

# Imaging

## Case Report: Abnormal Liver Tissue Uptake of Tc-99m Pyrophosphate during Myocardial Imaging

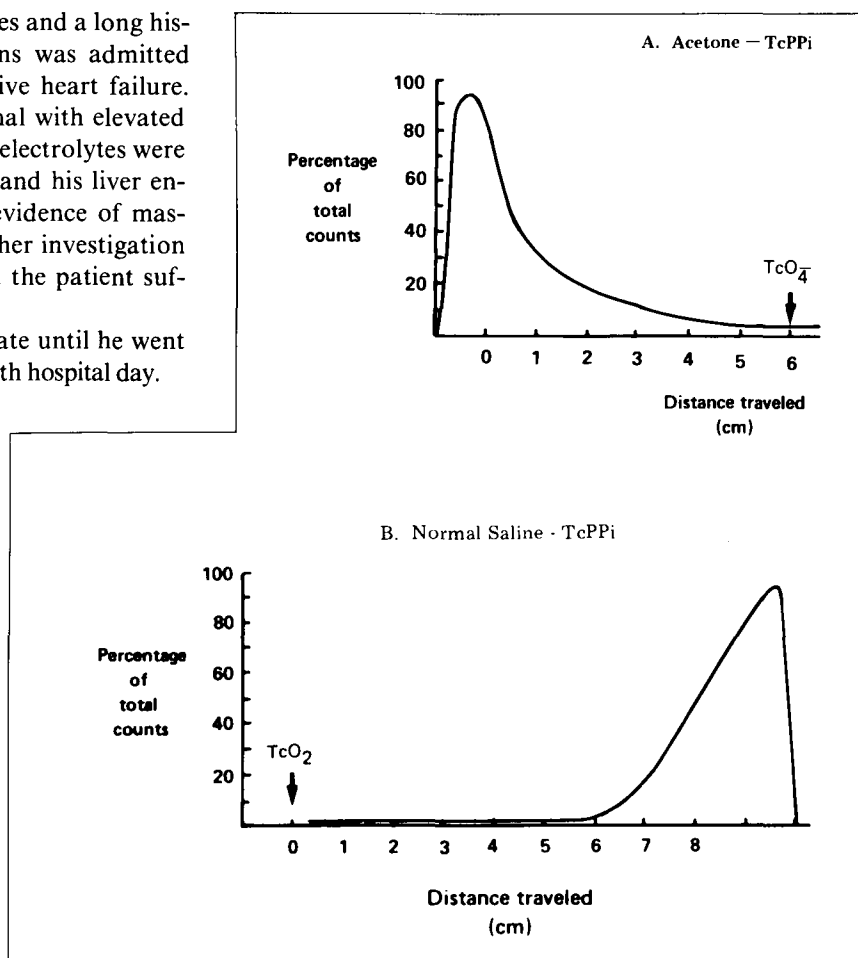
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A 67-year-old black man with diabetes and a long history of multiple myocardial infarctions was admitted to the hospital, apparently in congestive heart failure. His ECG findings were grossly abnormal with elevated cardiac isoenzymes. The patient's urine electrolytes were consistent with acute tubular necrosis and his liver enzymes were grossly abnormal, giving evidence of massive central lobular necrosis. Upon further investigation by proctoscopy, it was discovered that the patient suffered necrosis of the bowel wall also.

The patient continued to decompensate until he went into cardiac arrest and expired on his seventh hospital day.

**FIG. 1.** Immediate radiochromatography performed on Tc-99m PPI preparation. (A) Using acetone as solvent, relative percentages were plotted on ordinate and distance from origin on abscissa. Arrow indicates relative percentage of free pertechnetate. (B) Using saline as solvent, arrow indicates relative percentage of reduced hydrolyzed technetium.



### Procedure

A Tc-99m pyrophosphate (PPI) heart scan was performed on the fourth day of hospitalization to investigate the possibility of a myocardial infarction. Technetium

Scan PYP containing 12.0 mg sodium pyrophosphate and 3.4 mg stannous chloride (Mallinckrodt, Inc.) were prepared according to the manufacturer's insert.

Quality control procedures were performed on both the Mo-99/Tc-99m generator eluate and the Tc-99m PPI preparation (1).

The eluate was checked with aluminum ion indicator

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paper (New England Nuclear, Medical Diagnostics Div.) and the concentration of  $Al^{+3}$  was noted to be less than  $10 \mu g/ml$ , which is acceptable according to FDA standards (1).

Radiochromatography was performed using Gelman ITLC-SG paper in acetone and normal saline solvents to check for free pertechnetate ( $^{99m}TcO_4^-$ ) and reduced hydrolyzed technetium ( $^{99m}TcO_2$ ). With acetone, free pertechnetate travels to the solvent front while the tagged product (Tc-99m PPI) and the reduced hydrolyzed technetium remain near the origin. In normal saline solvent, the Tc-99m PPI and free pertechnetate travel to the front, while the reduced hydrolyzed technetium remains at the origin.

Use of a well adapter, a device for counting the ITLC strip above the scintillation crystal, allows for quantification of free and reduced levels (2). The relative percent impurities were calculated to be 5% free pertechnetate and 1% reduced hydrolyzed technetium for a total tag of 94% (Fig. 1).

The scan was performed with a gamma camera at approximately 4 hr postinjection of 15-mCi Tc-99m PPI, in accordance with our usual procedure. Four views of the chest were obtained; anterior, 45° LAO, 60° LAO, and left lateral. During patient positioning, it was noted on the oscilloscope that there was abnormal uptake of activity in the liver (Fig. 2).

What is a possible explanation for the localization of Tc-99m PPI in the liver?

### Discussion and Conclusion

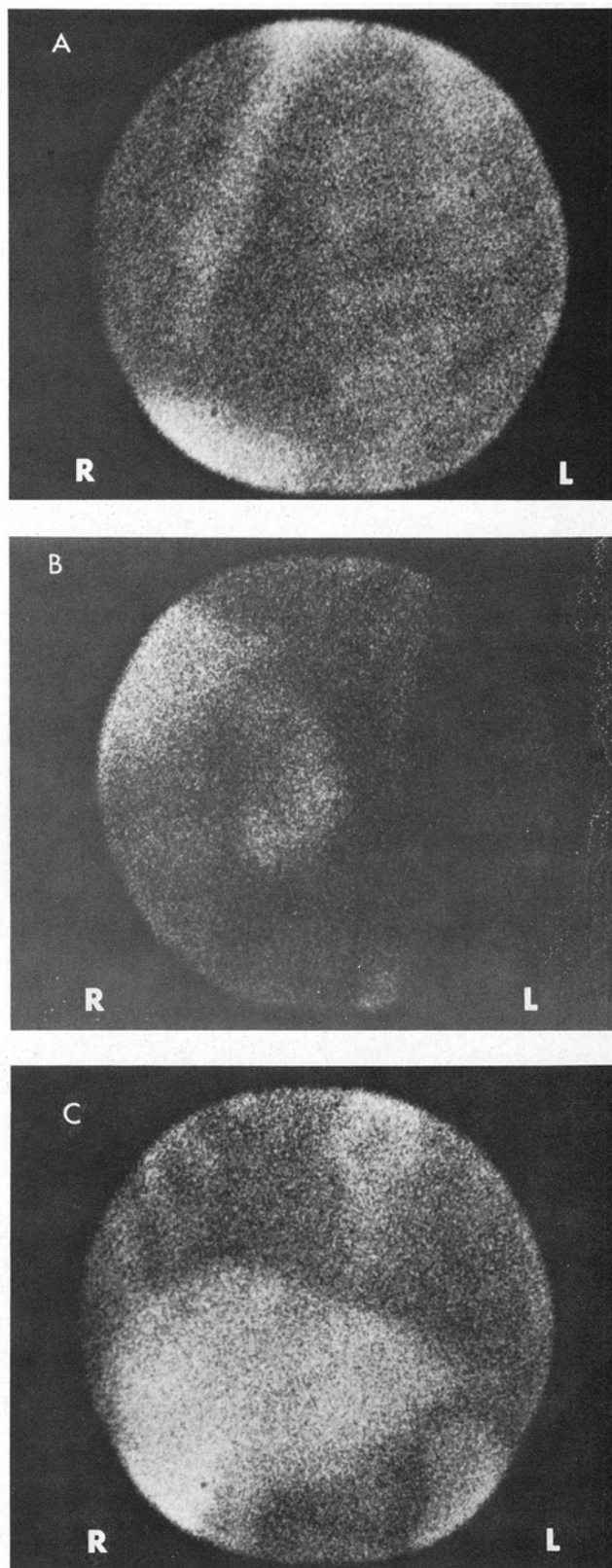
The Tc-99m PPI heart scan was reported to be negative for myocardial infarction (Fig. 2). Radiopharmaceutical quality control ruled out the possibility of high reduced hydrolyzed technetium levels in the preparation that would have localized in the liver and spleen (3). Figure 2(B), however, shows no splenic activity, confirming the chromatography results for reduced hydrolyzed technetium.

No stomach activity was noted, ruling out free pertechnetate contamination and confirming radiochromatography values (3).

The  $Al^{+3}$  concentration was less than  $10 \mu g/ml$ , decreasing the probability of soft tissue uptake caused by high  $Al^{+3}$  concentrations (4).

Studies have demonstrated that pyrophosphate scintigrams may become positive because of uptake by calcium deposition in and around infarcted zones of the myocardium. (5-7).

We think this same calcium deposition mechanism is a possible answer to the accumulation of Tc-99m PPI activity in the necrotic liver. Further, calcium deposition is hypothesized to occur with necrotic cardiac tissue. No autopsy was performed to verify calcium deposition in the liver.



**FIG. 2.** Photographs obtained 4 hr postinjection of 15 mCi-Tc-99m PPI. (A) 45° LAO of chest demonstrates good skeletal uptake with no uptake by the myocardium, indicating a negative heart scan. (B) Left anterior view of abdomen demonstrates uptake in bone and kidney, with no uptake in the spleen. (C) Right anterior view of abdomen demonstrates uptake of Tc-99m pyrophosphate in liver.

## References

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