SJRS 2010
Vejle
Denmark
September 6.-7. 2010

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sjrs@pacs.dk
Joint meeting of the

8th Symposium of
the Scandinavian Japanese Radiological Society

and

11th Nordic Japan PACS Symposium

September 6. - 7th 2010

Munkebjerg Hotel, Vejle, Denmark

Sponsored by
Dear Friends

Welcome to the joint meeting of the 8th symposium of the Scandinavian Japanese Radiological Society and the 11th Nordic Japan PACS symposium. SJRS was founded in 1985, so we can celebrate our silver jubilee as a society this year. This is the first time the meeting is held in Denmark, and we are proud to show you the forest and fjord in Vejle and the area of the historical birthplace of the Danish kingdom.

We have come a far way in the 25 years – our week long airmail letters was first converted to plain fax printing and now we send data e-mails with abstracts and PowerPoint presentations in seconds. I got my basic MRI training under Professor Kumazaki in Tokyo in 1992 with a grant of this society – I was most impressed by the use of regional chemotherapy at Nippon Medical School back then. The Nordic countries have only recently started using these procedures more systematically – this meeting will focus on tumour ablation and regional chemotherapy – I am exited to hear how far we have come both in Japan and in the Nordic countries.

When the Nordic Japan PACS symposium started 20 years ago in Osaka, there were no DICOM standard and each vendor tried to implement their own systems. Now we all have PACS and we can today celebrate the full penetration of PACS in Japan and the Nordic countries. The question is then – how can we use all this digital imaging ? The specially invited session on CAD will point the direction of future radiology.

Finn Kristian Mathiesen
President SJRS 2010
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History

Scandinavian Japaneese Radiological Society was founded by Professor Kumazaki, Tokyo and Professor Nordenström, Stockholm at a radiological meeting on Hawaii in 1985. The purpose is to facilitate exchange of young radiologists between Japan and Scandinavia, and to arrange joint scientific meetings.

Since 1993 the meetings have been held together with the Nordic Japan PACS symposium, that was founded as a forum for exchange of ideas for the development of PACS as an alternative to the mainstream trends in USA and Central Europe.

Previous meetings:

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SJRS Board meeting in the Nobel room in Stockholm 2006
Scientific Programme

Monday September 6th, 2010

8.00-09.45 Registration

9.00-9.45 Coffee

9.45-10.00 Opening Session, F. Mathiesen, Vejle, DK

Special Invited Session on CAD

Chairmen H Fujita, Gifu, JP and F Lærum, Oslo, N

10.00-10.30 (A1) Achievements and Challenges of Computer-Aided Diagnosis in Radiology. K. Doi, Chicago, USA

10.30-10.45 (A2) Integration of temporal subtraction and nodule detection systems for digital chest radiographs into PACS. S. Sakai, Tokyo, JP

10.45-11.00 (A3) Computer-aided diagnosis using thoracic CT images. S. Kido, Yamaguchi, JP


11.15-11.30 (A5) Recent CAD projects in Japan. H. Fujita, Gifu, JP

11.30-13.00 Buffet lunch

News in oncoradiology

Chairmen S Rafaelsen, Vejle, DK and T Hosoya, Yamagata, JP

13.00-13.20 (B1) Retrograde-outflow percutaneous isolated hepatic perfusion without laparotomy. S. Murata, Tokyo, JP

13.20-13.40 (B2) MRI of liver tumours. E. Fallentin, Copenhagen, DK

13.40-13.55 (B3) Hepatic Radiofrequency tumour ablation. B. Skjoldbye, Herlev, DK

13.55-14.10 (B4) Negative-balances isolated pelvic perfusion for pelvic malignancies. S. Murata, Tokyo, JP

14.10-14.30 (B5) CT colonography and new logistics. A. Drolsum, Oslo, N

14.30-15.00 Coffee

Oncology continued.

Chairmen T Kozuka, Osaka, JP and B Persson, Stockholm, S

15.00-15.15 (C1) Chemotherapy. J. Ploen, Vejle, DK

15.15-15.30 (C2) Lung Radiofrequency tumour ablation. HH. Torp-Madsen, Aarhus, DK

15.30-15.45 (C3) PET/CT scanning in oncology. T. Ormstrup, Vejle, DK

15.45-16.00 (C4) Hybrid catheter intervention for acute massive pulmonary thromboembolism. H. Tajima, Tokyo, JP

16.00-16.15 (C5) Transcatheter management for unresectable hepatocellular carcinoma with marked arterioportal shunts: TACE during portal vein occlusion. F. Sugihara, Tokyo, JP

16.15-16.30 (C6) Transcatheter arterial ethanol embolisation under c losses renal circuit for large renal cell carcinoma. S. Onozawa, Malmö, S

16.30-16.40 (C7) Transcatheter arterial chemoembolization in rabbit VX2 liver tumor: Comparative study of epirubicin-iodized oil suspension and emulsion. T. Ueda, Tokyo, JP

16.40-16.50 (C8) Transcatheter arterial chemoembolization of rabbit VX2 liver tumor: Cisplatin-Iodized Oil Suspension VS Emulsion. T. Mina, Tokyo, JP

16.50-17.00 (C9) Short and long-term results for balloon-occluded retrograde transvenous obliteration for esophageal and gastric varices: A 10-year experience. F. Uchiyama, Ebina, JP
Scientific Programme

Tuesday September 7th, 2010

PACS status

Chairmen T. Kushihashi, Showa, JP and J Reponen, Oulo, Fin

8.00-8.30 (D1) Current status of PACS in Japan, and the complete
timeline experience and clinical usefulness of
immediate diagnosis for all radiological imagings.
T. Kushihashi, Showa, JP

8.30-8.45 (D2) PACS in Denmark – consolidation and integration:
Streaming technology – the future of teleradiology?
F. Mathiesen, Vejle, DK

8.45-9.00 (D3) New Challenge towards the smarter Hospital.
Y. Kinosada, Gifu, JP

9.00-9.15 (D4) PACS in (western) Norway. A. Aslaksen, Bergen, N

9.15-9.30 (D5) Server based computing as an infrastructure of
hospital-wide EPR and inter-hospital system.
H. Kondoh, Tottori, JP

9.30-10.00 Coffee

PACS continued

Chairmen A. Aslaksen, Bergen, N and H Kondoh, Tottori, JP

10.00-10.20 (E1) Regional imaging interpretation centre – a new
customization with emphasis to education and
subspecialists’ training. F. Lærum, Oslo, N

10.20-10.40 (E2) PACS in Finland – development and current status in
eHealth environment. J. Reponen, Oulu, Fin

10.40-11.00 (E3) PACS, current status in Sweden. P. Leander, S

11.00-11.20 (E4) Development of PACS using the DICOM and
IHE specification. Y. Ando, Chiba, JP

11.20-11.30 (E5) Observation environment for diagnostic imaging:
Considering illuminance in image interpretation.
M. Kuchiki, Yamagata, JP

11.30-13.00 Buffet lunch

Oncological imaging update

Chairmen H Tajima, Tokyo JP and B Højlund Bech, Copenhagen, DK

13.00-13.30 (F1) Elastography
E. Bibby, London, UK

13.30-13.50 (F2) Regional chemotherapy – getting
started. HH Nørgaard, Herlev, DK

13.50-14.00 (F3) CEUS vs. MDCT in the detection of
Synchronous liver metastases from
Colorectal cancer.
S. Rafaelsen, Vejle, DK

14.00-14.30 (F4) The present status on CIN prevention.
P. Aspelin, S

14.30-15.00 Coffee
Scientific Programme

Tuesday September 7th. 2010 - continued

Free presentations

Chairmen N. Albiin, Stockholm, S and M Sako, Kobe, JP

15.00-15.15 (G1) Use of iodine contrast media iso-attenuating with diagnostic gadolinium doses in angiographic x-ray procedures may avoid both CIN and NSF in azotemic patients. U. Nyman, S


15.30-15.40 (G3) The terminology and diagnostic standard of non-mass lesion - Ultrasound Diagnosis of Breast Lesions seen as abnormalities of the ducts. E. Tohno, Tsukuba, JP

15.40-15.50 (G4) The terminology and diagnostic standard of non-mass lesion – Hypoechois area in the mammary gland. T. Endo, JP

15.50-16.00 (G5) The terminology and diagnostic standard of non mass lesions – Clustered microcysts on breast ultrasound. Y. Kajiura, JP

16.00-16.10 (G6) The terminology and diagnostic standard of non-mass lesion - Distorsion on ultrasound, H. Tsunoda, St Luke, JP

16.10-16.25 (G7) Radiation doses at chest computed tomography close to that of chest x-ray. U. Nyman, S

16.25-16.40 (G8) Pancreatic tumors: Low-kilovoltage computed tomography (CT) for improved detection: a phantom study. L. Loizou, S

16.40-16.50 (G9) Analysis of photoresponse between hematoporphyrin and CD44 cell adhesion molecule related domain of the type IV collagen for control of the stroma reconstruction change caused by diseases. M. Machida, Tokyo, JP

16.50-17.00 Closing Session., F Mathiesen and H. Aronen.
Computer-aided diagnosis (CAD) has become one of the major research subjects in medical imaging and diagnostic radiology. Many different types of CAD schemes are being developed for detection and/or characterization of various lesions in medical imaging, including conventional projection radiography, CT, MRI and ultrasound imaging. Organs that are subjected to research for CAD include the breast, chest, colon, brain, liver, kidney, and the vascular and skeletal systems. More than 10,000 commercial CAD systems have been used at many hospitals, clinics, and screening centers for assisting radiologists in their task of detecting breast cancers. From prospective studies, CAD has provided a gain of approximately 10-20% in the early detection of breast cancers on mammograms. CAD may be defined as a diagnosis made by a physician who takes into account the computer output as a “second opinion”. The purpose of CAD is to improve the quality and productivity of physicians in their interpretation of radiologic images. The computer output is derived from quantitative analysis of radiologic images by use of various methods and techniques in computer vision, artificial intelligence, and artificial neural networks. The computer output may indicate a number of important parameters such as the locations of potential lesions and the likelihood of malignancy of detected lesions. Because the basic concept of CAD is broad and general, CAD is applicable to all imaging modalities, and to all kinds of examinations and images.
Title:
Integration of Temporal Subtraction and Nodule Detection System for Digital Chest Radiographs into PACS

Shuji Sakai, M.D.
Department of Diagnostic Imaging and Nuclear Medicine,
Tokyo Women's Medical University, Tokyo, Japan

Abstract
Since May 2002, temporal subtraction and nodule detection systems for digital chest radiographs have been integrated into PACS of Kyushu University Hospital. Various problems which we faced and solutions which we have overcome have been analyzed up to now. Previously, temporal subtraction and nodule detection images were produced automatically in an exclusive server, and delivered with current and previous images to the workstations with conventional DICOM protocol. At present, PACS of Kyushu university Hospital is based on the Web technology and we refer to CAD images on the Web browser server synchronized with reading chest radiographs. Furthermore, we evaluate the usefulness of commercially available CAD systems in clinical practice.
Computer-aided diagnosis using thoracic CT images

We have developed computer-aided diagnosis (CAD) algorithms using thoracic CT images. There are two targets in the development of CAD algorithms for pulmonary diseases. One is a localized pulmonary disease. In this target, a CAD for pulmonary nodule detection is important and many algorithms are published. The other is a diffuse pulmonary disease. This target includes many kinds of diseases and variety of texture patterns. However, number of published algorithms for this is smaller than that for a localized pulmonary disease. Here, we present CAD using thoracic CT images for especially diffuse pulmonary diseases.

Shoji Kido, MD, PhD and Yasushi Hirano, PhD
Applied Medical Engineering Science, Graduate School of Medicine, Yamaguchi University, Japan
Special Invited Session on CAD

4. Nachiko Uchiyama, MD: Current status of CAD utilizing digital mammography in Japan,
Research Center for Cancer Prevention and Screening, National Cancer Center, Tokyo, Japan

Abstract
To describe the current status of CAD utilizing digital mammography in Japan including the function of CAD, history of CAD for mammography, the differences between CAD for analog mammography and digital mammography, detection performance, and the appropriate directions for use.
As part of the “Knowledge Cluster Initiative” of the Japanese government, three CAD projects were hosted at the Gifu University since 2004 (until 2009.3). These projects were regarding the development of CAD systems for the early detection of (1) cerebrovascular diseases using brain MRI and MRA images by detecting lacunar infarcts, unruptured aneurysms, and arterial occlusions [1,2]; (2) breast cancers using ultrasound 3-D volumetric whole breast data by detecting the breast masses [1,3,4]; and (3) ocular diseases such as glaucoma, diabetic retinopathy, and hypertensive retinopathy using retinal fundus images [1,5,6]. In addition, a new project on CAD has recently started in Gifu, in which a CAD system for screening systemic illnesses (such as osteoporotic or arteriosclerotic diseases) on dental panoramic radiographs [7] is developing. In this talk, some results will be presented from these projects.

References:
Retrograde-outflow percutaneous isolated hepatic perfusion without laparotomy

Satoru Murata, MD, PhD, Shiro Onozawa, MD, PhD, Hiroyuki Tajima, MD, PhD, Takahiko Mine, MD, Tatsuo Ueda, MD, Fumie Sugihara, MD, Fumio Uchiyama, MD, Hiromitsu Hayashi, MD, PhD, and Shin-ichiro Kumita, MD, PhD.

From the Center for Advanced Medical Technology / Department of Radiology, Nippon Medical School, 1-1-5 Sendagi, Bunkyou-ku, Tokyo 113-8602, Japan.

Abstract

Isolated hepatic perfusion (IHP), reported to be a promising technique for managing liver tumours, has not been used therapeutically because it involves aggressive surgical intervention and can be performed only once. Due to the associated major surgical trauma and morbidity, and the inability to repeat IHP, a feasible protocol for safe and repeatable percutaneous IHP is required. The existing percutaneous IHP techniques using balloon occlusion catheters are simpler and facilitate repeated therapy, but they result in higher rates of leakage from the perfusion circuit into the systemic circulation. The two major reasons for the higher leakage rates are that collateral veins such as small tributaries of the retrohepatic inferior vena cava (IVC) in the hepatic ligament and along the bile duct are not occluded and that the anatomical distance between the IVC and the origin of the hepatic vein is often too short to allow occlusion of the suprahepatic portion of the IVC above the level of the hepatic veins without occlusion of the hepatic veins themselves. When segmental hepatic venous outflow is acutely occluded, the corresponding liver parenchyma is supplied only by the artery and drainage of the affected parenchyma occurs via the portal vein, suggesting that percutaneous IHP therapy can be applied by employing inflow via the hepatic artery and outflow via the portal vein. Accordingly, the aim of this study was to establish a safe and repeatable retrograde-outflow technique for percutaneous IHP by using only interventional radiology.
MRI of liver tumors

The technical development of magnetic resonance imaging over the last two decades has made MRI of the liver an increasingly robust diagnostic tool. The possibility of ultrafast imaging with scanning in all vascular phases and the use of liver-specific contrast agents has improved diagnostic sensitivity and specificity. The characterization of focal liver lesions with MRI is based not only on the enhancement behavior but also on the native signal intensity in T1 and T2 weighted imaging. Because of their very high T2 signal the two most frequently occurring benign focal liver lesions, cysts and hemangiomas, are easily recognized and differentiated from malignancy. The signal intensity at T1 weighted and chemical shift imaging can also reveal a fatty or hemorrhagic component which assists in the precise characterization and determination of the origin of a lesion. When all information obtained from the signal intensity and contrast enhancement of a lesion is assembled, most focal liver lesions are easily diagnosed with a high grade of confidence.

The liver specific contrast agents are either paramagnetic iron oxides which are taken up by the Kupffer cells in normal liver tissue or Gadolinium chelates with a certain degree of protein binding which allows the contrast agent to be taken up by the hepatocytes and excreted in bile. The combination of a Gadolinium contrast for dynamic imaging and a liver specific effect makes these agents extremely valuable for lesion characterization. Liver metastases contain no Kupffer cells or functioning hepatocytes and the use of liver specific contrast has been shown to increase the sensitivity and specificity for liver metastases, especially for small metastases < 1 cm. The liver specific agents also seem promising in detection of hepatocellular carcinoma, HCC – although some highly differentiated tumors will be able to take up the liver specific agent. MRI is considered the most accurate diagnostic tool for detection of small HCCs.

The introduction of parallel imaging methods which allow even faster MR imaging, provided the basis for applying diffusion weighted imaging, DWI, previously used in CNS imaging, also in abdominal examinations. By applying diffusion gradients to the imaging sequence it is possible to obtain an estimate of the free water diffusion in liver tissue and tumors. Malignant tumors are highly cellular and they reduce the free water movement in the extracellular space and thereby the apparent diffusion. The restricted diffusion results in high signal intensity, persistent at high B values, and the diffusion weighted imaging methods are currently thoroughly investigated for abdominal applications. For liver imaging the addition of DWI supposedly even further increases the diagnostic accuracy of MR imaging for malignant tumors.

Eva Fallentin
Rigshospitalet
Copenhagen
Denmark
Hepatic tumor ablation.
A review of contemporary methods and applications.

Bjørn Skjoldbye,
Surgical Gastroenterology, Herlev Hospital, Denmark.

Focal ablation may principally be applied in any organ. However, the liver is the most
commonly targeted organ for minimal invasive ablation procedures, either
percutaneously or during open surgery. The vast majority of ablations are performed
under imaging guidance (MR-CT-US). Ultrasonography provides the flexibility and
precision required for most of the procedures. However, the choice of image modality
for guidance is mainly based on local preferences.
Fusion Ultrasonography (FUS) provides new and very promising opportunities for
guidance and follow-up of the ablation procedures. The real-time ultrasound image and
a corresponding CT image of the same image plane are shown simultaneously enabling
an improved navigation before, under and after the ablation procedure.
The choice of ablation method seems determined by availability and local preferences
rather than objective criteria’s. The treatment algorithm for some of the ablation
methods are empiric standard recommendations rather than being based on feedback
control by the peripheral or average temperatures in the ablation volume.
Imaging with contrast is essential for instant evaluation of the treatment.
MR may be used to relative temperature measurements during the procedure. CT does
not have this feature. MR and CT both require “procedure room” environment. The
cost/benefit and versatility in interventional guidance favours US-guided procedures.
Intraoperative US-guided ablation has become increasingly important in procedures
with combined liver surgery and minimal invasive ablation procedures including
laparoscopic resections.
Ultrasound contrast (CEUS) scanning is considered mandatory before and after the
ablation in cases of US-guided ablations. Fusion Ultrasonography (FUS) enable precise
marking of the intended ablation volumes before the treatment. The marking will remain
as coordinates for the procedure control during the ablation and post-procedure
evaluation of the ablated area.
Thus, FUS seems to be the “hottest” news for image guided ablations in 2010.
Negative-balances isolated pelvis perfusion for pelvis malignancies

Satoru Murata, MD, PhD, Shiro Onozawa, MD, PhD, Hiroyuki Tajima, MD, PhD, Takahiko Mine, MD, Tatsuo Ueda, MD, Fumio Uchiyama, MD, Fumie Sugihara, MD, and Shin-ichiro Kumita, MD, PhD.
From the Center for Advanced Medical Technology / Department of Radiology, Nippon Medical School, 1-1-5 Sendagi, Bunkyou-ku, Tokyo 113-8602, Japan

Abstract

Background: Negative-balance isolated pelvic perfusion (NIPP) dramatically decreases drug leakage into the systemic circulation, providing a high platinum concentration in the pelvic circulation. Our primary goal was to establish a safe regimen for high-dose regional chemotherapy.

Methods: The subjects were 30 patients with advanced rectal cancer who received a total of 56 sessions of NIPP therapy. The administered cisplatin dose ranged from 150 to 200 mg/m², increased in a stepwise fashion. NIPP incorporates two procedures: the isolated pelvic perfusion of anticancer drugs at a negatively-balanced inflow-outflow rate (aspirated volume higher than returned volume), and the isolated dialysis of anticancer agents in the pelvic cavity to decrease drug concentrations after NIPP therapy. We analyzed correlations between various parameters and prognosis.

Findings: The maximum platinum concentration during perfusion was 57.5 mg/l and 3.9 mg/l in the pelvic and systemic circulation, respectively. Performance status improved significantly (P<0.001). The tumor response was good (complete and partial response) in 23% of the patients (n=7), stable disease in 70% (n=21), and progression disease in 7% (n=2). The parameters significantly decreased survival period were dissemination, bone or bladder invasion, irradiation before NIPP, intense nausea after NIPP. The parameters significantly increased survival period were acceptable response in the pelvic region. Distant metastasis in the extra-pelvic region did not significantly decrease survival period.

Interpretation: NIPP therapy may be able to safely deliver high-dose regional chemotherapy and effectively control tumor growth in patients with inoperable rectal cancer.
Radiofrequency ablation (RFA) of lung tumours is a new treatment, first published in 2000. Surgery is still first choice and the selection of patients should be carried out in the context of a multidisciplinary tumour-team.

- **RFA IS A SAFE AND MINIMAL INVASIVE OPTION FOR A SELECTED GROUP OF PATIENTS WITH EARLY STAGE PRIMARY LUNG CANCER OR A SMALL NUMBER OF LUNG METASTASES, WHO ARE UNFIT FOR SURGERY (CO-MORBIDITY, ESPECIALLY LIMITED CARDIO-RESPIRATORY FUNCTION) OR PATIENTS WHO NOT WISH TO UNDERGO MAJOR SURGICAL TREATMENT.**

- **SIZE CRITERIA: MAXIMUM SIZE OF 3 CM**

- **MAX PERFORMANCE STATUS 2**

- **REDUCED MORTALITY COMPARED TO SURGERY AND CONVENTIONAL RADIATION THERAPY.**

- **SURVIVAL PARALLELS THOSE OF NON-SURGICAL TREATMENT-MODALITIES.**
Hybrid catheter intervention for acute massive pulmonary thromboembolism

Departments of Minimally Invasive Treatment and Radiology, Nippon Medical School Musashikosugi Hospital, Kawasaki, Japan
Department of Radiology, Nippon Medical School Hospital, Tokyo, Japan*
Vascular Centre, Skane University Hospital, Malmoe, Sweden**
Iri Clinic, Saitama, Japan***


Massive pulmonary thromboembolism is a life-threatening condition with a high early mortality rate due to acute right ventricular failure and cardiogenic shock. Traditional treatment of acute massive pulmonary thromboembolism is intravenous bolus of heparin, and in addition to anticoagulation, systemic thrombolysis is potentially life saving therapy. Surgical thrombectomy is helpful for severe case with bleeding risk.

Recently, percutaneous catheter intervention has been shown to have a role in therapy for patients with acute massive pulmonary thromboembolism. Percutaneous catheter intervention is divided in two groups: catheter directed thrombolysis and catheter tip embolectomy, and the latter is classified in aspiration thrombectomy, mechanical fragmentation, and rheolytic thrombectomy.

No controlled clinical trials have been performed that have compared surgical embolectomy with percutaneous catheter intervention. The results of small cohort studies have suggested that the clinical outcome after percutaneous catheter intervention is comparable to that after surgical embolectomy.

From 2004, we have published several scientific papers concerning “hybrid” percutaneous catheter intervention by mechanical fragmentation using a rotating pigtail catheter with local fibrinolysis and manual clot aspiration thrombectomy for acute massive pulmonary thromboembolism with haemodynamic impairment. In this paper, we will show our new data about the efficacy and safety of this “hybrid” treatment.
Transcatheter management for unresectable hepatocellular carcinoma with marked arterioportal shunts: TACE during portal vein occlusion.

Fumie Sugihara, Satoru Murata, Takahiko Mine, Tatsuo Ueda, Fumio Uchiyama, Jun Watari, Shiro Onozawa, Hiroyuki Tajima, Tatsuo Kumazaki, Shinichiro Kumita
Dept of Radiology, Nippon Medical School

Purpose: To assess the clinical effects of transcatheter arterial chemoembolization (TACE) during the corresponding portal vein occlusion (TACE-PVO) in patients with hepatocellular carcinoma (HCC) and marked arterioportal shunts (AP shunts).

Materials and Methods: This was a pilot study of TACE-PVO in patients with HCC who had marked AP shunts. The subjects were 21 patients with unresectable HCC and marked AP shunts who underwent shunt embolization with the use of coils and/or gelatin-sponge particles (group A: n = 7) or by TACE-PVO (group B: n = 14). Written informed consent was obtained and the study was approved by the hospital IRB. Clinical parameters and data on embolization of AP shunts and on tumor response were assessed prospectively. Our primary aim was to assess the safety and efficacy of TACE-PVO in patients with unresectable HCC and marked AP shunts.

Results: No major procedure-related complication occurred in either group. Effectiveness for AP-shunt treatment was significantly better in group B than in group A in terms of both immediate results (P = 0.009) and subsequent results (P = 0.028). Tumor response in the therapeutic target area was significantly (P = 0.002) better in group B than in group A. The 1- and 2-year survival rates in group A were 28.6 % and 0 %, respectively, whereas the 1-, 2-, and 3-year survival rates in group B were 85.7%, 64.3%, and 42.9%, respectively. Survival was significantly (P = 0.008) better in group B than in group A.

Conclusions: TACE-PVO may be a safe and useful therapy for selected patients with unresectable HCC and marked AP shunts.
Transcatheter arterial ethanol embolization under closed renal circuit for large renal cell carcinoma

Abstract

Purpose: To assess the safety and efficacy of transcatheter arterial ethanol embolization under closed renal circuit (TAE-CRC) for large renal cell carcinoma (RCC).

Materials and methods: Twenty five patients with RCC were treated by TAE-CRC. The dosage of ethanol ranged from 0.2 to 0.5 ml/kg, was increased in a stepwise manner. Serum ethanol concentrations in the systemic venous circulation were monitored in 14 patients. The survival rate was calculated by the Kaplan-Meier Method.

Results: The serum ethanol concentration was less than 0.1 mg/ml in 12 cases and 0.2 mg/ml in 2 cases. There is no complication related with TAE-CRC. The over all 1-, 3- and 5-year survival rates were 71%, 35% and 35%.

Conclusion: TAE-CRC reduces ethanol leakage to the systemic circulation and is safe and effective treatment for large RCCs with increasing ethanol dosage.
Title:
Transcatheter arterial chemoembolization in rabbit VX2 liver tumor: comparative study of epirubicin-iodized oil suspension and emulsion

Tatsuo Ueda¹, Satoru Murata¹, Takahiko Mine¹, Fumie Sugihara¹, Shiro Onozawa¹, Ryo Takagi¹, Hiroyuki Tajima¹, Munehiko Onda², Zenya Naito², Tatsuo Kumazaki¹, Shinichiro Kumita¹

¹Department of Radiology, Nippon Medical School.
²Department of Oncological Pathology, Nippon Medical School

Purpose:
To evaluate antitumor effects of transcatheter arterial chemoembolization (TACE) with the use of epirubicin-iodized oil suspension and emulsion in a rabbit VX2 liver tumor.

Material and Methods:
Ten rabbits with VX2 liver tumor were divided into two groups. TACE was performed with epirubicin-iodized oil suspension (0.5mg/kg epirubicin and 0.1ml/kg iodized oil, n=5) or epirubicin-iodized oil emulsion (0.5mg/kg epirubicin with 0.1ml/kg saline solution and 0.1ml/kg iodized oil, n=5). 1 week after TACE, all rabbits were sacrificed and the growth ration and viable proportion of the tumor calculated on the basis of enhanced ultrasonography and histopathological findings. Sustained release was evaluated by changes in plasma epirubicin concentration over time. Differences between the two groups were statistically assessed.

Results:
The growth ratio and viable proportion of tumors were significantly lower (P < 0.05) in the suspension group (mean ± SD, -7.3% ± 11.3% and 28.0% ± 10.4%, respectively) than in the emulsion group (21.4% ± 12.6% and 49.6% ± 10.5%, respectively). At 1 h after administration, plasma epirubicin concentrations were significantly higher (P < 0.05) in the suspension group than in the emulsion group, while no significant difference in plasma epirubicin concentration was observed between groups at 0.5, 3, 6, or 24 h after administration.

Conclusion:
The use of epirubicin-iodized oil suspension is superior to that of emulsion in terms of antitumor effects for rabbit VX2 liver tumor.
Transcatheter Arterial Chemoembolization of Rabbit VX2 Liver Tumor; Cisplatin-Iodized Oil Suspension VS Emulsion,

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PURPOSE: To evaluate the antitumor effects and hepatotoxicity of transcatheter arterial chemoembolization (TACE) with cisplatin-iodized oil suspension and emulsion in a rabbit model.

MATERIALS AND METHODS: TACE was performed on 12 rabbits with hepatic VX2 tumors using cisplatin suspension (1 mg/kg cisplatin and 0.1 ml/kg iodized oil, n = 6) or emulsion (1 mg/kg cisplatin, 0.1 ml/kg of iodized oil, and 0.1 ml/kg saline solution, n = 6). Time series changes in plasma platinum concentration were compared over 24 h. Seven days after TACE, all rabbits were sacrificed, and the growth ratio and residual viable proportion of tumors were calculated on the basis of ultrasonographic and pathological findings. Hepatotoxicity was also evaluated. Differences between the 2 groups were statistically assessed with Mann-Whitney U tests.

RESULTS: Plasma platinum concentrations in the suspension group were significantly higher than those in the emulsion group (P < 0.05) 0.5–24 h after TACE. Growth ratios (-24.6% ± 9.98% vs. 21.4% ± 8.87%, P = 0.004) and residual viable proportions of tumors (25.8% ± 5.02% vs. 51.1% ± 11.4%, P = 0.09) were significantly lower in the suspension group than in the emulsion group. Hepatotoxicity was transient in all rabbits.

CONCLUSION: Cisplatin-iodized oil suspensions made the slow release of cisplatin possible at the tumor border. Suspension is preferable to emulsion for both drug delivery and antitumor effect in the TACE treatment of VX2 liver tumors.
Short and long-term results of balloon-occluded retrograde transvenous obliteration for esophageal and gastric varices: A 10-year experience

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Department of Radiology, Ebina General Hospital.

Purpose: Balloon-occluded retrograde transvenous obliteration (BRTO) is a very useful treatment for gastric varices in terms of efficacy, safety, and degree of invasiveness, and the recurrence rate of gastric varices has been also reported to be 0%-10% after BRTO. Purpose of this study was to retrospectively evaluate the effects of BRTO, especially on liver function changes.

Methods: Between April 1998 and March 2008, a total of eligible 34 patients (10 in the Child-Pugh A, 15 in the Child-Pugh B, 9 in the Child-Pugh C) suffering with portal hypertension or liver cirrhosis underwent B-RTO procedures at our institution to treat their esophageal and gastric varices or hepatic encephalopathy. Of 34 patients, 23 had a HCV and one had a HBV, and chronic alcohol ingestion in 5. Hepatic encephalopathy was recognized in 16 patients. Written informed consent was obtained and the study was approved by the hospital IRB. Changes in the Child-Pugh score before and after the B-RTO procedure in each group were statistically analyzed by means of (Wilcoxon's) signed rank test.

Results: (1) Hepatic encephalopathy was improved in all 16 patients (100 %). (2) The Child-Pugh score was not significantly improved both in patients with the Child-Pugh A or B. However, 8 of 9 patients (89 %) with the Child-Pugh C were significantly (P<0.01) improved after the B-RTO procedures, and got the Child-Pugh B. There were no procedure-related complication occurred.

Conclusion: BRTO can effectively control hepatic encephalopathy, and improve liver dysfunction in case of severe hepatic cirrhosis.
Abstract

(1) Key note speaker (30 minutes) by Tamio Kushihashi, MD
   Professor, Department of Radiology, Showa University Northern
   Yokohama Hospital

Current status of PACS in Japan, and the complete filmless and paperless university hospital: ten years’ experience and clinical usefulness of immediate diagnosis for all radiological imagings.

Our university hospital has been operating excellently with complete filmless and paperless systems for nine and half years. Also, using 12 full PACS systems, we have been performing immediate reading, within 30 minutes, for all imaging studies. In this meeting, I will present these full PACS systems replaced at 2008 and the clinical usefulness of immediate reading. Now we can make about 300 diagnostic reports with one diagnostic radiology specialist in one day using speech recognition systems, transcriber description and over 3000 typical diagnostic reports. In these excellent circumstances, clinicians diagnose immediately based on our reports over 90% CT and MRI examinations and plan next strategies simultaneously.

In addition, I will present the results of JRS questionnaires for PACS, RIS and EHR in main hospitals in Japan.
PACS in Denmark – consolidation and integration: Streaming technology – the future of teleradiology?

Finn Kristian Mathiesen, Vejle Hospital, Vejle, Denmark

Denmark now have a full PACS coverage, there are no analog departments left. The PACS systems have been introduced by the counties and even bought on local hospital level, so a variety of vendors are present. The 16 counties have now been changed into 5 regions – 4 of these have PACS from multiple vendors. The future will be focused on consolidation either by new tenders or integration through broker solutions.

A national strategy is in progress that will make all medical data available to all patients and caretakers before the end of 2013, with 5 focal points: Each region must have a regional EPR, a uniform clinical portal, single-sign-on, digital dictation and a plan for introduction of speech recognition. The clinical single-sign-on EPR portal must include notes, medicine, ordering/answer, booking and Patient Administration Systems and have access to pathology, microbiology, lab results and PACS images.

One of the keys to achieve these goals is that PACS data must be available and exchangeable between all hospitals before the end of 2012. Streaming technology seems to be the only fast and realistic solution to achieve that goal.

Denmark have a national patient ID and have issued national personal digital signatures (NemID), that allows patients to access their own medical records from a common database of all hospital EPR systems (eJournal) via a public health web portal (Sundhed.dk). The same national read-only EPR is accessible from most hospital EPR.

There are plans for making PACS images available for the patients from the Web portal.

The value of all PACS images available for all doctors at all times, have been estimated at no less than 700 million Dkr. annually.

(1) Mathiesen FK. WEB technology – the future of teleradiology ?. Computer Methods and Programs in Biomedicine 2001; 66: 87-90
Abstract. The Gifu University Hospital was renovated and reopened on June the 1st, 2004. Our new hospital is a completely computerized digital hospital and has achieved two of our goals: getting the “total intelligent” and “filmless and paperless” hospital. At the previous, and last but one this conference, I had showed our electronic patient record system (SystemGifu), which is now working in practice on an optical fiber network systems. The “SystemGifu” is excellent in clinical evaluation and has been proved to be practical and routinely available to enhance the quality of medicine, to analyze and optimize clinical processes. Furthermore, our hospital has been able to get large volume of clinical and administrative data for more than 6 years.

In my presentation at this conference, I will demonstrate the outcome of our new challenge, which makes the hospital smarter by using accumulated clinical and administrative massive data archived in SystemGifu. That is a new application (Route Finder for MRI), which is designed and developed to increase the operability of entering a series of imaging parameters in a MRI (magnetic resonance image) room.

“Route Finder for MRI” can help a radiological technician to select an appropriate imaging parameter along a series of imaging parameter items on a MRI operational console in daily clinical procedures. To realize the “Route Finder for MRI”, we have analyze the massive imaging parameters and a combination of such imaging parameter items archived in a RIS and PACS during the past 6 years. We can find several combination of imaging parameters and practical procedures, which are considered appropriate parameters used by expert radiological technicians at the past MRI examinations. “Route Finder for MRI” can advice the appropriate imaging parameters in case of real clinical situations by using these expert knowledge in real time, even if a radiological technician is less-experienced people.

My presentation is on utilization of the archived data and extracted knowledge, improving the clinical procedures, and challenge to make the hospital smarter.
The first commercial PACS system in Norway was installed in 1998. During the early years of the 2000th century there was a rapid implementation of PACS systems in Norway, and in 2005 all Norwegian public hospitals and private institutes were fully “PACSified”. The public mammography screening was the last to be digitized.

The Norwegian specialist health care is organized into four regional trusts, each divided into several local trusts. Different local trusts have purchased RIS/PACS systems from different vendors. Due to organizational changes there are even different RIS/PACS systems within one local trust.

The paper will discuss pros and cons of different solutions for communication between local RIS/PACS systems and experiences with implementing those solutions from a technical, organizational and legislative point of view.
Server based computing as an infrastructure of hospital-wide EPR and inter-hospital system
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[Purpose] We renewed the PACS and EPR system on January 2008 and we introduced a server based computing (SBC) system as an infrastructure of the total integrated PACS and EPR. The total integrated PACS operates all DICOM images, non-DICOM images, images from ophthalmology department and department of laboratory, the reports with key images and scanned documents with e-signature. We made a real paper-less hospital information system. SBC has many advantages for security and cost-effectiveness, but it was the first time that it was used for a large-scale hospital-wide information system. We also started to use SBC as an infrastructure of inter-hospital system from July 2010. On this paper we would report the advantages and problems of SBC as an infrastructure of paperless EPR and inter-hospital EPR sharing system.

[Methods] The total integrated PACS contains all the images of CT, MRI, FCR, nuclear medicine, endoscopy, ultrasound, respiratory examination, many types of reports and scanned images with e-signature. We had DICOM images of CT, MRI, FPD and FCR, but we had non-DICOM images of ultrasound, nuclear medicine and ophthalmology department and many reports with key image in several kind of format, XML+PDF, XML+JPEG, PDF, TXT+JPEG/PNG. In our hospital we would make a totally digitized system, but the papers with signature were existed. Scanning system was introduced for digitization of that kind of paper with e-signature. SBC was also implemented for higher security, cost-effectiveness and better management. Seventy SBC servers were introduced between the data base server and client terminals, the client applications run on the SBC servers and the patient's data existed in the application server and SBC server, but never in the client terminals. Manipulation data of the keyboard and the mouse went from the client terminals to SBC server and only the monitor image returned to the client terminal. We could use thin-client terminals and old PCs which had used for five years of the previous contract period.

[Results] The operation of the new system was started from January 2008, SBC made it possible to operate single sign on system, which covered EPR, PACS and many kind of departmental systems. After you stopped the operation of PACS and EPR from one terminal, keeping the connection from SBC server to PACS and EPR, make it possible to restart the operation immediately from another terminal via the same SBC server. We call the function “User Roaming”. We found out the computer viruses on the terminals in 2009, but we were not disturbed the operation by the virus. The client PCs for primary diagnosis had special monitors with ten bits in depth, but SBC servers operate images with only 8-bits in depth. So the client PCs for primary diagnosis should run the client application on the terminal to connect the server directly. We started the operation of the inter-hospital system, we could look into the other hospital EPR and PACS on the SBC window in the own hospital information terminals without another storage for the inter-hospital system.

[Conclusions] SBC was introduced as an infrastructure of EPR and PACS for better security and cost effectiveness. SBC was also useful to make the inter-hospital system economically.
Regional imaging interpretation centre – a new concept with emphasis to education and subspecialists’ training.
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Teleradiology is still an emerging technology which to date has put most emphasis on new ways of distributing image interpretation services. We are currently working on a new concept for organising a regional interpretation centre for Southeast Norway. The centre should be public owned and based on a commuting work force of hospital radiologists rotating to the centre, spending 20-40% of their time there and the rest of their working time in their respective hospitals. They will continually ”bring along” at least the same number of examinations to interpret, as they else would have executed in their home hospital during same time.

The centre should also be hierarchic organised with subspecialists, integrated with a basic level of radiologists and specialists in training. This will ensure interpretation quality, efficiency, and high subspecialist accessibility secured by short communication lines between different levels of competence.

The Centre will serve as an educational centre for postgraduate- and CME-training, and benefit the high interpretation volumes and proximity to robust subspecialist competence.

Higher efficiency gained by focus on - and undisturbed dedication to - the interpretation and reporting processes is assumed to have a potential of increased reported volumes by as much as perhaps 50%. This effect should however not entirely be taken out to combat current capacity problems, but also be exploited for improvement of subspecialist competence and specialists education in a large and robust organised radiological community serving the whole region.

Teleradiology is considered a disruptive technology. It is now time that we consider new organisational options to develop radiological competence and science at large, not only the increased accessibility of radiological interpretation services.
PACS in Finland – development and current status in eHealth environment

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*Finland has been an early adopter of new digital technology, first experiments of teleradiology have been made already in 1960-ties but clinical teleradiology and picture archiving and communication systems (PACS) installations have started in 1990-ties. All the hospital districts were digitized by 2007 and today medical imaging is an integrated part of a comprehensive electronic medical record and eHealth environment.*

The Finnish health care system is mainly based on public funding, 85% of the care is delivered by 21 hospital districts and 229 primary health care centres owned by the municipalities. The rest 15 % of the care is delivered by private sector. In a sparsely populated country (5.3 million inhabitants) even most of primary care health centres are well equipped with radiography and ultrasound facilities.

First experiments with teleradiology took place in 1969/1970 with the television links of the Finnish Broadcasting Corporation, but the real implementation of teleradiology for secondary opinion and emergency hours coverage started at the beginning of 1990-ties. By 1996, most of the hospital districts offered some sort of teleradiology services to the local hospitals and primary health care centres. The use of mobile teleradiology (smartphone technology) for emergency CT and MRI scans was developed by Oulu University hospital within R&D projects financed by the EU.

At the same time workstations and miniPACS solutions were taken into use at the university hospitals. Turku University Hospital was the first to take a hospital wide PACS into use in 1995 and Töölö emergency hospital (part of Helsinki University hospital) was the first filmless hospital in year 2000. In Northern Finland, Raahe and Kajaani Hospital were the first ones to include also distant primary health care centres into a filmless environment in 2002.

After the turn of millennium, the Finnish government invested substantially in health care IT technology and regional eHealth environments were being built with an integrated electronic patient record (EPR) as the core application. FinnTelemedicum at the University of Oulu performed a comprehensive survey of all public health care institutions and most prominent private service providers in 2003, 2005 and 2007. The results show that more than 94% of primary health care centres were using electronic patient record as a primary source of patient information already in 2003. For hospitals, the same level was reached in 2005. Full 100% coverage in all public health institutions was reached in 2007. Filmless PACS environment was in production in 12 out of 21 hospital districts in 2003 and by the end of 2007 all the hospital districts were filmless. In the Finnish environment, EPR is tightly integrated with PACS, laboratory systems and electronic referral system. Desktop integration provides a fluent user interface.

Existing situation in Finland favours regional PACS environments where each archive mainly serves one hospital district area, including both secondary and primary care. With a patient’s given consent, images are available to all professionals taking part of patient care. E.g. at the capital...
Helsinki university hospital district area there are 21 hospitals, 53 primary health care centres and 9 primary health care centres using the same archive (HUSpacs). They store 900,000 examinations of 20 TB of data every year. Image distribution to the distant sites is enabled through a web interface over a secure connection.

In eastern Finland at the Kuopio university hospital area the university site, two regional hospitals and 10 primary health centres make a consortium. They have integrated remote requesting and image delivery through RIS with the EPRs used in the area. From imaging point of view, the county forms one virtual hospital. This type of PACS-RIS-EPR integration has been implemented in many county hospital areas.

Also Tampere university hospital and Turku university hospital have each created regional medical imaging centres, which store and deliver images from secondary and primary care. The Turku PACS actually stores images from two different counties. They have been filmless since 2002 and store presently 9.5 TB of imaging data annually.

The present challenge in Finland in to build one lifelong national archive for digital medical data called an eArchive. There is a new law from year 2007 which states that every public health care institute must join in by 4/2011. A lot has already been done in standardization of different interfaces, but the latest information reveals that the target will be achieved only gradually during the years 2011-2013. Only the radiology reports will be included into the first phase, while long term storage for images is scheduled to be solved in next phase starting from year 2014. Already today, imaging data can be exchanged between institutions using DICOM tools because of unique nation wide patient ID.

References:

PACS, current status in Sweden
Peter Leander, Regional Chief Radiology Officer, Skåne Region, SWEDEN

Sweden has more than one decade of experience in PACS and today, almost invariably, the Departments are paper- and filmless. After being used to a digital Department, including images and RIS-data on demand to be sent nation-wide via a dedicated health Internet, now the regions in Sweden move toward a new level of integration.

PACS-clusters are implemented enabling the patient-data to be retrieved transparent for clinicians and radiologists.

The lecture will give an overview of the current PACS-status in Sweden with emphasis on the PACS- and RIS-cluster implementation in the Skåne Region.
Development of PACS using the DICOM and IHE specification

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Abstract:
In the PACS environment, DICOM is used as a standard. Recently to compensate the incompleteness of DICOM the IHE technical framework is also used. This paper describes that how to analyze the workflow in our hospital and the standard like DICOM and IHE is implemented.

The order of image examination is transmitted to the Radiology Information System (RIS) from the Hospital Information System (HIS) in a HL7 format. Modalities retrieve worklists of DICOM standard, and automatically demographic data of a patient is set. Created images are stored into the PACS server and the status of examination is reported to the HIS by the method of DICOM MPPS. In this case, we use the Schedule Workflow (SWF) of the IHE technical framework.
At Viewing stations the function of single-sign-on (IHE EUA) and patient synchronization (IHE PSA) connected with the HIS application is working.

Our hospital is specialized in the heavy particle therapy and all patients are introduced by related hospitals. A few years ago, patients brought images by films but now bring images by CDs. These CDs conform to the IHE Portable Data for Imaging (PDI). At our reception, images in a CD are read out and transmitted to the PACS server. We use the IHE Import Reconciliation Workflow (IRWF) for changing the patient's ID.
Using the various standards we can make interfaces between HIS and RIS clear and can reduce previous arrangements and/or coordination at system implementation. We believe that we can cut down the cost and trouble at the future replacement.
Observation environment for diagnostic imaging: Considering illuminance in image interpretation

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Introduction
Until now, the recommended illuminance for image interpretation of hard-copy mammogram was 50 lx or lower. Diagnosis of soft-copy mammogram has been steadily increasing in Japan, new illuminance standards are needed for optimal image interpretation.

Purpose
The purpose of this study was to clarify the effects of observation environment on observed images, measure changes in illuminance during image observation, and determine optimal illuminance in the image interpretation room.

Subjects and Methods
In order to evaluate submonitor effects, the submonitor was placed to side of the image interpretation monitors, and its brightness was set 22 cd/m² or 192 cd/m². At each setting, illuminance was measured on the hands and at three points on the image interpretation monitors when the angle between the submonitor and image interpretation monitors was set at 0°, 30°, or 45°.

Nine interpreters determined the acceptable illuminance for observing the contrast between the inside and outside of the mammary glands as the illuminance of the room was gradually increased from complete darkness. In addition, limits of illuminance necessary to perform manual operations during image interpretation were also evaluated.

Results and Discussion
We found that the submonitor had a strong effect on illuminance needed for image interpretation. In addition, the placement and angle of the submonitor are also important. The mean acceptable illuminance for observations within the mammary gland was 21.4 lx (range, 17.5–24.4 lx), and 17.1 lx for observations outside the mammary gland (range, 10.3 for dense mammary gland–20.6 scattered). During extraglandular observations, the acceptable illuminance in dense mammary gland was significantly lower than that of the three other breast structures. The mean acceptable limit for illuminance near the hands was 17.6 lx.

Although the acceptable mean illuminance and illuminance near the hands was thought to be approximately 17 to 25 lx, we plan to carry out follow-up examinations that consider dense mammary glands, which require lower indoor illuminance.
CEUS vs. MDCT in the detection of synchronous liver metastases from colorectal cancer.

A prospective, blind study.

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PURPOSE: To compare the sensitivity and specificity of contrast-enhanced ultrasonography (CEUS) and 64-slice multidetector-computed tomography (MDCT) in the detection of liver metastases in patients with colorectal cancer (CRC).

MATERIALS AND METHODS: From September 2004 to December 2008, 271 consecutive patients with primary CRC were included in this study (146 males and 125 females, with a mean age of 67.4 years, range: 34-91 years). Patients with benign tumours, diverticulitis and stent treatment were not included. The study was approved by the local ethical committee. All patients signed the informed consent form and underwent combined liver ultrasonography and CEUS using 2.4 ml Sonovue iv. Time from injection to arrival time in the hepatic vein (ATHV) was noted. Contrast enhanced 64-slice MDCT in the portal phase was performed and interpreted blindly. In all patients intraoperative ultrasound was used as gold standard. Additional follow-up, MRI or fine-needle biopsy was performed on all suspicious lesions or if there was any inconsistency in the results. When liver resection was performed, the pathological examination contributed to the gold standard.

RESULTS: Liver metastases were detected in 22 patients (8%). Both CEUS and MDCT had sensitivity of 86%. Specificity of CEUS was 97% and MDCT 96%. In patients with and without liver metastases ATHV was 19.8 sec. and 23.3 sec., respectively, p< 0.05.

CONCLUSION: CEUS showed a sensitivity and specificity comparable to that of MDCT. In this study, we could also observe that ATHV was shorter in the metastatic group than in patients without liver metastases.
Contrast induced acute kidney injury (CIN) is a potentially serious renal complication to the use of iodine contrast media (CM) in radiology. Especially in patients at risk.

With the fast growing use of radiological interventions and computed tomography, effort of how to prevent the occurrence of CIN has become increasingly important.

To date these efforts have not been enough since the prevalence of CIN is still reported to be between 3 and 50% according to the patient risk profile.

Today we know that we have to have a standardized definition of CIN in order to be able to analyze different strategies.

We have to identify the risk patients. Those with reduced renal function especially in combination with diabetes.

Use effective plasma expansion.

Consider pharmaceutical intervention

Use the contrast media with the lowest nephrotoxicity

Follow patients at risk.

The lecture will give an update on all the above aspects—what we know today on how to best prevent CIN.
Use of iodine contrast media iso-attenuating with diagnostic gadolinium doses in angiographic x-ray procedures may avoid both CIN and NSF in azotemic patients.

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**Background:** Despite their low radiodensity, gadolinium contrast media (Gd-CM) have been reported to give satisfactory diagnostic results in angiographic x-ray procedures in azotemic patients, but carry the risk of nephrogenic systemic fibrosis (NSF).

**Purpose:** To evaluate how small I-CM doses (I=iodine) would be if they were to be used in volumes and concentrations resulting in the same x-ray attenuation as Gd-CM at computed tomographic angiography (CTA) and percutaneous catheter angiography/interventions (PCA/PCI), thereby avoiding NSF in patients with severe renal impairment and possibly also contrast medium-induced nephropathy (CIN).

**Material and methods:** CT Hounsfield units (HU) were measured in 20-mL syringes filled with CM containing 0.01/0.02,/0.05/0.1 mmol/mL of iodine or gadolinium atoms and placed in phantoms simulating chest and abdomen. Relative contrast were measured in 20-mL syringes filled with iohexol at 35/50/70/90/110/140 mg I/mL and 0.5M gadodiamide and placed in phantoms equivalent to 13 and 20 cm of water after exposure with radiofluoroscopy (RF), digital radiography (DX) and x-ray angiography (XA) systems. Clinical doses of Gd-CM at CTA/PCA/PVI were reviewed.

**Results:** At CT 0.5M Gd corresponded to 91-116 mg I/mL in the chest and to 104-125 mg I/mL in the abdominal phantom at 80-140 kVp. At RF/DX/XA systems 0.5M Gd were iso-attenuating with 35-90 mg I/mL at 60-115 kVp. Clinically, 60 mL 91-125 mg I/mL (5.5-7.5 gram-iodine) or 73-100 mg I/kg at 80-140 kVp CTA and 60 mL of 35-90 mg I/mL (2.1-5.4 gram-iodine) at 60-115 kVp PCA/PCI would be roughly iso-attenuating with 60 mL 0.5M Gd-CM (=0.4 mmol Gd/kg in a 75 kg person).

**Conclusions:** Meticulous examination technique and judicious use of ultra-low I-CM iso-attenuating with Gd-CM, which has been proven diagnostic in CTA and PCA/PCI, may minimize the risk of nephrotoxicity in azotemic patients, while there is no risk of NSF.
Title: Visualization of Hemodynamics in Intracranial Arteries after EC/IC Bypass Surgery using Time-Resolved Three-Dimensional Phase-Contrast (4D-flow) MRI

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PURPOSE: To demonstrate the clinical feasibility of 4D flow MRI at 3T in the evaluation of hemodynamics in patients after extracranial/intracranial (EC/IC) bypass surgery.

METHOD AND MATERIALS: Eleven patients (7 females and 4 male, mean age; 65 years, seven with atherosclerotic IC occlusion, four with post ligation of IC giant aneurysm) after EC/IC bypass surgery were examined. Two of the 11 patients underwent MRI before and after bypass surgery. MR studies were performed on a 3T unit (Achieva 3-T; Philips Medical Systems). The imaging parameters of 3D phase-contrast MRI were as follows; TR/TE/NEX= 8.4msec /5.4msec/1, FA=13, FOV=210X210mm, VENC=70cm/sec, voxel size=1.19X1.36X1.4mm. We obtained 15 phases of 3D flow data during cardiac cycle. The acquisition time of MR data was about 15 minutes. The date was transported to another personal computer with 4D flow visualization software (GT-Flow; GyroTools). Time-resolved 3D-streamline images of ipsilateral MCA and EC/IC bypass graft were generated. The blood velocity of ipsilateral MCA M1 of ICA occlusion and bypass-graft was measured.

RESULTS: In all patients, 4D flow MRI visualized the local arterial hemodynamics from EC/IC bypass graft to MCA M2 successfully. 4D flow MRI demonstrated retrograde flow from bypass graft anastomosis to M1 in 3 patients and anterograde flow from contralateral ICA or BA to M1 in 8 patients. The average maximum and minimal blood velocities of ipsilateral MCA M1 were 26.7 and 11.3 cm/sec, respectively, while those of bypass graft were 42.1 and 25.5cm/sec. In two patients who underwent 4D flow MRI before and after surgery, 4D flow MRI demonstrated decrease in blood velocity of ipsilateral MCA M1 and increase in that of M2.

CONCLUSION: 4D flow MRI may be a useful noninvasive method in the assessment of arterial hemodynamics after EC/IC bypass surgery.
Background: The majority of the breast lesions are seen as masses on ultrasound. But there are lesions including some cancers which do not show masses. These non-mass lesions are increasing with improvement of the equipments. It is important to define these lesions and clarify their diagnostic importance. The committees of both the Japan Society of Ultrasonics in Medicine (JSUM) and the Japan Association of Breast and Thyroid Sonology (JABTS) are trying to establish the terminology and diagnostic standard of non-mass lesions on breast ultrasound. Representing those committees we would like to introduce the results made so far.

The ultrasound images of the non-mass lesions are divided into four:
1. Abnormalities of the ducts
2. Hypoechoic area in the mammary gland
3. Clustered microcysts
4. Architectural distortion

Purpose: To propose definition and differential diagnoses of the lesions seen as abnormalities of the duct.

Results:
Echo free mammary ducts seen beneath the areola are normal. The abnormal ducts are defined as follows:
• Dilatation of the duct extending beyond the areola
• Duct containing internal echoes
• Abnormalities of the duct wall or duct cavity

Breast diseases which show abnormalities of the ducts are
• Intraductal proliferative diseases
• Intraductal papillary neoplasms
Both include wide range of diseases from benign change to early cancers. The diagnosis of each disease is usually made microscopically.

The basic rules for diagnosis are:

- Lesions occupying multiple lobes are usually benign.
- Abnormalities localized in the solitary lobe can be malignant.

1. **Dilatation of the duct without internal echoes**
   Diffuse, bilateral or multi-directional dilatation: usually benign or normal variation.
   Unidirectional (single lobe) dilatation: if not associated with abnormal nipple discharge, usually benign. When associated with bloody discharge, proliferative lesions such as intraductal papilloma (IDP) or ductal carcinoma in situ (DCIS) should be accounted for.

2. **Duct with internal echoes**
   Ducts containing internal echoes are usually dilated.
   Diffuse, bilateral or multi-directional ducts with internal echoes are usually benign.
   When seen unidirectional or in single lobe, the nature of the internal echoes should be evaluated. If solid masses are seen, the differential diagnoses include DCIS or IDP.
   If the internal echoes are floating and considered to be fluid, the content may be blood or milk. Bloody content is often caused by intraductal proliferative lesions such as DCIS or IDP, when the masses are too small to be identified.

3. **Abnormalities of the duct wall**
   This include thickening of the duct wall or unequal (uneven) caliber. The findings are usually accompanied by abnormalities of the internal echoes and suspicious of malignancy, especially DCIS. Other differential diagnoses are IDP or chronic inflammation.

**Conclusion:**
By understanding the ultrasound patterns and their differential diagnoses, next step (follow-up or ultrasound-guided biopsy) should be considered.
The terminology and diagnostic standard of non-mass lesions (2)
Hypoechoic area in the mammary gland

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The committees of both the Japan Society of Ultrasound in Medicine (JSUM) and the Japan Association Breast and Thyroid Sonology (JABTS)²

Background
The mass is a main finding of the breast cancer on both mammography and ultrasonography. But as the mammographic cancer screening has popularized, many impalpable and asymptomatic cancers have been detected. Some of them are recognized as hypoechoic area and not seen as mass lesions. And before now we have experienced many cases that are felt as mass lesion on palpation, but only hypoechoic glandular changes can be seen on the sonograms. We have called them as “hypoechoic area in the mammary gland”. Now, that is ranked one of the findings of non-mass-like lesions and tried to define to the ultrasonic finding by the committees of both the Japan Society of Ultrasound in Medicine (JSUM) and the Japan Association Breast and Thyroid Sonology (JABTS).

Definition
It was defined as the hypoechoic area with different properties compared with surrounding or corresponding area of the opposite breast, but it isn’t recognized as a mass on the ultrasonography. It includes three subtypes as follows: a) spotted or mottled hypoechoic area b) geographic hypoechoic area c) hypoechoic area with indistinct or ill-defined border.
   a) spotted or mottled hypoechoic area
      Small hypoechoic areas are seen forming one lesion.
   b) geographic hypoechoic area
      Many small hypoechoic areas grow together and can be seen as geographic shape.
   c) hypoechoic area with indistinct or ill-defined border.
      The hypoechoic area can’t be seen as mass lesion due to their ill-defined margins.
Results

The main lesions that may be seen as the hypoechoic area in the mammary gland are as follows:

- IDC, ILC, inflammatory carcinoma
- Intraductal proliferative lesions
  - DCIS, IDC with a predominant intraductal component, usual ductal hyperplasia and atypical ductal hyperplasia
- Benign epithelial proliferations
  - Adenosis including variants, Radial Scar/Sclerosing complex lesion
- Mastitis
  - lymphocytic mastitis, acute mastitis

The most of the cancers estimated as non-mass lesions show hypoechoic area in the mammary gland. But benign lesions such as various epithelial proliferations and mastitis also show similar findings. So, differential diagnosis of these lesions is very important. The distribution of the hypoechoic area and the presence of the echogenic foci that suggest calcifications are important information to differentiate malignancy from benign lesions. Bilateral and diffuse distribution is a benign sign, and often seen in the young women’s breast. If hypoechoic area is seen focally or in only one segment, especially accompanied with echogenic foci, it is the highly suggestive finding. So, if hypoechoic area was found, the scanning of not only the concerned breast but also corresponding area in the opposite breast is very important.

Conclusion

Recently ultrasound image has remarkably improved, we can see subtle difference of glandular echo level or bulging structure originated from intraductal proliferative lesions. The hypoechoic area in the mammary gland is very important finding of the breast ultrasound diagnosis.
Clustered microcysts on breast ultrasound
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【Introduction】
On ultrasound, clustered microcysts is defined that multiple microcysts with the size of a few millimeters exist in the mammary gland. The microcysts are anechoic and recognized as small cysts. Breast with diffuse multiple microcysts are not considered abnormal, usually it is due to mastopathy (Fibrocystic change). If the microcysts are clustered locally in mammary gland, or many microcysts are distributed segmentally, malignant lesion may be present. The actual condition of the clustered microcysts is unclear. We investigate and report that how often we check the clustered microcysts and the rate of malignant lesion in the clustered microcysts.

【Patients and methods】
From Jan. 2005 to Dec. 2009, The number of the cases that we performed breast examination with ultrasoundgraphy were 8626 cases. We picked up the cases that showed the clustered microcysts pattern on ultrasound and investigated histopathological finding.

【Results】
In 8626 cases, 39 cases were presented the clustered microcysts pattern on ultrasound. The age of patients was from 26 to 76 years old(mean 43.9 years old). The patients were all women.
11 cases were diagnosed with malignant disease. 5 cases were invasive ductal carcinoma, other cases were ductal carcinoma in situ. 28 cases were benign lesions.
In 5 cases of invasive ductal carcinoma, the lesion had the low echoic area around the clustered microcysts on ultrasound findings. Other one case didn't have the low echoic area, the invasive lesion was smaller than 0.1 millimeter in size. In contrast, the cases of the ductal carcinoma in situ were not showed low echoic area around the clustered microcysts.
The definition of the clustered microcysts is still not firmly fixed. The clustered microcysts pattern is very rare, but it remains possible that this microcysts pattern concludes the malignant lesion. So, the committees of both the JSUM and the JABTS should try to confirm the definition of the clustered microcysts. On the other hand, we should be concerned about overdiagnosis because malignancy is very rare.
The terminology and diagnostic standard of non-mass lesions (4)
Distortion on Ultrasound

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Background
Architectural distortion on mammography (MMG) is considered to be one of the most important indicators of breast cancer. Recently, Architectural distortion has been detected via ultrasonography even in the absence of a definitive mass. The committees of both the Japan Society of Ultrasound in Medicine (JSUM) and the Japan Association Breast can Thyroid Sonology (JABTS) are trying to establish the definition of no-mass lesions on breast ultrasound. Architectural distortion is one of the categories of non-mass lesions.

Definition
It was defined as the disorder of construction on the ultrasonography of the case recognized as the distortion of the mammary gland substance and taking along it. The one to form the tumor was excluded. The definition of architectural distortion is the disorder of construction of mammary gland and surrounding tissue and distortion refers to the presence of a radiating structure concentrated at a point.

Results
The cause of the architectural distortion are divided into four.
(1) biopsy or operation
(2) benign disease
(3) malignant disease
(4) neoadjuvant chemotherapy for breast cancer

1. biopsy or operation
The scar formed due to fibrosis following biopsy or operation was detected as a hypoechoic linear structure.
2. benign disease
Benign disease are possible to be the cause of distortion including fibrosis, adenosis, sclerosing adenosis or fat necrosis.

3. malignant disease
Both of DCIS and Invasive carcinoma are sometimes seen as distortion by ultrasound. Invasive ductal carcinoma and invasive lobular carcinoma construct the surrounding breast tissue and fatty tissue. DCIS in sclerosing adenosis causes distortion. In such cases the distortion is due to both DCIS and sclerosing adenosis. Recently the frequency of the DCIS in sclerosing adenosis seen as distortion increases in Japan.

4. neoadjuvant chemotherapy for breast cancer
Neoadjuvant chemotherapy for breast cancer causes the distortion. Chemotherapy cause fibrosis and retract the surrounding tissue of the lesion. If the primary lesion was circumscribed bulky mass before chemotherapy, after chemotherapy, typical distortion is seen in some cases. The histopathological findings proved the distortion is due to fibrosis.

Conclusion
Recently ultrasound technique has remarkably improved, the lesion that do not form a definite mass images has been recognized. The architectural distortion is important as one of findings of the non-mass lesions in diagnosis of breast ultrasound.
Radiation doses at chest computed tomography (CT) close to that of a combined chest x-ray and tomosynthesis

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Background: According to the Swedish Radiation Safety Authority (SSI Report 2008:02, Patient radiation doses in Sweden – 1999 and 2006; www.ssm.se) the mean effective dose of chest CT in Sweden 2006 was 6.6 mSv (range <3.4 to >17 mSv; mean CTDI_{vol}/DLP 10 mGy/390 mGycm) or almost 100 times higher than the 0.07 mSv mean effective dose of a PA/lateral chest x-ray. A 0.05 and 0.13 mSv effective dose has recently been reported (Båth et al. Radiat Prot Dosimetry. 2010;139:153-8) for a 70 kg person examined with a PA/lateral chest x-ray and tomosynthesis, respectively, or a total effective dose of about 0.2 mSv or 3% of the mean effective CT dose.

Purpose: To demonstrate the quality of some chest CT performed at radiation doses close to that of a combined chest x-ray and tomosynthesis (=digitized conventional tomography).

Material and Methods: Non-contrast enhanced chest CT, using a 16-row detector Siemens Somatom Sensation 16 at 80 kVp/17 effective mAs/CTDI_{vol} 0.37 mGy or 120 kVp/11 effective mAs/CTDI_{vol} 0.77 mGy depending on patient size, for evaluation of questionable lesions at chest x-ray, follow-up of pulmonary noduli and to diagnose pneumothorax. DLP was recorded and effective dose was calculated using an effective dose/DLP conversion factor of 0.017.

Results: Pulmonary vessels was clearly visualized as well as noduli down to a diameter of 2 mm. Pulmonary infiltrates hardly visible at chest x-ray, pneumothorax and normal-sized mediastinal lymph nodes were clearly visualized at ultra-low chest CT. The effective dose ranged from about 0.2 mSv at 80 kVp to 0.5 mSv at 120 kVp, i.e. a radiation dose roughly equal or double that of a combined chest x-ray and tomosynthesis.

Conclusions:
1. Technique exists to perform diagnostic chest CT at radiation doses not far from those of chest x-ray, especially if combined with tomosynthesis.
2. Low-dose chest CT would be of particular value in children and young adults, and to replace AP bedside chest x-rays, not seldom of suboptimal quality.
3. Low-dose chest CT also discriminate structures in the mediastinum.
4. Studies comparing the diagnostic accuracy of low-dose chest CT and tomosynthesis are needed to decide whether it would be more cost-effective to invest in dedicated low-price chest CT equipments in the future instead of equipments for tomosynthesis.
Pancreatic tumors: Low-kilovoltage computed tomography (CT) for improved detection – a phantom study

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Introduction
Detection of small pancreatic tumors by CT has always been challenging.

Objectives
The aim of this study was to investigate the effect of decreasing the tube voltage from 120 to 80 kV on the detection of pancreatic tumors.

Method and Materials
Three scanning protocols was used; one using the standard tube voltage (120 kV) and two using 80 kV but with different tube currents (500 and 675 mA) to achieve equivalent dose (15 mGy) and noise (15 HU) as that of the standard protocol. Tumors were simulated onto collected CT phantom images. The attenuation for the tumor and normal parenchyma at 120 kV was 110 and 130 HU, respectively, as previously measured in clinical examinations. By scanning and measuring of iodine solution with different concentrations the corresponding tumor and parenchyma attenuation at 80 kV was found to be 185 and 219 HU, respectively. To objectively evaluate the differences between the three protocols, a multi-reader multi-case free-response receiver operating characteristic study was conducted, using three readers and 100 cases, each containing 0-3 lesions.

Results
The highest reader averaged figure-of-merit, \( \theta \), was achieved for 80 kV and 675 mA \( (\theta = 0.7635) \), and the lowest for 120 kV \( (\theta = 0.5467) \). There was a significant difference between the three protocols \( (p = 3.45 \cdot 10^{-12}) \). Post-hoc analysis shows that there was a significant difference between 120 and 80 kV, but not between the two levels of tube currents at 80 kV.

Conclusion
We conclude that the effect of decreasing the tube voltage is larger than the effect of increasing the current.
Analysis of photoresponse between hematoporphyrin and CD44 cell adhesion molecule related domain of the type IV collagen for control of the stroma reconstruction change caused by diseases

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【Introduction】

Hematoporphyrin (HP) is taken by cancer cells and is distributed intratumoral tissue. In photodynamic therapy (PDT), HP, as photosensitizer was induced by singlet oxygen with light irradiation to cancer cells death and the tumor being destroyed, is previously reported. It was also reported that HP was a good photosensitizer because of it activated by multiphoton absorption and this approach offers the advantage of much deeper penetration depth due to excitation for photodynamic therapy. On the other hand, the pH is decreasing around cancer cell, and the basement membrane change their nature and construction in the acidic environment. We reported that the type IV collagen that is a main component of basement membrane showed the acid solubility and showed unstability of the collagen helical structure in acidic solution state.

Furthermore, H1 domain (1263-1277 domain (IVH1)) of IVα1 developed a function related to cell permeation and cell proliferation in tumor. And, it was reported that this triple helix of IVH1 bind to CD 44 which is the cell adhesion molecule and cancer stem cell have CD44. Then we synthesized model peptide of a H1 domain of type IV collagen, and examine type IV collagen, model peptide and HP molecule association in solution tested by absorption spectrum and fluorescence of HP (photobleaching) caused by protein or amino acid were tested and was discussed from a viewpoint of control of a stroma by PDT.
【materials & methods】

Materials (Chemicals) : 0.3% type IV collagen with HCl (pH3), which was purified from human placenta (Sigma), Hematoporphyrin IX (HP: HPFrontier scientific), model peptides as human type IV collagen triple-helix (1263-1277) region (GVKGDKNPGWPGAP-CONH2) (IVH1) and acetylated IVH1. These model peptides were synthesized and were analyzed with MALDI-TOF MS (mass spectrometry). Type IV collagen were meshed using CD measurements (JASCO J-805 spectropolarimeter, JASCO engineering, Tokyo, Japan).

Light source: The light source was deuterium lamp (CVI) using range (200-800nm) and using band pass filter (280nm) and LED (Emitted diode) in the UV spectral range with main bands 378nm, 400nm and visible light LED other fluorescence and absorption measurements. Fluorescence spectrometer, JASCO FP6000, (JASCO engineering, Tokyo, Japan).

(1) Type IV collagen and HP assembly test: type IV collagen (800μl, 0.15%), NaCl (80μl, 0.5mM), HP (80μl, 1mM) in PB solution (pH7, 6, 5, 4, 5mM) were carried out using a quartz cuvette and the supernatant part of the solution was measured absorption with fiber-spectroscopy (Ocean Optics USB000).

(2) HP affinity measurement for model peptides, human type IV collagen: HP (25μM) in PB (phosphate buffer solution, 400μl) (pH7, 25°C) added each pitied 20, 30, 50μl (1mM).

【Result】

(1) Type IV collagen shows acid fusibility, and self-assembly of type IV collagen occurs with the NaCl concentration dependently.

(2) When HP was added in phosphate buffer solution of this condition, IV and HP made complex and formed the sediment.
( 3 ) Association constant is extremely small (0.12–0.15 μ M⁻¹ s⁻¹); however, molecular complex of IV and HP advanced in pH 4 obviously.

( 4 ) When the molecular complex of IV and HP warms in solution to 34 degrees, the molecular complex was dissolved in solution of acidic condition (pH 4) and remained in a neutral condition (pH 7).

( 5 ) Time variation of absorption spectrum (220–380 nm) was observed in the buffered solution in presence of the peptides and HP.

( 6 ) The decrease of fluorescence (600–680 nm) as photobleaching of HP was observed by combine with protein and peptides.
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