《招待講演》

Future of PET in the United States

Stanley J. Goldsmith, M.D.
New York Presbyterian Hospital-Weill Cornell Medical Center
New York, USA

Positron Emission Tomography [PET] imaging has evolved over the past 30 years from a research tool available at only a few medical centers to a dramatic method for clinical diagnosis that already has a major impact on patient care in the United States, particularly in Oncology. A recent development, the marriage of PET and CT is likely to significantly change nuclear medicine and diagnostic imaging in the eyes of the medical profession, patients and the general public.

In the United States today, F-18 FDG is approved as a diagnostic agent by the FDA. It is produced commercially in cyclotrons and is available to most population centers throughout the country. It is estimated that in 2001, over 170,000 individual FDG studies will have been performed. This growth has been stimulated by government recognition of the merit of FDG imaging by providing reimbursement for studies, thus stimulating other insurance sources to do likewise. In 1999, the Federal government approved 5 indications for reimbursement:

1. Differential diagnosis of the solitary pulmonary nodule
2. Staging of lung carcinoma
3. Evaluation of lymphoma [as an alternative to Ga-67 scintigraphy]
4. Evaluation of recurrence in patients with colon carcinoma
5. Evaluation of recurrence in patients with malignant melanoma

These applications were approved for both dedicated ring detector systems and modified dual-head gamma cameras operating in the coincidence mode.

In December 2000, the coverage was expanded to include additional tumors such as esophageal and head and neck carcinoma and additional indications. Reimbursement for these additional indications, however, is limited to high performance ring detector systems.

Recognition by the government of additional indications was received well by the nuclear medicine community but the limitation on equipment has created confusion since there are now many different instruments with varying resolution and ability to detect small lesions.

Approximately 10% of PET studies are performed on dual-detector gamma cameras with coincident circuitry. Dual-detector systems are available with a variety of sodium iodide crystal thickness: 1/2, 5/8, and 1 inch [1.3, 1.6 and 2.5 cm]. In addition, a full ring [360 degrees] sodium iodide

based system is available composed of 6 large curved crystals with Anger-type photomultiplier tube arrays. At the top of the line are multi-detector Bismuth Germanate crystal systems with thousands of crystals and resolution approaching the range of the positron in tissue. Systems based on Gadolinium or Lutetium Orthosilicate are in development. These systems have potential advantages over BiGO but it is too early to know if they will result in further improvement in lesion detection. Perhaps the greatest impact in terms of acceptance of PET imaging will come from the recent addition of CT. This development replaces the radionuclide source for attenuation correction and provides greater throughput as well as precise anatomic placement of the FDG findings onto anatomic structures as defined by CT. It is likely that superimposing PET information on high resolution anatomic images will result in even wider use of PET by clinicians and radiologists.