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ORIGINAL ARTICLE

Access to Catheterization Facilities in Patients Admitted With ST -Elevation Myocardial Infarction: A Pilot Study

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KEY WORDS: *acute myocardial infarction; reperfusion therapy; thrombolysis; primary angioplasty; revascularization*

ABBREVIATIONS
CABG = coronary artery bypass grafting
NW = north-western
PCI = percutaneous coronary intervention
STEMI = ST-elevation myocardial infarction

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ABSTRACT

BACKGROUND: Thrombolytic therapy and percutaneous coronary intervention (PCI) are effective means to achieve reperfusion in ST-elevation myocardial infarction (STEMI), but current trends favour primary PCI. However, there seems to be considerable international and national differences in the management of patients with STEMI. Pertinent epidemiological data for Greece are lacking. Thus, the aim of this pilot study was to investigate the current implementation of reperfusion strategies in North-Western (NW) Greece.

PATIENTS AND METHODS: The region of NW Greece is populated by 600,000 inhabitants, and is served by 6 district hospitals, and 1 tertiary university hospital, the only one offering PCI, but not on a 24-hour basis. Thus, the most prevalent reperfusion strategy in our region is thrombolytic therapy. The present study was a prospective population-based survey conducted over a 5-month period. Sources of data included cardiology departments, coronary care units, and intensive care departments located in the area.

RESULTS: The total study population consisted of 170 consecutive patients (135 men) with a mean age of 67 years, divided into three groups according to time between symptom onset and presentation: 99 patients (58.2%) presented within 3 hours (group I), 23 (13.5%) between 3-12 hours (Group II), and 48 (28.2%) after 12 hours (Group III).

In group I, thrombolysis was performed in 78 (78.7%), primary PCI in 8 (8%) and rescue PCI in 6 (6%); 93 patients (94%) were subjected to elective coronary angiography and subsequently 38 (40.8%) had elective PCI, 4 (4.3%) coronary artery bypass grafting (CABG), and 51 (54.8%) were managed medically. In group II, thrombolysis was given in 17 (73.9%), and rescue PCI in 2 (8.6%) patients; all patients (100%) were subjected to elective coronary angiography and subsequently 10 (43.4%) to elective PCI, and 1 (4.3%) to CABG. In group III, thrombolysis was performed in 4 (8.3%), and rescue PCI in 1 (2.1%) patient; 42 (87.5%) patients were subjected to elective coronary angiography and subsequently 11 (22.9%) had elective PCI, and 8 (16.6%) CABG.

CONCLUSION: A large proportion of patients with STEMI arrive late, but reperfusion therapy is sufficiently implemented in NW Greece. The goal of 75% is certainly attainable. Organizing networks of reperfusion at regional level can help to improve the rate of reperfusion therapy. Finally, the option of next-day PCI after successful thrombolysis is gaining wider acceptance.

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INTRODUCTION

The primary goal of therapy for acute ST-elevation myocardial infarction (STEMI) is rapid, complete and sustained restoration of the infarct-related coronary artery blood flow and myocardial perfusion, with a consequent positive impact on the patient's outcome.[1-14] Timely reperfusion of the infarct-related artery is the cornerstone of therapy for this goal.

Thrombolytic therapy and percutaneous coronary intervention (PCI) are effective means to achieve reperfusion, but current trends reflect an increasing preference for PCI.[1,8,9] However, there seems to be considerable international and national differences in the management of the STEMI population.[1-9] Pertinent epidemiological data for Greece are lacking. Thus, the aim of our pilot study was to investigate the current implementation of reperfusion strategies in North-Western (NW) Greece.

PATIENTS AND METHODS

THE GREEK COHORT

The region of NW Greece, an isolated area with 600,000 inhabitants, is served by 6 General District Hospitals, and 1 Tertiary – University Hospital having cardiac catheterization laboratory with PCI facilities. Primary PCI cannot be implemented as a routine treatment option in our region since there is no experienced staff on-call available on a 7-day/24-hour basis. Because the catheterization laboratory during daytime is busy with elective cases it is difficult to accommodate STEMI patients for primary PCI. For the time being only patients in real and urgent need for PCI, such as those who are hemodynamically compromised and hypotensive, young patients with large infarcts or with contraindication to fibrinolysis can undergo primary PCI, as there is no policy of prehospital thrombolysis or of facilitated PCI. Thus, the most prevalent reperfusion strategy in our region is thrombolytic therapy.

The present study was a prospective population-based survey conducted over a 5-month period. Sources of data included cardiology departments, coronary care units, and intensive care departments located in the area.

RESULTS

The total study population consisted of 170 consecutive patients (135 men, 35 women) with a mean age of 67 years. For all hospitals the current policy is to thrombolyse patients with STEMI and transfer only for rescue PCI. They were divided into three groups according to time between symptom onset and presentation to the hospital. Ninety nine patients (58.2%, 76 men, 23 women, mean age 62 years) presented to the admitting hospitals within 3 hours after the onset of symptoms (Group I), 23 (13.5%, 17 men, 6 women, mean age 69.5 years) between 3 and 12 hours (Group II), and 48 (28.2%, 42 men, 6 women, mean age 68.2 years) after 12 hours (Group III).

In the *first* group of patients, thrombolysis was performed in 78 (78.7%), primary PCI in 8 (8%) and rescue PCI in 6 (6%). Ninety three patients (94%) were subjected to elective coronary angiography and subsequently 38 (40.8%) of them to elective PCI, 4 (4.3%) to coronary artery bypass grafting (CABG), and 51 (54.8%) were managed conservatively.

In the *second* group (3-12 hours), thrombolysis was performed in 17 (73.9%), and rescue PCI in 2 (8.6%) patients, while no patient was subjected to primary PCI. All patients (100%) were subjected to elective coronary angiography and subsequently 10 (43.4%) of them to elective PCI, 1 (4.3%) to CABG, and 12 (52.1%) were managed conservatively.

Finally, in the *third* group (>12 h), thrombolysis was administered in 4 (8.3%), and rescue PCI in 1 (2.1%) patient, while no patient was subjected to primary PCI. Forty-two (87.5%) patients were subjected to elective coronary angiography and subsequently 11 (22.9%) of them to elective PCI, 8 (16.6%) to CABG, and 29 (60.4%) were managed conservatively.

DISCUSSION

Our preliminary results show that at first the main reason for no reperfusion was the delayed presentation (>12 hours) of a substantial number of patients. Second, the main objective to achieve at least 75% of reperfusion therapy within the shortest possible time following onset of symptoms had been reached. The vast majority of patients with STEMI presenting within 3 hours and less often within 12 hours after the onset of symptoms was offered a reperfusion treatment, mainly thrombolysis. The length of prehospital delay was inversely proportional to the receipt of fibrinolytic therapy, with over 86% of patients who presented within 3 hours after the onset of symptoms receiving reperfusion therapy and just over 74% who presented between 3 and 12 hours after symptom onset. There is of course significant room for improvement in patients who present between 3 and 12 hours with the option of performing more frequently primary PCI. Finally the current practice in our region is to refer almost all patients for elective coronary angiography in a relatively long time interval (usually 2-7 days post-admission). Subsequently, a considerable proportion of those patients are offered a revascularization treatment without having undergone non-invasive tests for myocardial ischemia.

Even though the development of reperfusion strategies and ancillary therapies over the last decades resulted in significant improvement in the prognosis of STEMI, the implementation of such therapies in the 'real world' is often inefficient.[1-9] Despite the increasing use of primary PCI, the proportion

of eligible patients undergoing early reperfusion remained constant at about 70%, from 1994 through 1999, with roughly 30% of patients receiving neither reperfusion therapy. Findings from the GRACE[7] study showed that nearly one –third of patients who presented with STEMI within 12 hours and who were eligible for reperfusion therapy did not receive it. Thus, a considerable proportion of patients with STEMI do not receive reperfusion therapy for a variety of reasons. These include age, gender, concomitant comorbid conditions, delays in seeking medical attention, disparities in health system organization, 'triaging' problems, disparities in patients' transfer, awareness of the public, and other reasons.

On the other hand, when primary PCI is available in a "timely" fashion and the procedure can be performed by an experienced operator in a large volume center, PCI should be considered the preferred reperfusion strategy. However, one of the biggest remaining problems is that this strategy is vastly underutilized.[1] The majority of patients with STEMI are admitted to local hospitals without primary PCI facilities.[2-7] Access to early angiography is limited in most countries around the world and in many regions of the US. Data from recent registries have shown that approximately 60% of patients with high risk acute coronary syndromes undergo angiography, of whom approximately 2/3 undergo revascularization (based on the anatomy). Furthermore, only about 40-45% of patients undergo angiography within the first 48 hours after admission.

The European Society of Cardiology (ESC) guidelines[1] on PCI offer interventional cardiologists a guide to decision –making when choosing the optimal time course and type of intervention for patients presenting with STEMI, with the aim of maximizing patient outcome and reducing mortality (Fig. 1). Of the two methods of reperfusion therapy of STEMI, PCI is more difficult to implement but offers the best results when performed in an optimal setting.

According to current guidelines, reperfusion therapy should be commenced in all patients presenting with STEMI within 12 hours after the onset of symptoms. For those presenting in a hospital without a PCI facility within 3 hours after the onset of symptoms, fibrinolysis is an acceptable option of reperfusion therapy. After 3 hours following onset of symptoms, primary PCI is strongly favoured by all guidelines. The strategy of choice for patients admitted more than 6 hours after symptom onset is definitely emergency catheterization because many of them will probably receive more harm than good from fibrinolysis, especially if their chest pain has subsided. In such patients further delay due to transportation to another site seems to be justified because myocardial salvage is minimal in this late phase and the ultimate goal is sustained patency of the infarct related artery and risk assessment. If primary PCI is not available, patients admitted approximately 6-12 hours after symptom onset who have ongoing chest pain and persistent ST-segment elevation may also be considered for fibrinolysis as a last chance of reperfusion.[10] There is no evidence that

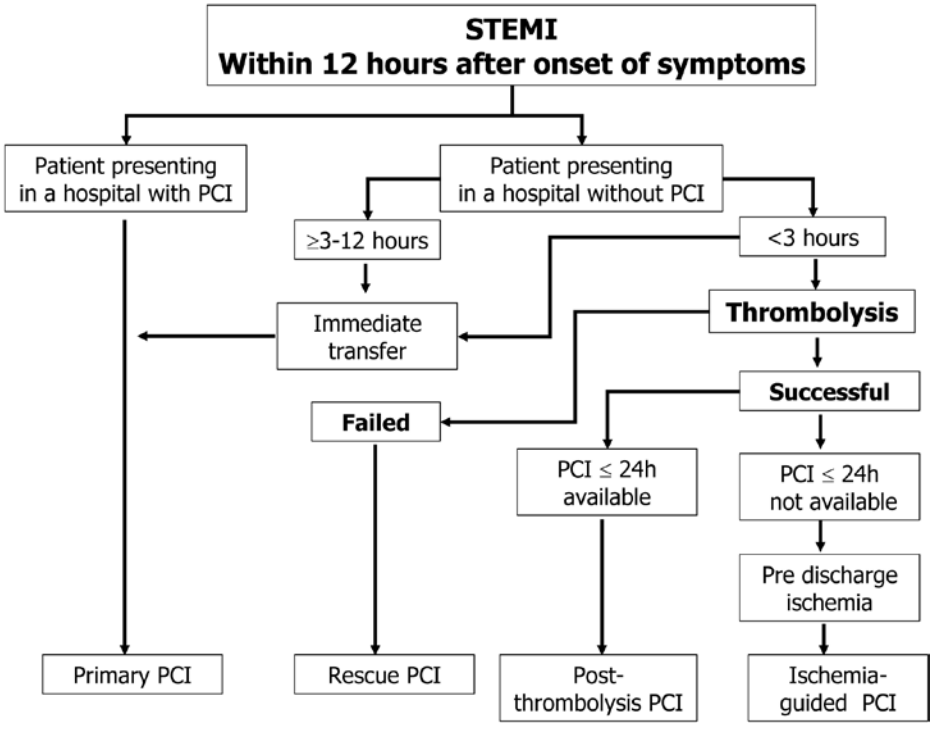

FIGURE 1. Flow chart of the treatment strategy for patients with STEMI.

fibrinolysis offers any benefit after 12 hours, possibly because it does not restore artery patency. Early PCI is also optimal but, in contrast to thrombolysis, revascularization after 12 hours with PCI may be of some benefit. Primary PCI is also preferred for patients presenting with cardiogenic shock and for those with contraindications to thrombolysis, regardless of the time from symptom onset. Moreover, in the case of failed thrombolysis, rescue PCI should be immediately performed.[4] Even in the case of successful thrombolysis, if it is feasible, the patient should be transferred for post-thrombolysis PCI within the first 24 hours post-admission.[11,13]

CONCLUSIONS

We conclude that a large proportion of patients arrive late, but reperfusion therapy is sufficiently implemented in NW Greece. The goal of 75% is certainly attainable. Organizing networks of reperfusion at regional level based on a clear common protocol, can help to improve the rate of reperfusion therapy. Special attention should be paid to next-day PCI after successful thrombolysis, since it has been proven efficacious. Public information campaigns should be considered, as most of the time delay between onset of symptoms and start of reperfusion therapy is the delay in patients seeking medical attention.

In Greece no special funding exists for primary angioplasty and thrombolysis in the hospital remains the standard treatment. Things may be about to change, however, even though such a service would require enormous reorganization of services and considerable additional investment. Patients with acute myocardial infarction would bypass their local hospitals and go to specialized centers providing a 24-hour angioplasty service. This proposal entails daunting logistical and financial challenges, and the prospect of large numbers of emergency procedures, many of them performed out of regular working hours, raises questions about the quality of such a service.

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