

CONCISE COMMUNICATION

The Detection and Delineation of  
Abdominal Abscesses with Gallium-67

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#### INTRODUCTION:

Gallium-67 is reputed to be of value in delineating the anatomic distribution of certain malignancies (1-4). Reports also indicate that this nuclide is concentrated in hepatic and pulmonary abscesses (5). McCabe et al (6) have found it a valuable agent in delineating acute bacterial abscesses in the rabbit. We have attempted to reproduce these results in the rabbit before embarking on a systematic study in man.

#### METHODS AND MATERIALS:

In 4 adult rabbits pellets containing  $10^9$  E. coli organisms were implanted high in the peritoneal space. Additionally in 3 rabbits germanium-drifted lithium photoluminescent dosimeters were also implanted. In 4 other adult rabbits, a peritoneal incision was made and a dosimeter alone was implanted. These animals served as scanning controls. Each of 4 experiments consisted of a test animal and a control. Three to 4 days after the surgical procedure 0.25 to 0.75 mCi of gallium-67 - citrate were injected intravenously into an ear vein of each rabbit. Imaging with an Anger camera was performed in pairs 5 hours to 5 days after injection. Upon completion of scanning each rabbit was sacrificed and the dosimeter recovered.

Imaging was performed by collecting 20,000 counts over the abdomen in each rabbit by a Nuclear-Chicago Pho-Gamma HB camera using

a high-energy, parallel-hole collimator. The isotope peak was set at 190 kev with a 30 percent window. High voltage was set at 835. Polaroid prints were made with an oscilloscope setting of 780 and 35 cm negatives with a setting of 300.

#### RESULTS:

Scans were read by one of us (WCH) without knowledge of the presence or absence of an abscess. In one pair of animals, each given 0.25  $\mu$ Ci Ga-67, no judgement as to the presence or absence of an abscess could be made. In the remaining 6 animals, a correct decision was easily made whether or not an abscess was present. The scan interpretation identified 3 animals in whom abscesses existed and predicted 3 in whom there was no abscess. These findings were verified at necropsy. Figures 1 and 2 show a positive and negative scan, respectively.

Thermoluminescent dosimeter readings in 3 animals were 3.77, 3.87, and 1.74 R, expressed as rods per millicurie injected. These values closely approximate those calculated for liver and spleen exposure in humans.

They quite reasonably accord with dosimetric calculations previously made at the institution in study by gallium detection of neoplasms in humans.

#### DISCUSSION:

Although Winkelman et al (7) and Deyssine (8) have reported visualizing acute bacterial abscesses using concentrates of Cr-51-

labeled leukocytes, we have been unable to do so satisfactorily, despite purified preparations of physiologically normal leukocyte and an excellent chromium tag. The major impediment has been a high isotope concentration in the reticuloendothelial system and a subsequently low target to background ratio.

Gallium also concentrates heavily in the reticuloendothelial system. However, its concentration in certain neoplastic tissue provides a target-background ratio of diagnostic differentiation. We believe for this reason, gallium will be successful in delineating certain abscesses. Our preliminary studies indicate it will be difficult to assess an abscess in the reticuloendothelial organs and lungs because gallium usually concentrates there. This could be significant limitation to the development of a clinically useful technique of abscess delineation. The hypochondrium is the area one often suspects clinically and, particularly with the scintillation camera, resolution with gallium scanning is not good. However, lower portions of the abdomen, pelvis, neck and joints may justify the use of gallium for abscess detection.

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