Reperfusion Therapy Starts in the Ambulance

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Reperfusion therapy for ST-elevation acute coronary syndromes aims at early and complete recanalization of the infarct-related artery in order to salvage myocardium and improve both early and late clinical outcomes. The benefit rises exponentially the earlier therapy is initiated. The highest number of lives saved is within the first hour after symptom onset: the “golden hour.” The exponential form of the curve relating mortality to time-to-reperfusion has major implications for the timing of treatment. The impact of delay in time-to-treatment lessens as the duration of ischemia lengthens. Consequently, reducing delays will have a much more positive return in patients presenting early for those presenting late. These considerations have provided a strong incentive for the initiation of very early reperfusion therapy.

The optimal site for initiation of reperfusion strategies is the patient’s home or place where the infarction occurs. Prehospital diagnosis and treatment has been performed since 1985, when Gotsman applied prehospital fibrinolytic therapy with streptokinase in Jerusalem, Israel. This strategy has proven to be feasible, relatively safe, and efficacious. The time gain with prehospital fibrinolyis is $1$ hour and results in $15\%$ relative risk reduction of early mortality. Later, this form of therapy spread over the world, including the United States, where in the Seattle and Boston areas a time gain of at least 30 minutes could be reached. The major component of time gain in prehospital triage is bypassing emergency departments of hospitals, where door-to-needle easily exceeds 30 minutes, the upper limit mandated in the guidelines. An absolute prerequisite for prehospital triage is proper ECG diagnosis of ST-elevation acute myocardial infarction by ambulance personnel. This can be done by telephone transmission of the ambulance ECG for judgment by a hospital cardiologist or by computer diagnosis. Both methods are equally reliable and not inferior to hospital diagnosis of ST-elevation acute myocardial infarction. Prehospital diagnosis and triage of ST-elevation acute myocardial infarction is not only applicable to early start of fibrinolytic therapy but can also be used for adjunctive and efficacious therapies like aspirin, (low-molecular-weight) heparin, clopidogrel, and/or glycoprotein IIb/IIIa antagonists. Finally, the ambulance is the almost ideal place for triage for primary coronary angioplasty for ST-elevation acute myocardial infarction. Prehospital diagnosis followed by direct transfer to a hospital with percutaneous coronary intervention (PCI) facilities reduces time-to-treatment with at least 1 hour in Denmark. This may also be attractive in the United States, where nearly $80\%$ of the adult population lives within 1 hour of driving time from a PCI center.

Prehospital triage, treatment, and prompt transfer to tertiary care hospitals require an elaborate system of well-trained ambulance personnel, a single dispatch system, and regional collaboration of cardiology hospitals. Whether nurses are entitled to diagnose and treat patients with acute myocardial infarction in an ambulance environment differs from country to country. Training personnel and installing equipment in ambulances in large areas are expensive but seem cost-effective. The establishment of an ambulance system to improve time delays in the treatment of ST-elevation acute myocardial infarction pays off medically, as well.

In this issue of Circulation, the STEMI Registry Group from Vienna, Austria, report on the buildup of a proper ambulance system for triage and diagnosis of ST-elevation acute myocardial infarction together with a regional rotational on-call system for PCI hospitals in a 1.8-million urban area. In $>1000$ patients, they found that the implementation of guidelines of early reperfusion therapy of acute ST-elevation myocardial infarction markedly improved over the years the system is active. This resulted in a drop in mortality and an increase in the use of primary angioplasty over a short period of time. Interestingly, they also compared prehospital fibrinolytic therapy and primary angioplasty with regard to mortality in relation to time-to-treatment. In addition, these investigators found that in the first 2 hours of symptom onset, there is no difference in mortality, whereas in patients presenting later angioplasty is superior in outcome. This corroborates well with the randomized Primary Angioplasty in Patients Transferred From General Community Hospitals to Specialized PTCA Units With or Without Emergency Thrombolysis (PRAUGE-2) trials, as well as the French USIC and German PREMIR Reggie trials. It seems that with an elaborate ambulance system, early treatment of ST-elevation myocardial infarction results in a low hospital mortality irrespective of the type of reperfusion strategy used. This is of great importance because in many parts of the world early primary PCI is still an illusion, whereas ambulances can reach patients quickly and start reperfusion therapy with fibrinolyis followed by transfer to a tertiary care facility where PCI can be performed, if necessary. Such a strategy is essentially
Mortality in Studies Comparing Prehospital Fibrinolysis to Primary PCI in ST-Elevation Myocardial Infarction

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients</th>
<th>Year</th>
<th>Prehospital Fibrinolysis</th>
<th>Primary PCI Follow-Up</th>
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<td>CAPTIM</td>
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<td>4.9%</td>
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<td>4.4%</td>
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</table>

Disclosures

None.

References


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