

Editorial

## The 'real world' asks for coronary artery bypass grafting

**Keywords:** Coronary artery bypass grafting; Scoring; Coronary stenting

In this issue of the *European Journal of Cardiothoracic Surgery*, a meta-analysis to compare coronary artery bypass grafting (CABG) versus drug-eluting stents (DESs) in multi-vessel coronary disease is presented. The authors claim that the original observational studies that were included in their meta-analysis would reflect 'the real world clinical practice' and should therefore be used to support the results of randomised trials and determine the standard of care [1]. Without going into the details, the authors pool the data of nine different studies that show only one thing in common: a substantial variation with regard to patient characteristics. To give only an example, Table 1 (see Ref. [1]) summarises the number and percentage of patients with double-vessel disease, triple-vessel disease and left main stem stenosis in each group. From this summary, it is obvious that there was no similarity in the patients treated in any of the original studies. While most patients in the CABG groups had triple-vessel disease, more involvement of the left anterior descending coronary artery (LAD), more chronic occlusions and a higher prevalence of left main disease, most patients in the DES groups had double-vessel disease alone, a substantial number without involvement of the LAD.

It is important to note that the quoted retrospective studies used for this (and other) meta-analysis used different inclusion criteria and definitions with often substantial variations. According to a study [2], the definition of multi-vessel percutaneous coronary intervention (PCI) was as follows: 'PCI in two or more major epicardial coronary arteries or one major artery and a branch originating from another major epicardial artery supplying different myocardial regions.' By this definition, stenting of a small diagonal branch as well as the distal circumflex artery could be defined as 'multi-vessel stenting'. This is clearly not the surgical understanding of treating multi-vessel disease. For years, Taggart has pointed out that in almost all studies comparing CABG and PCI there was no equal distribution with regard to the extent of disease [3,4]. Since the early days of PCI, it is known, that in patients with double-vessel disease and normal left ventricular function, there is no immediate survival benefit for CABG over PCI. It is the patients with triple-vessel disease involving the LAD who have the largest benefit of CABG [5].

The largest study so far on this subject by Hannan et al. comprises 69.3% of the CABG (7437 out of 10 728) and 73.6% of the stent patients (9963 out of 13 540) used for the meta-analysis by Benedetto et al. [6]. The added value of pooling these well-defined data with eight much smaller sources that used different data sets and outcome measures remains uncertain. All the authors of the original studies quoted in the meta-analysis agree that the original population of their retrospective analyses differed for the two groups for severity of illness and many variables including diabetes, age and other confounding factors. Thus, propensity analysis and adjustments to account for differences in periprocedural risk were applied in some but not all studies. Few studies used proportional hazard Cox regression models or other less well-accepted statistics to correct for the underlying risk. It is not known how and if the extent of coronary artery disease was always used as a confounding variable, but certainly it was not used uniformly as an independent risk factor.

The SYNTAX score describes the coronary vasculature with respect to the number and complexity of lesions. A high SYNTAX score (or more complex disease) is a predictor for an increased rate of re-intervention after primary PCI and stent implantation [7]. In contrast, CABG does not only treat the culprit lesion but also deals with 'future culprit lesions' because the graft is usually placed to the mid or distal vessel [4]. As a result, lesion complexity has less of an impact on the 1-year results after CABG for triple-vessel disease [8].<sup>1</sup>

The presented meta-analysis does not provide new evidence that could guide clinical decision making for the treatment of patients with multi-vessel disease. Therefore, we should continue to refer to the best-available evidence provided by the study of Hannan et al. who arrived at a clear-cut conclusion: already after 18 months CABG is associated with lower mortality rates and lower rates for death or myocardial infarction and repeat re-vascularisation than treatment with DESs [4]. Since we already know from the ARTS trial that the gap between PCI and CABG tends to get larger in favour of CABG over time, this statement will most likely get stronger as time goes by.

<sup>1</sup> SYNTAX supplemental data. Accessible @ <http://content.nejm.org/cgi/data/NEJMoa0804626/DC1/1>.

The other piece of meaningful information from 'the real world' comes from the all-comers randomised SYNTAX trial that concluded with the statement that CABG remains the standard of care for patients with three-vessel or left main coronary artery disease, since the use of CABG, as compared to PCI with DES, resulted in lower rates of the combined end point of major adverse cardiac events (MACE) at 1 year [9]. This is in line with the recently published ACCF/SCAI/STS/AATS/AHA/ASNC 2009 appropriateness criteria for coronary re-vascularisation for patients with advanced CAD and the necessity for coronary re-vascularisation [10]. CABG was rated as appropriate in all of the clinical scenarios developed, whereas PCI was rated appropriate only in patients with two-vessel CAD with involvement of the proximal LAD and rated uncertain in patients with three-vessel disease. For patients with left main stenosis and/or left main stenosis and multi-vessel CAD, CABG but not PCI was rated appropriate and likely to improve patients' health outcomes or survival (see Fig. 1 in Ref. [10]).

## References

- [1] Benedetto U, Melina G, Angeloni E, Refice S, Roscitano A, Fiorani B, Domenico G, Sinatra R. Coronary artery bypass grafting versus drug-eluting stents in multivessel coronary disease. A meta-analysis on 24,268 patients. *Eur J Cardiothorac Surg* 2009;36:611–5.
- [2] Lee MS, Jamal F, Kedia G, Chang G, Kapoor N, Forrester J, Czer L, Zimmer R, DeRobertis M, Trento A, Makkar RR. Comparison of bypass surgery with drug eluting stents for diabetic patients with multivessel disease. *Int J Cardiol* 2007;123:34–42.
- [3] Taggart DP. Coronary revascularisation. *Br Med J* 2007;334:593–4.
- [4] Taggart DP, Thomas B. Ferguson Lecture. Coronary artery bypass grafting is still the best treatment for multivessel and left main disease, but patients need to know. *Ann Thorac Surg* 2006;82:1966–75.
- [5] Taggart DP. PCI or CABG in coronary artery disease? *Lancet* 2009;373:1150–2.
- [6] Hannan EL, Wu C, Walford G, Culliford AT, Gold JP, Smith CR, Higgins RS, Carlson RE, Jones RH. Drug-eluting stents vs. coronary-artery bypass grafting in multivessel coronary disease. *N Engl J Med* 2008;358:331–41.
- [7] Valgimigli M, Serruys PW, Tsuchida K, Vaina S, Morel MA, van den Brand MJ, Colombo A, Morice MC, Dawkins K, de Bruyne B, Kornowski R, de Servi S, Guagliumi G, Jukema JW, Mohr FW, Kappetein AP, Wittebols K, Stoll HP, Boersma E, Parrinello G, ARTS II. Cyphering the complexity of coronary artery disease using the syntax score to predict clinical outcome in patients with three-vessel lumen obstruction undergoing percutaneous coronary intervention. *Am J Cardiol* 2007;99:1072–81.
- [8] Lemesle G, Bonello L, de Labriolle A, Steinberg DH, Roy P, Slottow TL, Torguson R, Kaneshige K, Xue Z, Suddath WO, Satler LF, Kent KM, Lindsay J, Pichard AD, Waksman R. Prognostic value of the syntax score in patients undergoing coronary artery bypass grafting for three-vessel coronary artery disease. *Catheter Cardiovasc Interv* 2008;73:612–7.
- [9] Serruys PW, Morice MC, Kappetein AP, Colombo A, Holmes DR, Mack MJ, Stähle E, Feldman TE, van den Brand M, Bass EJ, Van Dyck N, Leadley K, Dawkins KD, Mohr FW, and SYNTAX Investigators. Percutaneous coronary intervention versus coronary-artery bypass grafting for severe coronary artery disease. *N Engl J Med* 2009;360:961–72.
- [10] Patel MR, Dehmer GJ, Hirshfeld JW, Smith PK, Spertus JA. ACCF/SCAI/STS/AATS/AHA/ASNC 2009 appropriateness criteria for coronary revascularization: a report of the American College of Cardiology Foundation Appropriateness Criteria Task Force, Society for Cardiovascular Angiography and Interventions, Society of Thoracic Surgeons, American Association for Thoracic Surgery, American Heart Association, and the American Society of Nuclear Cardiology: endorsed by the American Society of Echocardiography, the Heart Failure Society of America, and the Society of Cardiovascular Computed Tomography. *Circulation* 2009;119:1330–52.

Volkmar Falk\*

Universitätsspital Zürich, Rämistrasse,  
Zürich, Switzerland

\*Corresponding author. Address: Klinikdirektor,  
Klinik für Herz- und Gefässchirurgie, Universitätsspital  
Zürich, Rämistrasse 100, CH-8091 Zürich,  
Switzerland.

Tel.: +41 44 255 3298; fax: +41 44 255 4446  
E-mail address: volkmar.falk@usz.ch

Available online 14 July 2009