Interventional cardiology: successes and failures

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Ever since the seminal first balloon angioplasty in a young patient with angina pectoris on 16 September 1977 by the late Andreas R. Grünzig at the University Hospital Zurich,1 interventional cardiology has contributed importantly to the rise of cardiovascular medicine.2 With the advent of drug-eluting stents, restenosis has become less important,3 but whether or not it affects hard outcomes including mortality, or represents a clinical nuisance only is still a matter of debate. Whether we really use percutaneous coronary interventions (PCIs) only in those patients who truly need it has also been questioned by many critics of current clinical practice.4

Finally, although primary PCI has become the standard of care in acute coronary syndromes (ACS), the event rate in the years thereafter remains high, particularly due to the development of systolic dysfunction and heart failure. Thus, the possibility of improving current ACS management further, for instance by limiting reperfusion injury (thereby protecting the myocardium), is another open question. Almost all pharmacological interventions have failed, although pre-conditioning appears to be promising.5

Grünzig started in coronary circulation, but structural interventions have recently become almost as important. Catheter-based interventions for aortic stenosis or mitral regurgitation have successfully been introduced in selected patients.6 In contrast, percutaneous closure of a patent foramen ovale (PFO) in patients with cryptogenic stroke is an effective procedure and is very controversial. All these open issues of interventional cardiology are addressed in the current issue of the European Heart Journal.

The first paper of this issue on 'Prognostic role of restenosis in 10 004 patients undergoing routine control angiography after coronary stenting' by Adnan Kastrati and co-workers7 from the Deutsches Herzzentrum in Munich, is a FAST TRACK accompanied by an excellent Editorial by Johann Auer from the General Hospital in Braunau, Austria.8 was presented at the Hotline session of the Annual Congress of the European Society of Cardiology in Barcelona in September. The authors investigated the impact of restenosis on 4-year mortality in 10 004 patients with 15 004 treated lesions undergoing routine control angiography 6–8 months after coronary stenting. Restenosis was defined as diameter stenosis ≥50% in the in-segment area at follow-up angiography. The primary outcome was 4-year mortality. Restenosis was present in 26.4% of the patients. Overall, there were 702 deaths during follow-up. Of these, 218 deaths occurred among patients with restenosis and 484 among those without it [hazard ratio (HR) 1.19; P = 0.03]). The Cox proportional hazards model adjusting for other variables identified restenosis as an independent correlate of 4-year mortality (HR 1.23; P = 0.02). Other independent correlates of 4-year mortality were age, diabetes mellitus, current smoking habit, and left ventricular ejection fraction. Thus, in this large cohort of patients undergoing coronary stenting, restenosis was a strong independent predictor of 4-year mortality.

The second paper 'Fractional flow reserve vs. angiography in guiding management to optimize outcomes in non-ST-segment elevation myocardial infarction: the British Heart Foundation FAMOUS-NSTEMI randomized trial' by Colin Berry et al. from the University of Glasgow9 which is accompanied by a thought-provoking Editorial by Bernard De Bruyne from Aalst, Belgium10 and an EHJ Today video11 is another FAST TRACK paper presented at the Hotline session of the Annual Congress of the European Society of Cardiology in Barcelona in September. The authors randomly assigned 350 non-ST-segment elevation myocardial infarction (NSTEMI) patients to fractional flow reserve (FFR)-guided management or angiography-guided standard care in six UK hospitals. FFR was measured and disclosed to the operator in the FFR-guided-group, but was not disclosed in the angiography-guided group. FFR ≤0.80 was considered as an indication for PCI or coronary artery bypass surgery (CABG). FFR disclosure resulted in a change in treatment between medical therapy, PCI, or CABG in 21.6% of patients. At 12 months, revascularization and MI remained 7.8% lower in the FFR-guided group, but major adverse cardiac events (MACE) excluding procedure-related MI tended to be higher. Thus, in NSTEMI, angiography-guided management leads to higher rates of coronary revascularization than FFR-guided management.

The third paper on the 'Effect of intravenous TRO40303 as an adjunct to primary percutaneous coronary intervention for acute ST-elevation myocardial infarction. MITOCARE study results' by Dan Atar et al. from Oslo University12 accompanied by an Editorial by Hans Erik Betker13 is also a FAST TRACK manuscript presented at the Hotline session of the Annual Congress of the European Society of Cardiology in Barcelona in September. MITOCARE evaluated the efficacy and safety of an i.v. bolus of TRO40303 for the reduction of reperfusion injury in patients presenting with ST-elevation myocardial infarction (STEMI) within 6 h

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of onset of pain undergoing PCI for STEMI. The primary endpoint was infarct size expressed as area under the curve (AUC) for creatine kinase (CK) and troponin I (Tnl) over 3 days. Secondary endpoints measures were infarct size assessed by cardiac magnetic resonance (CMR) and safety outcomes. Infarct size was not significantly different between groups. There were no significant differences in CMR-assessed myocardial salvage index or left ventricular ejection fraction or in the mean 30-day echocardiographic ejection fraction either. Surprisingly, a greater number of adjudicated safety events occurred in the TRO40303 group. Thus, inhibition of mitochondrial permeability transition by TRO 40303 in STEMI patients treated with PCI did not reduce reperfusion injury of the ischaemic myocardium.

The fourth paper on ‘Percutaneous closure of patent foramen ovale in patients with cryptogenic embolism: a network meta-analysis’ by Peter Juni et al. uses novel and complex statistics to investigate a possible role for a PFO as a cause of paradoxical embolism and cryptogenic stroke. As the randomized trials have failed to demonstrate superiority of PFO closure over medical therapy, possibly due to lack of power and many crossovers, Juni and colleagues performed a network meta-analysis of published trials. They included four randomized trials with 2963 patients and 9309 patient-years using Amplatzer (AMP), STARFlex (STF), and HELEX (HLX) closure devices. Patients allocated to PFO closure with AMP were less likely to experience a stroke than patients allocated to medical therapy [rate ratio (RR) 0.39], while no effect was found for STF (RR 1.01) and HLX (RR 0.71). The probability to be best in preventing stroke [rate ratio 0.39] and HLX (RR 0.71). Thus, it appears that the effectiveness of PFO closure depends on the device used as only the AMP was superior to medical therapy in preventing strokes in patients with cryptogenic embolism.

References