Ambulance diagnosis of ST elevation myocardial infarction eligible for primary PCI

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Reperfusion therapy for ST-elevation acute coronary syndromes aims at early and complete recanalisation 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 greatest 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 ischaemia lengthens. Consequently, reducing delays will have a much more positive return in patients presenting early than 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 the place where the infarction occurs. Prehospital diagnosis and treatment has been carried out since 1985.¹ 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.^{2,3} The major component of time gain in prehospital triage is bypassing emergency departments of hospitals. 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.⁴ Prehospital diagnosis and triage

of ST-elevation acute myocardial infarction is not only applicable to an early start of fibrinolytic therapy, but can also be used for adjunctive and efficacious therapies such as aspirin, (low-molecular-weight) heparin,⁵ clopidogrel⁶ and/or glycoprotein IIB/IIIA antagonists.⁷ Finally, the ambulance is almost the ideal place for triage for primary coronary angioplasty for ST-elevation acute myocardial infarction. Prehospital diagnosis followed by direct transfer to a hospital with PCI facilities reduced time-to-treatment by at least one hour in Denmark.⁸ This may also be attractive in the United States, where nearly 80% of the adult population lives within one hour driving time from a PCI centre.⁹

Whether nurses are authorised 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 is expensive, but seems cost-effective.¹⁰ But the set-up of an ambulance system to improve time delays in the treatment of ST-elevation acute myocardial infarction also pays off medically.

In this month's issue of the Netherlands Heart Journal, the Groningen group report on their results of diagnosis of STEMI in the ambulance and direct transfer to the cath lab of the University Medical Centre of Groningen.¹¹ They find that in 82% of their patients the culprit vessel is re-opened within 90 minutes after ambulance diagnosis of STEMI. The majority of patients could be transferred immediately from the ambulance to the cath lab where the team was ready to perform the procedure. Only 40% of patients had to be admitted to the CCU first, before the primary PCA could be performed. Although similar results have been reported from the Netherlands before,¹² they clearly show that the optimal site for STEMI triage is the ambulance, resulting in the shortest symptom-to-balloon and call-to-balloon times.

Whereas campaigns to reduce patient delays have failed so far,¹³ the interval between first medical contact and the initiation of reperfusion therapy has become

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shorter by several logistic interventions: prehospital ECG,¹⁴ direct transfer to a hospital with primary PCI facilities⁸ and facilitation by antiplatelet and lytic drugs.¹⁵ Yet, the implementation of these strategies is difficult and needs to be well organised.¹⁶ Only when general practitioners, ambulance systems and catheterisation laboratories are willing to set up a local programme, is a good system like that in Groningen,¹¹ Nijmegen,¹² Venlo¹⁷ and Vienna¹⁶ possible, where call-to-balloon times are way under 90 minutes. Often legislation prohibiting ambulance nurses from diagnosing and treating myocardial infarction and non-uniform dispatch centres hampers the implementation of a fast track system for the rapid treatment of ST-elevation myocardial infarction. In the Netherlands a national ambulance protocol is active, of which the Groningen example is a clear product. These treatment modalities are currently also in use in several other European countries, but in many other areas, especially in the US, they still need to be developed when the ambulance system is not centrally activated and appropriate training of paramedics for this purpose is still not always available. ■

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