Threatened Reinfarction*

Effective Therapy Using Streptokinase with Reversal of Cardiogenic Shock


Thrombolytic therapy has an established niche in the treatment of acute myocardial infarction. One view, often rigidly held, is that this therapy should be attempted only if ischemic pain is present for less than four hours. Additionally, treatment is often reserved for those with an anterior infarction, a subgroup that did well in early reports. This case report demonstrates an impressive reversal of cardiogenic shock after streptokinase therapy in a patient who experienced an inferior infarction. His chest pain and ST elevations were present for more than nine hours at the commencement of treatment. (Chest 1990; 98:495-97)

Thrombolytic therapy has been practiced in several areas, but efficacy is most convincing in acute myocardial infarction. Previous studies have demonstrated increased rates of recanalization, improved left ventricular function, and reduced mortality. Because of its large size, the GISSI study was able to conclude that certain groups of patients were more likely to benefit from thrombolytic therapy than others. Mortality was significantly reduced in patients aged younger than 65 years, in those experiencing a first infarction, or in those in Killip class 1 or 2. The most striking reduction in mortality, 47 percent, occurred in patients administered streptokinase within one hour of the onset of symptoms. Recent data, however, suggest that benefit may be realized up to 24 hours after the onset of infarction. While successful recanalization is commonplace, and reversal of cardiogenic shock has been reported, we report the case of a patient with cardiogenic shock in whom streptokinase therapy was begun nine hours after the onset of chest pain and was associated with an impressive reversal of the shock state.

CASE REPORT

The patient is a 69-year-old man who presented to a referring hospital with three hours of chest tightness that was associated with nausea, diaphoresis, and dyspnea. He had been experiencing a stable anginal syndrome for about four years prior to hospital admission, consisting of intermittent chest discomfort on exertion that was relieved by sublingual nitroglycerine or rest. In the referring hospital, the patient had a slow functional rhythm that responded to atropine and resulted in transfer to our hospital. On admission to our Cardiac Care Unit, he was hemodynamically stable, and physical examination was remarkable only for bibasilar crackles on auscultation of the lungs. His electrocardiogram revealed acute inferolateral ischemia and first-degree atrioventricular block. Intravenous streptokinase, 1.5 million units, was administered, resulting in partial resolution of the inferior ST elevations. Follow-up therapy consisted of aspirin 325 mg daily, but no intravenous heparin. Subsequently, the peak creatine phosphokinase value was 7,200 u/L, and the MB fraction was more than 5 percent. For the next few days the patient experienced mild postinfarction angina that was always relieved by sublingual nitroglycerine. A baseline

Figure 1. Electrocardiogram prior to streptokinase administration. Note marked ST elevations inferiorly.
ST elevation of 1.5 mm persisted inferiorly.

On the fifth hospital day, chest pain recurred but was now unresponsive to nitrates. Subsequently, the patient complained of severe shortness of breath and became cyanotic. On examination, bilateral crackles, decreased breath sounds in both lungs, and an S3 gallop were evident. Sinus tachycardia and a respiratory rate of 35/min were present. Because respiratory arrest was imminent, the patient was intubated, ventilated, and treated with furosemide and morphine. Ventricular tachycardia occurred, and cardioversion resulted in the rapid atrial fibrillation (ventricular response, 140 bpm). This did not respond to cardioversion; however, verapamil 2.5 mg intravenously resulted in slowing of the heart rate. His electrocardiogram now showed atrial fibrillation, with a ventricular rate of 94 bpm, and markedly elevated ST segments inferiorly with reciprocal changes (Fig 1). Since the patient had peripheral cyanosis and was diffusely mottled, a pulmonary artery catheter was inserted, revealing a cardiac index of 1.2 L/min/m² (Table, A). He was stabilized with epinephrine 0.1 μg/kg/min and dopamine 40 μg/kg/min (Table, B). Despite the time elapsed since symptom onset (nine hours), thrombolytic therapy was considered in view of his persistent markedly elevated ST segments and cardiogenic shock. Therefore 1.5 million units of streptokinase was given IV over one hour.

During streptokinase infusion, the patient had a brief episode of hypotension. No bleeding complications were noted. Two hours following administration of streptokinase, the rhythm was sinus, rate 100 bpm and the ST segments were much improved (Fig 2). We were able to reduce dopamine dosage from 40 μg/kg/min to 2 μg/kg/min over three hours, with an improved blood pressure and no change in cardiac index (Table, C). By 48 hours, treatment with all sympathomimetics was discontinued (Table, D). ST elevation persisted inferiorly and was demonstrated by cardiac scintigraphy to represent apical aneurysm formation. Interestingly, creatine phosphokinase elevation occurred to more than 5,000 U/L, but the MB fraction was undetectable.

One week after streptokinase therapy, coronary angiography demonstrated a right dominant coronary system with significant stenosis of the right, left anterior descending, and two marginal branches of the circumflex arteries. The patient underwent coronary artery bypass grafting. His postoperative course was complicated by mild congestive heart failure that was controlled with furosemide, digoxin, and captopril. The patient was discharged home with no symptoms of ischemia and only minimal fatigue on exertion. He remains well one year after hospital discharge.

**DISCUSSION**

Cardiogenic shock is associated with a mortality rate of about 80 percent. Pharmacologic support and mechanical assists, while perhaps impressive in individual cases, have not appreciably altered this mortality. Efforts at reducing the amount of infarcted myocardium have therefore been the focus of recent research. Reductions in short-term

**Table 1—Hemodynamic Indices Before and After Streptokinase Therapy**

<table>
<thead>
<tr>
<th></th>
<th>Before Streptokinase</th>
<th>After Streptokinase</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Arterial pressure, mm Hg</td>
<td>104/65</td>
<td>111/56</td>
</tr>
<tr>
<td>Cardiac index, L/min/m²</td>
<td>1.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Pulmonary capillary wedge pressure, mm Hg</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Inotropic support (drug:dose), μg/kg/min</td>
<td>DB:1</td>
<td>DP:40 EP:0.1</td>
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*DB indicated dobutamine; DP, dopamine; EP, epinephrine.*
mortality are demonstrable with both β-blockade and thrombolytic therapy, most impressively with intravenous streptokinase therapy. However, the influence of thrombolytic therapy on long-term mortality remains controversial, and the rate of reinfarction has actually been demonstrated to be higher following treatment, suggesting that a definitive procedure, ie, coronary angioplasty or bypass grafting, is necessary. In the setting of cardiogenic shock, short-term mortality has been lessened with the early use of angioplasty.

The case we present is likely one of threatened reinfarction after initially successful thrombolysis. By averting reinfarction with a second administration of streptokinase, we observed dramatic improvement in left ventricular function that was temporally related to the partial resolution of electrocardiographic changes. That this improvement was a consequence of the slowing of atrial fibrillation with verapamil is unlikely. The heart rates before and after streptokinase therapy were quite similar, and conversion to sinus rhythm occurred after the ST segments improved. The lack of creatine phosphokinase-MB elevation is consistent with reperfusion before infarction occurred. Although this response to thrombolytic therapy would not have been predicted based on previous data, the most recent major study demonstrated reduced mortality when treatment was begun between 12 and 24 hours, and for the first time determined a reduced mortality rate with thrombolysis in inferior infarction. Generalizations about the relationship between initiation of therapy and the onset of chest pain require the understanding that ischemic pain is not necessarily an accurate marker for the beginning of infarction. Therefore, one should consider thrombolytic therapy regardless of the duration of pain in the patient with acute ST elevations. Finally, also noteworthy is the lack of bleeding complications in this patient despite the prior placement of central venous and arterial catheters.

In conclusion, we report an impressive resolution of cardiogenic shock with the administration of intravenous streptokinase in a patient with acute inferior ischemia. This result demonstrates the potential efficacy of thrombolysis despite persistence of ST segment elevation and pain for more than four to six hours. While this single report alone cannot support routine use of thrombolytic therapy in cardiogenic shock associated with myocardial ischemia, it does suggest that one must not be constrained by arbitrary time limits when there is evidence of ongoing ischemia unrelied by standard approaches.

REFERENCES

Life-Threatening Bleomycin Pulmonary Toxicity with Ultimate Reversibility*

Lynn C. Hartmann, M.D.; Stephen Frytak, M.D.; Ronald L. Richardson, M.D.; Douglas T. Coles, M.D., F.C.C.P.; and Roger E. Cupps, M.D.

A 60-year-old man with advanced seminoma was treated with four cycles of a cisplatin, etoposide and bleomycin. He then developed severe pulmonary toxicity with diffuse infiltrates as evidenced on a chest x-ray film. The room air PaO2 value was 32 mm Hg. The patient was treated with steroids and oxygen supplementation, including a high FIO2 for several days, and survived and eventually experienced marked improvement in his pulmonary status. Aggressive management of severe bleomycin-induced pneumonitis appears justified.

Chest 1990; 98:497-99

A 60-year-old man with a distant smoking history and advanced seminoma was treated with four cycles of a combination of bleomycin, etoposide and cisplatin, with bleomycin given intraocularly, 15 units weekly to a cumulative dose of 240 units. At the completion of his chemotherapy, without evidence of active

*From the Departments of Medical Oncology, Radiation Oncology, and Thoracic Diseases, Mayo Clinic, Rochester, MN.

Reprint requests: Dr. Hartmann, Medical Oncology, 200 SW First Street, Rochester, MN 55905

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