Relationship between coronary lesion morphology and inducible wall motion abnormalities

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Assessing the functional severity of a coronary artery stenosis is one of the major goals of diagnostic cardiology. However, when selecting a new interventional approach the cost of any new therapy has to be taken into account.

Patients who have suffered a myocardial infarction are a group for whom defining optimal treatment is difficult. To find out which akiinesia consists of a scar, which of hibernating myocardium, which stenosis may lead to an adverse prognosis, and which can be treated conservatively, becomes more and more important in the face of cost effectiveness on the one hand and the possibility of restenosis on the other.

A large number of studies have shown that stress echocardiography has the potential to discover the early stages of an ischaemic reaction before ECG abnormalities or chest pain develop. For dobutamine as well as for dipyridamole and occasionally for dynamic stress echocardiography, the potential to differentiate between hibernation, stunning and scar has been shown.

In this issue, Dr Lu and co-workers publish their experience with coronary lesion morphology and the dipyridamole echocardiography test in the chronic state after myocardial infarction. Their previous investigations were in patients with single-vessel disease without prior infarction. In the present study they showed that induced wall motion abnormalities were observed more often in patients with a complex culprit lesion morphology after myocardial infarction. Interestingly, it was possible to demonstrate that the period up to the development of new wall motion abnormalities was shorter in patients with complex culprit lesions than in patients with angiographically simple lesions. Furthermore ischaemic reactions were observed with low dose dipyridamole in 73% of patients with complex lesions compared to only 22% with simple lesions. No
differences were observed regarding the wall motion score index, the severity of angina, the initial treatment for myocardial infarction and the degree of stenosis in the culprit lesion comparing patients with complex and simple lesions and with a positive dipyridamole echocardiography test.

These promising results point to the different observations that are possible with stress echocardiography in patients after myocardial infarction. Individual tolerance in the dipyridamole echocardiography test might be helpful clinically to plan the urgency of invasive procedures.

The authors suggest that different plaque morphology not only implies different susceptibilities to ischaemia, but probably also reflects different degrees of endothelial dysfunction, and that impaired endothelial modulation of coronary tone is the main reason for the reduction of flow reserve in complex lesions. Therefore, dilatation of poststenotic epicardial segments would lead to a more pronounced pressure drop across the stenotic lesion if compared to stable lesions. If this explanation proves it is an important mechanism, Lu and colleagues might define a special role for dipyridamole echocardiography in the post infarction period or in unstable syndromes. The fact that the mean values of percentual stenosis, locations of the stenotic segments and mean TIMI grades were not statistically different points to dipyridamole's particular advantage in this setting. Further studies must show whether dobutamine or dynamic stress echocardiography are also able to differentiate between complex and simple lesions. Picano and co-workers presented the results of the EPIC study which showed that dipyridamole echocardiography testing also provides prognostic information after myocardial infarction.

As the authors stated themselves, their definition of classifying a lesion as complex was mainly based on qualitative interpretations of lesion morphology. Neither angioscopy, intravascular ultrasound nor Doppler measurements were performed. Using the wall motion score index means that the sum of scores is divided by the number of visualized segments. Depending on which kind of segments are poorly visualized, the wall motion score index may be falsely high or low. Therefore, comparative studies should report on the percentage and distribution of hypokinetic, akinetic or dyskinetic segments and their visibility during the whole test. In their description of methods, the authors explained that akinesis evolving into dyskinesis does not necessarily mean ischaemia, but data about how often this was observed and how it influenced wall motion score indices were not given.

Precise definitions of the beginning of wall motion abnormalities may sometimes be difficult in the course of stress echocardiography. This becomes more important when the ischaemic segments are located in the posterolateral perfusion areas. In these cases, the sensitivity and specificity of stress echocardiography are somewhat lower compared to lesions in the left anterior descending coronary artery and therefore it can be expected that the exact timing of the occurrence of wall motion abnormalities will be also more influenced by false results.

The degree of collateral supply looked better in the group with simple lesions (grade 4 compared to 3). Perhaps these patients had gained later reperfusion and therefore more complete infarctions compared to patients with complex culprit lesions who had reached incomplete reperfusion earlier. Further studies should focus on whether early pathological responses during dipyridamole echocardiography testing after myocardial infarction are mainly the result of complex lesion morphology or more complex disease states with larger areas of hibernation.

The data provided by Dr Lu and co-workers open a fascinating new chapter on the evolving field of stress echocardiography, by integrating the anatomical and physiological consequences of coronary artery stenosis. We will have to learn at what time, at what dose and what kind of stress agent is appropriate in the post infarction period to answer today's highly specialized questions concerning hibernation, lesion morphology and prognosis.

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References