

Primary Angioplasty: this Balloon is of General Interest, Indeed

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«The benefit obtained from early reperfusion of the occluded artery limits the size of infarction, reduces the degree of ventricular dysfunction and improves survival.»¹ This classic statement made by a classic cardiologist (Eugene Braunwald) is the first enunciation of the hypothesis that favorable consequences derive from the early restoration of blood flow in the occluded artery responsible for acute myocardial infarction (AMI). This hypothesis reached the status of a theory with the publication of the results of GUSTO I. This prospective, randomized, multicenter, and multinational study compared four different thrombolysis guidelines in 40 000 patients with AMI. The angiographic substudy of 1200 patients in whom angiographic evaluations were made at different intervals converted the Braunwald hypothesis into theory and demonstrated, for the first time, a direct relation between TIMI 3 flow in the artery responsible for infarction 90 min after thrombolytic treatment and 30-day survival.² All the therapeutic strategies designed to achieve the best possible result in patients with AMI have had the ultimate goal of obtaining the maximum coronary bloodflow in the artery responsible for infarction in the largest possible percentage of patients. The primary angioplasty plan published in this number of the REVISTA ESPAÑOLA DE CARDIOLOGÍA, inaugurated in the region of Murcia by the Cardiology Department of Hospital de la Arrixaca, headed by Dr. Mariano Valdés, is a commendable effort designed to improve the possibilities of reperfusion in the largest possible number of patients with AMI in this autonomic community.³ The search for an ideal reperfusion strategy has always been guided by the following cardinal points: effectiveness, time, applicability, and cost.

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1. Beginning with cost, we observed that although it is a very important concern when comparing two therapeutic strategies, it has not originated a great deal of controversy due to the difficulty of comparing the relative costs of each treatment, especially when clinical results, including mortality, are different. The scant data available indicate that, although the cost of the acute episode and the first hospitalization are slightly greater in patients treated by primary angioplasty, the costs tend to equalize, with a slight balance in favor of angioplasty, due to the greater cumulative incidence of new hospitalizations and revascularization treatment after the acute episode in patients treated with thrombolysis.⁴

2. The difficulties of applying primary angioplasty in a generalized way as the treatment of choice for patients with AMI has been cited as the main argument in favor of thrombolysis in debates comparing both treatments. Thrombolytic treatment does not require infrastructure or special training, whereas primary angioplasty does in order to guarantee the desired results. Diverse strategies for increasing the applicability of primary angioplasty have been tried, with different results depending on the infrastructure, preparation, and motivation of centers. The program started by the team of Dr. Valdés has important merits: *a)* it has been born with the aim of offering reperfusion by primary angioplasty to a larger number of patients than thrombolytic treatment currently offers, and with the vocation of extending the use of the procedure to all the patients in the autonomic community; *b)* it has made a point of preparing a team of cardiologists, nurses, and technicians to guarantee a permanent service and adequate clinical results, and *c)* it is coordinated with emergency transport services and other hospital centers in an attempt to minimize the delay in treatment that mechanical reperfusion by primary angioplasty necessarily entails.⁵

3. Another one of the theoretically weak points of primary angioplasty is the inherent delay in preparation for applying this type of treatment. The coined phrase «time is muscle» refers to the importance of minimizing the delay from the onset of symptoms to the application of treatment. While true for any reperfusion strategy in patients with AMI, delay is so critical in patients treated with thrombolysis it has been

concluded that thrombolysis is really only effective in patients treated in the first hour after symptoms begin (the golden hour). Primary angioplasty is more tolerant of delay, since its effectiveness in the first 12 h after the onset of symptoms has been confirmed in patients. Delay has a minimum influence on the clinical result in patients treated within the first 6 h. Mortality increases in geometric progression, since it is multiplied by three when the delay in treatment exceeds 2 h from the time of arrival of the patient to the hospital emergency room.⁶ This fact highlights the importance of perfectly coordinating rapid transportation teams and hospital emergency and cardiology teams, as the Murcia teams have demonstrated. Analysis of times achieved by the team of Dr. Valdés once again confirms the importance of community awareness through information campaigns in reducing delays in reaching the hospital, which greatly affect total delay. Nevertheless, certain groups of patients (advanced age, diabetics, and women), because of the different manifestations of their symptoms, come to the hospital a much longer time after the beginning of symptoms. This circumstance, together with the worse prognosis of these patients, underlines the need for reducing as much as possible intrahospital delay.

4. Effectiveness. The first randomized studies that compared primary angioplasty with thrombolytic treatment did not end up by convincing those in favor of thrombolysis due to the small volume of patients included in studies compared with macrostudies of thrombolysis and the difficulty of demonstrating a reduction of mortality with primary angioplasty except in studies restricted to anterior infarctions.⁷

A meta-analysis of the 10 randomized studies published to date, collected by Weaver and Simes, has demonstrated a significant decrease in all important episodes: mortality, reinfarction, and cerebrovascular accident.⁸ The introduction of new technologies that have already been consolidated (stents) has improved even more the results of primary angioplasty to the point of achieving previously unthinkable mortality rates in patients with acute infarction.⁹ Other techniques used in the stage of consolidation (X-Sizer, Percu-Surge, Filterwire, etc.) promise to solve some of the problems inherent to the mechanical treatment of injuries with a major thrombotic component, distal embolization, and non-reflux. Other techniques that are still in the evaluation stage (administration of hyperbaric oxygen, overall circulatory cooling, etc.) could help to decrease the damage produced by reperfusion and recover damaged cardiac muscle. Finally, coadjuvant pharmacological treatment (glycoprotein IIb/IIIa inhibitors and/or reduced-dose thrombolytics) could improve even more the results of primary angioplasty when these drugs are administered early and/or to patients in whom definitive treatment with primary angioplasty is delayed more than 1 h, in an

attempt to improve flow in the initial coronariography.¹⁰

In summary, we can conclude that, compared with thrombolytic treatment, primary angioplasty is more effective and provides better short and long-term clinical results, can be carried out in a more suitable interval for achieving effective myocardial reperfusion if the patients are sent to a center with infrastructure and preparation and the coordination with the emergency transfer team is effective. In addition, as has been demonstrated effectively by the Murcia team, this reperfusion strategy (primary angioplasty) ends up being applied in a larger number of patients than thrombolytic treatment because the only two contraindications of primary angioplasty are the lack of adequate equipment and refusal by the patient or family members. Finally, the few analyses available on the relative costs of both reperfusion strategies suggest that primary angioplasty is not more costly. What lessons should we draw from the Murcia experience? This project has demonstrated that rational coordination of the use of available public resources makes it possible to start a primary angioplasty program that can be applied throughout an entire autonomic community.

The next question that would have to be answered is whether this experience can be exported to other autonomic communities. For want of a specific analysis in each region, it is not overly venturesome to affirm that most of the Spanish population resides in areas in which the Murcia experience could be implemented without further difficulty by creating what are already beginning to be known as infarction centers with sufficient infrastructure and preparation to guarantee good results not only in low-risk patients who are candidates for thrombolytic treatment and have a clinical profile similar to those included in randomized studies, but also in patients at higher risk, including those with a contraindication for thrombolysis. The location of these infarction centers should be established so that most of the patients assigned to the center have access within 1 h. For patients whose transfer to the center takes longer, studies currently under way will determine the role of coadjuvant pharmacological treatment in what is beginning to be known as facilitated angioplasty.

The DANAMI 2 study, presented on 20 March 2002 in the Late Breaking Trials session of the American College of Cardiology in Atlanta, has demonstrated that in a well-coordinated system the results of primary angioplasty are better than those of thrombolysis, even when patients are transferred for angioplasty after a maximum transfer time of 3 h.

In conclusion, the experience in Murcia indicates that it is possible to establish a coordinated program for using available resources to provide most patients with AMI the reperfusion strategy that has been shown to be most effective (primary angioplasty).

Considering that this experience can be implemented perfectly in most regions in Spain, it can be affirmed that this balloon (the primary angioplasty balloon) is of interest to all of us.

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