

## Department of Radiology

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### Research Activities

#### 1. Computed tomographic examination 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 diagnostic criteria of eosinophilic chronic rhinosinusitis using computed tomography (CT) and analyzed its clinical usefulness.

#### 2. Evaluation of the physiological laterality of the intracranial vein depiction with susceptibility-weighted imaging

The laterality of the intracranial venous system depicted with susceptibility-weighted imaging is an important index to suggest the presence of a related abnormality. However, because such laterality can also be seen in apparently healthy individuals, its significance is questionable. Therefore, we examined proven nonpathological cases in which the laterality of veins was depicted with susceptibility-weighted imaging.

#### 3. The prevalence of apical cap on chest radiographs

The pulmonary apical cap (PAC) is pathologically identical to pleuroparenchymal fibroelastosis (PPFE), which is a new entity of chronic progressive interstitial lung disease. We evaluated the prevalence and temporal changes of PAC on radiographs of the chest and compared them to those of PPFE to assess the clinical significance of PAC and to determine the radiological borderline between PAC and PPFE.

#### 4. Electrocardiography-gated multidetector CT for evaluating malformations of the coronary sinus

Evaluating malformations of the coronary sinus is important from the viewpoint of risk management for such procedures as inserting a central venous catheters or a pacing lead. We examined the diagnostic utility of electrocardiogram-gated multidetector CT in comparison with ultrasonic cardiography for evaluating coronary sinus abnormalities.

#### 5. Use of Breast Imaging Reporting and Data System magnetic resonance imaging descriptors for differentiating mucinous carcinoma from fibroadenoma

Pure mucinous carcinomas (MCs) and mixed MCs similar to them both show findings similar to those of fibroadenomas, with myxomatous or edematous changes on both mammography and ultrasonography. Among breast carcinomas that have long T2 relaxation times, MCs are common and difficult to distinguish from fibroadenomas on T2-weighted images alone. We evaluated reliable Breast Imaging Reporting and Data System (BI-RADS) descriptors and non-BI-RADS magnetic resonance imaging (MRI) factors that contribute to differentiation of fibroadenomas from pure MCs or mixed MCs similar to

pure MCs.

6. MRI findings of primary cancers of the fallopian tube

We reviewed clinical, pathological, and imaging findings from 11 patients with primary cancers of the fallopian tubes. Such cancers have characteristic sausage-shaped tumors and are mainly solid, with a restricted diffusion and rim enhancement. For detecting and diagnosing these cancers, MRI, including diffusion-weighted MRI and dynamic contrast enhancement, is useful.

7. Evaluation of the diagnostic performance of tomosynthesis in pelvic insufficiency fractures

Digital tomosynthesis is a new digital technique that combines CT and digital image processing. Unlike conventional X-ray tomography, digital tomosynthesis is able to retroactively create an infinite number of arbitrary tomograms and is expected to be useful in musculoskeletal imaging. We evaluated the diagnostic value of digital tomosynthesis compared with radiography, CT, and MRI in pelvic insufficiency fractures.

8. Quantitative differentiation of benign and malignant mammographic circumscribed masses using intensity histograms

Through the use of mammography, circumscribed masses can be diagnosed with moderate accuracy using the intensity histogram standard deviation. Masses with a standard deviation less than the minimum of breast cancer can be roughly diagnosed as clinically benign. This study was published in the *Japanese Journal of Radiology*.

9. Comparison of cerebral perfusion and benzodiazepine receptor images between before and after adrenocorticotrophic hormone therapy for infantile spasms

Adrenocorticotrophic hormone therapy is effective for infantile spasms, but almost all patients show cerebral atrophy after therapy. The aim of this study was to determine changes of cerebral perfusion and benzodiazepine receptor images between before and after adrenocorticotrophic hormone therapy.

10. Study comparing transarterial chemoembolization with cisplatin-eluting microspheres and bland embolization with microspheres after arterial infusion of cisplatin for multiple hepatocellular carcinomas in bilateral lobes

After commercial microspheres became available in Japan, we first treated multiple viable hepatocellular carcinomas on bilateral lobes by performing transarterial chemoembolization with microspheres (HepaSphere<sup>®</sup>, Nippon Kayaku Co. Ltd., Tokyo, Japan) eluting a cisplatin material (IA-call<sup>®</sup>, Nippon Kayaku) for arterial infusion. However, because the therapeutic effect was not sufficient, after the cisplatin material was infused, embolization was performed with nonchemical microspheres (Embosphere<sup>®</sup>, Nippon Kayaku). Excellent therapeutic effects were observed and compared with these procedures about safety and feasibility.

11. Establishment and application of a general linear quadratic model that incorporates the time factor for the time-dose fractionation effect of radiotherapy

The linear quadratic model for quantitative evaluation has not been used to examine the lethal effect of irradiation but has been used to examine the biological effect of irradiation on normal tissue. However, a disadvantage in both cases is that the time factor is missing. Therefore, by using a general linear quadratic model that incorporates the time factor into the linear quadratic model, we studied the reproducibility of the time course of radiation

erythema of whole-breast irradiation during and after fractionated radiotherapy. (Grant-in-Aid for Scientific Research (C), No. 23500369, final year)

#### 12. Development of noninvasive quantitative evaluation of skin reaction due to breast-cancer irradiation

Because skin reactions associated with radiotherapy are quantitatively evaluated, objective evaluation is difficult between observers. The purpose of this study was to verify whether changes in skin reactions associated with radiotherapy can be objectively evaluated with noninvasive quantitative methods. (Grant from the Japan Agency for Medical Research and Development)

#### 13. Postoperative radiotherapy with volumetric modulated arc radiotherapy for prostate cancer

Three-dimensional conformal radiotherapy has long been used for the postoperative treatment of prostate cancer. However, we have not been able to achieve positive biochemical relapse-free survival. To improve results we have investigated volumetric modulated arc radiotherapy, which is a new type of treatment. With this treatment, toxicities of grades 3 to 5 have not occurred. In the future, we will report the present state of progression.

### Publications

**Ohta T, Nishioka M, Nakata N, Miyamoto Y, Fukuda K.** The role of ultrasonography in cases of acute abdominal pain in MDCT era based on a survey of current trends in imaging examinations for patients in an academic hospital. *Japanese Journal of Diagnostic Imaging*. 2015; **33**: 133-40.

**Ohta T, Nakata N, Nishioka M, Igarashi T, Fukuda K.** Quantitative differentiation of benign and malignant mammographic circumscribed masses using intensity histograms. *Jpn J Radiol*. 2015; **33**: 559-65.