# Comparison of Tc-99m Methylene Diphosphonate with Tc-99m Pyrophosphate in the Detection of Acute Myocardial Infarction: Concise Communication

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***Myocardial scans were obtained in ten patients with proven myocardial infarction. Scintigraphy on consecutive days was performed with technetium-99m methylene diphosphonate and technetium-99m pyrophosphate. Images obtained with the two tracers were generally equal in quality. Those with $PP_i$ exhibited denser uptake, while background activity was lower with MDP.***

**J Nucl Med 18: 790–792, 1977**

Technetium-99m phosphate tracers, introduced in 1971 as bone-scanning agents (*1*), have been found useful in the detection of acute myocardial infarction (*2*).

Technetium-99m pyrophosphate ($PP_i$) is the most commonly employed tracer for this purpose. Since Tc-99m methylene diphosphonate (MDP) is better than $PP_i$ for skeletal imaging (*3*), we designed this study to compare these two agents for imaging in acute myocardial infarction.

## MATERIALS AND METHODS

Ten patients were included in the study. All exhibited clinical evidence of acute myocardial infarction: elevation of CPK, SGOT, LDH and typical electrocardiographic changes. All infarcts were transmural.

The patients were scanned 2 to 4 days after the acute episode. Five patients were imaged, using $PP_i$ first, and then using MDP 24 hr later. The sequence was reversed in the other patients. The initial tracer was chosen at random.

Images were recorded 60–90 min after intravenous injection of 15 mCi of either tracer, there being no significant difference in the actual mean time after injection for each of the tracers. Five hundred thousand (500 K) counts were accumulated for each image; the average count rate being 170,000–180,000 cpm. Anterior, 45° left anterior oblique, and lateral views were obtained using a wide-field gamma scintillation camera with a high-resolution, low-energy collimator.

The studies of each patient were compared subjectively by two observers, without either observer's having knowledge of the tracer employed for a given study. The size of the infarct was also estimated in each case.

## RESULTS

The average overall image quality was comparable with both agents. In no case was the infarct missed with either agent, although in one case the infarct was much less obvious with MDP. In the two patients in whom MDP provided superior images (see Fig. 1), it was found to be the initial tracer in one patient and the second tracer in the other. In the other two patients, where $PP_i$ appeared better (see Fig. 2), it also happened to be the initial tracer in the one and the second in the other. The overall image quality in the remaining six cases was felt to be equal with both agents.

The infarct appeared larger in three cases with $PP_i$ (Fig. 2) and equal in size in the others.

Received Jan. 31, 1977; revision accepted March 14, 1977.

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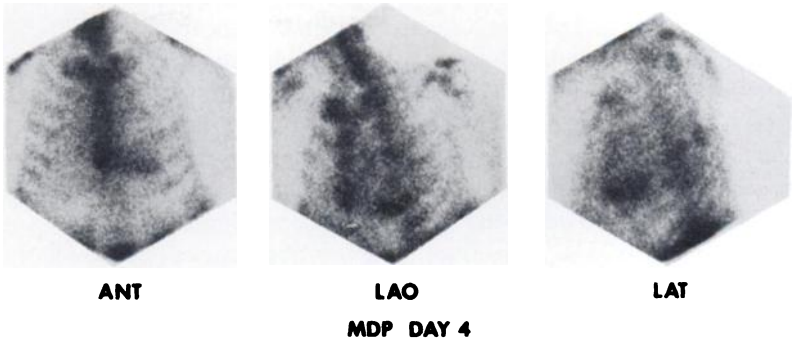


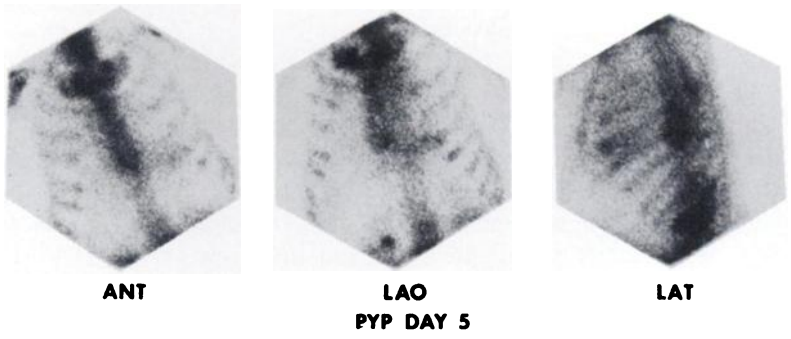
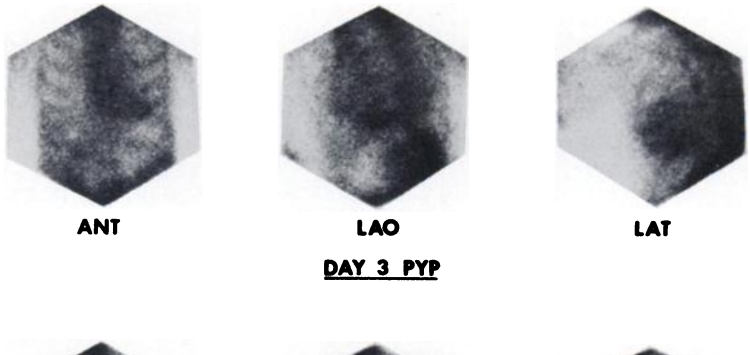




**FIG. 1.** Note that infarct is more obvious with MDP than with $PP_i$.



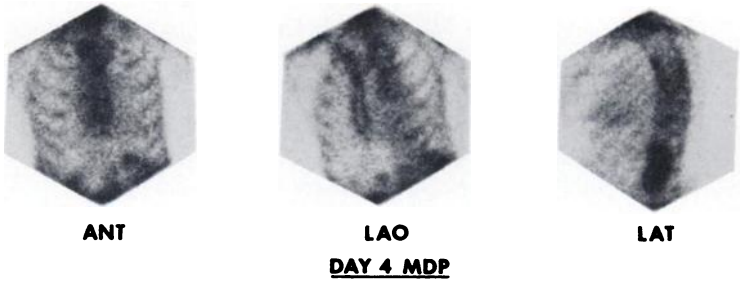




**FIG. 2.** Infarct uptake with $PP_i$ appears more intense and larger than with MDP, but background is lower with MDP.

## DISCUSSION

Several recent studies have indicated a high sensitivity of imaging techniques in the detection of acute myocardial infarction (*2,4*). In one recent publication (*5*), Tc-99m $PP_i$ was shown to be superior to Tc-99m glucoheptonate and Tc-99m tetracyclines in the detection of acute myocardial infarction. In our study we compared Tc-99m MDP with Tc-99m $PP_i$ for the same purpose and found them to be of approximately equal value. In general, higher uptake in the area of infarction was observed with Tc-99m $PP_i$, while background activity was lower with MDP.

Using a rat model, Davis et al. (*6*) found that the percentage of injected dose per gram of infarcted

myocardium was about 2.5 times greater with $PP_i$ compared to MDP, but infarct-to-normal myocardium ratio was slightly higher with MDP. Subramanian et al. have shown that in humans blood clearance of MDP is faster than $PP_i$ (*3*). These observations are consistent with, and explain, our finding of higher uptake of $PP_i$ and lower background with MDP.

In three of our cases, the area of uptake was larger with $PP_i$ than MDP. Pyrophosphate has been shown to accumulate in the periphery of the infarct zone (*4,7*); we can only assume that this phenomenon operated to a lesser extent with MDP. The possibility that $PP_i$ more accurately delineates the size of the infarct should also be considered.

## CONCLUSION

$PP_i$ and MDP were compared in the scintigraphic detection of acute myocardial infarction. Images with MDP have lower background, whereas those with $PP_i$ have higher uptake in the infarcted area. In general the two tracers are about equally satisfactory for this purpose.

## ACKNOWLEDGMENT

The authors wish to thank P. A. Farrer for his valuable suggestions, D. Saxe for preparing illustrations, and A. Leibe for typing the manuscript.

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