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THE USE OF ^{99m}Tc-SULFUR COLLOID TO ASSESS THE DISTRIBUTION OF ^{32}P-CHROMIC PHOSPHATE

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The use of ^{32}P-chromic phosphate in glucose suspension for intracavitary radiotherapy is complicated by the fact that the distribution of the particulate suspension after installation is unknown. The simultaneous administration of ^{99m}Tc-sulfur colloid with the radiopharmaceutical followed by imaging of the appropriate cavity will depict accurately the distribution of the injected colloid. If one assumes that the two agents initially will occupy the same space and are distributed in a similar fashion, an estimation of the distribution of chromic phosphate is possible.

Our department is called upon several times each year to treat malignant pleural or peritoneal effusions with radiocolloids. The agent usually selected is ^{32}P-chromic phosphate in glucose suspension. One drawback to the use of this agent is not knowing the distribution of the particulate suspension after its installation. The administration of 2 mCi of ^{99m}Tc-sulfur colloid together with the chromic phosphate permits imaging of the distribution of radioactivity in the body cavity being treated.

TECHNIQUE

Under sterile conditions, a 19-gage polyethylene catheter is inserted into either the pleural or peritoneal cavity and the excess fluid is removed. It is desirable to leave at least 500 cc of pleural fluid or 1,000 cc of ascitic fluid in the cavity to permit homogeneous distribution of the radiopharmaceutical. Following this, ^{32}P-chromic phosphate suspension is injected using a plastic syringe and flushed with 15 cc of normal saline. Five millicuries of ^{32}P-chromic phosphate are used for intrapleural therapy and 10 mCi for intraperitoneal therapy. Two millicuries of ^{99m}Tc-sulfur colloid are then injected through the same catheter. The catheter is then removed and a single suture inserted. The patient is instructed to turn several times to facilitate thorough mixing of the suspension and colloid with the ascitic fluid. Scintiphotograms of the appropriate cavity are then obtained and the distribution of radioactivity is analyzed.

DISCUSSION

Radiocolloids have been used for the treatment and control of recurrent malignant effusions for more than two decades (*1,2*). Several reports have indicated that palliation or control of recurrent effusions can be obtained in approximately 50% of patients (*3,4*). This success rate is approximately the same as that of chemotherapeutic drugs but without the bothersome side effects of these agents, namely pain, dense scarring of the pleural and peritoneal surfaces, and systemic drug reactions (*5*). The indications and rationale for the use of radiocolloids have been fully discussed elsewhere (*4,6*) and will not be considered further in this report.

Several colloidal agents are available but the most widely used and reported are ^{198}Au-colloidal gold and ^{32}P-chromic phosphate. Radiogold has several well-known advantages and disadvantages. Its cherry red color is a good index to both the stability of the colloidal preparation and to possible leakage and contamination. The associated gamma emission can be used to advantage in determining the distribution of the injected colloid by either rectilinear scanning or gamma camera scintiphotography. The gamma radiation is, on the other hand, a distinct disadvantage causing radiation exposure to personnel in the administration of the radiopharmaceutical and to those providing nursing care to the patient following

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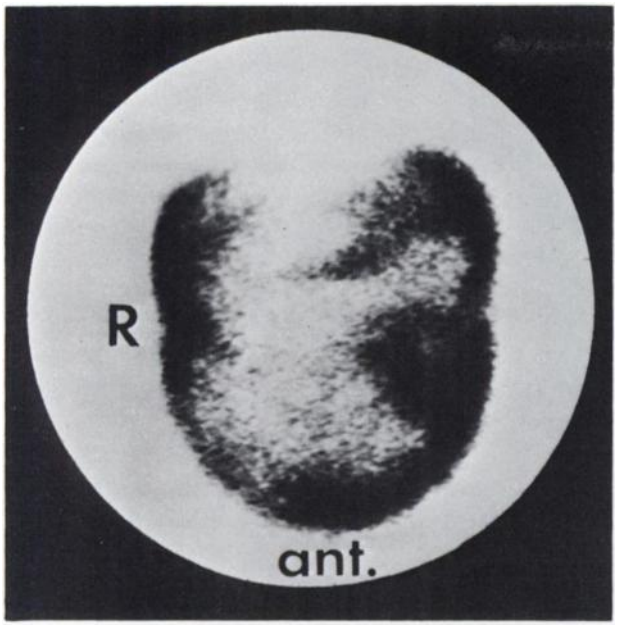

FIG. 1. 54-year-old male with metastatic carcinoma of pancreas complicated by recurrent ascites was referred for treatment with ^{32}P-chromic phosphate. Scintiphotogram obtained of abdomen after simultaneous installation of ^{32}P-chromic phosphate and ^{99m}Tc-sulfur colloid depicts accurately distribution of sulfur colloid in ascitic fluid within intraperitoneal cavity.

the installation. The short half-life is also considered to be a disadvantage in effective therapy (*1*).

Chromic phosphate with no gamma emission now appears to be the agent of choice. There is essentially no radiation hazard to personnel during and after administration. The 14-day physical half-life of ^{32}P is near optimal for effective therapeutic results. A major disadvantage of this agent in the past was the instability of earlier pectin suspensions and their tendency to clump and form a mixture of large and small aggregates in cavities after installation (*2*). Commercial preparations are now suspended in glucose which have proved to be more stable and do not form the large clumps that were characteristic of the earlier preparations. A further disadvantage is that of knowing the distribution of the injected radiopharmaceutical since pure beta radiation cannot be detected externally and the bremsstrahlung radiation that is produced is insufficient in quantity to permit a quantitative estimate to be made of the distribution of radioactivity. To circumvent this difficulty, we have injected 2 mCi of ^{99m}Tc-sulfur colloid together with the chromic phosphate colloid and obtained shortly thereafter a scintiphotogram of the abdomen (Fig. 1). This scintiphotogram shows very nicely the distribution of the sulfur colloid in the ascitic fluid in this patient. Assuming the sulfur colloid and chromic phosphate suspension occupy the same space initially, we feel assured that the distribution is satisfactory. Root, et al reported that within 24 hr after intraperitoneal or intrapleural injection, both radiogold colloid and chromic phosphate suspensions were no longer free within the fluid but were instead incorporated in the reticuloendothelial cells of the cavity wall (*7*).

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