

Diagnostic Radiology Division

Introduction

The Diagnostic Radiology Division is comprised of five groups: gastrointestinal tract group, hepatobiliary and pancreas group, nuclear medicine group, chest group, and interventional radiology group. More than 130,000 kinds of radiologic procedures were performed for both in- and outpatients in 2004. One of the major goals in our division is to make a precise diagnosis in patients with malignant tumors using various imaging modalities and another is to develop new imaging techniques to improve qualitative diagnosis. Present equipments include three multidetector-row computed tomography (MDCT) scanners, two 1.5-Tesla magnetic resonance imaging (MRI), two digital subtraction angiography (DSA) systems, three gamma-cameras, three digital radiography (DR) systems for gastrointestinal examinations, and two mammography systems. Two DSA systems are equipped with CT and are referred to as IVR-CT systems. All medical images utilized in our new hospital are digitized. Original or compressed images of computed radiography (CR), digital radiography (DR), radioisotope (RI), CT, and MRI can be easily and rapidly referenced on the medical information system for research, administration, and clinical expertise (MIRACLE).

Routine Activities

1. Gastrointestinal Tract Group

Two radiologists are at work to examine patients with gastrointestinal (GI) tract cancers, such as gastric, esophageal and colon cancers. The number of the GI examinations was 2,817, and more than 1,000 patients with GI cancer were examined by digital radiography (DR) for preoperative staging in 2004. Many early-stage lesions were investigated by the double contrast method, and all the studies were performed with newly developed digital radiography (DR) or flat panel detector (FPD). In addition, drip infusion pyelography (DIP) and mammography are also performed by one radiologist.

2. Hepatobiliary and Pancreas Group

Integrated diagnosis using CT, MRI, angiography,

and IVR-CT is performed for cancers of the parenchymatous organs by five radiologists. More than 35,000 CT examinations, more than 6600 MR examinations, and 914 angiographic examinations were performed in 2004.

3. Nuclear Medicine Group

There are two nuclear physicians and two nuclear technologists in the division of nuclear medicine, which has three gamma cameras. They examine about 3,500 patients annually. Of these examinations, 75% are whole body bone scans, 15% are Ga-67 scans, and 1% are Tl-201 scans for malignant bone and soft tissue tumors. In the last five years, as an emergency examination, Tc-MAA lung scan for the post-surgical pulmonary embolism has been increasing.

4. Chest Group

Two radiologists who belong to this group have in charge of more than 50,000 chest radiographies and more than 20,000 chest CT scans. MDCT examinations are routinely used to detect lung tumors or other lung abnormalities in addition to chest radiographs. High-resolution CT is performed to diagnose small peripheral lung cancers or other subtle lung abnormalities. Additionally, in order to obtain cytopathological diagnosis, fluoro-CT guided percutaneous needle biopsies for thoracic mass lesions were performed in more than 130 cases in 2004.

5. Interventional radiology Group

Five radiologists who belong to this group are responsible for various type interventions involving arterial embolization for hepatocellular carcinoma and bleeding, percutaneous port/catheter implantation for arterial chemotherapy, various kinds of drainage, biopsy, percutaneous vertebroplasty, stenting for biliary, vascular and alimentary stricture, placement of Vena-Cava filter and peritoneal-venous shunting. Most of them are performed under IVR-CT systems, and fully used as the minimally invasive treatment for cancer patients. Additionally, some clinical studies of interventional radiology are ongoing as the flagship hospital of multi-institutional cooperative study group.

Research Activities

This division has been developing medical imaging instruments with the support of the new Ten-year Strategy for Cancer Control. Methodology of CT examination using MDCT has been under review. A computer-aided diagnosis (CAD) system for both breast cancer using Fuji Computed Radiography (FCR) mammograms and lung cancer using MDCT has been more developed.

Digitalization of medical images in GI examinations was achieved by digital radiography. A new type of DR based on a newly developed flat panel detector (FPD-DR) was further introduced, and the clinical evaluation has been started. Another topic in GI tract group is CT colonography, which visualize colorectum using the volume data generated by MDCT. This technique was applied to the preoperative staging of colorectal cancer. More than 100 cases with MDCT for the staging have been examined, and the benefits of MDCT colonography in the diagnosis of colorectal cancer were clearly demonstrated. In hepato-biliary and pancreas groups, three-dimensional displays based on CT and MR imaging data are used for the planning of surgical treatment.

Clinical Trials

1. Clinical evaluation of a newly developed flat panel detector (FPD-DR) has been started under the approval of our institutional review board.
2. New CAD system has been put into practice for clinical evaluation in the detection of breast cancer and lung cancer, and has begun to be applied to the differential diagnosis for lung nodules.
3. The clinical usefulness of three-dimensional images, multi-planner reformation images using MD-CT has been reviewed in the diagnosis of brain, lung, breast, liver, pancreas and colo-rectum.

4. Clinical stages based on imaging diagnosis in HCC and pancreas cancer has been evaluated. This new clinical stage is expected to be useful in the selection of medical treatments.
5. Special emphasis on MR imaging would be performed in patients with brain tumors prior to operation. Spin-echo based thin-section MR imaging study using Stealth Station software can provide local information of surgical planning. Single shot fast spin-echo based diffusion weighted images could be utilized in patients with malignancies arising from the trunk. Assessment of apparent diffusion capacity might reflect histopathological regression in patients with superior sulcus tumor who underwent chemotherapy, irradiation, and surgical resection. Two-dimensional dynamic fast SPGR sequences are used to diagnose tumors arising from liver, gallbladder, pancreas, kidney, adrenal gland, and breast.
6. Eight clinical trials in the interventional radiology are ongoing: phase I/II study of hepatic arterial 5FU and intra-venous CPT-11 for unresectable liver metastases from colorectal cancer (JCOG-0208DI), phase I/II study of trans-jugular trans-hepatic peritoneal-venous shunt for intractable ascites (JIVROSG-0201), phase I/II study of percutaneous vertebroplasty (JIVROSG-0202), phase I/II study of RFA for intrapelvic malignant tumors (JIVROSG-0204), phase II study of percutaneous trans esophageal gastric tubing (JIVROSG-0205), phase II study of stenting for malignant colorectal stenosis (JIVROSG-0206), randomized study of bare- vs covered stent for malignant biliary stenosis (JIVROSG-0207), and phase I/II study of hepatic arterial infusion of gemcitabine for unresectable intrahepatic cholangio carcinoma (JIVROSG-0301).

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Number of radiological examinations

year	2000	2001	2002	2003	2004
CT	18,631	21,121	27,579	34,190	35,898
MRI	4,835	5,337	5,819	6,794	6,696
Angio	499	462	643	717	914
RI	3,400	3,230	2,966	3,486	3,394