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 63,000 inpatient and outpatient procedures annually.

The division also conducts clinical scientific research 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 six 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, CT, MRI, RI, PET, angiography and interventional radiology (IVR), mainly transarterial chemo-embolization (TACE).

The number of cases examined in 2005 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 new 10-year Strategy for Cancer Control. The prospective study of detecting small tumors in lung, biliary tract and liver using multi-slice helical CT is ongoing. And to determine CT finding as prognostic factors for survival in patients with newly diagnosed advanced pancreatic cancer.

We put high resolution and high speed body MR imaging to practical use by SENSE (sensitivity encoding) method. This new technique brought not only shortening of imaging acquisition time but also increase in number of imaging through one breath hold.

Diffusion weighted single shot echo planar imaging using sensitivity encoding (SENSE-DWI), which is a brand-new imaging technique of MRI, can depict many kinds of cancers sensitively. The high signal on SENSE-DWI itself is basically non-specific, however, the combined image interpretation of conventional images with SENSE-DWI brings completely different results in cancer imaging. SENSE-DWI is of application, especially the application for detection of hepatic metastasis leaded one of the most impressive results.

And we studied DWI of breast cancer with SENSE-DWI and its efficacy.

SENSE-DWI was of sufficient quality to support diagnosis and evaluation of neoadjuvant therapy of breast cancer. SENSE-DWI may permit the acquisition of more detailed information about lesions, including tumor cellularity, that is difficult to obtain with conventional MR technique.

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 made clear gradually, 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 intervals. 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 arisen 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.

We have studied clinical evaluation of CAD and appropriateness of high-resolution liquid crystal display (LCD) for Digital Mammography. The result of the image observation tests, the diagnostic performance of the readers was at maximum with the help of CAD system. The effectiveness of this CAD system in the interpretation of mammograms was suggested.

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/CT 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 on preoperative staging for lung cancer. 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 CT Angiography (CTA) were performed in patients with consecutive colorectal cancer. 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 addition, efficacy as navigation image for assisting endoscopic surgery may be probable by displaying 3D-images from the same angle with laparoscopy.

●S. Nawano●

Number of Cases Examined	2003	2004	2005
Plain X-ray examination	32346	32685	34406
Mammography	1735	1826	2076
Fluoroscopic Imaging (GI-series, etc.)	3381	3609	2741
CT	16829	17397	15972
MRI	4553	4813	4473
RI	2208	2334	2169
PET	1225	1414	1030
Angiography	547	503	408
Total	62824	64581	63275