Diagnostic Radiology

Introduction

The Division of Diagnostic Radiology is committed to improving health through excellence in image oriented patient care and research.

Our Division performs more than 64,000 inpatient and outpatient procedures annually.

The division also conducts clinical scientific researchs as well as basic scientific ones. And the results translate directly into better patient care.

Routine Activites

Our division has four helical CT scanners including two multi-slice CT scanners, two 1.5T MRI systems, two interventional radiology (IVR) CT systems, two gamma cameras with the capacity for single photon emission CT (SPECT), two digital radiographic (DR) systems for fluoroscopy, two mammography and four computed radiographic (CR) systems. IVR-CT system means digital subtraction angiography with helical CT. One IVR-CT system is equipped with 16 multi-slice CT. Positron emission tomography (PET) scanner and baby cyclotron had been introduced, and tumor imaging by 18F-FDG (fluorodeoxyglucose)has been performed. These all-digital image systems enhance the efficacy of routine examination.

This division has seven consulting radiologists and fourteen technologists. As part of routine work, every effort is made to produce an integrated report covering all examinations, such as plain radiographic examinations (chest, abdomen, head, neck, breast, bone and other structures), contrast radiological procedures (digestive, urinary and respiratory tracts), CT, MRI, RI, PET, angiography and interventional radiology (IVR), mainly transarterial embolization (TAE).

The number of cases examined in 2004 is shown in the table below.

Several conferences are routinely held in our division, including teleradiologic, pre- and postoperative conferences.

Research Activities

Our division has been developing a system of multi-slice helical CT with the support of the Comprehensive 10-year Strategy for Cancer Control and the 3rd term 10-year Strategy for Cancer Control. The prospective study is ongoing detect small tumors in lung, biliary tract and liver using multi-slice helical CT. Another study tries to determine CT finding as prognostic factors for survival in patients with newly diagnosed advanced pancreatic cancer treated with gemcitabine.

Regular and optional image conferences have been held using an exclusive optical fiber line between the Tsukiji and Kashiwa campuses.

By extension of this network, these conferences have been opened to other cancer centers, as well as other national hospitals.

By using the recent advancement of computer graphics, our division has achieved great success in obtaining three-dimensional displays of the internal body, based on imaging data from multi-slice helical CT and MRI. This is useful for planning surgery or radiotherapy, for doctors training, and for patient education.

We put high resolution and high speed body MR imaging to practical use by SENSE (sensitivity encoding) method. This new technique not only brought shortening of imaging acquisition time but also increased in number of imaging through one breath hold. Diffusion Imaging is well known to MRI sequence for early detection of brain infarction. Then we have studied to apply it for detecting small cancer in breast, rectum, pancreas and liver. Especially the detection rate of hepatic metastasis from colorectal cancer using diffusion imaging is higher than using superparamagnetic iron oxide contrast agent. Another main theme of current advances of MRI is clinical application of balanced turbo field echo sequence (BTFE). As the characteristics of this mysterious sequence have been made gradually clear, the correct way for the clinical application has been established. The contrast of BTFE is strongly affected by k-space ordering and shot interval, not by TR and TE. Now we routinely use 3D-centric-BTFE with no shot in tervals. In this condition, the image contrast basically depends on T2/T1. The sequences become very sensitive for flows and Gd-DTPA. These characteristics are clinically applicable for depicting not only the anatomy of biliary trees and pancreatic ducts but also the neoplasms originated from them.

A new computer-aided diagnosis (CAD) system using FCR (Fuji Computed Radiography) mammograms was introduced to study computerized detection for breast cancerous mass and microcalcifications. Sensitivity to breast cancerous mass and microcalcifications were 91% and 96%, respectively. False-positive rates were 0.3 and 0.2 per image, respectively.

Also another CAD system for lung cancer using multi-slice helical CT images is being developed. These CAD systems promise to have a great influence on cancer diagnosis as well as on patient care in the near future.

FDG-PET imaging is useful to detect metastasis and recurrence that are not detected by CT in patient with high level of tumor marker, and also to detect mediastinal lymph node metastasis in lung cancer. Furthermore, we have performed the study of PET-CT which combined two imaging modalities. PET images provide very sensitive information regardless of whether a mass is cancerous or not. And CT images provide detailed information about the various lesions. The PET-CT merges PET and CT images together. Especially FDG-PET and abdominal CTA were performed in consecutive 21 patients with colorectal cancer, 7 patients with pancreatic tumors for preoperative evaluation. All tumors were clearly depicted on PET-CTA, and feeder arteries were identified in all cases of colorectal cancer. Lymph node metastases also could be demonstrated in 3 cases of colorectal cancer. For pancreatic cancer which is known as hypovascular malignant tumor, PET-CTA could not show feeder artery but depict adjacent vasculature with good spatial correlation with the tumor. Main trunk and 1st to 2nd branch of superior mesenteric artery could be demonstrated in this study. In addition, efficacy as navigation image for assisting endoscopic surgery may be possible by displaying 3D-images from the same angle with laparoscopy.

● S. Nawano ●

Number of Cases Examined	2003	2004
Plain X-ray examination	32346	32685
Mammography	1735	1826
Fluoroscopic Imaging (GI-series, etc.)	3381	3609
CT 16829	17397	
MRI	4,553	4813
RI 2,208	2334	
PET	1225	1414
Angiography	547	503
Total	62824	64581