary angiography. These findings underscore the importance of developing more accurate selection criteria for coronary angiography following myocardial infarction. An invasive approach was beneficial in the FRISC II study that demonstrated a lower composite end-point of death or myocardial infarction (9-4% in the invasive group, compared with 12-1% in the non-invasive group, risk ratio 0-78 [95% CI 0-62–0-98], P=0 8031). There was also a significant decrease in myocardial infarction alone (7-8 vs 10-1%, 0-77 [0-60–0-99]; P=0-045) and symptoms of angina and re-admission were halved by the invasive strategy\[10].

Other studies have not shown such a benefit with an aggressive invasive approach. However, to demonstrate a survival benefit requires a large number of

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<td>Type of revascularization in AMI</td>
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<tr>
<td>PTCA</td>
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<tr>
<td>Rescue, or salvage</td>
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<tr>
<td>Immediate</td>
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<td>Delayed (24–48 h)</td>
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patients followed over a long period of time. In the CASS trial, even patients with three-vessel disease and reduced left ventricular function had to be followed out to 7 years to demonstrate an advantage of bypass surgery over medical therapy\[11\]. There was no significant benefit at 5 years\[12\]. Notably, the VAN-QWISH study could not demonstrate any benefit to an invasive approach to treating non-Q wave myocardial infarction, although other factors may have played a role\[13\]. The rate of angioplasty was low and the mortality associated with bypass surgery was exceedingly high.

One can conclude from the randomized trials and large registry studies that primary PTCA is the preferred method of reperfusion. Nonetheless, this statement must be tempered by the marked difference in results among different centres. The learning curve of primary PTCA is ‘steep’ and in addition to operator experience and expertise, logistical constraints and the availability of facilities and personnel exert a major impact upon the time to treatment and outcome. If a policy of primary PTCA is to be embarked upon as the routine approach to the management of acute myocardial infarction, it is necessary for each institution and operator to analyse his or her own results. They should not use as a justification, the results from population-based studies, such as by Marrugat et al., or the randomized trials among whom the many investigators were enthusiastic and highly experienced in primary angioplasty\[14,15\].

The authors should be congratulated upon the performance of a complex study involving two different populations in two cities in two different countries. All good studies provide some answers but also lead to new questions, and this study certainly provides us with a new range of questions.

**References**


