

General practitioners and emergency treatment for patients with suspected myocardial infarction: last chance for excellence?

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SUMMARY. *Pre-hospital coronary care usually consists of a medically staffed coronary care ambulance going into the community from a hospital base, as pioneered in Northern Ireland. In today's medicopolitical and economic climate, this model is not viable in mainland United Kingdom. Current proposals seem to favour a 'scoop and run' policy for heart attack victims, that utilizes the ambulance service but bypasses the general practitioner. Since the majority of telephone calls from people with suspected myocardial infarction are directed to general practitioners, a preferable alternative would be a 'stay and stabilize' strategy that uses the existing referral pattern and builds on general practitioners' medical education and skills. The role of the general practitioner in the management of patients with suspected myocardial infarction is discussed.*

Keywords: *coronary disease; emergencies; resuscitation; management of pain; thrombolytic therapy.*

Missed opportunity

IT is often said that in the United Kingdom original, trail-blazing work is carried out which is then exploited by other countries. That is certainly true of pre-hospital coronary care, pioneered in Northern Ireland,¹ but woefully neglected in mainland UK. There has been little interest even in pre-hospital resuscitation, and the intention to provide defibrillators in emergency ambulances in England was only announced by the secretary of state for health in 1990, 24 years after Pantridge and Geddes' pioneering work in Belfast. Meanwhile the concept of pre-hospital coronary care has been enthusiastically received in many parts of Europe² and North America,³ and pre-hospital coronary care in some form or other is provided in most developed countries. The negative reception to pre-hospital coronary care in the UK is a missed opportunity indeed, resulting in many avoidable deaths.

General practitioners

In the UK there is a universal, well organized system of general practice which could provide the basis for pre-hospital coronary care. It is now conceded by general practitioners that most patients with myocardial infarction are best served by admission to hospital, initially to a coronary care unit. But general practitioners, being most often the first medical contact, have a unique contribution to make to the initial management of acute myocardial infarction. All general practitioners are required to provide emergency care for coronary patients and with additional training they would be able to do this more effectively. They

know their patients, are available at all times, can respond rapidly, provide a proficient resuscitation service, relieve pain with opiates, use other drugs as appropriate, and initiate thrombolytic therapy.⁴ The alternative is an impersonal ambulance service which, at best, can transport the patient to hospital and can provide just one element of pre-hospital coronary care, that of resuscitation.

Resuscitation

For the general practitioner, suspected myocardial infarction is a matter of great urgency because of the patient's need for pain relief, the risk of cardiac arrest, and the importance of initiating thrombolytic therapy as soon as is practicable. A group practice should be organized so that one doctor is on call for emergencies each day, with a policy of rapid response to telephone calls from patients experiencing chest pain. Such organization enables the general practitioner to be at the patient's side within a few minutes of a telephone call; in Birkhead's study, the general practitioner was present within 20 minutes and in the study by Rawles and Haites, the general practitioner was present within 15 minutes.^{5,6} A rapid response means that cardiac arrest will be encountered in about 5% of calls from patients with suspected myocardial infarction,⁷ so it behoves the doctor to be equipped with a defibrillator, and to know how to use it. Some doctors like to summon the ambulance before setting off to attend a patient with suspected myocardial infarction, so that the ambulance, together with the defibrillator arrive at the same time as the doctor. However, not all calls from patients with suspected myocardial infarction can be recognized as such, and an ambulance may not always be immediately available. Where there is such a high risk of cardiac arrest, in which every second counts, it is unacceptable for a doctor to be dependent on somebody else to provide essential life saving equipment. Where cardiac arrest is witnessed by the general practitioner and treated promptly by defibrillation, the survival rate is better than 50% and is as good as that achieved by a mobile coronary care unit, even though the doctor may be working single handed and may not have had a large personal experience of resuscitation.⁴

Called to a patient with acute myocardial infarction, the general practitioner is most fearful of cardiac arrest, and is understandably anxious to get the patient into an ambulance and away to hospital as soon as possible. Possession of a defibrillator confers confidence to deal with the patient in a less hurried way, which is of reassurance to the patient.

The purchase of a defibrillator can be made the focal point of a health education drive, and the full cost need seldom fall on the practice. A defibrillator is an ideal objective for fund raising efforts by local charities, or the British Heart Foundation may assist with its purchase. At least one saved life may be expected in the lifetime of a defibrillator.⁸

General management of acute myocardial infarction

Pain relief with opiates is an essential part of the management of acute myocardial infarction, and there is good evidence that breaking into the circle of pain — autonomic response, hypotension, extension of infarct, pain — may itself make a major con-

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tribution to mortality reduction.⁹ Atropine is the other essential drug, for the treatment of bradycardia and hypotension. Experience of the acute phase of infarction, accumulated in Belfast and elsewhere, shows that autonomic disturbances are frequently present, the commonest being vagal overactivity with bradycardia and hypotension.^{10,11} Correction of these and any rhythm disturbances, together with relief of pain, is rarely followed by cardiogenic shock, and is associated with low subsequent mortality.¹² In 1970 Pantridge proposed that these unexpected consequences of early stabilization of the patient were due to limitation of infarct size.⁹ Whereas the direct effect on mortality of correction of ventricular fibrillation is easily seen, the indirect effects attributed to limitation of infarct size are difficult to quantify. Because of bias in the selection of patients carried in an ambulance equipped for cardiac emergencies, substantiation of the claim that early coronary care results in a reduction of late mortality can only come from controlled studies, and none of faultless design has been carried out.

Three studies are relevant. In the United States of America, community mortality fell by 25% in Charlottesville, Virginia with the introduction of pre-hospital coronary care, but only 8% of the observed reduction could be attributed to resuscitation from ventricular fibrillation.¹³ Simultaneously there was a rise in mortality in that part of Virginia not served by mobile coronary care, though mortality rates elsewhere in the USA were falling.

In Gothenburg, Sweden, patients with suspected myocardial infarction for whom hospital admission was requested were randomly allocated to a standard ambulance or an ambulance which was staffed by coronary care nurses trained to give drugs including morphine and equipped for cardiac emergencies with a defibrillator.¹⁴ The condition of patients travelling in the specially equipped ambulance was stabilized before transport, and two patients were successfully resuscitated from ventricular fibrillation. None was resuscitated in the standard ambulance, which did not carry a defibrillator or personnel authorized to use drugs. For patients with acute myocardial infarction alive when the ambulance arrived at the hospital, the mortality rate until discharge from hospital was 17% for those transported by the ambulance equipped for cardiac emergencies and 33% for those transported by standard ambulance; the difference in mortality rate persisted for up to five years. Only 13% of the difference between the two modes of transport could be attributed to resuscitation from ventricular fibrillation by the cardiac ambulance team.

In the two demographically similar communities of Omagh and Ballymena in Northern Ireland, all episodes of suspected myocardial infarction were documented over a 15 month period.¹⁵ Hospital coronary care facilities were similar but Ballymena had a medically staffed coronary care ambulance. The median delay from the onset of symptoms until coming under coronary care was four hours 16 minutes in Omagh and two hours 15 minutes in Ballymena. The mortality rate was 63% in Omagh and 50% in Ballymena and the difference in mortality rate was more pronounced in the lower age groups. Almost half of the mortality difference occurred in the first two hours when the proportion of patients coming under coronary care was higher in Ballymena. Only 5% of the reduction of mortality rate in Ballymena resulted from pre-hospital resuscitation from ventricular fibrillation.

These three studies from the pre-thrombolytic era provide strong support for the claim that, by stabilizing patients before they are moved, pre-hospital coronary care results in limitation of infarct size and reduced later mortality. Further, a much greater reduction of mortality rate is achieved indirectly by these general measures than directly by resuscitation from ventricular fibrillation.

Thrombolytic therapy

There is impressive theoretical, experimental, and trial evidence to show that the earlier thrombolytic therapy is given the greater is its efficacy, for example as seen in the Grampian region early anistreplase trial.⁴ Much effort has been devoted to shortening the time to commencement of treatment in hospital.¹⁶ However, few cardiologists take the argument to its logical conclusion and recommend administration of thrombolytic therapy by the first doctor who sees the patient. In most parts of the UK this is the patient's general practitioner,⁵ and it is only in inner city areas that more patients dial 999 for an ambulance or attend the hospital accident and emergency department following the onset of chest pain. Treatment in the community at the first opportunity not only saves the journey time but also bypasses the delays that occur in hospital, so that the total time saving averages two hours in rural areas,⁴ and about an hour in towns.² However, it should be noted that the latter figure is derived from studies conducted in centres where there is a particular interest in giving thrombolytic therapy as soon as possible. In a town served by a district general hospital where thrombolytic therapy for patients with suspected myocardial infarction is not a major concern, the time from admission to start of thrombolytic therapy may be more than an hour. Indeed, many patients with acute myocardial infarction are still treated in general medical wards, where there is less likelihood of them receiving thrombolytic therapy than in a coronary care unit. Administration of thrombolytic therapy in the community at least ensures that the patient receives treatment, at a time when it is most efficacious.

In the second international study of infarct survival, streptokinase given at a median time of five hours after the onset of symptoms reduced mortality by about a quarter, by three percentage points, from 12% to 9%.¹⁷ The mortality benefit may therefore be expressed as 30 lives saved per 1000 patients treated. The adverse effects of thrombolytic therapy, particularly haemorrhagic stroke, resulted in one or two lives being lost per 1000 patients treated.

In a subset of patients in the second international study of infarct survival, streptokinase administered two hours after the onset of symptoms reduced mortality by about a third. It would be reasonable to assume a similar efficacy when thrombolytic therapy is used in the community at the same median time of two hours. But the mortality rate on which the treatment acts is much higher in the community than in hospital. For example, the subsequent mortality rate for patients with acute myocardial infarction seen alive by their general practitioners was 25% in a community based study.⁷ Reduction of this high mortality by a third would result in about 80 lives being saved per 1000 patients treated. On the other hand, there is no reason to think that the risks of therapy are increased by its administration out of hospital.

The decision to use thrombolytic therapy depends on local circumstances, and on the general practitioner's assessment of the patient. Hitherto, the main decision to be made was whether or not to admit to hospital, which usually depended on making an operational diagnosis of suspected myocardial infarction. However, the threshold for admission to hospital is lower than that for the administration of thrombolytic therapy. Myocardial infarction is confirmed in only about half of the patients in whom it is suspected and who are referred to a coronary care unit.¹⁸ But a general practitioner's ability to predict the final diagnosis of acute myocardial infarction, based on initial clinical assessment, is good, as is the accuracy of the prognosis.¹⁹

If therapy is only given to those with ST elevation on the electrocardiogram, then only about 50% of patients subsequently shown to have infarction receive therapy, but more than 90%

of those who receive therapy will have had infarction.²⁰ If the threshold for therapy is reduced, for example when there is a convincing history plus any abnormality on the electrocardiogram, then a greater proportion of patients with infarction will receive therapy, but so too will a greater number of those without infarction; at the moment it is not clear where the threshold for therapy should be set in order to maximize benefit.

If the general practitioner uses the same criteria for instituting thrombolytic therapy as are used in hospital — ST elevation or bundle branch block — then the benefit–risk ratio is likely to be better than it is in hospital because of the greater efficacy of earlier thrombolytic therapy. Relaxation of the criteria for giving thrombolytic therapy in the community, to include patients with lesser electrocardiographic abnormalities such as ST depression or T wave inversion, would result in a benefit–risk ratio no worse than currently achieved in hospital, though a higher proportion of patients with infarction would benefit.

In spite of the theoretical possibility that very early thrombolytic therapy might abort myocardial infarction, abortion of the infarction being most likely with small infarcts at a time when the electrocardiograph reading is still normal, the administration of thrombolytic therapy to patients with a normal reading should be avoided. This is because the patient with chest pain and a normal reading is more likely to have a diagnosis other than myocardial infarction.

Fortunately for general practitioners, theirs is not the final decision on thrombolytic therapy, so they can give it to those cases most likely to benefit from early treatment, while those with less certain indications can be reconsidered for thrombolytic therapy on arrival in hospital.

Transfer to hospital should be calm and unhurried, and only undertaken after relief of pain and when the patient's condition is stable. The patient should travel in an ambulance equipped with a defibrillator, and should be monitored during the journey either by the general practitioner or having been handed over to ambulance staff.

Limitation of infarct size, by general medical management and by thrombolytic therapy, is now the primary objective of pre-hospital coronary care; resuscitation from ventricular fibrillation is an important but subsidiary aim. With the emphasis changing from the technical problems of cardiopulmonary resuscitation and defibrillation to total patient management, pre-hospital coronary care is a medical responsibility which cannot be readily delegated.²¹

Obstacles to seizing a second chance

Rather than encouraging and educating general practitioners to use thrombolytic therapy in selected patients, cardiologists have generally been cautious about recommending its use in general practice. Indeed, some cardiologists have even opposed the use of thrombolytic drugs by general practitioners (P Hannaford, Royal College of General Practitioners research unit, Manchester, personal communication). Thrombolytic agents are licensed for use in general practice, and there are no legal or ethical reasons why general practitioners should not use them. Moreover, the training and experience of many general practitioners are greater than those of the junior medical staff in hospital who are responsible for initiating thrombolytic therapy there. Specific objections to general practitioners' giving thrombolytic therapy in the community are that they lack the time, they do not normally carry electrocardiograph machines with them, they are inexperienced in the diagnosis of myocardial infarction, and they would be unable to deal with the adverse consequences of this treatment (*Pulse* magazine, 18 January 1992, p.64).

Although the new general practitioner contract has done little

to encourage emergency work, general practitioners do have a legal obligation to provide emergency cover for their patients. If one doctor in a group practice is on duty each day for emergency calls, a response time comparable to that of the ambulance service may be readily achieved.⁶

Most general practices possess an electrocardiograph machine, but hitherto electrocardiographic confirmation of the diagnosis has not been required to make the decision to admit a patient with suspected acute myocardial infarction to hospital; only a minority of doctors therefore carry the machine with them on emergency calls.^{22,23} But if general practitioners were persuaded that thrombolytic therapy in the community was in their patients' interests, and electrocardiographic confirmation of the diagnosis was a necessary prerequisite, then the machine would become part of the emergency equipment. As for interpretation of the electrocardiograph, this could be taught to a sufficient standard in a single postgraduate educational session. Another solution would be the use of an interpretive machine. Although a general practitioner with an average list sees no more than five cases of acute myocardial infarction per year, this frequency of reinforcement of his or her knowledge of the diagnosis and management of myocardial infarction should suffice to maintain an adequate level of competence.

The patient with recent acute myocardial infarction is at high risk of ventricular fibrillation, and the general practitioner looking after such patients should be prepared and equipped to deal with this eventuality. By comparison with ventricular fibrillation, serious adverse events of thrombolytic therapy occurring in the community are infrequent, and much less demanding in their management.

The way ahead

General practitioners need to be encouraged by local cardiologists, the British Heart Foundation, the Royal College of General Practitioners, and the Department of Health to fulfil their role in pre-hospital coronary care.

Basic life support techniques are now examinable for membership of the Royal College of General Practitioners. Additional training in resuscitation may be required, and can be obtained from the British Association of Immediate Care Schemes, or the training officers of the local ambulance service. Ideally, there should be close collaboration between general practice and the ambulance service so that whichever is called by a patient with a suspected myocardial infarction, both go to the patient and contribute to that care, the general practitioner with his or her medical skills and knowledge of the patient, and the ambulance personnel with assistance with resuscitation if needed, and provision of monitored transport of the patient to hospital.²⁴

The precise role for pre-hospital thrombolytic therapy needs to be defined, but general practitioners should be encouraged to use and evaluate thrombolytic therapy as part of a package of care for the patient with suspected myocardial infarction. The current post-marketing study of anistreplase, conducted under the auspices of the Royal College of General Practitioners, is a good way for general practitioners to gain experience in its use, while contributing to an audit of the management of suspected acute myocardial infarction in the community.²⁵ This study is in accordance with the recommendation of the British Heart Foundation working party that the management of myocardial infarction in the community and hospital should be audited continually.²⁴ As the role of thrombolytic therapy in the community becomes clearer, the resultant commercial interest in pre-hospital coronary care will provide welcome sponsorship for further training for general practitioners in this most important area of primary care.

Conclusion

The first opportunity to provide first class, Belfast-style, mobile coronary care in mainland UK was missed. However, general practitioners now have the chance to provide pre-hospital coronary care of an excellent standard; they should have every encouragement to do so.

References

- Pantridge JF, Geddes JS. A mobile intensive care unit in the management of myocardial infarction. *Lancet* 1967; 2: 271-273.
- The European Myocardial Infarction Project subcommittee. Potential time saving with pre-hospital intervention in acute myocardial infarction. *Eur Heart J* 1988; 9: 118-124.
- Baum RS, Alvarez H, Lobb LA. Survival after resuscitation from out of hospital ventricular fibrillation. *Circulation* 1974; 50: 1231-1235.
- GREAT group. Feasibility, safety and efficacy of domiciliary thrombolysis by general practitioners: Grampian region early anistreplase trial. *BMJ* 1992; 305: 548-553.
- Birkhead JS. Time delays in provision of thrombolytic treatment in six district hospitals. *BMJ* 1992; 305: 445-448.
- Rawles JM, Haites NE. Patient and general practitioner delays in acute myocardial infarction. *BMJ* 1988; 296: 882-884.
- Pai GR, Haites NE, Rawles JM. One thousand heart attacks in Grampian: the place of cardiopulmonary resuscitation in general practice. *BMJ* 1987; 294: 352-354.
- Rawles JM. Cost effectiveness of cardiac defibrillation by general practitioners [letter]. *BMJ* 1991; 302: 1606.
- Pantridge JF. The effect of early therapy on hospital mortality from acute myocardial infarction. *Q J Med* 1970; 39: 621-622.
- Adgey AAJ, Geddes JS, Mulholland HC, et al. Incidence, significance, and management of early bradyarrhythmia complicating acute myocardial infarction. *Lancet* 1968; 2: 1097-1101.
- Webb SW, Adgey AAJ, Pantridge JF. Autonomic disturbance at onset of myocardial infarction. *BMJ* 1972; 3: 89-92.
- Pantridge JF, Webb SW, Adgey AAJ, Geddes JS. The first hour after the onset of acute myocardial infarction. In: Yu PN, Goodwin JF (eds). *Progress in cardiology. Volume 3*. Philadelphia, PA: Lea and Febiger, 1974.
- Crampton RS. Impact of the mobile coronary care unit in the USA. In: Geddes JS (ed). *The management of the acute coronary attack*. London: Academic Press, 1986.
- Wennerblom S, Holmberg S, Wedel H. The effect of a mobile coronary care unit on mortality in patients with acute myocardial infarction or cardiac arrest outside hospital. *Eur Heart J* 1982; 3: 504-515.
- Mathewson ZM, McCloskey BG, Evans AE, et al. Mobile coronary care and community mortality from myocardial infarction. *Lancet* 1985; 1: 441-444.
- MacCallum AG, Stafford PJ, Jones C, et al. Reduction in hospital time to thrombolytic therapy by audit of policy guidelines. *Eur Heart J* 1990; 11: 48-52.
- Second international study of infarct survival collaborative group. Randomized trial of intravenous streptokinase, oral aspirin, both, or neither among 17 187 cases of suspected acute myocardial infarction: ISIS-2. *Lancet* 1988; 2: 349-360.
- Rawles J, Jamieson M, Jennings K, et al. An audit of the management of suspected acute myocardial infarction in the coronary care unit or in medical wards. *Aberdeen Postgrad Med Bull* 1992; 26: 8-13.
- Liddell R, Grant J, Rawles J. The management of suspected myocardial infarction by Scottish general practitioners with access to community hospital beds. *Br J Gen Pract* 1990; 40: 318-322.
- Karlson BW, Herlitz J, Edvardsson N, et al. Eligibility for intravenous thrombolysis in suspected acute myocardial infarction. *Circulation* 1990; 82: 1140-1146.
- Julian DG. The history of coronary care units [editorial]. *Br Heart J* 1987; 57: 497-502.
- Rawles JM. General practitioners' management of acute myocardial infarction and cardiac arrest: relevance to thrombolytic therapy. *BMJ* 1987; 295: 639-640.
- Colquhoun MC. General practitioners' use of electrocardiography: relevance to early thrombolytic treatment. *BMJ* 1989; 299: 433.
- British Heart Foundation working group. Role of the general practitioner in managing patients with myocardial infarction: impact of thrombolytic treatment. *BMJ* 1989; 299: 555-557.
- Kay C. Management of myocardial infarction in the community: a new RCGP study [editorial]. *Br J Gen Pract* 1991; 41: 89-90.

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