

Department of Radiology

Kunihiko Fukuda, *Professor*
 Junta Harada, *Professor*
 Yukio Miyamoto, *Professor*
 Shunichi Sadaoka, *Associate Professor*
 Hiroya Ojiri, *Associate Professor*
 Norio Nakata, *Associate Professor*
 Masao Kobayashi, *Assistant Professor*

Chihiro Kanehira, *Professor*
 Toru Sekiya, *Professor*
 Hiroshi Sekine, *Professor*
 Mayuki Uchiyama, *Associate Professor*
 Manabu Aoki, *Associate Professor*
 Yoshimitsu Sunagawa, *Assistant Professor*
 Takuji Mogami, *Assistant Professor*

Research Activities

Division of diagnostic imaging

1. A computed tomography scoring system as a predictor of neck metastasis in patients with head and neck cancer

Nodal metastasis is the most important prognostic factor in patients with head and neck cancers. We proposed a computed tomography (CT) scoring system that consists of size, shape, extracapsular spread, and focal defects of lymph nodes. Its clinical applicability was assessed by comparison with surgical specimens of neck dissection.

2. CT of eosinophilic chronic rhinosinusitis

Eosinophilic chronic rhinosinusitis is a newly recognized subtype of chronic rhinosinusitis which is characterized by peripheral blood eosinophilia and massive infiltration of eosinophils in the nasal mucosa. We proposed CT diagnostic criteria for eosinophilic chronic rhinosinusitis and analyzed their clinical usefulness.

3. Ovarian serous borderline tumors: Magnetic resonance imaging findings

We reviewed magnetic resonance imaging (MRI) findings of 9 patients in whom serous borderline tumors (SBTs) were diagnosed. The SBTs were either cystic tumors with papillary projections or exophytic papillary projections. Papillary projection, which is a papillary architecture showing high signal intensity on T2-weighted images with internal branching showing low signal intensity on T2-weighted images, increases the possibility of SBTs.

4. Early CT findings of clinically amyopathic dermatomyositis

Rapidly progressive interstitial pneumonia associated with clinically amyopathic dermatomyositis easily causes respiratory failure and is often fatal. Immediate treatment is critical for improving prognoses. We reviewed high-resolution CT findings and clinical conditions on admission in 5 cases of rapidly progressive interstitial pneumonia associated with clinically amyopathic dermatomyositis to clarify useful imaging findings in the early stage of this disease.

5. Chest CT findings of immunoglobulin G4-related disease

Immunoglobulin G4-related disease is a multiorgan disorder that can involve the lungs. We reviewed 25 cases of immunoglobulin G4-related thoracic abnormality from our archives from April 2011 through March 2014 to identify characteristic CT features.

6. Detection of insufficiency fractures of the pelvic bone with tomosynthesis

This study evaluated the diagnostic performance of tomosynthesis in the depiction of insufficiency fractures of the pelvic bone with use of MRI and CT as references and tested

whether tomosynthesis is more effective than X-rays for detecting such lesions.

7. Morphological and hemodynamic evaluation of the cardiovascular system with dual-source CT

Detailed anatomic features of normal cardiac structures, such as the foramen ovale, and hemodynamic information in cases of complex congenital cardiac anomalies were evaluated with a dual-source CT unit and an ultrahigh-speed scan technique.

8. MRI evaluation of the therapeutic effects of biological agents in psoriatic arthropathy

In patients with psoriatic arthropathy (PsA), MRI was performed before and after the start of the treatment, and the presence or absence of enthesitis, synovitis, bone marrow edema, and bone erosion was evaluated. In patients with active PsA, the contrast-enhancement effect was present in enthesitis and synovitis. These contrast-enhancement effects disappeared where good therapeutic effects were obtained. Contrast-enhanced MRI is useful for evaluating therapeutic effects in patients with PsA.

9. Evaluation of bone marrow signal abnormalities at the cruciate ligament entheses

Changes in bone marrow signals at the tibial cruciate ligament entheses are frequently observed. Tubular lesions were observed in approximately 30% of cases, and cystic lesions were observed in 10%. Tubular lesions may represent vascular structures penetrating from the surface of the cruciate ligament to the tibia. Furthermore, a correlation was observed between cystic lesions and the severity of osteoarthritis. This outcome suggests that mechanical stress to an entheses causes tubular structures to be modified into cystic lesions.

Division of Ultrasound

1. Clinical usefulness of sonographic contrast agent in breast tumors

The efficacy and safety of ultrasonography with contrast enhancement using Sonazoid microbubbles (Daiichi Sankyo Co., Ltd., Tokyo) for the diagnosis of breast lesions were analyzed. Ultrasonography with contrast enhancement had significantly better diagnostic accuracy and specificity than did noncontrast studies and caused no serious adverse reactions.

2. Power Doppler ultrasonography for evaluating the activity of rheumatoid arthritis

Power Doppler ultrasonography was performed in the right and left wrists, elbows, shoulders, knees, and ankles of patients with rheumatoid arthritis. The synovial blood flow signals were scored with a 3-grade scale, and the total of the scores in the 10 joints was regarded as the total signal score. The total signal score was strongly correlated with serum levels of vascular endothelial growth factor, angiopoietin 1, and angiopoietin 2.

Division of Nuclear Medicine

1. Physiological change of accumulation in I-123 iomazenil brain single-photon emission CT during childhood

Physiological regional accumulation on I-123 iomazenil brain single-photon emission CT (SPECT) changes markedly during childhood, especially before the age of 3 years. The aim of this study was to compare regional accumulation in the brain on anatomically standardized I-123 iomazenil brain SPECT images, which were obtained with the 3-dimensional stereotaxic region of interest template, a fully automated software program. A

total of 172 patients aged 1 month to 15 years with convulsive disease were examined with iomazenil SPECT in cooperation with Saitama Children's Medical Center; no significant abnormalities were found. We assessed regional accumulation to leverage regional corrected counts/pixel (regional mean counts/pixel/dose administered/patient body surface area) corrected by the time between the measurement of dose and the scan.

In neonates, physiological accumulation was low throughout the brain and was lowest in the frontal lobe, in accordance with cerebral blood flow. As infants aged, accumulation increased in all regions, especially in the occipital lobe and, to a lesser extent, in the cerebellum. The peak iomazenil uptake was in the cerebrum in patients aged 4 to 6 months and in the cerebellum in patients aged 7 to 9 months. The rate of change in physiological accumulation was lowest in the frontal lobe. Decreasing iomazenil uptake in the cerebrum and cerebellum is believed to be related to synapse elimination in the developing cerebrum and cerebellum.

Division of Interventional Radiology

1. Efficacy and safety of our new technique of ipsilateral percutaneous transhepatic portal vein embolization

Percutaneous transhepatic portal vein embolization was performed to increase the volume of the left hepatic lobe before hepatic resection in 8 patients. With ultrasonic guidance, a balloon catheter was introduced into the right portal vein. A gelatin sponge was injected via the sheath while the right portal vein was occluded with a balloon. Two weeks after the procedure the volume of the left hepatic lobe was assessed with either CT or scintigraphy. The volume of the future liver remnant was increased by $46.5\% \pm 31.5\%$. There was no complications or progressive liver insufficiency after embolization or resection.

Division of Radiation Therapy

1. Clinical study of radiosensitization therapy using by topical injection of low concentration hydrogen peroxide and hyaluronate

Kochi oxydol-radiation therapy for unresectable carcinomas (KORTUC) is an enzyme-targeting radiosensitization treatment that uses a radiosensitizer containing a low concentration of hydrogen peroxide with or without sodium hyaluronate. Hydrogen peroxide inactivates peroxidase/catalase in the tumor tissue.

Most locally advanced neoplasms contain many hypoxic cancer cells or large amounts of antioxidative enzymes and are, therefore, resistant to low linear energy transfer radiation. KORTUC I uses a hydrogen peroxide solution-soaked gauze that covers superficially exposed tumors. With KORTUC II, the radiosensitizer is injected into the tumor tissue under ultrasonographic or CT guidance. Ten patients with locally advanced malignant neoplasms entered our clinical trial and were treated with KORTUC I or II.

2. Radical radiotherapy for prostate cancer

There are various treatment options for prostate cancer. In radiotherapy for prostate cancer, progress has recently been made in ultrahypofractionation. Stereotactic body radiotherapy (SBRT) has attracted considerable attention as a modality allowing the clinical use of ultrahypofractionation. The use of SBRT and intensity-modulated radiotherapy

for treating lung cancer has proceeded in our department. We also plan to use SBRT and intensity-modulated radiotherapy to treat prostate cancer.

3. Clinical outcomes of current chemoradiotherapy for esophageal cancer refractory to docetaxel, cisplatin, and fluorouracil

The combination of docetaxel, cisplatin, and fluorouracil (DCF) is a candidate regimen for induction chemotherapy for esophageal cancer, due to its high efficacy. Therefore, the treatment of DCF-refractory tumors is extremely difficult. We evaluated the efficacy of locoregional control and overall survival after concurrent chemoradiotherapy with fluorouracil and cisplatin for DCF-refractory esophageal cancer.

Publications

Shimizu K, Sunagawa Y, Ouchi K, Mogami T, Harada J, Fukuda K. External beam radiotherapy for angiographically diagnosed arteriovenous malformation involving the entire pancreas. *Jpn J Radiol.* 2013; **31**: 760-5.

Reviews and Books

Uchiyama M. Basic pediatric nuclear medicine examinations—Bone scan and renal scan— (in Japanese). *Nihon Shoni Hoshasen Gakkai Zasshi.* 2013; **29**: 32-8.