Comparing contrast-enhanced breast imaging techniques for imaging variant breast diseases: A retrospective study

**PURPOSE:** To demonstrate the clinical utility and cost-effectiveness of contrast-enhanced breast imaging techniques, including contrast-enhanced mammography (CE-M), contrast-enhanced breast tomosynthesis (CE-TM), and contrast-enhanced MRI (CE-MRI), in the evaluation of patients with suspected breast lesions.

**METHODS:** A total of 100 patients with mammographic suspicious lesions were enrolled in the study. All patients underwent CE-M, CE-TM, and CE-MRI. The images were interpreted by two radiologists with a consensus reading process.

**RESULTS:** Benign lesions were accurately diagnosed in 80% of cases using CE-M, 85% using CE-TM, and 90% using CE-MRI. Malignant lesions were correctly identified in 95% of cases using CE-M, 97% using CE-TM, and 98% using CE-MRI. There was no significant difference in the diagnostic accuracy of the three techniques.

**CONCLUSION:** Contrast-enhanced breast imaging techniques are effective in the evaluation of breast lesions, with CE-MRI showing the highest accuracy. Further studies are needed to compare these techniques with other imaging modalities and to evaluate their cost-effectiveness.

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**Generalists versus Specialists: An Approach to Positive Cases with Screening Mammography**

**PURPOSE:** To evaluate the performance of generalists versus specialists in approaching positive cases with screening mammograms.

**METHODS:** From January 2010 to December 2012, 45,730 women had received screening mammograms at Chon-Inn Hospital or our mobile system. 4,891 women with BI-RADS Category 0, need additional image evaluation, were noted. Among them 2,580 returned to our center with radiologists who specialized in breast imaging for further studies. 1859 went to local hospitals for further work-up. Recheck rate is 90.8%. Differences between generalist and specialist performances at diagnostic outcomes were assessed for significance.

**RESULTS:** 37.2% of women with BI-RADS Category 0 screening mammograms, who returned to our center turned out to be BI-RADS Category 4, need tissue diagnosis versus 8.6% in generalists (P < 0.001). Cancer diagnostic rates were 5.3% for specialists and 1.7% for generalists (P = 0.008). DCIS represents 38.5% of all cancers found for specialists versus 21.4% for generalists (P = 0.318).

**CONCLUSION:** Specialists detect more cancer and DCIS, but recommend more biopsies than generalists.
Analysis of the Stereotactic Mammogram Core Needle Biopsy: Initial Experience in MMH

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PURPOSE: To evaluate and provide evidence for sampling of abnormalities in mammogram.

MATERIALS AND METHODS: 266 women were assigned to receive stereotactic Mammogram core biopsies using 14 French needles for mammographic BIRADS category 4 & 5 lesions including microcalcifications & mass over a 29-month period. 12 women were excluded due to breast too thin after compression or poor demonstration of microcalcifications. A total of 254 women underwent the procedure and 11 women have two foci of abnormalities in mammogram and received biopsy of two foci at the same time. Among 265 lesions, there are 255 microcalcifications and 10 hyperdense mass. Successful sampling of the lesion was determined by the detection of microcalcifications or hyperdensities on specimen radiography.

RESULTS: Among 265 lesions, microcalcifications were evident on specimen radiographs in 96.2% of the cases (100% of microcalcifications cases) and hyperdensities in 3.8% of the cases (100% of hyperdense masses), respectively. Patients with benign diagnosis underwent mammographic follow-up. Excisional biopsy was recommended for diagnosis of atypical ductal hyperplasia or carcinoma. Among 265 lesions, 213 benign, 6 atypical ductal hyperplasia and 46 carcinomas were diagnosed (10 invasive ductal carcinoma, and 36 ductal carcinoma in situ: solid, comedo, cribriform, microcystic). Surgical excision in 4 patients with atypical ductal hyperplasia on mammogram biopsy(2 refuse further surgical excision and lost follow up) showed 2 ductal carcinoma in situ and 2 fibrocystic change. Surgical excision in 28 patients diagnosed with ductal carcinoma in situ (8 refuse further operation and lost follow up) showed 25 intraductal carcinoma with no evidence of microinvasion, 2 intraductal carcinoma with focal invasion and 1 invasive ductal carcinoma. Surgical excision in 8 patients diagnosed with invasive ductal carcinoma (2 refuse mastectomy and lost follow up) showed ductal carcinoma in situ with focal microinvasion and invasive ductal carcinoma.

CONCLUSION: Mammogram core biopsy proved to be an accurate technique for the sampling, diagnosis, and early detection of breast cancer.

Changes of Biomarkers in Metastases of Breast Cancer

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PURPOSE: Investigate the changes of biological markers due to skeletal versus visceral metastases of breast cancer

MATERIALS AND METHODS: The breast cancer patients with mean age of 50.2 ± 11.6 years (28-75 years) from January 2003 to April 2013 were reviewed retrospectively; there were 63 female patients of metastatic breast cancer from whom the primary tumor and skeletal or visceral metastases were resected or biopsied for immunostaining. The interval of between the primary and the secondary histological results is 37.6 ± 26.3 months (1-101 months). The interested markers include ER, PR and HER2.

RESULTS: Total 14 patients had skeletal-only and 14 patients had visceral-only metastases, and the rest 35 patients had both. The changes in the positive/negative evaluation of ER, PR and HER2 were seen at the rate of 35.7% (5/14), 35.7% (5/14), and 7.1% (1/14) respectively in cases of skeletal-only metastases and at the rate of 14.3% (2/14), 7.1% (1/14), and 21.4% (3/14) respectively in cases of visceral-only metastases. The changes in the positive/negative evaluation of ER, PR were higher in skeletal-only metastases of breast cancer than visceral-only metastases, but not statistically significant (ER: p=0.190; PR: p=0.065).

CONCLUSION: The changes of ER and PR rate due to metastases and the rate was higher in skeletal-only metastases of breast cancer than visceral-only metastases. These findings are essential for predicting prognosis and making effective treatment decisions.
The Morphologic and Topographic Characters of Pulmonary Veins in Relation to Velocity of Propagation and Diastolic Abnormalities from Diastolic Dysfunction to Preserved Ejection Fraction Heart Failure: A Computed Tomography Study

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**BACKGROUND:** Diastolic dysfunction (DD), an assumed pathophysiologic intermediate between hypertension and heart failure (HF), has traditionally been evaluated by echocardiography. However, data regarding the transition from DD to preserved ejection fraction HF, an important clinical scenario, by assessing pulmonary vein morphological and topographical characteristics systematically, determining the following structures step by step, has been lacking.

**MATERIALS AND METHODS:** We studies totally 124 subjects with conventional echo done and 64-slice CT performed. Of all, only 119 had data analyzable for both echo and CT methods. Sequential pulmonary veins orifice diameter and area from all four veins, both max and minimal value, during consecutive 1 R-R heart cycle were analyzed equally into 6 parts. Echo-derived left atrial and ventricular volume, high-frame rate tissue Doppler imaging (TDI), velocity of propagation (VP), estimated LV filling pressure (PCWP by E/E') and some other diastolic indices were all obtained.

**RESULTS:** Of all 119 subjects (43 non-DD, 44 DD, and 32 HFPEF) entered for our final study (age: 59.3 ± 11.2, 37% female), we observed a graded enlargement, both max and minimum value, for all 4 pulmonary vein orifices across these three groups (all trend p < 0.05). In addition, linear relationship was observed between all 4 PV orifices area and echo-derived PCWP and VP (all p < 0.05) value, with both left superior and inferior PV maximum area further related to serum BNP level (both p < 0.05). When left superior and inferior PV maximum area were superimposed on LV mass index, PCWP and LA volume, there were significant increase in the HFPEF prediction model chi value using likelihood ratio test (both p < 0.05).

**CONCLUSION:** PV size estimates using computed tomography rendered detailed assessment of structural and functional characters feasible, and further help in disease status discrimination in subjects with impaired diastology and those who progressed into heart failure with preserved global pumping. Our data suggested that CT-based PV measure may help identify subjects at risk for more early stage heart failure.

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系統性地利用 MDCT 以"Van Praagh 命名法"分析複雜之先天性心臟病

Comprehensive Evaluation of Complex Congenital Heart Disease Using the Van Praagh Notation: Step by Step in MDCT

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**PURPOSE:** In this pictorial essay, we illustrate how to approach the complex congenital heart disease sequentially and systematically, determining the following structures step by step: (1) viscerocardial situs orientation (2) ventricular loop orientation and (3) abnormalities in the origin of great vessels or conotruncal anomalies.

**MATERIALS AND METHODS:** We retrospectively collect cases of complex congenital heart diseases diagnosed in our hospital from 2005 to 2013. After reviewing their images, we demonstrate the typical image features of each condition described in the Van Praagh notation system.

**RESULTS:** We find 32 cases of complex congenital heart disease from our image report database and approach these cases by using the Van Praagh notation system, with each letter representative for orientation of the atria, ventricles and great vessels. For the viscerocardial situs orientation, we present cases of situs solitus, situs inversus and situs ambiguous. For the ventricular loop orientation, cases of D-type and L-type ventricular loop are shown. For the relation and anomaly of great vessels origin, we demonstrate cases of D-type and L-type great vessel transposition, malposition with double outlet right ventricle and Tetrology of Fallot.

**CONCLUSION:** The Van Praagh notation, as a step-by-step approach to complex congenital heart disease, is a clear-cut and concise expression system for communication and discussion between the medical colleagues.
Low-tube-voltage (80 kVp) 320-row CT angiography using 40 mL of nonionic contrast medium for follow-up after abdominal aortic endovascular aneurysm repair: Endoleak Detection and Characterization—Preliminary Results

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Purpose: To determine the detection and characterization of endoleaks following abdominal endovascular aneurysm repair (EVAR) with CT angiography (CTA) using a low volume of contrast medium.

Methods and Materials: Between June 2011 and August 2013, 130 patients (21 women, 109 men; mean age 74 ± 9 [standard deviation] years) underwent CTA with a 320-row CT for follow-up of EVAR. All patients underwent 80 kVp CTA with 40 mL of nonionic contrast medium and 40 mL of saline chaser at an injection rate of 3 mL/s. Arterial phase acquisitions commenced after bolus tracking with a trigger threshold of 120 HU at the abdominal aorta. Two experienced, blinded observers evaluated all images in consensus. In comparison with standard-tube-voltage (120 kVp) CTA, the low-tube-voltage (80 kVp) CTA were reviewed for aneurysm sac size, presence and type of endoleak and contrast-to-noise ratio of endoleak.

Results: A total of 51 (39.2%) endoleaks were detected (type I, n=10; type II, n=41). In 18 (13.8%) patients, the aneurysm sac showed size increase due to persistent endoleak (type I, n=5; type II, n=13). Fifteen (11.5%) patients underwent further interventional procedure for the persistent endoleak (type I, n=4; type II, n=11). The mean aneurysm sac size increase was 4 ± 2 mm.

Conclusion: Preliminary results show that CTA with 40 mL of nonionic contrast medium is adequate for the detection and characterization of endoleaks following EVAR.

Myocardial Viability in Patients Following Coronary Artery Bypass Graft Surgery (CABG): Comparison of Late Gadolinium Enhanced Cardiac Magnetic Resonance Imaging (LGE-CMR) and ²⁰¹Thallium Single Photon Emission Computed Tomography (TI201-SPECT)

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Purpose: We sought to compare late gadolinium enhanced cardiac magnetic resonance imaging (LGE-CMR) with ²⁰¹Thallium single photon emission computed tomography (TI201-SPECT) for the assessment of myocardial viability in patients following coronary artery bypass graft surgery (CABG).

Material and Methods: Twelve patients with prior CABG underwent LGE-CMR and TI201-SPECT studies. The area of hyperenhancement on LGE-MRI was defined as scar tissue. The region with reduced perfusion on TI201-SPECT was defined as nonviable myocardium. In a 16-segment model, the segmental extent of hyperenhancement was compared with segmental TI201-SPECT perfusion defect.

Result: A total of 192 segments were studied. Overall, there was a strong correlation between the area of hyperenhancement on MRI and diminished thallium-201 uptake on SPECT (r=0.25, P=0.0004). There was a significant correlation between the imaging methods for middle (r=0.24, P=0.04) and apical (r=0.46, P=0.001) segments, but not for the basal segment (r=0.13, P=0.26).

Conclusion: LGE-CMR hyperenhancement as a marker of myocardial scar closely agrees with TI201-SPECT. LGE-CMR and TI201-SPECT have their own predominance and limitation in assessment of myocardial viability and detecting irreversibly injured tissue in patients following CABG.
Introduction: Prosthetic valve obstruction (PVO) is an important complication of artificial valves. Pannus formation is one of the cause of prosthetic valve obstruction and it should be differentiated from thrombus which is amenable to thrombolysis.

Case Report: A 56-year-old woman with a distant-history mechanical CarboMedics 19# aortic valve replacement and CarboMedics 27# mitral valve replacement, presented with cough, blood-tinged sputum, and mild dyspnea for two months. She was admitted for suspected heart failure. There was unremarkable finding in coronary angiography. Transthoracic echocardiogram revealed an increased gradient (Ao max PG 100.1 mmHg) across the aortic valve, suggestive of prosthetic valve dysfunction. Cardiac MDCT showed a low-density crescent shaped soft tissue mass on the ventricular side of the prosthetic aortic valve along the suture line. Based on the clinical and MDCT information, the likely diagnosis was thought to be pannus.

Discussion: PVO as a result of pannus formation is an infrequent but serious complication. Operative management is the preferred treatment for pannus. The ability to differentiate between pannus and thrombus pre-operatively is helpful in deciding the treatment goals. Literature review revealed low pannus detection rate of TEE and MDCT should be considered in situations of inconclusive echocardiography. Our case demonstrates MDCT is a useful imaging modality to diagnose dysfunctional prosthetic valves result from pannus based on the morphological aspects and localization.
Churg-Strauss 症候群之心臟磁振造影：病例報告
Cardiac Magnetic Resonance Imaging of Churg-Strauss Syndrome: A Case Report

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INTRODUCTION: Churg-Strauss syndrome (CSS) is a rare form of systemic vasculitis with risk of cardiac involvement. Currently there is no standard tool for early detecting the cardiac involvement. Here we present a CSS patient diagnosed and follow up with cardiovascular magnetic resonance (CMR).

CASE REPORT: A 37-year-old male who was diagnosed as CSS clinically.

DISCUSSION: The CMR study was performed in a 3-T MR system (Skyra, Siemens). Cine steady-state frequency precession (SSFP) was performed in standard cardiac views (2, 3 and 4 chamber views) with quantitative assessment of cardiac function. Late gadolinium enhancement (LGE) CMR was performed 7-10 minutes following intravenous injection of 0.15 mmol/Kg of gadolinium with magnitude and phase-sensitive inversion recovery techniques. Point-solved spatially localized spectroscopy (PRESS) MR spectroscopy study was carried out with a 2 × 1 × 1 cm3 spectroscopic volume located in interventricular septum during systolic phase (50 ms after R wave on ECG). The myocardial lipid content was normalised with water signal (L/W ratio). Initial CMR showed moderately impaired systolic left ventricle (LV) function, hypokinectic infralateral wall of LV, late enhancement of subendocardial LGE in LV, which confirming the cardiac involvement of CSS. The patient received treatment with corticosteroid and cyclophosphamide for six months. The follow up CMR revealed persistent cardiac lesions with a 60% reduction of L/W ratio. CMR could monitor disease course of CSS and provide guidance to treatment.

PURPOSE: Analyze the relationship among epidermal growth factor receptor (EGFR) mutational status, 18F-FDG uptake on PET and CT imaging feature in pulmonary adenocarcinoma, and to evaluate whether these factors can help predict the EGFR mutation.

MATERIALS AND METHODS: We reviewed retrospectively pulmonary adenocarcinoma patients who underwent EGFR mutation testing, pretreatment FDG PET/CT, and serum CEA analysis. The association between EGFR mutations and patient characteristics, maximal standard uptake value (SUVmax) of primary tumors, serum CEA, and CT imaging features was analyzed. A ROC curve was used to determine the optimal cutoff value of SUVmax.

RESULTS: Among 132 study patients, EGFR mutations were identified in 69 patients (52.2%). The cutoff value of SUVmax was 6. Patients with SUVmax ≥ 6 (P=0.002) and CEA ≥ 5 (P=0.013) were more likely to have EGFR mutations. CT characteristics of larger tumor size (≥ 3 cm) (P=0.023) and nonspiculated margin (P=0.026) were also associated with EGFR mutations. Multivariate analysis showed that higher SUVmax and CEA levels, never smoking, and nonspiculated tumor margin were the most significant predictors of EGFR mutation. The combined use of three or four of the four criteria yielded a specificity of 84.1-93.7%.

CONCLUSION: Higher pretreatment SUVmax and serum CEA levels, never smoker, and nonspiculated tumor margin were independent predicting factors of EGFR mutation. The combined use of these parameters may be helpful in discriminating mutational status, especially when the genetic test is not available or tumor tissue is insufficient for genetic analysis.
Non-contrast Enhanced Computed Tomography for Lung Malignancy Survey of Cardiovascular Patients before Cardiovascular Surgery

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PURPOSE: To evaluate the significance of non-contrast enhanced computed tomography (CT) of chest for the cardiovascular patient before they undergo cardiovascular surgery.

MATERIAL AND METHODS: A retrospective review of non-contrast enhanced chest CT findings of consecutive 92 patients (63 men and 29 women) with cardiovascular diseases was performed before cardiovascular surgery in our hospital from June to November, 2013. The CT findings in lungs were categorized into three groups: (1) nodular finding including malignancy, (2) non-nodular benign finding, and (3) negative finding.

RESULTS: The numbers of patients with the significant CT findings are (1) lung nodules including malignancy, n=16 (median age 60, age range 47-80), (2) non-nodular benign finding, n=41 (median age 64, age range 35-83), and (3) negative finding, n=35 (median age 57, age range 14-81). During the cardiovascular surgery, wedge resection of the lung lesions were done in only 3 patients of the first group. They were pathologically proved a benign nodule and two squamous cell carcinomas. The incidence rate of lung malignancy was at least 2.17% in this study.

CONCLUSION: The minimal incidence rate of lung malignancy was 2.17% in this study. However, only 3 of the 16 cases with nodular findings had pathology proofs, thus the incidence rate of lung malignancy may be underestimated. Therefore, a non-contrast enhanced CT of chest is important before patients undergo cardiovascular surgery.
Association of Primary Lung Cancer with Primary Malignancies of Other Organs: The Role of Medical Imaging

**PURPOSE:** To assess the incidence of primary malignancies of other organs occurring to the patients with primary lung cancer and the role medical imaging on this issue.

**MATERIALS AND METHODS:** All patients who were consecutively diagnosed primary lung cancers from Jan, 2009 to Sep, 2013 were retrospectively reviewed and their medical images were analyzed regarding the occurrence of metachronous and synchronous primary malignancies of other organs.

**RESULTS:** Of totally 801 patients reviewed, 40(5%) had 44 (N) associated primary malignancies of other organs. The primary malignancies of other organs were breast cancer (n=6, 13.6%), hepatocellular carcinoma (n=6, 13.6%), colorectal cancer (n=6, 13.6%), prostate cancer (n=5, 11.4%), gastric cancer (n=4, 9.0%), oral cancer (n=2, 4.5%) and other different cancers (n=15, 34.1%). Twelve patients had synchronous cancers of other organs and 28 patients had metachronous cancers of other organs. Eleven synchronous second primary cancers were detected or evaluated with medical imaging modalities, including CT, MRI and mammography during staging and follow-up examinations of lung cancers. Each of five patients got malignancies of 3 different organs including lung cancer.

**CONCLUSION:** Multiple primary malignancies of other organs in patients with lung cancers are not rare. Radiologists and clinicians should be aware of the possibility of synchronous primary malignancies of other organs in lung cancer patients. Proper medical imaging modalities are helpful in their detection and simultaneous tumor staging together with lung cancer.
罕見支氣管內纖維脂肪瘤：病例報告與文獻回顧

An Unusual Endobronchial Fibrolipoma with Obstructive Pneumonia: A Case Report and Literature Review

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INTRODUCTION: This case report on an endobronchial fibrolipoma includes a short summary of this rare benign lung tumor.

CASE REPORT: A 61-year-old male complained of cough for one week. CXR showed focal soft tissue opacity in the left suprahilar region, malignancy is highly suspicious. Chest CT scans showed a lobulated and inhomogeneous with fat content endobronchial nodule nearly obstructing the left upper lobe bronchus. For diagnostic purposes the patient underwent a bronchoscopic biopsy, flexible and rigid Bronchoscopy showed firm, elastic and movable mass occupying the orifice of left upper lobe bronchus. A pathologic specimen show most fibrotic change and is inadequate for diagnosis. Thoracotomy was performed and at bronchotomy, a nodule of 2 cm in size was found occluding the orifice of left upper lobe bronchus. The tumor was resected concurrently with part of the bronchus. The postoperative course was uncomplicated. The patient was discharged on day 12 and was in stable condition at about 1-year follow-up. Pathological examination showed polypoid tumor composed of dense fibrous stroma intermixed with scattered adipocytes and lined with respiratory epithelium and the tumor was diagnosed as an endobronchial fibrolipoma.

DISCUSSION: Most tumors of the tracheobronchial tree are malignant. Benign pulmonary tumors are rare entities. The symptomatology and radiographic features of these tumors are often indistinguishable from those of malignant lung tumors. Of note, the CT scan findings of bronchus inhomogenous mass with fat density can remind us about the diagnosis of hamartoma, liposarcoma and fibrolipoma.

罕見支氣管內纖維脂肪瘤：病例報告與文獻回顧

T-cell Lymphoma with Lung Involvement Presenting as Diffuse Nodular Lesions with Air-bronchogram: Three Cases Report

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INTRODUCTION: To describe the pulmonary manifestation of T-cell lymphoma on computed tomography as bilateral diffuse nodular lesions with air-bronchogram and review existing articles for obtaining proper diagnostic clues.

CASE REPORT: We retrospectively analyze the CT images of three patients with clinically diagnosed T-cell lymphoma. They are from 34 to 52-year-old, one female and two male respectively. Chest radiography and thoracic CT scan are obtained while hospitalization. Among CT scan of the chest in the three patients, two of them reveal bilateral diffuse nodular lesions in lung parenchyma and one display diffuse ground-glass nodules and conglomerated nodular consolidations in bilateral lung. Evidence of intra-nodular air-bronchogram is seen in all the three cases. T-cell lymphoma is diagnosed during hospitalization.

CONCLUSION: Variable manifestation of T-cell lymphoma in the thoracic CT has been demonstrated, including ground-glass opacity, centrilobular nodules, lymphadenopathy, interlobular septal thickening, pleural effusion, nodules or consolidation. The radiological appearance of chest may be confused with other pulmonary problems, resulting in a delayed or missed diagnosis. Therefore, awareness of this kind of imaging appearance as diffuse nodular lesions with air-bronchogram in HRCT of chest can offer clinicians proper diagnostic clues and correct therapeutic strategy.
Extrathoracic Extramedullary Haematopoiesis in Paraspinal, Presacral Region and Mesenterium: A Case Report

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INTRODUCTION: Extramedullary hematopoiesis is response to failure to achieve normal erythropoiesis in bone marrow. It usually occurs in hematological disorders, myeloproliferative disorders, or bone marrow infiltrated by nonhematopoietic cells. We reported an extremely rare case of 70-year-old male patient with extrathoracic extramedullary hematopoiesis occurred in paraspinal, presacral and mesenteric region concurrently.

CASE REPORT: The 70-year-old male patient presented to the emergency room with complaint of high body temperature and cloudy urine for 4 days at home. The patient had fever (38.2 degrees Celsius) and tachycardia (170 per minute). Laboratory examination revealed microcytic anemia (Hemoglobin: 8.3g/dL, MCV: 54.8fL, Serum Iron: 9ug/dL, TIBC: 129ug/dL), leukocytosis (WBC: 19800/uL) with left shifting (Seg: 81%), and elevated CRP level (23.83mg/dL). Blood culture yielded Gram positive cocci in clusters. Due to suspicious for intra-abdominal infection, whole abdominal CT scan was performed and showed several heterogeneous enhancing mass lesions in the para-spinal, pre-sacral and mesenteric region. Under the impression of leiomyosarcoma or rhabdomyosarcoma, CT guided biopsy was performed. Bone marrow cells were found in the specimen, indicating extrathoracic extramedullary hematopoiesis.

DISCUSSION: The common location of extramedullary hematopoiesis is spleen and liver. The less common location is in the thoracic region, included mediastinum, pleura, lung, breast. Extrathoracic extramedullary hematopoiesis is rare and usually asymptomatic; several cases of hematopoiesis in gastrointestinal tract, skin, brain, kidneys, and adrenal glands had been reported. To our knowledge, this is the first patient who concurrently has three rare locations of extrathoracic extramedullary hematopoiesis.
Liver Metastases of Hepatoid Adenocarcinoma of the Somach: CT Findings

Purpose: To evaluate the CT findings in patients with hepatoid adenocarcinoma of the stomach (HAS) with liver metastases.

Materials and Methods: From 2004 to 2013, 5 patients (4 men and 1 woman) with histologically proven HAS with liver metastases were retrospectively evaluated. Basic clinicopathological features of the HAS patients were collected. Pre- and post-treatment dynamic CT scans were evaluated for the primary HAS (size, necrosis, enhancement, and adjacent organ invasion) and the liver metastases of HAS (tumor number, location, necrosis, hemorrhage, tumor thrombosis, and enhancing pattern).

Results: Patients with HAS showed large size, necrosis, eccentric wall thickening and heterogeneous enhancement. Gastric outlet obstruction (n = 2) and adjacent organ invasion (n = 2) were also noted. All patients showed elevated AFP level and positive AFP staining. On the dynamic CT, the liver metastases of HAS showed similar enhancing pattern as HCC, with tendency of vascular permeation. We found early tumor necrosis, tendency of tumor hemorrhage and sentinel portal vein tumor thrombus prior to liver metastases could be useful hints for diagnosis of HAS in patient with uncertain gastric mass on CT.

Conclusion: HAS share some clinical and imaging characteristics with the advanced gastric cancer and the HCC. Be familiar such characteristics can help diagnosis of HAS and conduct appropriate tumor management.

Non-invasive Evaluation of Liver Fibrosis: the Diagnostic Performance of MR Elastography in Patients with Viral Hepatitis B and C

Purpose: The purpose of our study was to compare the diagnostic performance of MRE with the routinely available AST to platelet ratio index (APRI) test for predicting hepatic fibrosis.

Materials and Methods: Total 145 patients underwent both MRE and histopathological confirmation within a 3-month interval. MRE was performed using standard MRE sequence on a 1.5 Tesla clinical scanner. The liver stiffness (LS) was measured on automatically generated stiffness maps. Correlations between MRE, APRI, and histologic fibrosis stages were evaluated. Receiver operating curve (ROC) analysis of MRE and APRI for differentiating fibrosis (≥ F1), significant fibrosis (≥ F2), advanced fibrosis (≥ F3), and cirrhosis (F4) was performed.

Results: In our study, we found significant positive correlations between stiffness values measured by MRE and the METAVIR fibrosis score, also the APRI. The positive correlation coefficient is much higher in the stiffness values measured by MRE (p=0.751) than in APRI (p=0.53). The stiffness values measured by MRE in our studies enabled us to clearly separate the significant fibrosis stages (≥ F2) from normal or mild fibrosis (F0-F1) with the sensitivity of 90.8% and specificity of 93.6%, a cutoff value of 3.02kPa. Our study also compared the stiffness values among patient groups of hepatitis B and hepatitis C, which showed no significant differences.

Conclusion: In conclusion, MRE may be a promising, non-invasive method with excellent diagnostic performance in prediction of liver fibrosis. Hepatitis B or hepatitis C will not affect the elasticity measurement by MRE.
Biodistribution and Estimated Radiation Dosimetry Studies after Intra-arterial Administration of 188Re-MN-16ET/lipiodol and 90Y-microspheres in N1S1 Hepatoma-bearing Rat Model

目的: 估算放射线能量在188Re-MN-16ET/lipiodol和90Y-microspheres在N1S1肝癌瘤带标志鼠模型的生物分布。

材料和方法: N1S1肿瘤瘤带标志鼠模型被用于执行生物分布以及微SPECT成像在188Re-MN-16ET/lipiodol以及放射线剂量估计的计算。计算每个器官内放射线在成人在OLINDA | EXM（Organ Level IInternal Dose Assessment | Exponential Modeling）中的放射线辐射剂量。这些结果是通过在不同器官内注射111In-microspheres，一个90Y-microspheres的生物分布来计算的。

结果: 肝动脉注射188Re-MN-16ET/lipiodol进入肝癌瘤带标志鼠肿瘤内累积放射性活性在各种器官内。大多数188Re-MN-16ET/lipiodol在肝脏肿瘤内累积了放射性（肿瘤放射线活性在1、4、24小时为8.58±3.48% ID/g, 10.41±2.57% ID/g, 10.4172±1.45% ID/g和9.40±5.69% ID/g）。MicroSPECT结果和生物分布在48小时内是恒定的，大多数的放射性在注射后在所有器官内被累积。放射线的活动在111In-microspheres是相似于188Re-MN-16ET/lipiodol（肿瘤放射线活性在24和48小时内为10.84±2.82% ID/g和11.96±3.07% ID/g）。生物分布数据188Re-MN-16ET/lipiodol和90Y-SIR-Spheres在鼠模型中被转换到放射线辐射剂量以每种器官内的放射线活力为OLINDA | EXM。that estimated equivalent dose to the liver by hepatic arterial injection of yttrium-90 SIR-Sphere R and 188Re-MN-16ET/lipiodol were 5.13 mSv/MBq and 1.14 mSv/MBq respectively, while the absorbed dose of 300m liver tumors were 17.2 mGy/MBq and 3.65 mGy/MBq respectively.

结论: 188Re-MN-16ET/lipiodol as yttrium-90 SIR-Spheres in general, has the potential to be applied to the clinical treatment of liver tumors.

肝臓動態磁振造影画像半定量と定量パラメーターの比較

Dynamic Contrast-enhanced Magnetic Resonance Imaging of Liver with Gadoxetic Acid: Comparison between Semi-Quantitative and Quantitative Parameters

目的: 通过研究半定量和定量参数在脂酸酸的动态对比增强磁共振成像（DCE-MRI）中的相关性来理解半定量和定量参数在脂酸酸的动态对比增强磁共振成像（DCE-MRI）中的相关性。DCE-MRI包括: (1) 半定量参数: 峰值、斜率和AUC（面积下曲线）; (2) 定量参数由一个输入-单个- compartments模型: 绝对动脉血流量，绝对门静脉血液流量，绝对肝脏血液流量，动脉流率（ART），分布体积，以及平均转运时间。半定量和定量参数之间的相关性是通过Pearson’s correlation tests分析的。结果: 在两个健康和肝炎患者中，Peak值有高度正相关与门静脉血流量（r=0.40, P=0.048），但只有弱正相关与肝硬化的肝炎患者（r=0.252, P=0.063）。Slope和AUC没有与所有定量参数的相关性。结论: 半定量参数Peak代表肝血流量和分布体积的对照剂在肝中存在，并可能用于估计肝功能。
Short-term Effect of Image-guide Percutaneous Radiofrequency Ablation for Liver Metastases

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PURPOSE: Percutaneous radiofrequency ablation (RFA) is widely used in treatment of liver neoplasms, but limited study discusses about the effect on liver metastases.

MATERIALS AND METHODS: 36 patients (26 men and 16 women) with 75 liver metastases (mean long axis 3.5 cm) underwent image-guided RFA sessions from October, 2008 to December, 2012. The efficacy of RFA was evaluated using contrast-enhanced dynamic computed tomography immediately after RFA sessions and 2~3 months after treatment. Complete necrosis was defined as lack of contrast enhancement of the treated region.

RESULTS: Complete necrosis was noted in 50 lesions. Local tumor recurrence was noted in some lesion with enhancing tumor lesion noticed during follow up image study.

CONCLUSION: The short-term effect of percutaneous RFA for liver metastases appears increase in local tumor recurrence.

Alpha-fetoprotein Secreting Hepatoid Adenocarcinoma of the Stomach with Liver Metastasis: A Case Report

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INTRODUCTION: Alpha-fetoprotein secreting hepatoid adenocarcinoma of the stomach is a rare distinct variant of gastric cancer with both adenocarcinomatous and hepatocellular differentiations.

CASE REPORT: A 68 years old male complained of abdominal dull pain for 3 days. He also complained of general weakness in recent days. He denied fever, nausea/vomiting, bowel habit change, body weight loss, dyspnea, or cough. PE revealed RUQ tenderness without rebound pain. There is no jaundice. There is no history of HBV or HCV infection. The tumor marker showed AFP 331400ng/ml. Abdominal ultrasonographic examination revealed multiple mixed echogenic tumors in liver. CT examination revealed multiple hypervascular tumors in liver with rapid washout out of contrast medium. Irregular thickening of wall with mild enhancement is noted in gastric cardia. Endoscopic examination revealed an ulcerative tumor about 5cm over high body, posterior wall, near cardia. Echo-guided liver biopsy revealed poorly differentiated carcinoma, compatible with metastatic hepatoid adenocarcinoma from gastric cancer. Endoscopic biopsy revealed poorly differentiated carcinoma with alpha-fetoprotein production. TACE was performed to both hepatic lobes with DC beads loaded with 100mg Irioctanes. The patient developed mild fever and epigastric pain after TACE. CT performed 7days later revealed post-embolization changes and S4, S5, S6 tumor necrosis. AFP dropped to 88029 ng/ml. Systemic chemotherapy was given. The disease deteriorated progressively. The patient remains alive for 11 months after initial treatment.

DISCUSSION: The typical HCC enhancement pattern and multiple tumors is suggestive of hepatoid carcinoma of stomach with live metastasis. Careful search in stomach for primary tumor is mandatory.
Introduction: ALL with extramedullary involvement was not unusual. In our case, a primary presentation of ALL with hepatic accumulation of lymphoblasts mimicking a solid tumor was rarely seen. Imaging modalities including CT and MRI could not identify the nature of the contrast-enhanced mass or differentiate it from other focal hepatic neoplasm. Liver biopsy was necessary for a definitive diagnosis.

Case Report: A 19-year-old man presented with a 1-week history of intermittent fever, right upper quadrant abdominal dull pain, general malaise, and decreased appetite. Physical examination showed no localized or diffuse tenderness but prominent hepatomegaly and splenomegaly. Laboratory investigations disclosed a white blood cell count of 25,900/mm³ with 25.8% neutrophils, 37.1% lymphocytes, and 29.9% immature cells, a hemoglobin of 12.7 ng/dL, and a platelet count of 25,000/mm³. Abdominal ultrasonography detected a well-defined echogenic mass (81 × 62 mm) that occupied the sixth and seventh hepatic segments. Computed tomography (CT) scan revealed that the hepatic mass had low attenuation on the non-enhanced phase, inhomogeneous increased attenuation on the arterial phase, gradually fading attenuation on the portal venous phase, and isoattenuation on the delayed phase. Magnetic resonance imaging (MRI) revealed a faint hypointensity on a T1-weighted image and faint hyperintensity on a T2-weighted image. After gadolinium injection, the hepatic mass revealed a hyperintense enhancement on the arterial phase and regression to isointensity on the delayed phase, which was compatible with the manifestation of the dynamic CT scan. Precursor B-cell acute lymphoblastic leukemia with hepatic involvement.

Discussion: ALL was a clonal hematologic neoplasm of lymphoid origin. Proliferation and accumulation of lymphoblasts in the bone marrow resulted in suppression of hematopoiesis. ALL with extramedullary involvement was not unusual. Previous studies that suggested hepatic involvement of ALL demonstrated a cholestatic picture with obstructive jaundice clinically and a diffuse leukemic infiltration with hepatomegaly radiographically. The clinical features were nonspecific and generally reflected the degree of marrow failure. Fever was a common constitutional manifestation of the patients.

Purpose: Unilateral absent a kidney is usually noted incidentally by imaging. Some of them may accompany with other occult congenital abnormalities. Our goal is to retrospective review the possible causes and imaging manifestations of unilateral absent kidney related disorders.

Materials and Methods: A retrospective review was performed for cases of unilateral absent kidney by imaging in our hospital during the last 5 years. Cases with known history of nephrectomy were excluded. These cases were sorted out by the automatic keyword searching system from the reporting database in our hospital. We collected the clinical data and radiological manifestations of the patients.

Results: During the study period, 14 patients revealed unilateral absent kidney with various related diseases: an isolated renal agenesis (n = 2), dysplastic kidney (n = 4), Müllerian duct anomalies (n = 7), and crossed fused renal ectopia (n = 1). Among Müllerian duct anomalies, four cases are Herlyn-Werner-Wunderlich syndrome and MR imaging depicted most diagnostic information and helped the gynecologist determine appropriate therapy.

Conclusion: Based on our experience, multiple abnormalities were found in case with unilateral absent kidney. Awareness of the entire disease spectrum may enhance the patient care.
Experience of CT-guided Percutaneous Cryoablation for Renal Tumor

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PURPOSE: To share experience about the technique, safety and treatment response of CT-guided percutaneous cryoablation for renal tumor.

MATERIALS AND METHODS: A retrospective evaluation of 30 patients (32 tumors) receiving cryoablation. We emphasized on tumor morphology, technique successful rate, tumor control rate, renal function change and complications.

RESULTS: The mean follow-up period was 15.1 months (0.2-47.5 months). The mean age of patient was 73.7-year-old (34-89-year-old). The mean size of tumors was 31 mm (14-49 mm). There were thirty RCCs and 2 angiomylipomas. Technique successes were achieved in all patients. There were 2 grades III, 5 grade II and 1 grade I complications (Clavien-Dindo classification). The mean decrease of hemoglobin was 0.77 g/dL (+1.1 to -3 g/dL) and 3 patients received blood transfusion (all pRBC 2 unit). The mean hospitalization day was 2.2 days (1-10 days). Incomplete ablation (viable tumor on imaging follow up within 6 months) was noted in 3 patients, and 2 of them received repeat cryoablation and achieved successful local control. Tumor recurrence (viable tumor on imaging follow up after 6 months) was noted in 2 patients. Total 27 patients achieved successful local control (90%). The percentage change of clearance of creatinine at least 3 months after procedure was -1.02% (+24.07 to -47.11%).

CONCLUSION: CT-guided percutaneous cryoablation of renal tumor is an effective technique for patients who deny or are contraindicated to surgery. It provides acceptable complication rate and severity.

MRI Findings of Benign Intratesticular Epidermoid Cyst: A Case Report

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INTRODUCTION: Intratesticular mass is mostly malignant, and recognition the imaging features of some rare benign mass is also important. Here we present a case about a young male patient with a rare intratesticular epidermoid cyst.

CASE REPORT: A 22-year-old male patient without significant past history found a hard nodule in his right testicle for several days. Scrotum sonography showed a right 2.3cm x 4.6cm testicular mass with heterogeneous echogenicity. The serum α-fetoprotein and β-hCG level were within normal range. MR images showed a well-defined mass lesion in right testis with heterogeneous signal intensity on both T1WI and T2WI. No prominent enhancement was observed after contrast medium administration. Under the impression of nonseminoma of germ cell tumor, the patient then received right radical orchidectomy. The pathologic report demonstrated a benign epidermoid cyst.

DISCUSSION: Although most intratesticular masses are malignant, epidermoid cyst is one of the rare benign intratesticular masses. The histologic source is still controversial. To our knowledge, there is no consensus about the MRI findings of intratesticular epidermoid cyst; it is probably resulting from small number of cases. According to some case reports, no patients who undergone organ-preserving surgery has had recurrence. Recognition for the imaging features and differences from other malignant intratesticular masses may help avoiding the unnecessary radical orchietomy.
69-year-old female with Ureteral Sarcomatoid Carcinoma: A Case Report

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INTRODUCTION: Sarcomatoid carcinoma involving urinary bladder is well-known. However, its role in ureteral primary neoplasm is seldom well-known. The diagnosis is mainly based on CT and histology pattern of their histogenesis and the characteristics differentiating from carcinosarcoma.

CASE REPORT: A case of huge sarcomatoid carcinoma who presented with hematuria and insidious onset right flank pain. The diagnosis is based on CT and pathology findings. Urine cytology presented with urothelial carcinoma. CT revealed marked right hydronephrosis and a huge pelvic retroperitoneal tumor, upto 17*17*16 cm in size. Debulking surgery was performed. Histologically, sections of the pelvic tumor origin from ureter show epithelioid or spindle discohesive mesenchymal cells with hyperchromatic and pleomorphic nuclei, mixed with tumor giant cells and atypical mitotic figures. The result of immunohistochemical stain of epithelial tumor cells show positive staining for CK (AE1/AE3), CK7 (strong membranous staining) and weak membranous staining for CK20 in only patchy distribution. Combining the morphology and immunohistochemical results, a sarcomatoid carcinoma is considered.

DISCUSSION: The recent World Health Organization classification has applied the term of “sarcomatoid carcinoma” to all tumors showing morphologic and/or immunologic evidence of both malignant epithelial and mesenchymal differentiation. Such tumors have been postulated to represent either multiclonal collision tumors or monoclonal cancers with divergent differentiation. Sarcomatoid carcinoma seems to represent one of the common pathway of urothelial carcinoma differentiation.

Impact of Intravenous Gadolinium Administration to Improve Diagnostic Accuracy of Magnetic Resonance Imaging for Uterine Leiomyosarcoma

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PURPOSE: The aim of this study was to assess the impact of gadolinium-based contrast agent administration on the diagnostic accuracy of pre-operative magnetic resonance imaging (MRI) for patients with rapid-growing uterine mesenchymal tumors.

MATERIALS AND METHODS: Institutional Review Board approval and informed consents were obtained. From 2006-2012, 37 female patients with rapid-growing uterine tumors were enrolled for preoperative evaluation in a 3-T MRI unit, with final histopathologic diagnosis as leiomyosarcoma (LMS, n=5) or leiomyoma (n=32). Two radiologists retrospectively reviewed MRI images from these 37 patients, including T1- and T2-weighted images, dynamic contrast enhancement, and diffusion-weighted images (DWI, b=0, 1000 s/mm²). Statistical methods included kappa statistics for reader agreement, accuracy assessment and McNemar’s test for diagnostic performance comparison of the different MR methods for distinguishing LMS from benign leiomyoma. Surgical pathologic findings were used as the reference standard.

RESULTS: Reader agreement was excellent for all MR parameters. A central non-enhancing area (CNE) on dynamic contrast enhancement images was identified as a MR characteristic for LMS, with a sensitivity of 1.00, a specificity of 0.97 and overall accuracy of 0.97, significantly higher than those of T2-weighted imaging or DWI alone. Apparent diffusion coefficient values of LMS were not significantly different from those of benign leiomyoma (median 1.08 vs. 1.14x10^-3 mm²/s, P=0.97).

CONCLUSION: The presence of CNEs in contrast-enhanced MR has greater accuracy compared with DWI for preoperative diagnosis of uterine LMS. Administration of gadolinium-based contrast agent should be warranted in patients with rapid-growing uterine tumors.
利用血管攝影評估肝癌栓塞治療後肝動脈血管受損情形
Angiographic Evaluation of Hepatic Arterial Damage after Transarterial Chemoembolization for Hepatocellular Carcinoma: Comparison of Different Embolization Endpoints

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PURPOSE: To evaluate the predictive factor between different embolization endpoints and the degree of hepatic arterial damage (HAD) after first time of transarterial chemoembolization (TACE) for unresectable hepatocellular carcinoma (HCC).

MATERIALS AND METHODS: In this retrospective study, during 2008 Nov to 2011 Jun, 84 patients (56 males, 28 females) with unresectable HCC underwent first time of TACE treatment using a mixture of Lipiodol and doxorubicin, then followed by gelatin sponge. The endpoints of TACE were divided into 3 groups. Group A. segmental artery stasis; Group B subsegmental artery stasis; Group C, without arterial stasis. The follow up angiographies using a three-grade scale (grade1, no or slight wall irregularity; grade 2, overt stenosis; grade 3, occlusion) were reviewed to evaluate HAD. Grades 2 and 3 were considered to indicate significant HAD. The predictors of HAD were analyzed with SPSS v20.0 software.

RESULTS: A total of 84 patient underwent TACE with segmental artery stasis (Group A, n=25), subsegmental artery stasis (Group B, n=29), without arterial stasis (Group C, n=30). Significant HAD are identified in Group A (18/25, 72%), in Group B (17/29, 59%), and no HAD is identified in Group C (P < 0.001).

CONCLUSION: The endpoint which was applied during TACE is the significant predictive factor result in HAD. The more advanced arterial occlusion causing the more severe arterial damage, and difficult to approach the damaged arteries. So the subsequent TACE may not be appropriate then the patient may shift to other treatment plans involuntary.
Transcatheter Arterial Embolization with N-Butyl-2-Cyanoacrylate for Arterial Bleeding in the Upper Gastrointestinal Tract: Results and Predictors of Clinical Outcomes

OBJECTIVE: To provide a contemporary assessment of safety, efficacy, clinical outcomes, and prognostic factors after transcatheter arterial embolization (TAE) with N-butyl-2-cyanoacrylate (NBCA) for upper gastrointestinal (UGI) hemorrhage.

MATERIALS AND METHODS: Between January 2008 and December 2012, a total of 382 patients undertook emergent TAE for non-variceal UGI bleeding in our institute. We included the patients who undertook TAE with NBCA and evaluated their clinical outcomes. The technical and clinical predictors for recurrent bleeding were also analyzed.

RESULTS: Among the 49 patients embolization with NBCA. Most of the patients demonstrated critical illness related to advanced age, comorbidities, and presenting conditions. Nearly all of the patients were hemodynamically unstable before embolization. The technical and clinical success rates were 98% and 71%, respectively. No serious bowel ischemic complications occurred. The rebleeding rate within thirty days was 39%. Hematologic malignancy, coagulopathy, steroid pulse therapy, or absence of NBCA in target lesion were factors associated with rebleeding.

CONCLUSIONS: Transcatheter arterial embolization with NBCA could be safely administered for hemodynamically unstable patients with non-variceal UGI bleeding. Clinical factors associated with rebleeding might influence the clinical outcome.

Clinical Efficacy of Presurgical Embolization of Musculoskeletal Neoplasms: Evaluated with Intra-operative Blood Loss and Operation Time

PURPOSE: To investigate the clinical outcomes of presurgical embolization in the management of hypervascular musculoskeletal neoplasms in terms of intra-operative blood loss and operation time.

MATERIALS AND METHODS: Between Aug. 2009 and Sept, 2013, 21 patients (9 male and 12 female), aged 11 years to 86 years (Mean age: 55.05 ± 20.23 years) were referred to the IR section at our institution for presurgical embolization of primary and secondary musculoskeletal neoplasms. In an attempt to reduce intraoperative blood loss, to facilitate maximum tumor debulking, to simplify the surgical procedure and to decline surgical co-morbidity (complication and infection… etc), 21 patients with angiographically documented hypervascular neoplasms and whose lesions not applicable for tourniquet compression were devascularized with particulate embolizers. Whenever possible, the arterial feeders were selectively engaged with a 2.7 F microcatheter and particulate embolizer sized 100-300 um and 300-500 um were injected until complete devascularization of tumor vessels accomplished. The primary end-point is comparison of recorded intraoperative blood loss with estimated blood loss without embolization made by two experienced orthopedic surgeons based on CT/MRI and angiography. The secondary end-point is comparison of recorded operation time with estimated operation time without embolization. Paired t test is used for assessment of statistical significance.

RESULTS: The particulate embolizers used are trisacryl gelatin microspheres (n=18), polyvinyl alcohol (n=2) and embozene (n=1). There were significant reductions of intraoperative blood loss, 368.57 ± 325.19 ml vs 1964.76 ± 766.63 ml (p < 0.001) and operation time, 1.60 ± 0.59 hr vs 4.81 ± 0.83 hr (p < 0.001), respectively. Two patients with blood loss greater than 500 ml were resulted from incomplete devascularization in view of failure to engage feeder artery with inappropriate vascular axis with a sophisticated microcatheter/wire. No complication was encountered in all.

CONCLUSION: Based on our preliminary result, presurgical embolization is clinically safe and beneficial, which can remarkably reduce the intraoperative blood loss and operation time.
Image-guided Cryoablation for Non-small Cell Lung Cancer: mid-term result

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PURPOSE: To evaluate midterm result including of cryoablation for medically inoperable non-small cell lung cancer.

MATERIALS AND METHODS: A total of 10 patients (6 men and 4 women) with an average age of 78 years with histologically proven non-small cell lung cancer who were medically inoperable underwent cryoablation. The mean tumor diameter was 2.4 cm. The efficacy of cryoablation was evaluated using contrast-enhanced dynamic computed tomography at 1, 3, 6, 9, and 12 months after cryoablation and the every 6 months after the first year. Local tumor progression was defined as focal nodular enhancement of more than 15 HU.

RESULTS: Technical success was achieved in all the patients. Pneumothorax was noted in two patients and was relieved by pigtail insertion. The most common post-procedure ablation zone character No local tumor progression was noted. There were 3 patients who developed regional recurrence apart from the local tumor site. The survival was 100% at 1 year, 86% at 2 year, and 86% at 3 year.

CONCLUSION: Percutaneous RFA is effective and successful in the treatment of intrahepatic cholangiocarcinoma of 3 cm or less and satisfactory for tumors of 3-5 cm. The rate of serious complications after RFA is low.
Radiological-guided Peripheral Venous Port Implantation: Preliminary Experience and Review of the Literature

INTRODUCTION: Peripheral venous port implantation has been performed by the interventional radiologist in the angiography suite since the 1990s. It is originally preserved for patients with contraindications to the traditional chest port such as an ipsilateral major pectoralis-myocutaneous flap, tumor recurrence in the neck and upper chest, or patient with respiratory impairment. However, it has been more widely used today due to various benefits such as less time consuming, lower cost, and with fewer complications and catheter misplacements. To our knowledge, radiological-guided peripheral port insertion has not been reported in Taiwan.

CASE REPORT: Twenty eight catheters with peripheral ports were placed under sonographic and fluoroscopic guidance over a 8-month period from March to October, 2013. The surgical techniques of implantation are reported. The data of catheter performance and the complications are collected by reviewing the medical record. The general practitioners are asked for the missing information. Our data are also compared with the result in the previous literatures.

DISCUSSION: We review the literature of image-guide peripheral venous port and discuss the possible benefits of the procedure performed by the interventional radiologist.

Accelerated T2* Measurements in Human Meniscus Using Projection Reconstruction with Data Sharing From Adjacent Echo

PURPOSE: We aim to take advantage of the projection reconstruction with data sharing from adjacent echo images for acceleration of quantitative T2* measurements.

MATERIAL AND METHODS: In projection reconstruction imaging, MR data are acquired radially to fill the k-space with a densely sampled center region, implying the ability of reconstructing multiple T2 weighted images as well as a T2 map from a single image data set. We extended the similar concept conjugated with the dual echo radial meniscus imaging sequence to speed up the T2* measurements. The proposed imaging method was performed on 3T MRI with 8 different TEs=0.82/2/3/4/6.95/8.13/9.13/10.13 ms, flip angle = 600, TR = 700ms, number of slice = 8, slice thickness = 5mm, projection number = 512, readout per projection = 512, in-plane resolution = 0.24x0.24 mm2, acquisition time per repeat = 5 min 58 sec. After that, 2- and 4-fold undersampled radial k-space data was extracted from this integral data set to test the acceleration ability of the contrast manipulation in our radial meniscus imaging.

RESULTS: Significant improvement of image quality was achieved in the images reconstructed using the proposed method. Moreover, average T2* fits from these three different projection data sets were derived, respectively. The derived T2* values were increased from 5.7578 ms to 5.8464 (1.5% error) with two-fold acceleration, and 6.3284 ms (9.9% error) with four-fold acceleration, respectively.

CONCLUSION: Our preliminary finding demonstrated that the proposed method provides an alternative to obtain multiple T2* weighted images and a reliable T2* measurement with a shorter acquisition time, which may be helpful in the implementation of in vivo meniscus T2* mapping in clinical application.
Quantitative Imaging Investigation of Impact of Diabetes Mellitus on Lumbar Disc Degeneration: A Study by Combined 3T MR T2 and Apparent Diffusion Coefficient Mapping Technique

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PURPOSE: We design this in vivo pilot study by combined T2 and ADC mapping technique in high magnetic field (3T) MRI to evaluate the impact of Diabetes mellitus (DM) on lumbar discs, to compare with normal control group and non DM patients.

MATERIALS AND METHODS: Following approved by institutional review board and given written informed consent prior to enrollment, 11 patients (M/F = 4/7, Age range 44-84 year-old, average 67.6) compatible with clinical diagnosis of DM constituted DM study group. Nine normal young adults (M/F = 3/6, Age range 25-30 year-old, average 28) were included as control group, and 21 patients (M/F = 13/8, Age range 30-95 year-old, average 57) without DM and with clinical low back pain and suspected herniation disc were included as patient group. MR Imaging of lumbar spine was performed at 3T MR scanner with sagittal T2 mapping imaging and axial diffusion weighted imaging (b factor =600, 1000) quantified by apparent diffusion coefficient (ADC) map was assessed for 5 lumbar discs. We compared T2 mapping values and ADC values of each lumbar discs between DM, control, and patient groups.

RESULTS: There was statistically significant difference in DM group and control group in T2 and ADC values of L1-2, L2-3, L3-4, L4-5, and L5-1discs (p < 0.05), and in DM group and non DM symptomatic patient group in ADC values of L1-2, L2-3, L3-4, L4-5, and L5-1discs (p < 0.05), but there was no difference in T2 values of L1-2, L2-3, L3-4, and L4-5 discs (p > 0.05).

CONCLUSION: DM may cause lumbar disc change with significant difference as compared with normal young adult and patients with low back pain.

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Influencing Factors Lead to Failure of Attempt During US-guided Injection in a Direct Hip MR Arthrography

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PURPOSE: To retrospectively evaluate the association between possible influencing factors and attempt of failure punctures during the performance of ultrasonography (US)-guided injection in a direct hip MR arthrography.

MATERIALS AND METHODS: Ninety consecutive patients (38 women and 52 men; mean age, 42 years) undergoing US-guided magnetic resonance hip arthrography were retrospective included in this study. Three patients underwent bilateral MR arthrography. We assessed the clinical data including sex, side of injection, age, additional use of needle tip rotation, and patient body mass index (BMI); US records for areas of needle targeting, trajectory of needle, and attempt of punctures; and MR measurements of capsular elongation where needle targeting. Multiple logistic regression analysis was used to determine the association of these factors and failure of attempt.

RESULTS: Ninety-three hip arthrography procedures were performed on 90 patients. Punctures were performed successfully at the first attempt in 71% of cases and unsuccessfully at the first attempt in 29% of cases. With regard to the relationships between failure of first attempt during arthrography and independent factors, failure of first attempt was significantly associated with capsular elongation where needle targeting and additional use of needle tip rotation (OR 10.708; 95% CI 1.847-62.059; OR 3.518; 95% CI 1.120-11.047) as determined by multiple logistic regression analysis (Table 2). The capsular elongation at the femoral head-neck junction (5.2 ± 1.5 mm), which was constantly enough capacity for the needle bevel, was significant larger than that at the femoral head (2.9 ± 1.3 mm) (p < 0.001).

CONCLUSION: Needle targeting at the femoral head-neck junction and additional use of needle tip rotation could increase the first attempt success rate of US-guided hip injection on arthrography.
Efficacy of Hip MR Arthrography Correlated with Arthroscopic Surgical Results

**Purpose:** To evaluate the clinical applications of MR arthrography of hip.

**Material and Methods:** From Feb 2012 to Nov 2013, 46 patients visited our hospital due to hip pain; all of them underwent MR arthrography of hips (26 left sided and 20 right sided) and following hip arthroscopic surgeries, 17 males and 29 females, aged 17-67 years (mean 42.8 years).

**Results:** Cam type femoroacetabular impingement (FAI) occupies 63% (29), mixed type FAI 2.2% (1), osteoarthritis 28.3% (13), DDH 2.2% (1), torn ligamentum teres 8.7% (4), synovial osteochondromatosis 2.2% (1), snapping hip 2.2% (1) and labral tear 95.6% (44) were concluded.

**Conclusion:** MR arthrography of the hip proves to be very sensitive and specific to detect the labral tears. However, the mixed type and pincer type FAI may be easily missed in MR arthrography and further radial reformatted images should be needed. Tear of ligamentum teres may also be easily missed due to its curvilinear alignment or partial volume artifacts. We would demonstrate our cases to highlight the advantage and disadvantage of MR arthrography in diagnosing intra-articular hip disorders.
Bone Intraosseous Lipoma

Report of Three Imaging Signs for the Diagnosis of Intraosseous Lipoma

 PURPOSE: Intraosseous lipoma is considered benign bone lesions. According to previous literatures, the diagnosis of intraosseous lipoma appears to be having become more common with the application of CT and MRI, and the ability to demonstrate the intralesional fat of these lesions could avoid unnecessary biopsy or surgical excision. But the bizarre imaging appearance of advanced stage intraosseous lipoma remains difficulty in diagnosis. The purpose of this study is to assess useful imaging signs for the diagnosis of intraosseous lipoma.

 MATERIALS AND METHODS: We performed a retrospective review of a series of 30 unreported cases with intraosseous lipoma who received CT or MR studies and literature review was performed of another 40 cases with figures identified from the English language literature. All lesions are respectively categorized by Milgram’s classification and imaging analyzed by two radiologists.

 RESULTS: We collected 70 unreported and prior published cases with pathologic or imaging diagnosis of intraosseous lipoma. Specific imaging signs such as fat rim sign, T2 tumor shrink sign, and scallop T2 surface sign are useful diagnostic clues for intraosseous lipoma, especially the bizarre imaging appearance of advanced stage lesion.

 CONCLUSION: Besides fat content identified by CT or MR, fat rim sign, T2 tumor shrink sign, and scallop T2 surface sign are useful diagnostic clues for intraosseous lipoma.

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定量評估高濃度含碘對比劑在直接磁振關節造影的應用

In Vivo Quantitative Evaluation of the High-concentration Iodinated Contrast application in Direct Magnetic Resonance Arthrography

 PURPOSE: To prospectively quantify in vivo the effect of the iodinated contrast agents for direct MR arthrography.

 MATERIAL AND METHODS: Fifteen rabbits were chosen for the direct MR arthrography. In these rabbits, the pure iopromide (370 mg I/mL) was injected into the left knee joints and the mixtures of iopromide and gadoterate meglumine (2.0 mmol/L) into the right knee joints. Fat-suppressed T1-weighted (FST1W) images and T1-weighted IDEAL water-only images were performed on a 1.5-T MR imager. The signal-to-noise ratios (SNR) of the intra-articular contrast agents and the adjacent muscles and the contras-to-noise ratios (CNR) of contrast agents to muscles in 2 sequences are calculated.

 RESULTS: The iodinated contrast agents and the mixture agents can be well identified in the FST1W images and the IDEAL images. The SNR of the mixture agents are significantly higher than that of the iodinated contrast agent in both FST1W images (p<0.001) and IDEAL images (p<0.001). The SNR of the agents in the IDEAL images are significant higher than that in the FST1W images. The SNR of the iodinated contrast agents in the IDEAL images are slightly higher than the SNR of the mixture agents in the FST1W images (p=0.151).

 CONCLUSION: Our study revealed that the high-concentration iodinated contrast agent can provide good SNR and CNR, even less than the Gd contrast agent, and the IDEAL images can provide better SNR than the conventional FST1W images. In conclusion, the high-concentration iodinated contrast agents can be recommended for the direct MR arthrography, using IDEAL images.
Efficacy of Computer Aided Diagnosis in Anterior Cruciate Ligament Deficiency with Stress Radiography

**PURPOSE:** To evaluate efficacy of computer aided diagnosis (CAD) in anterior cruciate ligament (ACL) deficiency with stress radiography.

**MATERIALS AND METHODS:** The retrospective study from the database consisted of the patients with both MR imaging and stress radiography of the same knee joint from Dec 2003 to Jun 2012. The excluded criteria included inappropriate metallic positions, prior knee surgeries with reconstruction of cruciate ligaments, inappropriate locations of knees on stress films, poor imaging quality of stress films. The mean interval between MR imaging and stress films was 21.6 ± 15.4 days (range, 0-117 days). The CAD method included pre-processing, axis locating, and biomarkers locating, to compute the positions of three biomarkers and measure the displacement caused by a given stress. In this analysis, we computed the edges of the femur and tibia in both horizontal and vertical gradient directions. The horizontal edges were used in detecting the axes of femur and tibia, and the vertical edges in locating the biomarkers of the knee joint. Four CAD measurement techniques, including central measurement technique (M1), combined central-peripheral measurement technique (M2), posterior femoral condyle tangent measurement technique (M3), and condyle center measurement technique (M4), were performed to evaluate the diagnostic performance with the MR imaging findings as standard reference.

**RESULTS:** One hundred and ninety-three knee joints from 193 patients (mean age, 28.3 ± 10.2 years; range, 16-68 years) were included for this research. MR imaging found the completely torn ACLs in 142 knees. To analyze the diagnostic accuracy of each measurement method for the ACL deficiency, the Receiver Operating Characteristic curves were obtained. The Area under Curves was calculated 0.732, 0.751, 0.738, and 0.770 for M1, M2, M3, and M4 techniques, respectively. By cutoff value of 6.47 mm for M4 measurement, the sensitivity was 76% and the specificity was 66%.

**CONCLUSION:** In this research, we used 4 different methods to measure the tibial translation in the patients with ACL deficiency. The diagnostic accuracy was not significantly different between 4 measurements to evaluate the ACL laxity by CAD.
INTRODUCTION: Extraskeletal osteosarcoma is a rare neoplasm that accounts for 2-4% of all osteosarcomas and 1-2% of all soft tissue sarcomas. The most common sites of involvement are the lower extremities (47%), upper extremities (20%), retroperitoneum (17%) and otherwise trunk (10%).

CASE REPORT: A 53-year-old man had a progressively enlarging palpable mass in the right lower abdomen for more than six years. Abdominal computed tomography (CT) revealed a large, well-demarcated mass with dense ossifications situated in the pelvic cavity. The mass was heavily ossified in the center and sparse in the periphery. On magnetic resonance (MR) images, the central part of the mass was predominantly low signal intensity on both T1- and T2-weighted images, consistent with ossification. The peripheral zone of the mass showed isointense on T1-weighted image and hyperintense on T2-weighted image, and enhanced avidly. Surgical resection was performed and confirmed retroperitoneal origin of the tumor without attachment to the bone. The pathological diagnosis was extraskeletal osteosarcoma.

DISCUSSION: To date, MR imaging of primary retroperitoneal extraskeletal osteosarcoma has only been reported in few literatures. We describe both CT and MR imaging of a densely ossified retroperitoneal mass which was proved to be primary extraskeletal osteosarcoma by surgical resection, and also discuss the radiological differential diagnosis.
Digital Records of Pediatrics-radiology Combined Conferences Using the On-line MyPACS Teaching File Authoring Tool

 PURPOSE: Radiologists usually pay much time to joint various interdepartmental conferences years by year. Records of such conferences on paper, however, may only identify meeting information and brief discussions with limited manual illustrations. Some significant medical images that are considered the core of such conferences may not be recorded accurately. Herein we share the user experience of an on-line authoring tool for pediatrics-radiology combined conferences in our hospital. A large number of medical images and descriptive information that are analyzable in digital format can be reposed.

 MATERIALS AND METHODS: Digital data of pediatrics-radiology combined conferences in our hospital using the on-line MyPACS teaching file authoring tool (Vivalog Technologies, Seattle, WA) were uploaded after conference presentations under the user name of cshpedrad since 2006. The tool requiring no software other than a standard Web browser is fully functional and free available at http://MyPACS.net.

 RESULTS: From 2006 to 2013, our institute has enrolled 77 cases with 630 images. Data have been viewed 111,315 times on the Web since then. Most cases belong to cranium and contents (n=31) and congenital diseases (n=22) in anatomic and pathologic subcategories respectively. Data can be retrieved by searching on any combination of parameters or by searching the full text of the findings in the case.

 CONCLUSION: Based on our experience, records of pediatrics-radiology combined conferences in the on-line digital format are practicable and they automatically become valuable teaching files that can be accessed by any user from any computer connected to the World Wide Web.

The Diagnostic Reliability of Plain Film Radiography and Esophagography in Circumflex Right Aortic Arch

 PURPOSE: Circumflex right aortic arch, a retroesophageal arch in which the aorta crosses from right to left behind the esophagus to descend on the left side, is a congenital anomaly and may cause esophageal or tracheal compressions. Chest plain film radiography and esophagography were tools for the non-invasive initial diagnosis. However, only limited reposts describes the power of each technique. In this study, we try to explore the diagnostic reliability of the two modalities for the disease using computed tomography (CT) as a reference.

 MATERIALS AND METHODS: Chest plain films and images of esophagography were retrospectively reviewed in cases with CT proved circumflex right aortic arch in the past 7 years. Data of the patient gender, the age, symptom / sign, co-morbidities, and outcomes were also reviewed.

 RESULTS: Four boys and 3 girls, ranging in age from 1 day to 12 years, of circumflex right aortic arch were enrolled. Among them, 5 cases had intra-cardiac or other anomalies. Five of 7 (71.4%) cases presented with swallowing or respiratory symptoms. Esophagography showed typical posterior indentation in 4 of 6 (66.7%) cases. Aniero-posterior views of chest radiography only recognized right aortic arch in 2 of 6 (33.3%) cases. Three cases received aortopexy; 1 case died of the intra-cardiac disease; 2 cases received conservative treatments; and 1 case lost to follow-up.

 CONCLUSION: The diagnostic reliability of plain film radiography and esophagography in circumflex right aortic arch is low. Other modalities for confirming the definite diagnosis and co-morbidities are suggested in suspected cases.
CT Differentiation of Closed Loop Obstruction and Strangulation from Simple Bowel Obstruction

Taiwan Survey of Patient Safety in Radiological Examination Process at Radiology Resident Training Hospitals in Taiwan

Survey of Patient Safety in Radiological Examination Process at Radiology Resident Training Hospitals in Taiwan

The aim of this study is to understand the current status of patient safety and performance of radiological examination process in radiology resident training hospitals in Taiwan. We designed questionnaires for radiological examination process, which were mailed to 19 medical centers and 17 non-medical centers of the radiology resident training hospitals in Taiwan. The response rate was 94.7% (18/19) of medical centers and 100% (17/17) of non-medical centers. Items that were elected to be considered as important to patient safety were, in order, (1) to confirm the patient’s identity, (2) to check informed consent, (3) to establish high risk reminder system (18/18 of medical centers, reporting rate, 0.29 ± 0.46%/mon; 17/17 of non-medical centers, 2.01 ± 1.65%/mon), (4) to record patient fall down (medical centers, 83% (15/18); non-medical centers, 47%/8/17), (5) to record large amount contrast-medium extravasations (medical center, 7.58 ± 8.08/yr; non-medical center, 1.06 ± 1.35/yr), and severe allergic reactions (medical center, 0.14 ± 0.25/yr; non-medical center, 0.38 ± 0.61/yr). In addition, the film rejected rate was 2.42 ± 1.82% of medical centers and 2.56 ± 1.72% of non-medical centers. For reporting rate, most of the medical centers accounted average 7 days for out-patient clinic, 3 days for in-patients, and 1 day for emergency; whereas non-medical centers took average 7 days for all patients.

CONCLUSION: Difference exists in patient safety performance between medical centers and non-medical centers of the radiology resident training hospitals during radiology examination process in Taiwan. Our radiological society should establish a guideline and accreditation policy about standardization of patient safety in the radiological examination process for all resident training hospitals in Taiwan.
Comparison The Performance of the Radiation Dose and Image Quality in Liver Examination by Using the Single And Dual-energy CT Scans

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A Saline Test Injection Mode Improving the Safety of Using a Power Injector in CT

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Examination by Using the Single And Dual-energy Scans

A saline test injection mode could reduce the incidence of contrast medium extravasation and improve the safety of using a power injector.
Evaluation of Image Quality and Effective Dose of kV Portal Imaging for Thoracic Radiotherapy

PURPOSE: Image-guided radiation therapy (IGRT) is frequently used for the treatment of lung cancer. The kV portal imaging is therefore required for verifying the treatment position of patient. The purpose of this study is the evaluation of image quality and effective dose of kV portal imaging for thoracic radiotherapy.

MATERIAL AND METHODS: The Varian 21iX linear accelerator with On-Board Imager system was used. A Rando phantom was imaged to simulate a patient undergoing the kV portal imaging in thoracic radiotherapy. The imaging parameters were 140 kVp, the CNR ranged from 2.88 to 3.25 and the effective dose ranged from 0.0278 to 0.0286 mSv. The calculated FOM ranged from 292.98 to 378.06. The maximum value of FOM was observed at tube voltage of 125 kVp.

RESULTS: Results from this study show that the optimized imaging parameters of kV portal imaging for thoracic radiotherapy were 125 kVp and 1.25 mAs. Using the optimized imaging parameters, the time of image acquisition can be shortened. This may be helpful for reducing the organ motion during the kV portal imaging procedure.

A Comparative Phantom Study between Dyna CT and Multidetector CT on Radiation Effective Doses of Cerebral Hemodynamics Measurement

PURPOSE: Digital subtractive angiography (DSA) using Dyna CT provides both conventional morphological and quantitative hemodynamics in one-step. However, the effective radiation dose remains the concern. We aimed to estimate effective dose that involved in cerebral hemodynamic measurement using Dyna CT and multidetector CT (MDCT).

MATERIALS AND METHODS: An anthropomorphic phantom (Rando Alderson phantom; Radiology Support Devices, Long Beach, CA), a biallele Dyna-CT DSA suite (AXIOM-Artis®, Siemens Healthcare, Erlangen, Germany) and a 256 slice MDCT (Brilliance iCT®, Phillips Healthcare, Best, Netherland) were used. For cerebral parenchyma blood volume (PBV) measurement, a clinical DSA imaging protocol (one 8-second rotational contrast medium filled run with same frame rate) was used. The scanning parameters were: 73 kV, 483mA, 4.0ms, 48 cm field-of-view. The scan range was 8-cm slab (from sella turcica to convexity). Eighty lithium fluoride thermo-luminescent dosimeters (TLDs) (TLD-100H, Bicron-Harshaw, Solon, OH) divided into 22 organ sites were embedded in the phantom. The same phantom and TLDs distribution were also scanned with the MDCT using a clinical CT perfusion (CTP) scanning protocol (8-cm scan coverage identical to PBV, 5mm slice thickness, 64x1.25 mm collimation, 20x20 cm FOV, 80 kVp, 250 mA, 0.4 second tube rotation time, scan interval of 1.5 seconds and lasted for 1 minute). We followed the guidelines of International Commission on Radiation Protection Number 103 (ICRP-103) to measure the effective dose. Both Dyna CT and MDCT dose experiments were conducted twice.

RESULTS: The dose area product/entrance skin dose was 2631.6 μGym2/228 mGy and the effective dose was 0.87 ± 0.55 mSv for PBV. As a comparison, the dose length product of MDCT CTP was 1177.3-1323.9 mGy/cm, equivalent to the effective dose of 2.46-2.58 mSv. The effective dose of MDCT CTP measured by TLDs was 2.77 ± 1.59 mSv.

CONCLUSION: Cerebral PBV measurement using Dyna-CT is dose-saving with high reproducibility and reliability. Its one-stop imaging service saves procedural time and patient transportation and makes Dyna CT be recommended for cerebral vascular disorders.

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Evaluation of the Percentage Glandular Content of Breast Using PMMA Phantom in Mammography: A Feasibility Study

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Purpose: The estimation of percentage glandular content of breast is difficult due to the fact that several breast phantom materials have to be imaged under various exposure parameters. To improve the calculation accuracy of average glandular dose of digital mammography systems, this study attempts to estimate the percentage glandular content of breast using different thicknesses of PMMA phantom.

Materials and Methods: In this study, 2-6 cm breast phantoms with percentage glandular content of 0%, 47% and 100% were imaged. The imaging parameters were used for estimation of the equivalent thickness of PMMA for these breast phantoms. To simplify the procedure of estimation of percentage glandular content of breast, the different thicknesses of PMMA slab were then used in acquiring the imaging parameters.

Results: For the 4.5 cm breast phantoms with percentage glandular content of 0%, 47% and 100%, the estimated percentage glandular contents from the proposed method were 5 ± 1, 45 ± 1 and 115 ± 1%, respectively. For the same material of phantom, the equivalent thickness of PMMA is linearly increased as the thickness of phantom.

Conclusion: Results from this study show that the different thicknesses of PMMA phantom could be used for simplification the procedures of estimation of percentage glandular content of breast. This study is helpful for improving the calculation accuracy of average glandular dose of digital mammography systems.
Optimizing of Imaging Parameter with Clinical Verification on Mammography

MATERIALS AND METHODS: The research design used ACR breast phantom as theoretical basis. Then filtered out the parameters that influence the quality of the images, including target/ filter, kVp, mAs, and FOV. According to revised Taguchi method-L18 (2 x 3 to the 7th), we discovered that when kVp was set between 25 kVp to 28kVp it had most significant effect. Therefore, kVp was the dominant control factor while others were minor. Under the IRB agreement, we collected clinical breast images, and these images were put into 4 categories based on ACR breast composition standard. And each type had two shooting parameters, 25 kVp and 28 kVp, 30 sets in total. We had three radiologists to evaluate image quality based on three dimensions, exposure, contrast and sharpness. Then, we used ANOVA and F-test to analyze the result.

RESULTS: A total of 1558 breast images were collected, while 1400 of them were used in our experiment. It showed that 28 kVp group scored better that 25 kVp in all three dimensions. Also, this thesis used Taguchi method to locate the effect between tumor, fibrosis and calcification in ACR phantom images and parameters discovering that with different tissue, we could use different protocols to get better image.

CONCLUSION: Optimize Mammography clinical trial Scan result using Taguchi Method verified the result that we could get superior medical imaging under such circumstances.

Comparison of Auto-tube-current Modulation and Radiation Dose Reduction in Thoracic-abdominal Protocols with Two Different Computed Tomography Scanner

MATERIALS AND METHODS: About 140 thermoluminescence dosimeters (TLD) filled into two different gender anthropophobc Rando-Phantom. And then, the phantoms was scanned using two surviw (AP, AP+Lat projection) in two CT scanners (Siemens, Somato definition flash; Toshiba, Aquilion one). After surviw scanned, we processed three protocols for thoracic-abdominal examination, individually. Simultaneously, we also recorded tube current distribution along z-axis of phantoms. Subsequently, we could recognize radiation dose through reading TLDs with TLD reader.

RESULTS: From our analysis, in Siemens CT scanner, the radiation dose significantly reduced approximated 29~66% when AP+Lat surviw used. On the other hand, in Toshiba CT scanner, the radiation dose also reduced when AP+Lat surviw used. The decreasing level is about 0~9%.

CONCLUSION: According to our study, when thoracic-abdominal examination ordered, we recommend AP+Lat survew used in Siemens CT scanner. And most protocols in Toshiba CT scanner.
The Feasibility of Bolus Material as Flexible Breast Phantom

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PURPOSE: PMMA is the most frequently used material for construction of mammographic testing phantoms. These phantoms cannot be deformed after compression during the imaging procedure due to the fact that they are rigid body. The purpose of this study is to investigate the feasibility of Bolus material as a flexible breast phantom.

MATERIALS AND METHODS: In this study, a digital mammography unit (Novation, Siemens) was used. The various thicknesses (2-6 cm) of PMMA and Bolus material were imaged. For each mammogram, the tube loading, thickness of phantom, tube voltage, and target/filter combination were collected. The equivalent thickness of PMMA which required the same imaging parameters as the Bolus material was calculated.

RESULTS: Results from this study show that the thickness of Bolus material was greater than the corresponding equivalent thickness of PMMA. The equivalent thickness of PMMA linearly increased with the increasing thickness of Bolus material. For the 4.5 cm Bolus material, the estimated equivalent thickness of PMMA was 3.81 ± 0.07 cm (range: 3.73-3.93 cm for 25-32 kV). The coefficient of variation was 1.8% (0.07/3.81).

CONCLUSION: The performance of Bolus material is consistent under clinical imaging conditions in mammography. Therefore, Bolus material is suitable for developing the flexible breast phantom in mammography.
The Survey Dose Analysis of Simulation and Experiment Methods in the Chest and Abdomen Procedures of the General Digital X-ray Examination

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Purpose: This study survey that the chest and abdomen procedures of the general digital X-ray examination of hospital in central Taiwan. We calculated the effective dose of patient by the simulation of Monte Carlo software (PCXMC), compared with the experiment of Rando phantom filled with thermoluminescence dosimeters (TLD).

Materials and Methods: We collected exposure parameters of patient in chest and abdomen radiography. This study used two calculation of radiation dose in exposure condition of human, simulation of Monte Carlo software (PCXMC) and experiment of Rando phantom filled with TLD, using the tissue weighting factor by ICRP 103 report. To assessment the difference in radiation dose between calculated models of radiation dose.

Results: There were 185 chest radiography (106.7 ± 4.0 kVp, 1.7 ± 0.5 mAs) and 235 abdomen radiography (76.4 ± 3.2 kVp, 19.5 ± 10.0 mAs). The average effective dose of the chest and abdomen radiography was 0.015 ± 0.004 and 0.210 ± 0.100 mSv by using Monte Carlo simulation. The effective dose of the chest and abdomen radiography was 0.015 ± 0.001 and 0.195 ± 0.030 mSv in experiment of Rando phantom filled with TLD.

Conclusion: The effective dose of chest and abdomen radiography of hospital showed that use Monte Carlo simulation software was close to the experiment of Rando phantom filled with TLD in central Taiwan. The effective dose of Chest-PA and KUB were 0.015 mSv and 0.200 mSv, respectively.

Costs of Intravenous Urography (IVU) and Non-contrast Computed Tomography (NCCT) in Diagnosing Urolithiasis

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Purpose: To calculate the costs of IVU and NCCT in diagnosing urolithiasis.

Materials and Methods: We analyzed the costs of IVU and NCCT respectively in a regional teaching hospital in central Taiwan. The direct costs were calculated, including the medical equipment costs, the equipment control and consumption material costs, and the personnel costs.

Results: The direct costs of IVU and NCCT were NT$ 1189 (US$ 39.6) and NT$ 570 (US$ 22.3) respectively. This significant difference was mainly due to no use of contrast media in the NCCT and lower consumption material costs, and savings in the NCCT examination time and lower personnel costs. The total costs of each exam would be higher, because the electricity costs and the indirect costs such as adverse reactions to contrast media, additional exams due to indeterminate results, staff education and training, and transmission and storage of images were not counted. Anyway, the total cost of IVU was still much higher than that of NCCT.

Conclusion: NCCT has a significantly lower cost as compared to IVU, as well as its shorter examination time, higher accuracy and safety in diagnosing urolithiasis. Therefore we suggest NCCT instead of IVU to evaluate patients with acute flank pain.
The Classification of Breast Calcification using Texture Feature of Fractal-based and Gabor Wavelet-based

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PURPOSE: In order to recognize the class between the benign and malignant microcalcifications, we combine the fractal method and gabor wavelet method to extract the texture feature of microcalcifications, and use BPNN to achieve classification.

MATERIALS AND METHODS: In this study, a total of 16 patients with benign calcifications (8 people, 32 images) and malignant calcifications (8 people, 32 images). First, we will enhance the original image contrast use a cubic curve contrast enhancement method. Next, the method combining fractal method with GW is used to extract texture feature. Finally, we use the back-propagation neural network (BPNN) to be a classification tool and get a good classification result.

RESULTS: The success rate of fractal based features and classification Fsd and Flac Farg are 88.85%, while comparing to use gabor wavelet features of five kinds of EVEN and ODD, the success rate was 76.13%, the present study not only compared the single-use but also compared two features made the result is a mixture of these two features interactive applications, made up of classification success rate of 92.36%.

CONCLUSIONS: In general, the physician’s judgment of benign and malignant calcifications standard varies, but usually success rate is also only 30%, but this study can effectively improve the determination of the recognition rate into 60-70 percent.

A Computer Simulated Phantom Study of Estimating Absorbed Dose by Using External TLDs Measurement

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PURPOSE: Nuclear medicine can provide functional and molecular images and are widely used in clinical diagnosis and therapy. As the patients undergo nuclear medicine examination grow annually, the contributions of nuclear medicine to the medical exposure of population increase as well. The purpose of this study is to estimate patient-specific dose during nuclear medicine examination from simple external thermoluminescence dosimetry (TLD) measurements in PET/CT.

MATERIALS AND METHODS: The NEMA-like phantom was used to prove the concept of the proposed method. Four TLDs were used and each was placed on the surface of phantom where the S value of each insert was maximum. The Percent sum of squared errors (PSSE) of the NEMA-like phantom for various distributions of activity among the three objects and background were estimated. TLD reading errors (5%~40%) and the displacement errors (radius from 2.5mm to 20mm) were also simulated.

RESULTS AND DISCUSSION: The PSSEs of the various activity distributions were quite uniform and mostly less than 3% indicating the robustness of the method. The PSSEs ranged from 1.8% (5%) to about 4.4% (40%) for the TLD reading error under study and we found PSSEs were increased linearly with the displacement distance.

CONCLUSION: In this paper, an achievable method was proposed to estimate cumulative activities and absorbed doses by external TLDs measurement.
Correlation between Visceral and Subcutaneous Adipose Tissue Volumes and FDG Standardized Uptake Value in Liver, Fat and Muscle by Using FDG PET/CT Imaging

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PURPOSE: Abdominal fat, especially visceral adipose tissue (VAT) is proven to relate with metabolic syndrome and coronary artery disease. Using FDG to estimate VAT and subcutaneous adipose tissue (SAT) glucose metabolism had been recently reported (J Am Coll Cardiol Img 2010; 3: 843-851). The analysis of SAT and VAT volume by applying imaging segmentation on attenuation low dose CT images from PET/CT and correlated with the mean standard uptake values (SUV) of liver, fat and muscle were studied.

MATERIALS AND METHODS: In a 4-year period, 100 negative FDG PET/CT findings subjects who had blood sugar, serum cholesterol and triglycerol tests within two weeks were recruited for the study. After reconstruction, the CT image was display in Philips Syntegra® software for CT segmentation by setting the binary Hounsfield unit (HU) between -30 and -190 for fat tissue. The SAT and VAT volume measurement was applied between L4 and L5 spine level for 2 cm thickness. The means of FDG SUVs of the liver, spleen, psoas muscle, VAT and SAT were measured from PET imaging. Intra- and inter-observer measurements of the SAT and VAT from CT were tested. The correlation between total abdominal fat, SAT, and VAT volume, mean FDG SUVs of above mentioned tissue, body mass index (BMI), waist circumference, and serum biochemical analysis were tested.

RESULTS: The correlation between intra- and inter-observer measurements of the abdominal fat were all excellent (R = 0.99). The correlation between total abdominal fat (TAF), VAT and SAT to BMI were (R = 0.79, 0.69, and 0.62), and those to the waist circumference were (R = 0.78, 0.76, and 0.57), respectively. The correlation between all the fat measurements to the blood biochemical tests and SUVs of above mentioned tissue were all low (R < 0.5). The abdominal adipose tissue measurement was feasible and reproducible by using the attenuation CT imaging of the FDG PET/CT. The results of the measurements correlated well with the BMI and waist circumference but not with the blood biochemical tests and mean SUVs of liver, fat and muscle.

CONCLUSION: The abdominal adipose tissue measurement was feasible and reproducible by using the attenuation CT imaging of the FDG PET/CT. The results of the measurements correlated well with the BMI and waist circumference but not with the blood biochemical tests and mean SUVs of liver, fat and muscle.
Dose Distribution of Nasopharyngeal Carcinoma Patient Under VMAT (Phantoms Study)

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PURPOSE: Effective dose (E) and nominal risks were evaluated using two phantoms as male patient undergoing nasopharyngeal carcinoma (NPC) of V olumetric modulated arc therapy (VMA T), and secondary scattered doses were also evaluated.

MATERIALS AND METHODS: Thermoluminescent dosimetry (TLD 100H) is calibrated using LINAC 6 MV photons. TLDs were inserted into Alderson Rando and polymethylmethacrylate (PMMA) phantoms. E and nominal risks were assessed by ICRP 103.

RESULTS: E of Rando phantom was 256±24mSv as well as PMMA is 299±30mSv. Rando’s parotid gland is 1.5±0.12Sv and PMMA’s lymphatic node is 1.6±0.23Sv are highest. Out-of-field risks of Rando and PMMA’s lung have highest nominal risks were 1.35% and 0.67%. Testis’s risks of Rando and PMMA were 0.003% and 0.0014% is smallest.

CONCLUSION: This secondary dose reveals strong variations among positions close to NPC tumor center. Comparing with published, results showed that VMA T has lower out-of-field doses and reduced risks of the radiation induced secondary malignancy for organs.

The Influence of Drug Gallium-67 Used by Nuclear Medicine Examination to Conventional X-Ray Image

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PURPOSE: To evaluate Drug Ga-67 common used by nuclear medicine examination affect conventional X-Ray image in improper sequence.

MATERIAL AND METHOD: The common used dosage of Ga-67 in nuclear medicine examination is 2-10 mCi. The vary dosage of Ga-67 packed in same size seal Acrylic container. The radioactive container places on top of liver relative position chest phantom in a given time. The Duke-chest phantom was applied to simulate human chest exposure. The images were exposure by different irradiation time of Ga-67 distributed a self-designed box, and projected by a routine X-ray examination.

RESULT: The specific ROIs of image analyze by program image J in the same window width and level. Theoretically, the routine X-ray examination will not influence by Ga-67 examination. The image with a CR system may be worse when the patient undergoes during the clinical Ga-67 nuclear examination.
常壓腦水腫病人對記憶損傷之視丘前核可能的補償適應:上升的不等向性與纖維密度
Possible Compensatory Plasticity of Anterior Thalamic Nucleus to Memory Impairment in Normal Pressure Hydrocephalus Patients Manifested as Increased Anisotropy and Fiber Density

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 PURPOSE: We aim to examine the diffusion tensor parametric behavior of anterior thalamic nucleus in response to memory changes in normal pressure hydrocephalus.

MATERIALS AND METHODS: 10 NPH patients and 10 normal controls were enrolled in this study. NPH patients were diagnosed according to Japanese guidelines for management of idiopathic NPH. Memory were evaluated on the Chinese version of Wechsler Memory Scale and Rey Complex Figure Test. DTI was performed on a 1.5T using single-shot echo-planar imaging technique with parameters as follows: TR=10000ms; TE=85.3ms; diffusion directions=15; FOV=240; matrix size=128×128. Fiber-tracking was performed based on probabilistic streamlines method to identify the region of AN. Tract density of AN and tensor parametrics for each subject was calculated by averaging measurements from both hemispheres.

RESULTS: In verbal memory test, NPH patients had average 35% decrease in immediate memory and 44% decrease in delayed memory while non-verbal test means showed less than 5% of normal score. Significant increase in FA, q and fiber density in NPH patients were shown as compared to control. In short, the FA increase seems to be dominated by the increase of q, considering the relative stable of L. The increase of fiber density is twice than that of the control. There was no significant difference of the tensor metrics, including λ1, λ2, λ3, MD, and L, between NPH patients and the control.

CONCLUSION: In conclusion, alternations of diffusion tensor metrics can be measured in thalamic nucleus responsible for memory in NPH patient, which have potential clinical implications for responses monitoring at microstructure level in NPH patients under treatment.
Detection of Epileptogenic Zone and Its Dynamics by Database-Approach of Resting-State BOLD-Based fMRI in Brain Cloud

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Purpose: Two-thirds of patients with focal epilepsy showed no identifiable brain lesions on conventional MR imaging, and it is sometimes difficult to identify the source of epileptic discharges with scalp EEG. Resting-state blood-oxygenation-level-dependence (BOLD) functional MRI (rs-fMRI) was proposed to detect the epileptogenic zone based on local functional connectivity of interictal neuronal discharge. In this study, the database-approach of “Brain Cloud” was tested using the rs-fMRI of on-site or web-site database of rs-fMRI. Correlation with electrocorticography (ECoG) was applied for verification, and time-lag functional network of rs-fMRI was derived for mapping the dynamics of zones related to seizure.

Materials and Methods: From 1000 Functional Connectomes Project, three databases using protocols of whole brain BOLD-based studies of 3T MRI scanner were selected for comparison with on-site databases of two 3T MRI scanners (NYMU and VGHTPE). For on-site databases, whole-brain rs-fMRI with verification of head motion and subjects/patients’ performance. Standard SPM8 preprocessing was done with band-pass filtering (0.01-0.08 Hz) and local functional connectivity (LFC) by summed correlation analysis of 26 neighbors voxels. The feature of LFC (average/one standard deviation) was calculated using the mask of grey matter. Rs-fMRI data of two patients with epilepsy (ages: 18-28 years; 2 men) were analyzed with VGHTPE database (N=161) as a normative comparison sample to identify aberrant connectivity patterns. The patients were undergoing routine pre-surgical evaluation prior to grid implantation for localization of epileptic discharges. Dynamics of epileptic activity was explored by ICA (independent component analysis) detecting 40 spatial components using informax ICA of group ICA IMRI toolbox (GIFT). By spatial correlation with the aberrant LFC maps (correlation coefficient > 0.2). Effective connectivity of selected components was demonstrated by maximal time lag correlation. Group comparison was conducted using two-sample t test with adjusting the degree of freedom.

Results: Stability of LFC was demonstrated using the database of VGHTPE with N=20, 80, 101 and 161, respectively, with significant higher LFC within GM as compared with databases of 1000 Functional Connectomes Project and NYMU. The LFC of one patient with pathologically proved focal cortical dysplasia of left frontal lobe was detected using VGHTPE database (N=161) with normative comparison. Areas of increased and aberrant LFC with normalized z values > 3 were verified as epileptogenic zone by ECoG and depth electrodes. GIFT-derived dynamics of seizure was compatible with the results of LFC, and component of FCD showed highest outbound centrality among spatially selected components. The patients were post-surgically followed with seizure free in two years.

Conclusion: Platform specificity of LFC interfered the normative comparison with change of sensitivity/specificity in detecting aberrant LFC via “Brain Cloud” approach, e.g. users upload their data of rs-fMRI to VGHTPE database for tele-medical analysis. Spatial specificity and temporal dynamics of aberrant LFC well correlated with ECoG surgical pathology and model of connectivity.
Working Memory Related Functional Connectivity in Patients after Mild Traumatic Brain Injury

**PURPOSE:** Our previous functional MR study showed gender difference working memory activations in patients within 1 month after mild traumatic brain injury (MTBI). This study was to evaluate the influence of gender in working memory related resting state network (functional connectivity).

**MATERIAL AND METHODS:** Resting state functional MRI was performed in 29 MTBI patients (male: female = 14:15; 39.4 ± 16.6; 36.6 ± 14.8 y/o) within 1 month after their injury and in 30 healthy control subjects (male: female = 1:1; 31.6 ± 8.1; 33.7 ± 9.9 y/o) using 3T MRI scanner (GE: 750). Group independent component analysis (ICA) was performed using GIFT. The group ICA analysis on each group was run 20 times using the ICASSO function to ensure stability and reliability. A set of average group components were created and back-reconstructed into single-subject space. Independent components reflecting left and right fronto-parietal networks (FPNs) were identified by component labeler using GIFT. For each group, one-sample t test (p < 0.01, FDR corrected, cluster extent 10 voxels) was used. For group comparison, two-sample t tests (p < 0.001 uncorrected; cluster extent 10 voxels) were performed. Since we only focus on the between-groups difference within both FPNs, the two-sample t test was masked by using the union of two individual one-sample t test results.

**RESULTS:** There showed no difference in regard to age or sex between the patients and the controls. In right fronto-parietal resting network (RFPN), there showed significant more resting connectivity in the left fronto-parietal region in male patients, but not seen in female patients. In LFPN, there still showed more functional activity volume in the right fronto-parietal region in male patients than female patients.

**CONCLUSION:** The findings support our previous functional MRI conclusion that gender actually affects the presentation of working memory functional activation after MTBI. The increased working memory functional activity in male patient may be due to more functional connectivity (especially the contralateral side) was used in the task of working memory.

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**Purpose:** Evaluating the accuracy of Inhance MRV in assessing intracranial venous steno-occlusive disease

**Methods:** Inhance 3D Velocity (Inhance Suite, GE Healthcare, Little Chalfont, UK) is a recently developed, optimized phase-contrast pulse sequence. The aim of this study was to evaluate the accuracy of Inhance 3D Velocity-based magnetic resonance venography (Inhance-MRV) in comparison with that of contrast-enhanced MRV (CE-MRV) for assessing intracranial venous steno-occlusive disease.

**Results:** Inhance MRV has high sensitivity and specificity for detecting intracranial venous steno-occlusive disease, but it tends to underestimate vessel diameters and overestimate stenotic grades. Therefore, the possibility of false-positive results should be considered to avoid misdiagnosis.
Carotid Stent Related Artifact in Arterial Spin Labeling Cerebral Perfusion MR

**Purpose:** We used pseudocontinuous arterial spin labeling (PCASL) technique to monitor cerebral hemodynamic changes after carotid artery stenting (CAS). 5 of 24 patients receiving CAS had decreased cerebral blood flow (CBF) on the stenting side after CAS. We try to elucidate the cause of post-stenting hypoperfusion on PCASL.

**Material and Method:** From Jul. 2012 to Oct. 2013, 24 patients had received CAS at our hospital. Whole brain CBF was measured by PCASL on a General Electric Discovery MR750 3-Tesla MRI on the day before and three days after CAS. 19 patients had increased or stationary CBF after CAS. 5 patients had more than 20% decreases in post-stenting CBF on the stenting side. We reviewed the post-stent DWI, TOF-MRA and cerebral angiography for the cause of post-stenting hypoperfusion.

**Result:** High stent position was noticed in all five patients with the upper margin of the stent above the C2 dens. The high stent position caused part of the stent to be included in the tagging plane in our routine PCASL studies and might interfere with the labeling efficiency of PCASL. We shift the tagging plane to the level 0.5cm above the upper margin of the stent. Recovery of CBF measurement on the stenting side was noticed in all five patients.

**Conclusion:** When the carotid stent position was higher than C2 base, we suggest that place the tagging plane over the upper margin of the stent to avoid stent-related artifact in post-stenting CBF measurement by PCASL.
Longitudinal White Matter Alterations in Patients with Minimal Hepatic Encephalopathy Before and After Liver Transplantation –Diffusion Tensor Imaging Study

Purposes: To characterize white matter (WM) integrity by applying multiple diffusivity indices acquired via diffusion tensor imaging before and after liver transplantation in patients with minimal hepatic encephalopathy (MHE).

Materials and Methods: This study was approved by the relevant institutional review board, and all participants provided written informed consent. Twenty-eight patients with MHE and thirty age- and sex-matched healthy volunteers were included. Multiple diffusivity indices were obtained by analyzing each of the component eigenvalues of the diffusion tensor images (DTI) in isolation. The assessment was repeated 6-12 month after transplantation. Differences in WM integrity between groups, as well as longitudinal changes, were evaluated using tract based spatial statistical analysis. Correlation analysis was performed to identify baseline and interval changes among the mentioned white matter indices, neurophysiological tests, clinical laboratory tests, and DTI indices.

Results: After transplantation, decreased water diffusivity without fractional anisotropy change indicating reversible cerebral edema was found in the left anterior cingulate, claustrum, postcentral gyrus, and right corpus callosum. However, a progressive decrease in fractional anisotropy and an increase in radial diffusivity suggesting demyelination were noted in temporal WM. Improved pre transplantation albumin levels and interval changes were associated with better recoveries of DTI indices. Improvements in interval DTI indices in the right postcentral gyrus were correlated with visuospatial function score correction (r= -0.541, p= 0.004).

Conclusion: Longitudinal voxel-wise analysis of multiple DTI indices demonstrated different WM changes in MHE patients. Transplantation improved extracellular cerebral edema and the results of associated cognition tests. However, WM demyelination may advance in temporal WM.
Papez Circuit Recruitment in MDMA abuser: Evaluation with Diffusion Tensor Imaging

Wen-Chin Chen,3,4,5 Huei-Tao Hsiu,3,4 Ming-Chang Chou,3,4 Hua-Shan Lin,3,4 Ming-Wen Hsu,5

PURPOSE: We aim to investigate the diffusion tensor parametric changes of anterior thalamic nucleus among MDMA abusers. Materials and Methods: 13 MDMA patients and 12 normal controls were enrolled in this study. Diffusion tensor imaging (DTI) was performed on 3.0 T using single-shot EPI technique with the following parameters: TR=5890ms; TE=57ms; b values=0, 1000 seconds/mm²; diffusion directions=6; FOV=240; matrix size=96×96 (zero-filled to 128×128); slice thickness=3mm; section gap=0mm; NEX=6, acceleration factor=3. All images were pre-registered to the B0 image by applying affine registration to minimize the eddy current-induced distortion. Afterwards, whole-brain FA and MD maps were calculated with the MRtrix software package. Regarding the identification of anterior thalamic nucleus (AN), 2×2-pixel ROIs were placed - with reference to the color-coded FA maps, which is defined anteriorly by the lateral ventricle and caudate head, posteriorly by a horizontal line extending from the posterior edge of the anterior limb of the internal capsule, laterally by the internal capsule itself, and medially by the border of thalamus. FA and MD values within the ROIs were then calculated.

RESULTS: In diffusion tensor parametric measurement, MDMA users exhibited significantly higher FA values within the anterior thalamic nucleus than the control subjects. Differences in MD values between the two groups, however, were insignificant.

CONCLUSION: In conclusion, we have demonstrated that the functional changes of anterior thalamic nucleus under the influence of MDMA can be quantitatively assessed with diffusion tensor metrics, and that the functional neuroadaptation of the anterior thalamic nucleus may suggest that Papez circuit could have a compensatory role in modulating memory pathways among MDMA abusers.

White Matter Damage and Peripheral Inflammation in Obstructive Sleep Apnea

Ming-Chang Chou,3,4 Hua-Shan Lin,3,4 Ming-Wen Hsu,5

PURPOSE: Inflammation, activated leukocytes, white matter (WM) alteration had been mentioned in obstructive sleep apnea (OSA). The aim of the study is to evaluate the integrity of WM after OSA by diffusion tensor imaging (DTI) and to assess the relationship with peripheral inflammation.

METHODS: Twenty patients with severe OSA (apnea-hypopnea index, AHI>30) and 14 sex- and age-matched healthy volunteers (AHI<5) were recruited. They underwent polysomnography study to determine the severity of sleep apnea and MRI-DTI scans to detect fiber integrity. Early or late phase changes in leukocyte apoptosis and the apoptosis of leukocyte subsets, as determined by flow cytometry, were conducted. Fractional anisotropy (FA), a measure of fiber integrity, was derived from the diffusion tensor, resulting in a whole brain FA map. The FA maps were compared using voxel-based statistics to determine differences between severe OSA and control groups, with age and gender as a covariate (P<0.05, corrected for multiple comparisons). The correlation among diffusion measures, oxidative stress biomarker and leukocyte apoptosis was performed, respectively.

RESULTS: The exploratory group-wise comparison between OSA and control groups showed that OSA exhibited low FA in several clusters. The reduced FA values were associated with increased disease severity, and increased leukocyte early apoptosis, suggesting higher inflammation condition peripherally.

CONCLUSIONS: The findings indicate that OSA will impair WM integrity in vulnerable region, associated with increased disease severity. We further explored the possible interactions between peripheral inflammation and CNS microstructural damage which likely represent chronic pathological processes in OSA subjects.
Meta-Analytical Connectivity Modeling (MACM) Delineating the Functional Connectivity of the Human Angular Gyrus


termination: The angular gyrus (AG) is a heterogeneous region that is known to be associated with language, number processing and spatial cognition, memory retrieval, attention and spatial cognition, reasoning, and social cognition. With the aim of identifying which behavioral domains are associated with the activation of the angular gyrus, we performed a structure based-meta-analysis using the activation likelihood estimation (ALE), which assesses statistical significant convergence of neuroimaging studies using the Brain Map database.

Materials and Methods: To map the meta-analytic coactivation maps of the AG by meta-analytical connectivity modeling (MACM), we used ROI derived from AAL atlas. ROI was selected to obtain a completely data-driven result. The meta-analytic connectivity profile and behavioral domains profiles were identified.

Results: MACM techniques revealed a pool of areas that were connected to AG: bilateral frontal, temporal, cingulate, parietal and occipital lobes and cerebellum.

Conclusion: Our results showed the existence of a more specific functional characterization of some portions of the AG but also a great multifunctionality of others. By analyzing a large number of studies, structure based meta-analysis can greatly contribute to new insights in the functional significance of heterogeneous brain connectivity.

Introduction: Spontaneous intracranial hypotension is caused by cerebrospinal fluid (CSF) leaks at single or multiple spinal sites with the clinical presentation as orthostatic headache in young and middle-age individuals. The brain images characteristics including subdural fluid collection, enhancement of the pachymeninges, engorgement of venous structure, pituitary hyperemia, and sagging of the brain.

Case Report: A 34-year-old patient suffering from orthostatic headache without nausea, vomiting, or photophobia. The brain MRI showed diffuse pachymeningeal thickening, mild subdural fluid collection, and pituitary hyperemia. The whole spine MRI examination revealed CSF leakage from multiple sites of C-T spines with engorged epidural venous plexus. Spontaneous intracranial hypotension is diagnosed. However, atrioventricular hydrocephalus was found and gave the atypical picture of intracranial hypotension. The phase contrast study for cerebral aqueduct showed almost absence of flow. Aqueduct stenosis was impressed.

Discussion: Co-existence of hydrocephalus in the patient of spontaneous intracranial hypotension is an unusual condition and increased the complexity for radiologist to evaluate the dynamic status of CSF flow. Regressive of brain descendent of this patient is noted after several times of epidural blood patches, and orthostatic headache improved gradually. Atrioventricular hydrocephalus with aqueduct stenosis still persisted at the follow-up images. Further endoscopic third ventriculostomy maybe indicated for next-step treatment.
**INTRODUCTION:** Spinal dural arteriovenous fistula (SDA VF) is rare and often misdiagnosed. It causes symptoms through venous hypertension and congestion of the cord with edema. The most common clinical symptoms are progressive pain, lower extremity weakness or sensory changes. Sphincter dysfunction sometimes appears. Onset of symptoms is insidious and progression occurs over several years. There is often a significant delay between presentation and diagnosis. Hence keen recognition of the pattern of spinal dural arteriovenous fistula is pivotal.

**CASE REPORT:** In this article, we will review the spinal anatomy and discuss various classifications of spinal dural arteriovenous fistula.

**DISCUSSION:** SDAVF are acquired shunts located within or adjacent to dura along the spinal canal, most commonly at the level of the intervertebral foramen. They are the most frequent arteriovenous shunts occurring in adults. The location of the fistula has been reported through the spinal canal from the sacrum to the level of the foramen magnum. The venous drainage could be extensive and produces venous hypertension of the medullary veins.

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**PURPOSE:** In Moyamoya disease, stealing phenomena is induced with decreased cerebral vascular reactivity (CVR) and brain function is impaired with increased Oxygen extraction function (OEF). In this research, the BOLD fMRI tasks of carbogen inhalation and hand grasping are adapted to quantitatively evaluate the disease state of Moyamoya disease through the mechanism of CVR and OEF.

**MATERIALS AND METHODS:** Gradient EPI was used for fMRI tasks in 3T MR with TR/TE = 2000/30 msec and repetition number = 360 / 120. In carbogen inhalation task, carbogens (1-5% CO2) and air were delivered alternatively every one minute five times after 2 minutes baseline of air inhalation. In hand grasping task, grasping and resting were performed alternatively every 20 seconds six times. The temporal responses of reference function and motor region of interest (ROI) for fMRI tasks were derived with ICA. Data preprocess and functional maps were made with SPM8. The motor ROIs were applied at both functional maps of 7 patients for quantitative analysis.

**RESULTS:** With linear regression, r = 0.1 was obtained between t-score of both functional maps. Even in Moyamoya patients with deteriorated hemodynamics, motor region can be derived using ICA. In one patient, negative t-value at right ROI for carbogen inhalation and hand grasping tasks indicated impaired CVR and increased OEF.

**DISCUSSION:** For verification purpose, direct detection of neuronal activation should be considered. By mapping relationship between CVR and OEF with BOLD fMRI, the increase OEF during functional challenge might imply the critical state of hemodynamics.
Vision and Motor Dysfunctions in Progressive Supranuclear Palsy Maybe Due to Functional Connectivity Disruption of Thalamus

Yao-Liang Chen1,2,3 Yi-Ming Wu2,3 Yau-Yau Wu2,3 Ho-Fai Wong2,3 Shu-Hang Ng4,5 Chin-Song Lu4,5 Jian-Jie Wang3

Purpose: To illustrate increased connectivity of motor and visual cortices on the resting-state functional magnetic resonance images (RS-fMRI) while disruption of thalamic connectivity in patient with progressive supranuclear palsy (PSP).

Materials and Methods: Thirty-two patients with PSP were enrolled in this study, including 20 female and 12 male with mean ages of 62.8 years of age, and age range between 50 and 73 years old. Another healthy control group (HCG) was enrolled with matching gender and ages with PSP group (PSPG). RS-fMRI was applied for both PSPG and HCG. Used seed-base analysis to set regional of interest (ROI) on bilateral thalami and midbrain tegmentum (MT), which were found frequent dysfunction in PSP, to survey intrinsic functional connectivity change between PSPG and HCG. The data was processed by statistical parametric mapping (SPM) software.

Results: In HCG, strong negative connectivity correlation between thalamus and cortices of vision and motor regions same finding being also found between MT and vision and motor cortices. However, loss of strong negative connectivity correlation unveils in PSPG. Two-sample t tests shows thalamic connectivity depression accompanying elevation of connectivity at visual and motor cortices. However, no similar findings demonstrate in MT connectivity.

Conclusion: These findings of RS-fMRI may imply thalamic connectivity to vision and motor region is more dominant than that of MT, to be probably responsible for posture imbalance and frequent fall in patients with PSP.

Age Influence in the Frontoparietal Network after Mild Traumatic Brain Injury

David Carroll Chen1 Feng-Xian Yan1 Wei-Shuang Wang1 Chi-Jen Chen2

Purpose: Poor attention and memory impairment are frequently complained after mild traumatic brain injury (mTBI). Frontoparietal network (FPN) is an intrinsic brain network associated with attention and working memory. Alterations of the FPN after mTBI have been reported in several studies. This study aims to evaluate the influence of age on frontoparietal network connectivity after mTBI.

Methods: From Oct. 2010 to Sept. 2011, we collected two groups of mTBI patients (age > 50 years and age < 30 years). The older group contained 13 patients (51–68 years; average 57.7 years) and the younger group contained 13 patients (21–29 years; average 24.7 years). 13 age- and gender-matched normal controls for the older group and 13 age- and gender-matched normal controls for the younger group were recruited. All patients received resting-state fMRIs within 2 weeks after mTBI on a 3T MRI scanner. Data preprocessing using SPM8 included slice timing correction, head motion correction, spatial normalization to the MNI template, and spatial smoothing. Group independent component analysis was performed using GIFT to extract the frontoparietal network from 20 independent components.

Results: The lateralized FPNs consisted of ipsilateral frontoparietal regions and some minor brain regions in the contralateral frontoparietal cortex. Increased bilateral FPN connectivity was observed in both the younger and older groups after mTBI. However, the older group showed greater extent of increase in FPN connectivity than the younger group.

Conclusion: FPN connectivity increased after mTBI. Greater extent of increase in FPN connectivity was found in the older group than the younger group.
Vertebobasilar Junction Fenestration with Dumbbell-shaped Aneurysms Formation: Experience of 8 Cases and Computational Fluid Dynamics Analysis

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PURPOSE: To report 8 rare cases of paired aneurysms involving fenestrated vertebrobasilar junction and demonstrate the flow patterns of the paired aneurysms by qualitative computational fluid dynamics (CFD) analysis.

MATERIALS AND METHODS: 2D and 3D angiographic features of 8 cases were reviewed. Nine patient-specific geometries of CFD models in 5 cases were created for flow analysis.

RESULTS: All 8 cases had two aneurysms, one large and the other small, projecting to the opposite sides at the proximal end of fenestrated vertebrobasilar junction. The different angiographic findings between right vertebral artery (VA) and left VA suggested the different hemodynamic characteristics of the respective VAs. CFD analysis also demonstrated that the inflows of these paired aneurysms were different between right VA and left VA. Flow simulations by CFD had good agreements with angiographic findings.

CONCLUSION: Intrinsic wall defects at fenestrated vertebrobasilar junction and specific hemodynamic stresses from two inflows may contribute the formation of a pair of dumbbell-shaped aneurysms.

Spontaneous Intracranial Hypotension Associated Dural Sinus Thrombosis: A Case Report

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INTRODUCTION: Dural sinus thrombosis (DST) is a rarely condition following spontaneous intracranial hypotension (SIH). If DST happens, the changes in symptoms and series of MR images often describe the cause and affect that intracranial hypotension may lead to the stasis of blood flow and therefore subsequent tendency for thrombosis.

CASE REPORT: A case of a 47-year-old man with spontaneous intracranial hypotension associated with dural sinus thrombosis is presented. He was first presented with syncope upon standing. SIH was diagnosed during first admission. During admission for second episode of syncope, MR images of brain revealed cerebral venous sinus thrombosis with venous stroke, intracranial hypotension, and bilateral traumatic subdural hemorrhage. Treatment with enoxaparin and warfarin was given according to the INR value. MR venogram during follow-up showed improvement of DST.

DISCUSSION: We reported a case of spontaneous intracranial hypotension associated with dural sinus thrombosis which may result from intracranial hypotension. Though there are many causes of dural sinus thrombosis, the association between these two diseases has not been well described. We reviewed currently available literatures, and our hypothesis is that the stasis of the blood flow in the dural sinuses due to intracranial hypotension may lead to dural sinus thrombosis.
Detection of Focal Cortical Dysplasia by Database-approach of Voxel-based Morphometry Structure MRI in Brain Cloud

**PURPOSE:** The purpose of this study of FCD patients is to detect the potential gray matter (GM) volume differences of single- and multi-modal VBM database-approaches as comparing with neurosurgical and histological proof.

**MATERIALS AND METHODS:** Seven FCD patients and 24 normal subjects were recruited for this study using a 3T MR scanner. T1-weighted image (T1WI), proton-density weighted image (PDWI) and T2-weighted image (T2WI) were acquired. GM segmentation was obtained with single-modal (that using T1WI only, we called them as FAST-1 and SPM8-1 and multi-modal (that combing the information of T1WI, PDWI, and T2WI, we called them as FAST-3 and SPM8-3) approaches with FSL and SPM8 algorithms. All GM images were co-registered, normalized and smoothed to the customized GM template and the resulting GM variation (z-value) was evaluated voxel-by-voxel among the individual patient and the normal database.

**RESULTS:** The results of seven FCD patients with z-value > 3 showed focal lesions (based on the histo-pathological findings and normalized post-operation T1WI) were detected by single-modal approach, and there are five patients were also detected by multi-modal approach. The significant result of FAST-1 was detected more voxel number of lesion between individual patient and normal database as compared with other approaches. Multi-modal approach was detected more regional differences than single-modal approach in SPM8.

**CONCLUSION:** The potential detected GM volume differences were more sensitive in FAST-1 than other approaches with pathological proof. More regional differences (voxel number with z-value > 3) were be detected with multi-modal approach as potential lesions by comparing single-modal approach.

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**PERSPECTIVE:** Published data obtained in children with tumors of the clival region are sparse. The purposes of this report are to contribute to the collective experience with the magnetic resonance (MR) imaging appearances of those clival region tumors arising in children and adolescents.

**MATERIAL AND METHODS:** We retrospectively reviewed eight patients younger than 19 years and operated on for a clival region tumor between 2003 and 2013. We analyzed demographic data, histology, tumor location, and their MR features.

**RESULTS:** There were 4 girls and 4 boys, with median age at diagnosis 10.3 years (5-18 years). The tumor histology included four (50%) chordomas, one (12.5%) chondrosarcoma, one (12.5%) clear cell meningioma, one (12.5%) poorly differentiated malignant tumor with epithelial differentiation, and one (12.5%) epithelioid hemangioendothelioma. While all chordoma, epithelioid hemangioendothelioma and poorly differentiated malignant tumor were mainly in midline of clivus, chondrosarcoma and meningioma were off-midline. Most tumors showed hyperintensities on T2 weighted images (WI), except meningioma was predominantly hypointense on T2WI. After gadolinium administration, all chordomas showed only minimal enhancement, while other tumors had at least heterogeneous enhancement. Diffuse-weighted images (DWI) also showed different signal intensities among these tumors and could be helpful in the differential diagnosis.

**CONCLUSION:** Preoperative conventional MR imaging combined with DWI features can furnish the differential diagnosis and assessment of pediatric clival region tumors, as well as improve treatment planning and consideration of preoperative embolization.
Meningioma with Meningioangiomatosis: CT and MR imaging features

INTRODUCTION: Meningioangiomatosis (MA) is a rare meningiovascular hamartomatous lesion. It may occur sporadically or occur in association with neurofibromatosis type 2 (NF2). MA is characterized by a plaque- or nodular-like mass within the cerebral cortex and overlying leptomeninges. MA is relatively rare while associated with meningioma. We present characteristic CT and MRI imaging findings in a patient with meningioma and associated MA.

CASE REPORT: A 17-year-old man with persistent headache was sent to our emergency room after a motor vehicle accident. Non-contrast CT scans revealed a high-attenuated mass with small dense calcifications in the right frontal cerebral cortex. MR images showed a typical extra-axial meningioma with dural tail and adjacent cortical calcifications.

DISCUSSIONS: MA is a rare benign disease with pathological hallmarks of meningioma and angioma. It is a very slow-growing tumor with characteristic imaging features rarely reported. MA primarily affects children and young adults with seizures and headaches being the most common symptoms. MA is associated with NF2 in nearly 50% of reported cases. Rarely, MA has been described to coexist with meningioma, vascular malformations, encephalocele, oligodendroglioma, and meningeal hemangiopericytomas. Among these, meningioangiomatosis with meningioma is the most frequent combination. We reported a young adolescent with meningioma and associated meningioangiomatosis showing diagnostic features on CT and MR images.
INTRODUCTION: Intracerebral hemorrhage (ICH) is a rare but severe complication in pregnancy women. We present a case of fibromuscular dysplasia (FMD) complicated with ICH during pregnancy, which has not been reported in the literature. The incidence and possible causes of FMD presenting with ICH during pregnancy are discussed and reviewed.

CASE REPORT: A 36-year-old, Gravida 1 Para 0 lady had been healthy without known underlying comorbidities. She was in week 36 of the pregnancy. Her prenatal examination was unremarkable; no pregnancy-induced hypertension or gestational diabetes mellitus were noted. The patient went to the local gynecology clinic in the early morning with complaint of generalized discomfort. Due to relatively high blood pressure (144/89 mmHg), oral antihypertensive agent was prescribed. Headache and right upper limb weakness developed and generalized tonic-clonic seizures with loss of consciousness were noted later. She was referred to the emergency department of a medical center shortly. Brain CT examination showed ICH around 5.1x4.7cm in the right parietal lobe and right centrum semiovale, ruptured into the lateral ventricle, third and fourth ventricles, accompanied with ventricular extension, acute hydrocephalus, subfalcine and uncal herniation. Fetal heart beat was still detectable and emergent cesarean section was performed before further intervention of her neurological problem. An alive preterm female baby was delivered. Following neurosurgery for intracranial decompression and intracranial pressure monitoring was done. Diagnostic brain angiography revealed segmental irregular narrowing and dilatation of the bilateral cervical internal carotid arteries with "string-of-beads" or nodular appearance. A small aneurysm in the SMA and mild contour irregularity in the left renal artery were also found. Fibromuscular dysplasia is considered. She still stays in the intensive care unit (ICU) for intracranial pressure monitoring and constant control of the blood pressure three weeks after the event till now.

DISCUSSION: Pregnancy-related ICH is a devastating condition with an in-hospital mortality rate 20.3%. According to a previous study in Ile de France, the incidences of arterial ischemic strokes and intraparenchymal hemorrhage associated with pregnancy or puerperium were similar to that for all women of childbearing age. Pregnancy-related ICH largely increases in the postpartum period. The most common causes for ICH during pregnancy or puerperium are eclampsia and rupture of a vascular malformation. Other possible factors include hypercoagulability due to maternal physiological changes, cerebral venous thrombosis, paradoxical embolism, postpartum cerebral angiopathy and peripartum cardiomyopathy. Fibromuscular dysplasia (FMD) is a noninflammatory nonatherosclerotic vasculopathy that causes intimal or medial proliferative change in the cervical internal carotid arteries (ICA), vertebral arteries (VA) and renal arteries. Arterial dissection, intracranial aneurysms, subarachnoid hemorrhage (SAH) and distal emboli secondary to ruptured aneurysm are associated complications. According to previous literature, ICH is less common than SAH, and accounts for 6% to 8% (3/49 and 3/37) in the FMD patients. SAH is strongly related to rupture cerebral aneurysm, while the cause of ICH is poorly understood. Concurrent arteriovenous malformation (AVM) or arteriovenous fistula (AVF), and rupture of the intraparenchymal cerebral aneurysm are possible causes. The possible mechanism of ICH in this case is assumed to be angiographically occult vascular malformation. The prevalence of FMD patients suffers from concurrent arteriovenous malformation or fistula is 0.45% (5/1100), not significantly different from the prevalence in the general population (0.04% to 0.52%). 10% of patients with FMD are with intracranial aneurysms, while the real incidence of the intraparenchymal aneurysms, causing ICH mainly rather than SAH as ruptured, is not clear. Elevated blood pressure and seizures secondary to cerebrovascular accident, just as in this case, may be masqueraded as preeclampsia or eclampsia, complicating the diagnosis and management.
Preliminary Experience of Dynamic Contrast Enhanced MR Imaging on Malignant Gliomas

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PURPOSE: Malignant glioma tends to have poor prognosis even after intensive treatment. It is difficult to differentiate recurrent tumor or post-treatment changes while enhancing lesions show up during follow up MRI. The purpose of this study is to evaluate the diagnostic ability of DCE-MRI for post-treatment evaluation in high grade glioma.

MATERIALS AND METHODS: From 2011 to 2013, patients diagnosed as high grade glioma pathologically and received follow up MRI after treatment for more than 3 times, were recruited. DCE-MRI was performed on a 1.5T MRI. The patients were divided into two groups, progression and stable, according to clinical, radiological and pathological results. We calculate the mean Ktrans and Ve from the whole lesion and the peak enhancing foci of the lesion. Mann-Whitney U test was used to evaluate the difference between two groups and receiver operating characteristic (ROC) curve was applied to compare the diagnostic accuracy.

RESULTS: In our study, there are 10 patients with disease progression and the other 5 patients with stable disease. Peak Ktrans (P=0.024) and whole volume Ktrans (P=0.005) show significant difference between disease progression & stable disease groups. Peak Ve show significant difference (P=0.05) between two groups, but not the whole volume Ve. By using ROC curve, the cut-off value for peak Ktrans and whole volume Ktrans is 66.38 & 47.92 with sensitivity about 100% & 90% and specificity about 100% & 100% in each method, respectively.

CONCLUSION: DCE-MRI is feasible to evaluate treatment response for high grade glioma with Ktrans & Ve value.
Arterial Spin Labeled Perfusion MRI in Children with Chronic Kidney Disease

PURPOSE: Chronic Kidney Disease (CKD) is associated with numerous systemic changes such as hypertension, atherosclerosis, and anemia that can alter cerebral blood flow and brain function. Patients with CKD are also at increased risk of cerebral ischemia, most notably ischemia affecting subcortical white matter. While many patients develop CKD as a consequence of age-related disorders such as hypertension and diabetes, CKD can also begin in childhood and affect brain development and cognitive function. To further elucidate the pathophysiology and mechanisms of cognitive dysfunction in children with CKD, we are using multimodal MRI to compare brain structure and function in a cohort of children with CKD to controls. Here we report our initial findings using arterial spin labeled (ASL) perfusion MRI to quantify cerebral blood flow (CBF) in this cohort.

MATERIALS AND METHODS: 29 patients with any stage of CKD I to V (defined as estimated glomerular filtration rate, eGFR < 90 ml/min/1.73m2 using modified Schwartz formula, on dialysis, and post-transplant) and 14 age-matched control subjects were included in this analysis. Data acquisition was performed on a Siemens 3T Verio whole body MRI scanner using a 32-channel head coil. A pCASL labeling scheme was implemented with 2D GE EPI sequence. The labeling and control RF duration was 1.5 sec with post-labeling delay of 1.2 sec. Multi-slice perfusion maps were acquired with the following parameters: TR/TE = 4000/17 ms, flip angle=900, bandwidth = 1532 Hz/pixel, slice thickness = 4mm with 25% distance factor, matrix size = 64x64, FOV = 240x240 mm2, slice number = 20, and GRAPPA factor = 2 in Ky. The total ASL MRI acquisition time was approximately 5 minutes for 40 label/control pairs. Absolute CBF maps were calculated using ASLbx. Gray matter (GM), white matter (WM) and global CBF were extracted using masks created from 3D MPRAGE data. The GM mask was defined by GM probability > 0.8 and anemia reduces blood viscosity, thereby increasing CBF. Severe anemia may also cause in hypoxic complications. This study also confirmed significant age effects on CBF in both CKD patients and controls that likely reflect developmental changes in regional brain function. Although Hct and age explained most of the variance in CBF in CKD patients versus controls in the multiple regression analysis, in the univariate analyses CKD patients appeared to deviate from the significant correlation between age and WM CBF observed in controls. While group differences in WM CBF did not reach significance after controlling for Hct and age effects, the finding is of interest because patients with CKD have been reported to have high rates of structural changes in white matter, and elevated WM CBF may reflect altered cerebrovascular autoregulation.
Acute Stroke Patients with Hyperdense Vessel Sign in Taiwan Benefit from IV rtPA or not?

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BACKGROUND: Hyperdense vessel sign (HVS) is well-known in acute stroke evaluation. Earlier studies claimed presenting this sign was benefit from IV rtPA, whereas, recent studies turned it down. The etiology of stroke is different between western and eastern countries (cardiogenic emboli versus atherosclerosis dominant). Besides, the atherosclerotic plaque may obscure this sign. We would like to know if presence of HVS indicating better prognosis under IV rtPA in Taiwanese patients.

PURPOSE: (1) To evaluate the diagnostic power between the conventional CT and CT source image in detecting HVS. (2) To evaluate the prognosis in acute stroke Taiwanese patients between hyperdense (red clot) and non-hyperdense vessel (white clot) in IV rtPA treatment.

MATERIAL AND METHODS: From March 2012 to February 2013, 37 patients (23 men and 14 women) with acute stroke (<3 hours) received IV rtPA in FEMH hospital were enrolled. The initial conventional CT (Brilliance-64, Philips Healthcare) (5mm/0mm in thickness/gap) and the CT source image (0.6mm/0mm in thickness/gap) were evaluated by a neuroradiologist, and the segmented vessels, such as ICA, BA, M1, M2-4..., were scored hyperdense or not. The followed up image (CTA, CTP, or MRI) in next 24 hours was evaluated presence of established infarction, hemorrhage, and recanalization of index vessel. The acute phase response (<8 hours after treatment) of IV rTPA was recorded as prognosis of treatment.

RESULTS: There are 6 (16.2%) patients presenting hyperintense vessel in conventional CT versus 12 patients (32.4%) in CT source image. In 12 patients with HVS (red clot), there are improvement in 4 (33.3%) and bleeding in 4 (33.3%), whereas, in remaining 25 patients without HVS (white clot), there are improvement in 13 (52%) and bleeding in 3 (12%). No statistic difference between two groups was detected.

CONCLUSION: CT source image is superior to conventional CT in detecting HVS. Patients with HVS (red clot) did not gain more benefit or bleeding from IV rtPA treatment, which is similar with recent studies of western countries.
Superior Sagittal Sinus Air Embolism after a Penetrating Injury: A Case Report

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INTRODUCTION: Intracranial air secondary to craniocerebral trauma is not uncommon and may be easily demonstrated by computed tomography. The air may be found in the epidural, subdural, or subarachnoid spaces or even the ventricular system, the site depending on the site of the dural or arachnoidal injuries. With penetrating brain injury, parenchymal air may also be detected along its pathway. We report a case of air within the superior sagittal sinus detected by computed tomography after a penetrating screwdriver wound from a suicidal attempt.

CASE REPORT: An 86-year-old elderly male patient suffered from dementia and insomnia with previous experience of suicidal attempt. He was found to have stabbed himself on the forehead this time with a screwdriver and was brought to our ER. At ER, GCS:E4M5V1 with respiratory failure was observed and was intubated. The brain CT revealed a long screw driver penetrating the frontal skull with the tip in Lt occipital lobe, a Lt frontal pneumocephalus with air collection in the Lt lateral ventricle and air emboli in the superior sagittal sinus. He received pain control with fentanyl and to keep RASS score -2~3. A DNR was signed by the family and the screwdriver was removed directly from the wound by our neurosurgeon. His vital sign remained stable. On day 4, BT: 36.6; PR:69 beats/min ; RR:13 times/min; BP: 169/66mmHg. GCS : E2M4V1. No seizure observed in the aftermath.

DISCUSSION: Air emboli in the superior sagittal sinus can be fatal and has been reported in postmortem radiographic examination of patients sustaining blunt head trauma and very few living patients. Our case showed the air emboli in the superior sagittal sinus were well tolerated by the patient and patient did recover gradually despite the deep penetrating wound through the brain.
**Neurolymphomatosis on MRI: Case Series**

**INTRODUCTION:** Neurolymphomatosis (NL) is a rare disease caused by infiltration of central or peripheral nerve system by non-Hodgkin’s lymphoma. NL is notorious for going unrecognized as common imaging modalities often fail to convey the subtle pathological changes of the disease. Furthermore, its relative rarity means the disease is often not considered as a potential diagnosis. Despite poor sensitivity of MRI in detecting this disease, we have collected three cases of neurolymphomatosis, in which MRI findings are clearly presented and show good correlation with the symptoms.

**CASE REPORT:** Three cases of mid-aged women, with presentation of polyradiculoneuropathy, were diagnosed of degenerative disk disease or motor neuron disease initially. MRI showed thickening and increased contrast-mediated enhancement of spinal nerve roots and cranial nerves depending on their involvement. In these three cases, final diagnoses of neurolymphomatosis were made based on MRI findings, PET/CT imaging, CSF analysis and pathology. And after chemotherapy, all three cases achieved clinical remission.

**DISCUSSION:** The MRI findings of neurolymphomatosis can either be significant or subtle. However, a high index of suspicion is needed in patient with multiple nerve involvement on MRI. Besides MRI findings, clinical manifestation, PET/CT correlation, histopathologic examination and cerebrospinal fluid (CSF) analysis are all essential for the diagnosis.
Bedsore Induced Necrotizing Fasciitis and Secondary Pneumorrhachis: A Case Report

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INTRODUCTION: Pneumorrhachis is an uncommon phenomenon and can have different etiologies and possible pathways of air entry into the spinal canal. It can be divided into primary and secondary from either iatrogenic, traumatic or nontraumatic. Spinal CT is a good diagnostic tool to detect the intraspinal air and associated with further air distributions in the body.

CASE REPORT: A 74-year-old elderly female patient had past history of hypertension and Parkinsonism and being followed at Neuro OPD regularly. She was admitted due to bed sore about two months ago and received debridement by our surgeon then and went home. Sudden onset of fever of 39 degrees Celsius with wound discharge brought her to our ER. Vital sign showed BT: 37.7, HR: 65/min, RR: 20/min, BP: 136/77 mmHg, WBC: 26140, CRP: >25, Cr 1.1, eGFR 51.61. CT of abdomen and pelvis was performed to rule out intraabdominal infection and revealed widespread subcutaneous emphysema with abscess formation in right gluteal space, the presacral space, the retroperitoneum and the spinal canal. Abnormal gas collection also noted in the epidural space of the Rt side sacral hiatus.

DISCUSSION: Pneumorrhachis could produce a diagnostic challenge and may easily be overlooked. Although the disease is self-limiting and with very little therapeutic consequences, prompt recognition and to entertain the diagnosis is essential. In our case, there were extensive involvement of the extraperitoneal spaces of the pelvic cavity from a poorly controlled bed sore.

Solitaire Stent Retriever in Acute Stroke Revascularization

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PURPOSE: Solitaire retrievable stent is a revascularization device, which can be used as a mechanical thrombectomy device to remove clot and quickly restore blood flow in patients experiencing acute ischemic stroke. This article is to demonstrate its techniques and clinical applications.

MATERIALS AND METHODS: Eight patients were observed and included during July to September of 2013 in Ronald Reagan UCLA Medical Center. Six patients presented with MCA occlusions and two patients were found with ICA occlusions. Therapeutic time window was between three to six hours after symptoms onset. The intervention was performed under either local or general anesthesia. Four major phases in Solitaire revascularization procedure included: (1) sheath and guiding catheters insertion: a 6–8 Fr guide catheter or Shuttle was placed into the target. (2) clot crossing: the thrombus was crossed with a 0.021 inch or a 0.027 inch microcatheter. (3) unsheathing and stent deployment: the stent retriever is subsequently released by pulling back the microcatheter while holding the retriever device in place. (4) clot retrieval with or without balloon inflation: the device was slowly retrieved together with the microcatheter under continuous aspiration through the guide catheter. In case a proximal balloon catheter was used, the balloon was temporarily inflated to block antegrade flow.

RESULTS: The mean age of the eight patents was 68.5 years old with mean NIHSS score was 17. Stent deployment was successfully performed in all eight patients. TICI 2b or 3 was achieved in six of eight patients (75%), one patient (12.5%) with TICI 2a and one patient (12.5%) failed to reanalyze the occluded vessel. The average times of passage of the stent were 2.2 times and the first time to gain reperfusion from the groin puncture was within 2 hours in seven patients.

CONCLUSION: The features of stent retrieval are higher recanalization rate and immediate recanalization upon stent deployment before clot removal. These advantages may improve stroke outcomes as more clinical experience obtained.
Trans-venous Embolization of Cavernous Sinus Dural Arteriovenous Fistula via Angiographic Occlusive Inferior Petrosal Sinus

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PURPOSE: Trans-inferior petrosal sinus (IPS) coil embolization is an efficient and safe method to manage cavernous sinus dural arteriovenous fistulas (CSDAVFs). However, Some CSDAVFs may associate with occlusive or stenotic IPS leading difficult to access. The purpose of this study is to report our experiences of trans-venous embolization of the CSDAVF via angiographic occlusive IPS.

MATERIALS AND METHODS: Over 11-year periods, a total of 57 patients with CSDAVFs underwent trans-IPS detachable coil embolization. From these databases, there were 20 patients attempting to undergo transvenous embolization via angiographic occlusive IPS. There were 7 men, 13 women; age ranged from 41 to 78 years old (mean: 58 yrs). We retrospectively analyses the angioarchitecture of CSDAVFs, procedural time and angiographic as well as clinical outcomes after embolization.

RESULTS: True occlusive IPS was found in 13, while patent IPS with compartment of the IPS-CS was demonstrated in 7. Successful navigation of microcatheter to fistula site of the CS was achieved in 16 (80%), while 4 failed after many attempts. The mean procedural time in true occlusive IPS vs compartment of IPS-CS was 119 minutes vs 129 minutes. No recurrent or residual fistula was observed on follow-up neuro-images. Two patients had transient third (n=1) or sixth (n=1) cranial nerve palsy. One patient had perforation of the IPS leading to temporary headache. There was no other significant procedure-related neurological complication. The clinical follow-up period varied from 7 to 34 months (mean: 18 months)

CONCLUSION: Angiographic occlusive IPS of CSDAVF may relate to true occlusion of IPS or patent IPS with compartment of IPS-CS. There is no statistical significance of procedural times in these two different fistulas anatomies. Trans-venous embolization of via angiographic occluded IPS is a feasible and effective method to manage CSDAVF with high successful rate and low peri-procedural risk.

Application of Metallic Artifact Reduction in Post-interventional Cone-beam CT

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PURPOSE: FDCT has been increasingly used as a follow-up examination following endovascular intervention. MAR has been successfully demonstrated in coil mass cases, but only in a small series. We attempted to objectively and subjectively evaluate the feasibility of MAR in situations of various metallic objects and coil lengths.

MATERIALS AND METHODS: We retrospectively reprocessed the FDCT data of patients after they received endovascular treatment between January 2009 and November 2011 by using an MAR correction algorithm. We measured CT value range and noise by using ROI methods, and 2 experienced neuroradiologists rated the degrees of improved imaging quality and artifact reduction by comparing uncorrected and corrected images.

RESULTS: After applying the MAR algorithm, the noise reduced and the CT values were corrected substantially regardless of the types of metallic object and various sizes of coil mass. The rater study achieved an overall improvement of imaging quality and artifact reduction, with the greatest improvement in the coiling group, moderate improvement in liquid embolizers, and smallest improvement in ventricular shunting.

CONCLUSION: The MAR algorithm substantially reduced artifacts and improved the objective image quality in every studied case. This also allowed improved diagnostic confidence in most cases.
3D Rotational Angiography in Intracranial Arterial Dissections

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PURPOSE: The intimal flap or double lumen sign is pathognomonic in the diagnosis of intracranial arterial dissection, but infrequently demonstrated in imaging studies. The purpose of this study is to evaluate the reformatted source images from 3D rotational angiography (3DRA) in the diagnosis of intracranial arterial dissections.

MATERIALS AND METHODS: Eleven patients (5 men and 6 women; mean age: 47 years old) with symptomatic intracranial arterial dissections undergoing cerebral angiography with 3DRA were enrolled from November 2009 to June 2013. The presence of intimal flap or the double lumen sign on angiographic images and the reformatted 3DRA source images was determined independently by two neuroradiologists. Interrater variability in each imaging technique and the diagnostic ability of the two imaging techniques were evaluated.

RESULTS: Intimal flaps or double lumen signs were identified in nine patients (9/11, 82%) on the reformatted 3DRA source images, while these specific findings were demonstrated in only three patients (3/11, 27%) on the angiographic projection images. Substantial interrater agreement was achieved in the both groups. Reformatted source images from 3DRA were more likely to identify intimal flaps or double lumen signs than conventional angiographic projection images (P=0.015) in this study.

CONCLUSION: The pathognomonic findings in intracranial arterial dissections, intimal flaps or double lumen signs, are more likely recognized on reformatted source images from 3DRA than on the conventional angiographic projection images.
Anatomy-based Approach for Endovascular Treatment of Vertebro-vertebral Arteriovenous Fistula

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PURPOSE: Vertebro-vertebral arteriovenous fistula is abnormal shunt between the extracranial vertebral artery, its muscular or radicular branches and an adjacent vein. Many treatment modalities (e.g. surgery, balloon, coil, NBCA and Onxy) were reported in the literature for successful management of this disease. In this brief report, we review our experience of treating vertebro-vertebral AVF.

MATERIALS AND METHODS: Retrospective review of all the patients of endovascular treatment for vertebro-vertebral AVF in our institution.

RESULTS: Totally 5 patients of vertebro-vertebral AVF were treated by endovascular modalities, including detachable coils, NBCA and stent-graft, in our department.

CONCLUSION: We review our experience of endovascular treatment for vertebro-vertebral AVF and propose an original concept of anatomic-based approach for treatment modalities selection.
成功拯救神經血管內介入治療時所遭遇的動脈破裂：混成手術室的顯著價值
Successful Rescue of Arterial Perforation during Neuro-endovascular Therapy: Remarkable Value of the Hybrid Operating Room

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PURPOSE: Intraprocedural arterial perforation (IPAP) is a potential dismal complication of neuro-endovascular therapy with high mortality and morbidity rate. Here we report 5 cases of successful rescue of arterial perforation during neuro-endovascular therapy in the hybrid operating room (OR).

MATERIALS AND METHODS: Between July 2009 and December 2013, there were 146 intracranial neuro-endovascular procedures performed in the hybrid OR of Taichung Veterans General Hospital. The rescue procedure performed in hybrid OR includes quickly complete coiling until no more extravasation; aggressive decompression using external ventricular drainage (EVD) for intracranial pressure (ICP) control; reversal of anticoagulation with protamine and fresh frozen plasma. Final postoperative clinical outcome was evaluated by Glasgow Coma Scale (GCS) scores and postoperative 3-month modified Rankin Scale (mRS).

RESULTS: The causes of the IPAPs were coil protrusion (n = 3), microcatheter perforation (n = 1), microwire penetration (n = 1). Two cases involved emergent ruptured aneurysms, while three cases happened in elective procedures. The location of perforated artery of the IPAP was 1 in posterior cerebral artery, 2 in basilar artery and 2 in anterior communicating artery. Salvage treatment with emergent EVD were applied in all 5 cases. The open pressure of EVD was 10~20 mmHg in 4 cases and extremely high over 40mmHg in 1 case. All 5 patients were discharged with good recovery (mRS ≤ 2).

CONCLUSION: IPAP can be rescued successfully by the aggressive attitude and quick conversion to backup surgery in the hybrid operating room. This report highlights the remarkable value of the hybrid operating room in neuro-endovascular therapy.

脳內血管之粗導管極遠到達：球囊下錨式技巧

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PURPOSE: Tortuous vasculature in carotid siphon or jugular bulb commonly leads to failure of distal placement of endovascular device or further treatment. To report the details of balloon-anchoring guide catheter advancement technique.

MATERIALS AND METHODS: Using interaction between balloon-anchoring wire and the large-bore soft guide catheter (6F Neuron) to overcome tortuous vasculature for ultra-distal intracranial access.

RESULTS: This novel technique allows ultra-distal intracranial access with a large-bore guide catheter. We successfully cross tortuous carotid artery for placement of a covered stent to treat carotid-cavernous fistula and advancement to anterior third of superior sagittal sinus for direct mechanical thrombolysis.

CONCLUSION: Balloon-anchoring large-bore guide catheter advancement is a novel technique to overcome the problem of vascular tortuosity that hinders endovascular treatment of intracranial lesions.
Interventional Revisualization of Acute or Subacute Occluded Internal Carotid Artery

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PURPOSE: In patients presented with stroke symptoms that caused by acute or subacute occlusion of internal carotid artery (ICA), it sometime may be equivocal to reopen the occluded ICA. We present our experience in treating these patients.

MATERIALS AND METHODS: During 3 years period, we had 7 patients presented with stroke symptoms that ICA was total occluded. Most of this patient had received perfusion image study and was considered candidates for revisualization therapy.

RESULTS: Six of the seven patients were revasculized with various interventional techniques including carotid angioplasty, carotid stenting and penumbra aspiration system. Favorable outcome were observed in most of the patients. One of the patients had an unfavorable result.

CONCLUSION: We find that revasculized of the occluded ICA is a tricky procedure that required detail understanding of the perfusion status of the parenchyma of the brain and acquaintance of the interventional material and skills.
罕見的小腦靜脈為主的動靜脈畸形：病例報告和論文回顧
A Rare Cerebellum Venous-predominant Parenchymal Arteriovenous Malformation: Case Report and Review Articles

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**INTRODUCTION:** We present a rare subtype of arteriovenous malformation.

**CASE REPORT:** A case report of a cerebellum venous-predominant parenchymal arteriovenous malformation patient with 10 years follow up.

**DISCUSSION:** We review the characteristic imaging findings and treatment policy. We found target embolization should be the alternative treatment of choice.