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Screening In Japan, many whole-body FDG-PET studies are performed on healthy people every year. Although some unsuspected cancers are found, the $2000 exams are too costly to be recommended.

Screening FGF-PET may be appropriate, however, for people who are at high risk for developing cancer. Recommendations for screening FDG-PET will probably increase over time as genetic screening becomes more common.

To date, no data exist about the results in FDG-PET on the basis of genetically defined risk factors, but a step in this direction is the study of so-called paraneoplastic disease. Some patients with diseases such as dermatomyositis or encephalitis may have an undiagnosed associated cancer.

The patient shown in Figure 3 had dermatomyositis and was found to have a previously undiagnosed bronchogenic carcinoma on a whole-body FDG-PET study.

By Benner and Associates in Switzerland was selected as the Image of the Year at a meeting of the Society of Nuclear Medicine.

**CONCLUSION**

The sensitivity of nuclear medicine (PET and SPECT) makes it possible to trace the biochemical processes wherever they are occurring throughout the human body. Photons emitted by radioactive tracers, such as F-18 FDG can penetrate the tissues of the human body and be measured by radiation detectors that surround the entire body or are directed at particular regions or organs.

PET and SPECT have provided a new way to define disease in terms of abnormalities in biochemical or physiologic processes in specific regions of the body. The totality of these processes varies from person to person, and each sick person is characterized by abnormalities in one or more of these regional biochemical processes.

In oncology, one of the most important measurements is the rate of utilization of glucose, which can be measured with F-18 FDG. Thus, the nature of the disease is defined in terms of the nature of the individual person. People can have similar components of disease, but no two patients will be the same. PET and SPECT can therefore be used to detect disease-directed care.

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**DISCUSSIONS IN PET IMAGING**

PET imaging has contributed to the versatility of FDG-PET for the characterization of solitary pulmonary nodules. Its average spatial resolution is 4-mm, which can vary with the phase of the respiratory cycle during the imaging. Care must be taken to ensure that motion does not increase the statistical noise to the point that lesions may be missed. Lesions identified with F-18 fluorothymidine (FLT) can be useful for monitoring the tumor-shrinking effects of preoperative chemotherapy. Medicare granted coverage for three indications relating to breast cancer in March 2002. The program began to accept billing for FDG-PET to stage breast cancer patients with distant metastases, to restage patients with hepatic metastases, and to monitor therapy.

**Current Status**

FDG-PET is a powerful tool that is an essential part of oncologic's diagnostic armamentarium. In February 2002, the Centers for Medicare and Medicaid Services (CMS) included coverage to recognize FDG-PET's diagnostic potency for many cancer-related applications.

In its ability to characterize focal lung lesions, PET imaging can detect up to 89% accuracy in detecting lesions with FDG-PET.** The combination of FDG-PET for the characterization of solitary pulmonary nodules to determine the likelihood of malignancy.**

Since 1998, Medicare has covered the use of FDG-PET as a cancer imaging technique. It is increasingly prescribed for examining suspected breast, cerebral, cervical, esophageal, head and neck, lung, and thyroid cancers. It plays a role in staging melanoma and monitoring the effectiveness of Hodgkin's and non-Hodgkin's lymphoma treatment. FDG-PET's treatment monitoring role is expanding swiftly, and its potential to avoid misinterpretation.

The energy substrate for different types of cancer varies. FDG-PET accurately discriminates between malignant and benign solitary pulmonary nodules. Its average sensitivity in seven studies that examined FDG-PET's ability to characterize focal lung lesions was 93%, with an average specificity of 89%. FDG-PET uptake rate can predict patient survival. A study of 156 patients with adenocarcinoma of the lung...
compounds can provide information in the care of patients. Because tumors in prostate cancer involve a relatively low grade of malignancy, they may respond to treatment with C-11 choline is a better tracer. The combination of anatomic information from CT and functional information from PET tracer PET is better than the use of CT alone for the detection of lymph node involvement in patients with recurrent metastatic prostate cancer. C-11 choline studies are able to differentiate between relapse and scars that are part of the recovery process after surgery. Patients with cancer in the head or neck may have continuing cancer elsewhere in the body. F-18 FDG uptake may be found in the normal ovary and uterus changes that occur with the menstrual cycle. It is important to know the menstrual phase when interpreting abdominal and pelvic F-18 FDG-PET images of women of childbearing age. F-18 fluoro-estradiol (FES) could be useful in the identification of cancer that expresses estrogen receptors and is treated effectively with drugs that block these receptors. F-18 fluorothymidine (FLT) could detect rapid DNA synthesis in normal areas, such as bone marrow, or rapidly dividing cancerous cells. Even in the most malignant tumors, only a small percentage of cells are dividing. A 40% increase over the course of the 30 minutes is the FLT is accumulating. All of the cells are hypermetabolic, however, as indicated by their avid accumulation of FDG. PET imaging with FLT could provide information that enables an estimate of breast cancer’s response to chemotherapy. FDG also correlates well with response to chemotherapy.

Other candidates for commercial use as PET tracers are carbon-11 methionine and [11C] acetate. Both are PET tracers that can image only a 20-minute half-life, hundreds of C-11 compounds can provide information in the care of patients. Because tumors in prostate cancer involve a relatively low grade of malignancy, they may respond to treatment with C-11 choline is a better tracer. The combination of anatomic information from CT and functional information from PET tracer PET is better than the use of CT alone for the detection of lymph node involvement in patients with recurrent metastatic prostate cancer. C-11 choline studies are able to differentiate between relapse and scars that are part of the recovery process after surgery. Patients with cancer in the head or neck may have continuing cancer elsewhere in the body. F-18 FDG uptake may be found in the normal ovary and uterus changes that occur with the menstrual cycle. It is important to know the menstrual phase when interpreting abdominal and pelvic F-18 FDG-PET images of women of childbearing age. F-18 fluoro-estradiol (FES) could be useful in the identification of cancer that expresses estrogen receptors and is treated effectively with drugs that block these receptors. F-18 fluorothymidine (FLT) could detect rapid DNA synthesis in normal areas, such as bone marrow, or rapidly dividing cancerous cells. Even in the most malignant tumors, only a small percentage of cells are dividing. A 40% increase over the course of the 30 minutes is the FLT is accumulating. All of the cells are hypermetabolic, however, as indicated by their avid accumulation of FDG. PET imaging with FLT could provide information that enables an estimate of breast cancer’s response to chemotherapy. FDG also correlates well with response to chemotherapy.

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FDG-PET was able to detect not only skin abnormalities but also lung cancer in this patient with paraneoplastic syndrome. (Provided by Johann Wolfgang Goethe University Hospital in Frankfurt, Germany.)


Figure 3. FDG-PET was able to detect not only skin abnormalities but also lung cancer in this patient with paraneoplastic syndrome. (Provided by Johann Wolfgang Goethe University Hospital in Frankfurt, Germany.)


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