Mechanisms and Prevention of Acute Myocardial Infarction: STOP MI Campaign

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Although the incidence of in-hospital death from acute myocardial infarction (MI) is about 5%, about 40% of the patients who suffer acute MI die mainly before hospitalization. It takes days to weeks from the time of coronary plaque rupture to the onset of acute MI in half of acute MI patients, although it takes only a day for the rest half of the patients. It is also known that a half of acute MI patients have pre-infarction angina days to weeks before the onset of acute MI. This symptom of unstable angina is often disregarded by the patients because it is often a mild chest pain or heartburn of short duration.

However, if we can treat all of those pre-infarction angina patients properly, we can prevent them from suffering MI and reduce the number of MI patients into half. In order to make those patients with pre-infarction angina go to hospital, “STOP MI campaign” has been started by The Japanese Circulation Society.

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by statins has been demonstrated to prevent and reduce atherosclerosis evaluated by various intra-coronary imaging devices. Angioscopically, the number of yellow plaques in a coronary artery was demonstrated a risk of future acute coronary syndrome event, and statin treatment was demonstrated to stabilize the plaques by reducing their yellow color intensity. Another possible strategy is to use stronger anti-thrombotic medications. DAPT study demonstrated that the use of dual anti-platelet therapy reduced the incidence of acute MI significantly in comparison with the single anti-platelet therapy, although dual anti-platelet therapy also increased the incidence of bleeding events comparing with the single anti-platelet therapy. In the future, an anti-platelet drug that does not increase bleeding risk but prevent the formation of occlusive thrombus may become a preventive drug of acute MI. Anti-coagulation factor XI may be a promising drug for this purpose. Anyway, now in Japan, the number of acute MI patient is still increasing regardless of the efforts we have done so far to reduce it.

IV. New strategy to prevent acute MI

According to a pathologic study, it takes days to weeks from the time of plaque rupture to the onset of acute MI in about half of acute MI patients, while it takes < 24 hours in the rest half of the patients. From the time of plaque rupture to the onset of acute MI when thrombus occludes coronary artery, sub-occlusive thrombus may cause the symptom of unstable angina, i.e., pre-infarction angina (d).

Fig. 1  Mechanisms for the occurrence of acute MI and pre-infarction angina

The disruption of vulnerable plaque (a, b) causes thrombus formation (c) and the formation of occlusive intra-coronary thrombus cause acute MI (e). However, since many disrupted plaques do not cause any event, the disruption of plaques is not the determinant process for the onset of acute MI but the formation of occlusive thrombus may be the real determinant process. On the other hand, a pathologic study revealed that it takes days to weeks from the time of plaque rupture to the onset of acute MI in about half of acute MI patients, while it takes < 24 hours in the rest half of the patients. During this process, sub-occlusive thrombus may cause the symptom of unstable angina, i.e., pre-infarction angina (d).
pression, or heartburn of short duration (a few minutes to 10 minutes), which often appears repeatedly, may be the pre-infarction symptom, i.e., a sign of acute MI onset in the near future. Therefore, the “STOP MI campaign” is mainly a public education program. Additionally, we need to develop an effective strategy to diagnose those suspected patients correctly, because those suspected patients sometimes do not have objective abnormality in electrocardiogram, echocardiography, or serum troponin, and thus, need coronary CT to have correct diagnosis.

V. Take-home messages

Acute MI is a highly lethal disease, and about 40% of the patients who suffer acute MI die mainly before hospitalization. However, a half of those patients have a chance to prevent the onset of acute MI by treating coronary artery disease at the time they have pre-infarction symptom days to weeks before the onset of acute MI. This pre-infarction symptom may be a relatively mild chest pain, chest oppression, or heartburn of a short duration (a few minutes to 10 minutes) that may occur repeatedly. Those who have a suspected symptom should be diagnosed quickly, often by coronary CT, to receive a proper treatment without a delay.

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References