

PCI in acute left main disease: a paradigm shift or a new reality?

Roberto Corti* and Stefan Toggweiler

Department of Cardiology, Cardiovascular Center, University Hospital Zurich, Zurich 8000, Switzerland

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This commentary refers to ‘Unprotected left main revascularization in patients with acute coronary syndromes’[†], by G. Montalescot *et al.*, on page 2308

In the last decade, percutaneous coronary intervention (PCI) has become the treatment of choice for patients with acute coronary syndrome (ACS) in most industrialized countries. As the benefit of acute PCI increases with decreasing delay to vessel revascularization, major efforts have been focused in optimizing each step in patient care. This includes raised awareness in the general population, well-organized alarm systems, rapid and safe patient transportation, pre-hospital patient care, and centralization of acute PCI facilities in high-volume centres.¹ These optimized strategies have resulted in a continuous decrease in mortality over the last few years (Figure 1). In fact, in-hospital mortality after acute PCI in ACS today is as low as <5%.^{2–4} The introduction of new anti-thrombotics and the increasing use of drug-eluting stents⁵ have the potential to improve the outcome of ACS patients further. In addition, elective revascularization of left main disease exhibited very promising results in recent trials. In the subgroup of patients with relevant left main disease of the recently published SYNTAX trial, rates for major adverse cardiac or cerebrovascular events were similar in patients treated with PCI and coronary artery bypass graft (CABG) (15.9 and 13.7%, respectively).⁶ However, left main stenting has been carried out with increasing frequency during the last years. Nevertheless, patients with unprotected left main disease still represent a challenge for the interventionalist, especially in the setting of an ACS.

Montalescot *et al.* have reported the results of patients with ACS and left main disease included in the Global Registry of Acute Coronary Events (GRACE) between 2000 and 2007.⁷ From a total of 43 018 patients, 1799 patients (4%) with relevant left main disease were treated by either PCI alone ($n = 514$), CABG alone ($n = 612$), or no revascularization ($n = 673$). Over time, a trend towards more PCI and less CABG was observed.

Several pieces of important information can be derived from this study. First of all, unprotected left main disease in patients with ACS is associated with a high mortality, especially in patients

presenting with ST-segment elevation myocardial infarction (STEMI) and/or haemodynamic instability. Overall in-hospital mortality was 7.7%, but reached 11% in patients who presented with STEMI or new left bundle branch block (LBBB), and was as high as 34% in patients with cardiogenic shock or cardiac arrest. For comparison, in the recently published Expanded GRACE registry,⁴ in-hospital mortality was 3.7%. The second important piece of information is that in patients not requiring immediate revascularization, a postponed surgical revascularization (during the same hospitalization) provides the best short- and long-term outcome. Patients treated with CABG had an in-hospital mortality of 5.4%, which favourably compared with patients treated conservatively (7.6%) or by PCI (11%). As this is a register and not a randomized trial, we cannot conclude that one or the other revascularization strategies provides better outcome. Patients treated with acute PCI did indeed present more often as STEMI, new LBBB, or cardiogenic shock. Thus, patients treated with PCI had the highest risk at hospital admission. This explains the high in-hospital mortality in this group, but also the incremental mortality of 5.4% during the next months (i.e. between hospital discharge and 6-months follow-up). The good results seen with CABG are at least in part due to a lower risk for this patient group at admission and a patient selection bias. In fact, median time from admission to operation was 4.5 days. Hence, patients who were initially scheduled for CABG, but died before the operation were assigned to the ‘conservative treatment group’. This selection bias is also important in patients with previous cardiac arrest where the neurological condition often only becomes evident after 1 or 2 days. Nevertheless, the outcome of patients treated with CABG was excellent, with incremental mortality of only 1.6% at 6 months. Patients with initial conservative treatment, on the other hand, exhibited an in-hospital mortality of 7.6%. Although 39% of these patients were scheduled for elective CABG, the mortality rate between hospital discharge and 6-month follow-up was as high as 10%. In fact, it appears that the third and probably most relevant message from this registry is that patients that were revascularized during the event hospitalization showed a better long-term outcome compared with the initial conservative therapy. This

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* Corresponding author. Tel: +41 1255 11 11, Fax: +41 44 2554401, Email: roberto.corti@usz.ch

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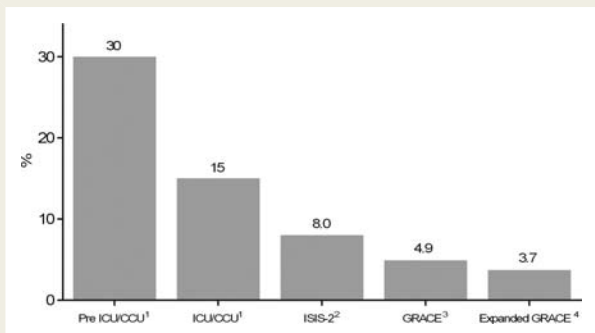


Figure 1 Mortality of acute coronary syndrome. The mortality of patients with acute coronary syndrome decreased during the last decades. In the pre-ICU/CCU era, mortality was as high as 30%. The ability to treat arrhythmias with ICD and β -blockers led to a significant decrease in mortality. The next step forward was the introduction of intravenous thrombolysis. Finally, percutaneous coronary revascularization led to the low mortality rates of ACS we face today. 1. Braunwald E, Zipes DP, Libby P. *Heart disease: a textbook of cardiovascular medicine*, 6th edn. WB Saunders and Co., 2001. 2. ISIS-2 (Second International Study of Infarct Survival) Collaborative Group. Randomized trial of intravenous streptokinase, oral aspirin, both, or neither among 17187 cases of suspected acute myocardial infarction: ISIS-2. *J Am Coll Cardiol* 1988;**12** (6 Suppl A):3A–13A. 3. Steg PG, Goldberg RJ, Gore JM, et al. Baseline characteristics, management practices, and in-hospital outcomes of patients hospitalized with acute coronary syndromes in the Global Registry of Acute Coronary Events (GRACE). *Am J Cardiol* 2002;**90**:358–363. 4. Goodman SG, Huang W, Yan AT, et al. The expanded Global Registry of Acute Coronary Events: baseline characteristics, management practices, and hospital outcomes of patients with acute coronary syndromes. *Am J Cardiol*. 2009;**158**:193–201.

highlights the importance of early revascularization in the presence of symptomatic left main disease.

As mentioned above, it is important to keep in mind that these data were derived from a registry and not a randomized study. Thus, the presence of selection bias is evident and is reflected by the differences in clinical presentation. In addition, left main disease is a very heterogeneous disease in terms of clinical presentation and anatomy, and each factor can potentially influence the decision-making process in the setting of ACS. A complete occlusion of the left main, for instance, is usually associated with cardiogenic shock and therefore represents a very high-risk situation requiring immediate life support strategies and urgent revascularization, often in conjunction with the use of left ventricle assist devices, whereas a subtotal stenosis may present as unstable angina with subendocardial ischaemia associated with a much lower risk. For the interventionalist, an ostial or midshaft left main lesion is easier to treat than distal lesions (which normally represent a real technical challenge because of the involvement of a major vessel bifurcation). In addition to lesion morphology, several clinical features might influence decision-making strategies. Indeed, the presence of three-vessel disease or a total occlusion of the right coronary artery may shift the treatment preference of the physician in charge towards surgical revascularization. In contrast,

patients presenting with haemodynamic or rhythm instability require immediate decision making, resulting most commonly in an urgent percutaneous revascularization. Even though the optimal treatment strategy for an individual patient can be reached in a case-based discussion between interventionalist and cardiac surgeon, such an approach is not applicable in an emergency situation. This explains why it is indeed very difficult to conduct a randomized trial in patients with ACS and left main disease. Nevertheless, as demonstrated by the SYNTAX trial, such studies are possible under certain conditions. In patients presenting with ACS, however, only those in haemodynamically stable conditions may be eligible for future trials. Such a study would be important, as suggested by the registry data of Montalescot et al.⁷

Finally, a concern of this study may be the short follow-up (6 months). Unplanned revascularization due to in-stent restenosis and late/very late stent thrombosis may affect the long-term outcome of PCI patients and favour surgical revascularization in the long term. Currently, rates of target lesion revascularization in patients with left main disease receiving a drug-eluting stent range from 0 to 14%.⁸

In our opinion, this observational study provides new important data that stress the importance of prompt and complete revascularization of patients presenting with ACS and left main coronary artery disease. Further research is required to characterize better those patients which benefit the most from percutaneous or surgical revascularization.

Conflict of interest: none declared.

References

- Spaulding C, Morice MC, Lancelin B, Haddad SE, Lepage E, Bataille S, Tresca JP, Mouranche X, Fosse S, Monchi M, Vernejoul N for the CARDIO-ARIF registry Investigators. Is the volume–outcome relation still an issue in the era of PCI with systematic stenting? Results of the greater Paris area PCI registry. *Eur Heart J* 2006;**27**:1054–1060.
- Stone GW, Lansky AJ, Pocock SJ, Gersh BJ, Dangas G, Wong SC, Witzenbichler B, Guagliumi G, Peruga JZ, Brodie BR, Dudek D, Möckel M, Ochala A, Kellock A, Parise H, Mehran R, for the HORIZONS-AMI Trial Investigators. Paclitaxel-eluting stents versus bare-metal stents in acute myocardial infarction. *N Engl J Med* 2009;**360**:1946–1959.
- Steg PG, Goldberg RJ, Gore JM, Fox KA, Eagle KA, Flather MD, Sadiq I, Kasper R, Rushton-Mellor SK, Anderson FA; GRACE Investigators. Baseline characteristics, management practices, and in-hospital outcomes of patients hospitalized with acute coronary syndromes in the Global Registry of Acute Coronary Events (GRACE). *Am J Cardiol* 2002;**90**:358–363.
- Goodman SG, Huang W, Yan AT, Budaj A, Kellenly BM, Gore JM, Fox KAA, Goldberg RJ, Anderson FA, for the Expanded Global Registry of Acute Coronary Events (GRACE2) Investigators. The expanded Global Registry of Acute Coronary Events: baseline characteristics, management practices, and hospital outcomes of patients with acute coronary syndromes. *Am J Cardiol* 2009;**158**:193–201.
- Mauri L, Silbaugh TS, Garg P, Wolf RE, Zelevinsky K, Lovett A, Varma MR, Zhou Z, Normand S-LT. Drug-eluting or bare-metal stents for acute myocardial infarction. *N Engl J Med* 2008;**359**:1330–1352.
- Serruys PW, Morice MC, Kappetein P, Colombo A, Holmes DR, Mack MJ, Stähle E, Feldman TE, van den Brand M, Bass EJ, Dyck NV, Leadley K, Dawkins K, Mohr FW, for the SYNTAX Investigators. Percutaneous coronary intervention versus coronary-artery bypass grafting for severe coronary artery disease. *N Engl J Med* 2009;**360**:961–972.
- Montalescot G, Brieger D, Eagle KA, Anderson FA Jr, FitzGerald G, Lee MS, Steg Ph G, Avezum Á, Goodman SG, Gore JM for the GRACE Investigators. Unprotected left main revascularization in patients with acute coronary syndromes. *Eur Heart J* 2009;**30**:2308–2317. First published on 30 August 2009. doi:10.1093/eurheartj/ehp353.
- Colombo A, Chieffo A. Drug-eluting stent update 2007: part III: technique and unapproved/unsettled indications (left main, bifurcations, chronic total occlusions, small vessels and long lesions, saphenous vein grafts, acute myocardial infarctions, and multivessel disease). *Circulation* 2007;**116**:1424–1432.