

Effects of Isosorbide Dinitrates Intravenously in High Doses Over a Short Period in Anterior Acute Myocardial Infarction

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The effects of intravenous isosorbide dinitrate administered in high doses over a short period of time in 17 patients (14 men, 3 women, mean age 67 years) with anterior wall acute myocardial infarction were evaluated. Patients were classified into 2 groups based on the electrocardiographic pattern of acute ischemia. Patients presented with anterior

acute myocardial infarction; an electrocardiographic pattern of third-degree ischemia demonstrated a more favorable electrocardiographic and radionuclear angiographic evolution than similar patients who presented with an electrocardiographic pattern of second-degree ischemia.

(Am J Cardiol 1988;61:78E-80E)

The recording of the electrocardiogram during progressive levels of ischemia shows several typical patterns (Fig. 1). The initial phase of ischemia is characterized by the development of a tall and peaked T wave (first-degree ischemia). If the ischemia progresses, then ST-segment elevation (second-degree ischemia) is observed in addition to the tall and peaked T wave. Finally, with maximal ischemia, a further elevation of the ST segment with disappearance of the S wave and an increment in the size of the R wave (third-degree ischemia) is seen.^{1,2}

Patients with acute myocardial infarction (AMI) may demonstrate 1 of these 3 degrees of ischemia when admitted to the coronary care unit (if admitted before the development of pathologic Q waves). Each pattern of degree of ischemia has typical evolutionary changes when evolving to AMI (Fig. 2).

The purpose of this study is to evaluate the effects of intravenous isosorbide dinitrate given in high doses over a short period of time on the electrocardiographic (ECG) evolution of patients presenting during the early stages of AMI with initial ECG patterns of second- or third-degree ischemia (Fig. 1 and 2), and to compare the differences between both groups.

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Methods

Inclusion criteria: Patients were admitted to the study when all the following criteria were met: (1) severe chest pain suggestive of AMI of less than 1 hour in duration; (2) an ECG pattern of second- or third-degree ischemia and without pathologic Q waves in the anterior chest leads; (3) no evidence or history of previous transmural (Q wave) anterior wall AMI; (4) a systolic blood pressure of ≥ 120 mm Hg; and (5) heart rate of no more than 90 beats/min.

Protocol of study: A 3-channel electrocardiogram with fixed precordial leads was recorded every 5 minutes during the first hours and every 15 minutes during the second hour. Radionuclear ventriculography was performed by the first-pass technique during the first 24 hours of admission and 14 days later. Administration of isosorbide dinitrate (50 mg dissolved in 50 ml of 5% dextrose) was started at 166 μ g/min and was raised every minute until one of the endpoints was reached. No maximal dose was set. The endpoints of therapy were (1) a reduction in systolic blood pressure to 90 mm Hg, (2) an increment in heart rate >110 beats/min, and (3) a negativization of T waves in the precordial leads or completion of 2 hours of treatment.

Results

Patient characteristics: Seventeen consecutive patients with anterior wall AMI who fulfilled the inclusion criteria were included in the study. There were 14 men and 3 women (ages range from 55 to 74 years [mean 67]). Ten patients had second-grade ischemia

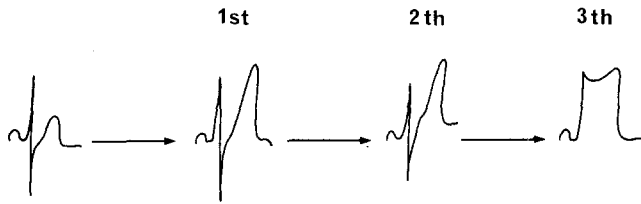


FIGURE 1. Schematic representation of degrees of ischemia. See text for explanation.

(group I), whereas 7 patients had third-degree ischemia (group II). The total dose of isosorbide dinitrate administered during the first hour was 90 ± 25 mg and during the second hour, 80 ± 30 mg.

Electrocardiographic characteristics and comparisons: Q waves: In group I, no significant Q waves were observed in the infarcted area within the first 2 hours from the onset of AMI. In group II, pathologic Q waves appeared in all 7 patients within 2 hours.

ST-segment elevation (Fig. 3): In group I, the initial mean level of ST elevation was 9 mm and decreased to

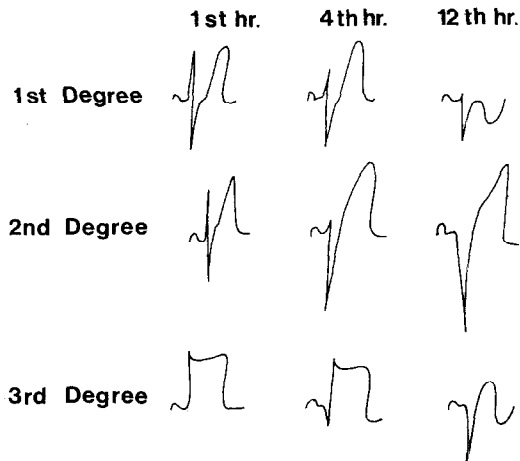


FIGURE 2. The natural electrocardiographic evaluation of acute anterior wall myocardial infarction according to the initial degree of ischemia.

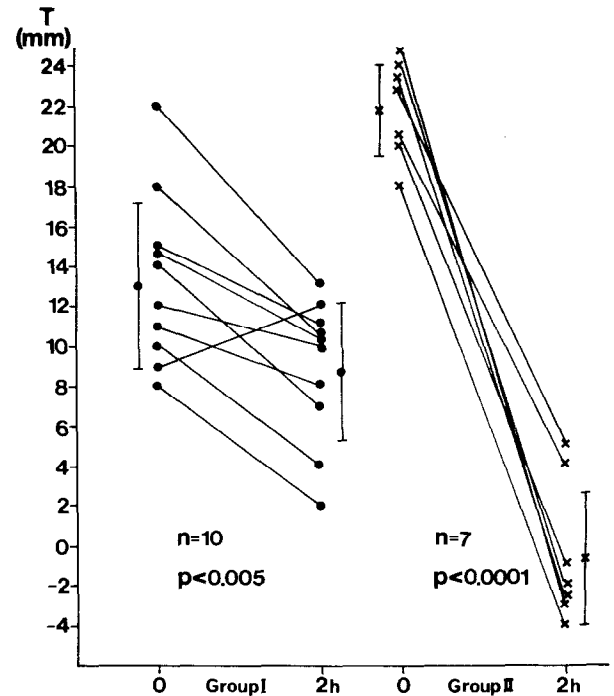


FIGURE 4. Effect of intravenous isosorbide dinitrate on the height of the T waves. See text for explanation.

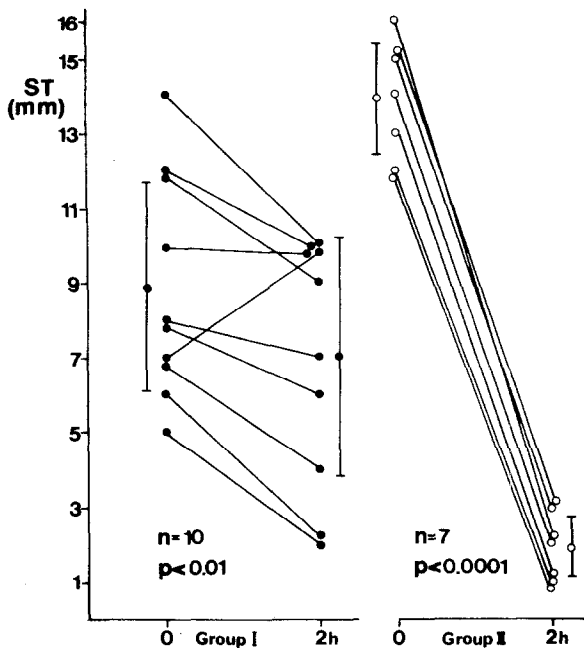


FIGURE 3. Effect of intravenous isosorbide dinitrate in the degree of ST-segment elevation. See text for explanation.

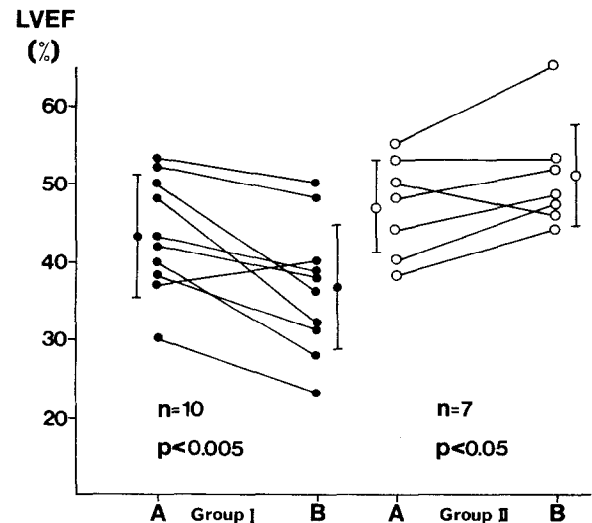


FIGURE 5. Changes in left ventricular ejection fraction (LVEF) over a 2-week period. See text for explanation.

a mean level of 7 mm after 2 hours of treatment ($p < 0.01$). In group II, the initial mean level of ST elevation was 14 mm and decreased to a mean level of 5 mm within 1 hour and to 2 mm within 2 hours of treatment ($p < 0.0001$). Significant differences were found between both groups for these 2 time points: $p < 0.005$ for the first hour and $p < 0.0005$ for the second hour.

T waves (Fig. 4): In group I, the initial mean level of the T wave was 13 mm. It remained unchanged after 1 hour of treatment and decreased to 9 mm after 1 hour ($p < 0.005$). In group II, the initial level was 22 mm and decreased to 10.5 mm after 1 hour, and to a negative level of -0.7 mm after 2 hours of treatment. Highly significant differences were observed between T-wave levels in both groups, $p < 0.0001$.

Radionuclear left ventricular ejection fraction (Fig. 5): Group I mean initial ejection fraction was 43% and decreased to a mean of 37% after 2 weeks ($p < 0.005$). Group II mean initial ejection fraction was 47% and increased to 53% after 2 weeks ($p < 0.05$). The

initial ejection fraction for both groups was similar; however, the second study had statistical differences ($p < 0.005$).

Conclusion

Isosorbide dinitrate, when administered intravenously in high doses over a short period of time, has a beneficial effect on the ECG evolution of patients with anterior wall AMI, when the initial ECG pattern is third-degree ischemia. This treatment can be an alternative mode of therapy for patients with anterior AMI in whom thrombolytic therapy is contraindicated.

References

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