

Routine angiographic follow-up for left main percutaneous coronary intervention: Back to the old times?

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Routine 6-month angiographic follow-up was common practice back in the 90's due to relatively high rates of significant restenosis. Back then, the rate of repeated target vessel revascularization (TVR) could be as high as 30–40% in specific patient subsets, such as diabetics, long lesions or small vessels [1]. Invasive imaging is also a necessary part of the comprehensive evaluation of new devices and coronary intervention strategies, which have clearly helped the scientific community to bring down target vessel failure rates to one-digit figures. However, the systematic performance of repeated catheterization in asymptomatic, ischemia-free patients, undoubtedly leads to more interventions, the so called “oculostenotic reflex”, without clear reduction in myocardial infarction or cardiovascular mortality [2, 3]. But, is this also true for patients with left main or last remaining vessel percutaneous coronary intervention (PCI)?

In this issue of “Cardiology Journal”, Aurigemma et al. [4] present interesting results from a retrospective study evaluating the impact of routine angiographic follow-up after successful PCI of unprotected left main stenoses. Approximately 90% of the 190 patients were treated with a 1-stent technique and index procedures were performed with intravascular imaging in roughly 1 out of 4 cas-



es. Despite interventionalists' recommendations to perform routine 6- to 9-month catheterizations in all patients, it was not done in 48% of those eligible cases due, most likely, to patient and physician preference.

As expected, study groups had some important differences at baseline: patients in the clinical follow-up group tended to be older (although not a statistically significant difference), with also a trend to a higher rate of renal failure and with more prior myocardial infarctions. Patients in the angiographic follow-up group were more commonly treated with a 2-stent technique, although rates of final kissing-balloon were rather similar (65%). The main finding of this study is that routine angiographic group had 3× higher TVR rates, but more importantly cardiac mortality were significantly lower at a mean follow-up of 35 months.

Different groups have tried to analyze the impact of systematic angiographic follow-up after successful left main PCI [5–7]. In contrast to the study of Aurigemma et al. [4], other Italian investigators, looking into a similar retrospective database of 198 patients with left-main treated between 2002 and 2007, found that routine angiographic follow-up did not reduce myocardial infarction or cardiac death [5]. In a larger multicenter registry enrolling 1267 patients with left main treated with second-generation drug-eluting stent (DES), 440 patients

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were selected by propensity score matching taking into consideration clinical and procedural variables and compared planned angiographic follow up with clinical only follow up [6]. After a median follow up of 16 months, the rates of all cause and cardiovascular death were significantly lower in the angiographic group (6% vs. 14%, $p = 0.01$ and 3% vs. 6%, $p = 0.04$). The rates of TVR were higher (15% vs. 5%, $p < 0.001$), although this is clearly a worthy price to pay if it leads to reduced mortality.

Routine angiography was not mandated in the SYNTAX and EXCEL trials. These 2 studies have shown that left main PCI was equivalent to coronary artery bypass grafting (CABG) in Syntax scores less than 32 [7, 8]. Recently published ReACT study from Japan, a randomized clinical trial of 700 patients, has shown an inconclusive difference in outcomes at 5 years between routine angiography and clinical follow up in the left main subgroup due to small simple size [9].

Retrospective studies have important limitations that should be considered before embracing the conclusion that one should re-catheterize all asymptomatic and ischemia-free patients with left main PCI. Most important, there are relevant baseline differences between study groups, not always corrected by multivariate analyses. Probably, clinicians felt more reluctant to send asymptomatic elderly patients, with renal failure and poorer left ventricular function for routine catheterization. These patients are much more prone to present severe complications, not always avoidable by treating restenosis, such as heart failure, sepsis, or arrhythmic sudden death. Second, we have no data on how this “clinical only” follow up was done. It could have been only simple office consultations with no intention to look for non-invasive signs of ischemia or left ventricular dysfunction. In that case, physicians could have missed an opportunity to perform a control angiography and prevent some of the events that might have ultimately lead to a worse prognosis. What would be the difference between the two groups if systematic imaging stress tests (or maybe also cardiac computed tomography) were performed 4–6 months after index revascularization in “clinical-only” patients?

Another practical issue is the timing of angiographic follow up. The rationale for re-catheterization after a 6-month interval is based on typical patterns of restenosis after bare-metal stent implantation [1]. However, although a 6 or 9 month interval seems adequate in many cases of side-branch or focal in-stent restenosis, other

cases of late “catch-up” phenomenon or neoath-erosclerosis occur > 1 –2 years after first and second generation DES and would be missed in this control angiography [10]. In addition, late or very-late stent thrombosis are better avoided by optimal stent deployment, in most cases based on intravascular imaging during the index procedure, and probably can not be prevented by performing routine 6–9 months angiographic follow up.

So, what are the main implications of this study to clinical practice? Current guidelines have been recently issued and grant a IIb recommendation to control angiography in asymptomatic patients with high-risk PCI, including unprotected left main [11]. The American College of Cardiology Foundation/American Heart Association/Society for Cardiovascular Angiography and Interventions (ACCF/AHA/SCAI) guidelines removed a previously class IIA recommendation of routine angiography in 2011 PCI guidelines [12]. Now that better stents are available and experience in treating left main lesions with PCI has been gained, optimal long-term results must be pursued, at least equivalent to those achieved with arterial grafts. Thus, randomized studies are needed to definitively solve an important question of what is the best follow-up strategy in this previously CABG-exclusive disease. Until then, patients should at least be provided with an optimal medical treatment, a close follow-up including a low threshold to repeat catheterization, non-invasive imaging including a stress test, and perhaps routine angiography in some high-risk cases.

Conflict of interest: None declared

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