Progress in Radiology 2023

The 14th Symposium of the Japanese
Scandinavian Radiological Society (JSRS)
& 17th Nordic Japan Imaging Informatics
Symposium

May 30 - June 1, 2023
Stockholm & Linköping, Sweden

Universitetssjukhuset
i Linköping

Local organizing committee

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Karolinska university hospital, Stockholm:

Antonios Tzortzakakis

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Linköping university hospital, Linköping:

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14th Symposium of the Japanese Scandinavian Radiological Society and 17th Nordic Japan Imaging Informatics Symposium.

Program

Location: Conference Room J3:06 Ulf von Euler, BioClinicum, Solnavägen 30, Solna.

Tuesday, 30 May 2023

08:30 - 09:15: Registration

09:15 - 09:30: Opening Ceremony

Welcome, speech from Prof. Rimma Axelsson, National Societies representatives.

09:30 - 09:45: Peter Aspelin. Scandinavian Japanese Radiological Society – The Past, the Present and the Future.

09:45 – 10:15: Honorary Lecture 1

Prof. Rimma Axelsson. Karolinska University Hospital. Theranostics - See what you treat and treat what you see.

10:15 – 12:30 SJR 2023 - Progress in Radiology: Precision Medicine & Theranostics Session 01 -- Moderators: Antonios Tzortzakakis and Shiro Obata

10:15 – 10:30: Pawel Rasinski. Tumor characterization by [68Ga]FAPI-46 PET/CT can improve treatment selection for pancreatic cancer patients: An interim analysis

10:30 – 10:45: Siri af Burén. [68Ga]Ga-ABY-025 positron emission tomography (PET) for noninvasive quantification of Human Epidermal growth factor Receptor 2 (HER2) status in metastatic breast cancer with low HER2 expression - preliminary results

10:45 – 11:15 Coffee Break

11:15 – 11:30: Kenta Konishi. Initial Experience with Quantitative Evaluation of Somatostatin Receptor-positive Tumors Treated with Lu-177 DOTATATE

11:30 – 11:45: Olof Jonmarker. The influence of short-term hormone treatment on 68Ga PSMA PET/MRI – a pilot study

11:45 – 12:00: Wenchao Gu. Delay phase of 18F FDG PET radiomics signature based on machine learning for predicting muscle invasion in bladder cancer.

12:00 – 12:15: Hiromi Hirasawa. Efficacy of 18F-Deoxyglucose Positron Emission Tomography for Detection of Renal Cell Carcinoma in Patients with End-stage Renal Disease

12:15 – 12:30: Mai Kim. Modified Lugano classification of FDG-PET imaging for response assessment in locally advanced unresectable or recurrent/metastatic oral squamous cell carcinoma.

12:30 – 13:30: Lunch Break
13:30 – 14:45 SJR 2023 - Progress in Radiology: Informatics – Education – Challenges
Session 02 – Moderators: Nils Dahlström and Masamitsu Hatakenaka

13:30 – 13:45: Hiroshi Kondoh. Survey of the Current State of Hospital Cybersecurity in Japan and Countermeasures.

13:45 – 14:00: Jarmo Reponen. User experience of radiology information systems (PACS, RIS) in Finland. A comparison to the user experience of electronic health record systems

14:00 – 14:15: Hauke Bartsch. Clinical radiology is ready for hospital-based research studies using deep-learning.

14:15 – 14:30 Hannu Aronen. New methods for resident training evaluation: Finnish experience with Entrustable Professional Activity (EPA) in resident training.

14:30 – 14:45 Mai Britt Bjørk. Prediction of age older than 18 years in sub-adults by MRI-segmentation of 1st, 2nd and 3rd molars.

End of the scientific programme Day 1.

15:20 Social Event. Meeting Point: Eugeniavägen 18C

Wednesday, 31 May 2023

09:00 - 09:30: Honorary Lecture 2:
Prof Yoshito Tsushima, Gunma University Hospital. Safe and comfortable radiology examination.

09:30 – 10:45 SJR 2023 - Progress in Radiology: Interventional Radiology
Session 03 -- Soeren Rafaelsen and Tomas Bjerner

09:30 – 09:45: Hidemasa Saito. Efficacy of endovascular treatment for completely occlusive acute-subacute portal and mesenteric vein thrombosis with severe complications in patients without cirrhosis

09:45 – 10:00 Tomokazu Takeuchi. Postprocedural complication of central venous (CV) port systems: comparison of upper arm and subclavian ports

10:00 – 10:15 Tatsuo Ueda. Endovascular treatment with Viabahn stent-grafts for peripheral arterial injury and bleeding at the visceral arteries: initial and midterm results

10:15 – 10:45: Shiro Obata. A game changer of cancer treatment, KORTUC (Kochi oxydol radiation therapy to unresectable carcinoma); collaboration of IVR and radiotherapy.

10:45 – 11:15: Coffee Break

11:15 – 15:15 SJR 2023 - Progress in Radiology: Abdominal Radiology
Session 04 – Moderators: Torkel Brismar and Takahiko Mine

11:15 – 11:30 Ingfrid Haldorsen. Imaging at primary diagnostic work-up in uterine cervical cancer

11:30 – 11:45: Masamitsu Hatakenaka. GLZLM_SZHGE from DWI may predict node metastasis in uterine endometrial cancer

11:45-12:00: Kristine Fasmer. Does abdominal fat distribution have an impact endometrial cancer prognosis and disease progression?

12:15 – 12:30: Raffaella Pozzi Mucelli. Imaging findings and performance of MRI-based surveillance for individuals at risk for pancreatic cancer.

12:30 – 12:45: Soeren Rafaelsen. Structured templates in reporting CT staging on colon cancer. A national survey

12:45 – 13:00: Soma Kumasaka. Prostate calcification as a predictor of future prostate cancer.

13:00 – 14:00: Lunch Break

14:15 – 14:30: Gina Al-Farra. Imaging side effects and complications of antineoplastic therapy in gastrointestinal tract- radiological review.

14:30 – 14:45: Taha Durukan. Contrast Media Dose in Abdominal Computed Tomography Scans of Children with Suspected Appendicitis – a Retrospective Quantitative Study.

14:45 – 15:00: Yuko Seki. Post-contrast acute kidney injury (PC-AKI) in patients with multiple myeloma undergoing contrast-enhanced CT.

15:00 – 15:15: Kristoffer Sola. The correlation between sarcopenia and muscle quality to survival in kidney transplant recipients.

15:15 – 15:45: Coffee Break

15:45 – 16:45 SJR 2023 - Progress in Radiology: Modern Challenges
Session 05 – Moderators: Anders Persson and Hiroshi Kondoh

15:45 – 16:00: Takahiko Mine. Evaluation of blood flow energy loss before and after endovascular aneurysm repair using 4D Flow MRI.

16:00 – 16:15: Aziza Adem. Investigating photon-counting CT image quality and optimal contrast-media enhancement of hypo-attenuated leaflet thickening.

16:15 – 16:30 Nanako Furuta. Nodules on chest radiography detected by artificial intelligence (AI): What We Need to Know, What We Can Ignore?

16:30 – 16:45: Kotomi Iwata. Measurement of Turbulent Kinetic Energy in Hypertrophic Cardiomyopathy Using Triple-velocity Encoding 4D FlowMR Imaging.

End of the scientific programme Day 2.

18:00 Social Event. Meeting point:

Nobel Prize Museum
Börshuset, Stortorget 2, Gamla Stan, Stockholm

Thursday, 01 June 2023

09:00 – 09:30: Board Meeting (conference room J3:01, Tore Curstedt)

09:30 – 10:15 SJR 2023 - Progress in Radiology: Modern Challenges
Session 06 – Moderators: Ingfrid Haldorsen and Masafumi Kanoto

09:30 – 09:45: Seigoh Happoh. A Combined Approach Using 4D Flow MRI for Cerebral Blood Flow and Deep-Learning-Based Volumetry for Brain Volume.

09:45 – 10:00: Akane Ohashi. Evaluation of the diagnostic performance of three imaging modalities: A preliminary analysis of high-risk breast cancer screening program in southern Sweden.

10:00 – 10:15: Yusuke Sato. Clinical value of maximum intensity projection (MIP) images created from contrast-enhanced CT in breast cancer detection.

10:15 – 10:45: Coffee break

10:45 – 11:15 Honorary Lecture 3
Prof. Lennart Blomqvist. Karolinska University Hospital. Incidental imaging findings in the setting of hereditary cancer syndromes – Experiences from a nationwide study on individuals with h*TP53* related cancer syndrome.

11:15 - 11:30: Hiroyuki Tajima. Historical impacts of Scandinavian Japanese Radiological Society.

11:30 – 11:45: Jarmo Reponen. Progress in Radiology; Nordic Japan Imaging Informatics Symposium.

11:45 - 12:15: Yoshito Tsushima: Closing remarks, Presentation of future meeting, Group photo.

12:15 - 13:15 Lunch Break

ca: 13:30 - Bus to Linköping. Visit CMIV, Centre for Medical Image Science and Visualization, Linköping University and Linköping University Hospital.
(Return by bus after the visit.)

JSRS 2023 Stockholm is sponsored by:

See what You treat and treat what You see

Theranostics Trial Center Karolinska (TTC-K)

Rimma Axelsson

Professor in Nuclear Medicine,
Division of Radiology Department of Molecular Medicine and Surgery,
Karolinska Institutet

The number of clinical trials investigating new targeted drugs for various indications is rapidly expanding and add to the momentum of *precision medicine* for cancer patients. At the same time, benefit-toxicity balance is of utmost importance from the perspective of an individual patient as well from a health-economic point of view. Patient selection for the treatment with these drugs is currently made by molecular analyses, using immunohistochemistry and/or in situ hybridization, on a tumor biopsy, either from the (archived) primary tumor or a metastatic lesion. However, an assessment of predictive biomarkers on a tumor biopsy has its limitations – invasiveness with needs for tissue samples which is not always practically feasible; non-representativeness of a solitary biopsy for the whole body because of intra- and intertumoral as well as spatial heterogeneity in receptor expression, limited efficacy in predicting whether the administered drugs will reach their target and thereby can execute anticancer activity. Therefore, access to more refined diagnostic tools that could provide information about the presence of the target for such treatments with high reliability is critical.

The occurrence of such target could be visualized by PET imaging and concept of image guided therapy are implemented within Theranostics Trial center Karolinska.

This presentation will cover several new imaging tracers tested within Theranostics Trial Center Karolinska, such as Programmed Death Ligand 1, Human Epidermal growth factor Receptor 2 and Poly Adenosine diphosphate-Ribose Polymerase.

Tumor characterization by [^{68}Ga]FAPI-46 PET/CT can improve treatment selection for pancreatic cancer patients: An interim analysis

Pawel Rasinski, Department of Clinical Science, Intervention and Technology - CLINTEC Karolinska Institutet

Purpose

Correct and timely diagnosis of pancreatic cancer (PC) is essential for treatment selection. Standard-of-care imaging methods can sometimes not differentiate malignancies from inflammation or detect malignant transformation in premalignant lesions. This interim analysis aims to evaluate the diagnostic accuracy of [^{68}Ga]FAPI-46 PET/CT for PC and determine the sample size needed to demonstrate whether or not this imaging technique improves the characterization of equivocal lesions detected by standard-of-care imaging methods.

Methods

30 patients scheduled for surgery of suspected PC underwent [^{68}Ga]FAPI-46 PET/CT imaging. Standardized uptake values (SUV$_{max}$ and SUV$_{mean}$) were determined in target lesions and postoperative histopathology was used as reference standard. Receiver operating characteristics (ROC) and power analyses were performed for whole cohort, and a sub-cohort of 11 patients with equivocal clinical imaging work-up preoperatively.

Results

Histopathology revealed malignancy in 20/30 patients. [^{68}Ga]FAPI-46 uptake was significantly elevated in malignant tumors compared to benign lesions ($p<0.001$). ROC analyses showed 100% sensitivity and 80% specificity for differentiation of malignant from non-malignant pancreatic tumors in the whole cohort, as well as 100% diagnostic accuracy in the sub-cohort with equivocal imaging work-up only. 38 equivocal observations are needed for sufficient power.

Conclusion

[^{68}Ga]FAPI-46 PET/CT can differentiate malignant from benign lesions in the pancreas with high accuracy. A sample size of 120 patients should generate the 38 observations needed to demonstrate that [^{68}Ga]FAPI-46 PET/CT is superior in characterizing equivocal lesions detected by standard-of-care imaging.

Clinical Application

We propose that [^{68}Ga]FAPI-46 PET/CT can be clinically applied not just as a complement but could become a necessary tool when standard-of-care imaging is inconclusive.

[^{68}Ga]Ga-ABY-025 positron emission tomography (PET)

for noninvasive quantification of Human Epidermal growth factor Receptor 2

(HER2) status in metastatic breast cancer with low HER2 expression - preliminary results

Siri af Burén[1,2], Renske Altena[3,4], Emma Jussing[3,5], Mattias Karlsson[1], August Blomgren[1], Nikolai Brun[6]; Fredrik Y Frejd[6,7], Thuy A. Tran[3,5], Rimma Axelsson[1,8]

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4. Department of Breast cancer, Endocrine tumors and Sarcoma, Theme Cancer, Karolinska University Hospital, Stockholm, Sweden.
5. Department of Radiopharmacy, Karolinska University Hospital, Stockholm, Sweden;
6. Affibody AB, Solna, Sweden;
7. Department of Immunology, Genetics and Pathology, Uppsala University, Sweden;
8. Department of Molecular Medicine and Surgery, Karolinska Institutet, Stockholm, Sweden

Purpose: Tumors with low HER2 expression account for about 50% of all breast cancers and can be treated with HER2-drug antibody conjugates (ADC). The purpose of this pilot study is to investigate the feasibility of HER2-specific PET imaging with the affibody molecule [^{68}Ga]Ga-ABY-025 (hereafter HER2 PET) for visualization of lesions with HER2-low status to improve the selection of patients who would benefit from effective targeted treatment.

Methods and Materials: In this pilot, 10 participants with metastatic HER2-low breast cancer undergo a HER2 PET followed by a tumor biopsy guided by imaging results. The pilot is deemed successful when HER2 PET identifies all lesions with HER2 expression and no false-negative [^{68}Ga]Ga-ABY-025 uptake is detected in biopsy-verified HER2-expressing lesions according to immunohistochemistry (IHC) or in situ hybridization (ISH).

Results: As of February 13th, 9 patients had been informed about the study. Five patients consented and underwent HER2 PET. Four of these underwent biopsies of either hepatic metastatic lesions (n=3) or lymph nodes (n=1). Maximum standardized uptake values in lesions biopsied varied between 6.0 and 28.7 and correlated to IHC results of either 1+ or 2+, i. e HER2-low.

Conclusion: Preliminary results suggest HER2 PET with [^{68}Ga]Ga-ABY-025 is feasible for the detection of HER2-low tumors. Patient accrual will continue.

Clinical Relevance/Application: Given the confirmation of preliminary results the use of HER2 PET may be of significant value as a non-invasive tool to identify patients with HER2-low breast cancer that would benefit from treatment with HER2-ADC's.

Initial Experience with Quantitative Evaluation of Somatostatin Receptor-positive Tumors Treated with Lu-177 DOTATATE

Kenta Konishi[1], Kohei Wakabayashi[1], Naofumi Ota[1], Tomoyuki Asao[1], Shuhei Aramaki[1], Wenxin Li[1], Haruka Fujita[1], Michifumi Sawada[2], Katsumasa Nakamura[1]

1) Department of Radiation Oncology, Hamamatsu University School of Medicine
2) Department of Radiology, Hamamatsu University Hospital

【Purpose】Lu-177 DOTATATE for somatostatin receptor-positive tumors was covered by insurance in Japan in June 2021 and started in our institution in June 2022. The purpose of this study is to investigate the quantitative evaluation of Lu-177 DOTATATE in response or non-response cases.

【Method】We examined 6 patients with somatostatin receptor-positive tumors retrospectively, who were treated at our institution since June 2022. The dose was 7.40 GBq every eight weeks for four doses. The Lu-177 whole body scan and SPECT/CT were performed using Symbia Intevo 6 (Siemens Healthcare, Erlangen, Germany). We measured standardized uptake value and absolute radioactivity concentration (kBq/ml) on the highest uptake target lesions in the tumor using syngo. via (Siemens Healthcare), which is an image analysis software.

【Result】Three patients were pancreatic neuroendocrine tumors and 3 patients were carcinoids (thymus 2; rectum 1). Most of the patients had liver metastases, followed by metastases in the bones and the lymph nodes. One response case with liver metastasis from rectal carcinoid had a higher quantitative value to liver metastasis, and the quantitative value decreased with each treatment (2916.8, 2167.9, 1936.9, 1370.0 kBq/ml, respectively). On the other hand, one non-response case with lymph node metastases from thymic carcinoid had a low quantitative value to lymph node, and no change in quantitative value with each treatment (93.56, 97.80, 88.48, 100.36 kBq/ml, respectively).

【Conclusion】It was suggested that the quantitative evaluation might be useful as one of the predictive indicators of somatostatin receptor-positive tumors.

The influence of short-term hormone treatment on ^{68}Ga PSMA PET/MRI – a pilot study

O Jonmarker, F Jäderling, C Wassberg, S Gabrielson, T Tran, C Li, A Sanchez Crespo, R Axelsson

Purpose: Short-term treatment with antiandrogens and similar substances have been shown to produce a flare effect on prostate cancer bone metastasis. The purpose of this study was to see if such an effect could increase detectability of lymph node metastasis.

Methods and Materials: Patients with de novo high risk prostate cancer and patients with biochemical relapse were recruited. Study subjects were examined with a 3T PET-MRI at baseline, after one, three, and four weeks of treatment with bicalutamide 150mg daily, or, in one case, dutasteride 0.5mg daily. 2MBq/kg body weight ^{68}Ga-PSMA-11 was injected, and imaging included whole body DWI, pelvic T2W imaging and dynamic and static PET imaging up to 90 minutes post injection. Tracer uptake in tumors and metastases was analyzed using a three-compartment model and compared to non-prostate tissue uptake. Differential equations were used to calculate a receptor affinity parameter.

Results: Five patients with de novo cancer and four with recurring disease were enrolled. Tumor size decreased and apparent diffusion coefficient increased during treatment. No PSMA flare was detected on static PET images of the five primary tumors, or the five suspect lymph node metastases present at baseline. Analysis of dynamic PET data indicates an overall increasing receptor affinity during treatment.

Conclusion: PSMA receptor affinity determined using dynamic PET examination seems to increase with short-term hormone treatment.

Clinical Relevance/Application: Determining receptor affinity using described method may be valuable when evaluating PSMA radiotracers. Short-term hormone treatment may increase effectiveness of PSMA radioligand therapy.

Delay phase of 18F FDG PET radiomics signature based on machine learning for predicting muscle invasion in bladder cancer

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3. WeiLun PET Center, Department of Nuclear Medicine, Guangdong Provincial People's Hospital, Guangdong Academy of Medical Sciences, Guangzhou, China

Purpose

To investigate a delay phase of PET radiomics signature for the preoperative prediction of muscle invasion in bladder cancer (BC).

Method And Materials

We enrolled 100 BC patients who underwent surgical resection and had pathological results. Pyradiomics was used to extract features, and feature selection was performed based on t-tests with Bonferroni correction. Additionally, LASSO regression was applied to shrink the features. The final features were input into various machine learning models, including Enet, SVM, and XGBoost, to construct the risk model. A 10-fold cross-validation was employed to obtain the PET radiomics signature. The testing and training group ratio was 0.6, and the prediction performance of the radiomics signature was evaluated using the ROC curve.

Results

These methods generated 19 features were selected to create the radio mics-signature. The AUC value of the Enet model showed the best accuracy in predicting muscle invasion (Train group: AUC 0.877, Test group: AUC 0.878). SVM showed AUC values of 0.750 and 0.611 in the train and test groups, respectively. XGBoost showed AUC values of 0.846 and 0.679 in the train and test groups, respectively.

Conclusion

Our radiomics signature, created by the Enet model, can discriminate the presence of muscle invasion in BC. Multicenter validations are needed to confirm these results.

Clinical Relevance/Application

The PET radiomics signature's delay phase can aid in predicting muscle invasion, helping manage BC, given the critical role of histopathological assessment in treatment decisions and the significant impact of accurately distinguishing between muscle-invasive and non- muscle-invasive bladder cancer on treatment selection.

Conflict of interest disclosure

The authors have no conflict of interest.

Efficacy of ^{18}F-Deoxyglucose Positron Emission Tomography for Detection of Renal Cell Carcinoma in Patients with End-stage Renal Disease

Hiromi Hirasawa, Department of Diagnostic Radiology and Nuclear Medicine,
Gunma University Hospital, Japan

Purpose: To evaluate the usefulness of FDG-PET/CT as a screening tool for detecting renal cell cancer (RCC) in patients with end-stage renal disease.

Methods and materials: This prospective study recruited 150 participants who were current or former dialysis patients from 2012 to 2016, and performed FDG-PET/CT to screen for RCC. Images were independently evaluated by three radiologists. Negative examinations were observed until the end of 2019.

Results: 150 participants (mean age, 58 +/-13 years [standard deviation]; 105 men) underwent FDG-PET/CT. Twenty patients (20/149, 13.4%) were diagnosed as positive. RCC was found in seven. Of the four who underwent surgical resection, the pathological results were clear cell RCC in one, papillary RCC in one, and acquired cystic disease associated RCC in two. Two participants were diagnosed as having RCC on bone biopsy, and one was diagnosed on dynamic CT but opted for observation. The sensitivity, specificity, and negative predictive value were 100%, 93.9%, and 100%, respectively.

Conclusion: FDG-PET/CT was confirmed to be useful in detecting renal cell carcinoma (RCC) in patients with end-stage renal disease. Our findings suggested potential for its use as a screening examination for RCC in this patient population.

Clinical Relevance/Application:

Dialysis patients are at increased risk for renal cell carcinoma (RCC). Differentiating between RCC and benign cysts on imaging is frequently difficult. FDG-PET/ CT can be a practical alternative to ultrasound, CT, or MRI in patients with end stage renal disease. Its higher cost can potentially be offset by its efficiency compared to traditional imaging modalities.

Modified Lugano classification of FDG-PET imaging for response assessment in locally advanced unresectable or recurrent/metastatic oral squamous cell carcinoma

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[Purpose] Surgical resection is the standard treatment for oral squamous cell carcinoma (OSCC); however, in locally advanced (LA) unresectable OSCC and recurrent/metastatic (R/M) OSCC, the treatment of choice consists of a combination of immune checkpoint inhibitors, molecularly targeted therapies, and conventional radiochemotherapy. Thus, we evaluated the application of the modified Lugano classification (mLugano) to FDG-PET/CT imaging for staging LA or R/M OSCC and its association with treatment response as determined by the Response Evaluation Criteria in Solid Tumors (RECIST).

[Patients and Methods] Our study enrolled 30 patients with LA or R/M OSCC who underwent FDG-PET/CT before treatment at the Department of Oral and Maxillofacial Surgery, Gunma University Hospital, between April 2013 and September 2022, and for whom the mLugano classification could be evaluated. Furthermore, the primary endpoint was RECIST; duration of response and overall survival were secondary endpoints.

[Results] Evaluation by the Pearson chi-squared test revealed a statistically significant association between the mLugano classification and RECIST (p = 0.001). In multivariate Cox regression analysis, the mLugano classification was statistically significantly associated with duration of response (p = 0.02) but not with overall survival (p = 0.209).

[Conclusions] Thus, the mLugano classification could potentially be a useful predictor of treatment response in patients with LA or R/M OSCC.

Survey of the Current State of Hospital Cybersecurity in Japan and Countermeasures

Hiroshi Kondoh, Department of Internal Medicine, Kyoritsu Memorial Hospital

I am conducting a research study on cyber security (hereinafter referred to as CS) countermeasures under the budget of the Ministry of Health, Labor and Welfare (MHLW) starting in 2020. [Objective] I would consider the countermeasures for the radiology department based on this situation. [Materials and Methods] Since last year many medical institutions were attacked, CS has been the focus of attention. Measures to prevent the entrance to the internal network have been effective, but recent ransomware attacks have made the internal safety of the network. Especially since 2018, there is an urgent need to address this vulnerability, as attacks have shifted from traditional disparate attacks to targeted and intrusive attacks. [Results] In the radiology department, on-site maintenance has been replaced by online maintenance at Corona Disaster, leaving the external connection, equipment ownership, and even configuration to the company. A similar practice is in place for remote diagnosis, but once an attack occurs and medical information is compromised, the hospital is held accountable. The radiology department needs to ensure thorough information management for the hospital's CS. [Conclusion] The following is a list of specific measures to be taken. A network diagram including external connections should be drawn up and a list of the details of these devices and their configurations, as well as a list of responsible persons, and their contracts should be kept up to date. We need to take measures against external connections in case the organization to which they are connected is hacked.

User experience of radiology information systems (PACS, RIS) in Finland.

A comparison to the user experience of electronic health record systems

Jarmo Reponen, MD, PhD, Professor, University of Oulu, Finland

Purpose

In Finland, the user experience (UX) of health information systems, including electronic health record systems (EHRs) has been studied nationwide and systematically since 2010. The purpose of this study was to compare the performance of information systems (ISs) used in radiology to general EHRs and relate the results to information technology (IT) infrastructure changes.

Method And Materials

An electronic survey was sent to Finnish doctors who had an e-mail address in the register of the Medical Association about their UX with EHRs and other ISs in 2010, 2014, 2017 and 2021. The number of respondents varied from 3,900 to 4,700, respectively. The survey questions included statements on a 5-point likert scale about the UX aspects of the ISs and a request to give the ISs a general "school grade". The collected data was segmented according to medical specialities and information systems.

Results

The UX of radiology ISs was comparable to the best EHRs in 2010, 2014 and 2017 studies. The school grades were at the same level as those best EHRs, too. In 2021, the user experience deteriorated and the school grades fell. At the same, a major IT infrastructure change took place in the capital region.

Conclusion

Radiology ISs have been in the forefront of ISs and therefore their UX has mostly been ahead of general EHRs. However, major changes in the IT infrastructure can adversely affect the working environment.

Application

Careful planning and consideration of benefits is needed before major IT infrastructure modifications.

Clinical radiology is ready for hospital-based research studies using deep-learning

Hauke Bartsch, Department of Radiology, Haukeland University Hospital, Bergen, Norway

Haukeland University Hospital by stable diffusion and control net, "Architecture on mountain range, color on silk, …"
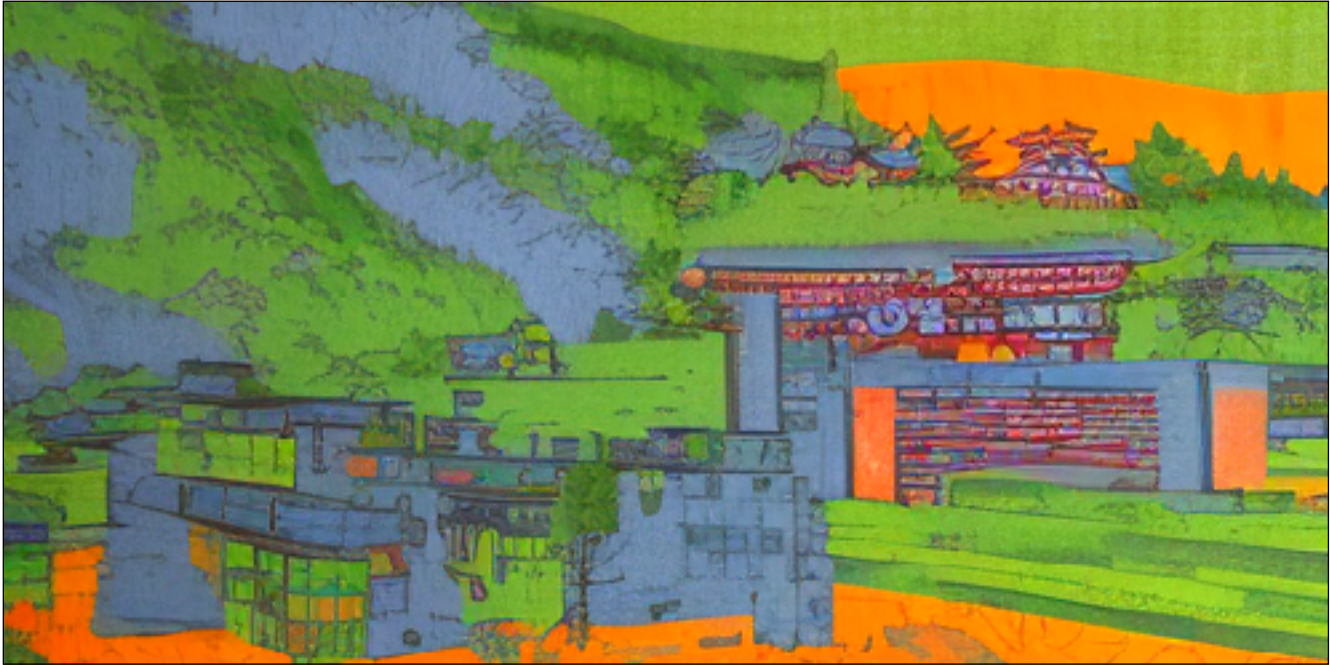
Abstract: Radiology systems are designed to support distributed order management, imaging and image reading workflows. We present work in our health region to extend clinical radiology infrastructure to support multi-center research projects utilizing deep learning. We use (i) a dedicated commercial-grade picture archive and communication system (PACS) combined with (ii) a research data capture solution (REDCap) and (iii) a clinical to research translator network appliance (FIONA) for meta-data pseudonymization and removal of burned-in image information. Radiographers and researchers responsible for research image capture use FIONA to add event-based information to all images before they become available in research PACS to individual project users. FIONA leaves trace information of each transfer in a structured data REDCap project, which is also used for project life-cycle management, storing diagnostic data and information about e-consent and participant randomization. Benefitting from a centralized hospital-based IT solution our research system is accessible free of charge in 4 major hospitals and 30 health-care institutions for the hosting of multi-center studies. We present performance assessments of the system on a flagship mammography screening study where we processed image data for 116,000 patient visits from three major hospitals using a commercial deep-learning application. Our system removes the need to export image data to traditional high-performance computing solutions and accelerates data processing benefiting from mature clinical standards for data distribution.

New methods for resident training evaluation: Finnish experience with Entrustable Professional Activity (EPA) in resident training

Hannu J. Aronen, Milja Holstila, Peter B. Dean, Jussi Hirvonen

Department of Radiology, University of Turku and Turku University Central Hospital

Background: The duration of the Finnish radiology residency training period was extended in 2012 from 4 to 5 years. The European Society of Radiology (ESR) has harmonized the framework for radiological education among its member countries via the European Training Curriculum (ETC). The requirements of resident training in Finland follow the recommendations of the European Training Curriculum, which forms the normative basis for radiological education in most European countries. The ETC separates proficiency into Knowledge, Skills, and Competencies and Attitudes but does not consider EPAs in its current form. Entrustable Professional Activity
(EPA) is a tool for comprehensively evaluating the confidence level in resident performance across various medical competencies, which has been introduced to the resident programs in Finland.

Methods: Five EPAs were developed for radiology in Finland and are used in all five university hospitals: 1) performing ultrasound-guided biopsy; 2) comprehensive evaluation of the breast patient; 3) chairing a multidisciplinary meeting; 4) crafting a comprehensive radiological report; and 5) imaging the acute abdomen. Successfully passing the EPAs is registered in a new electronic system (ELSA).

Results: The EPAs were evaluated in resident training, and the preliminary experience has been encouraging for the residents, examinees, and professors. In a recent systematic survey conducted at the Tampere University Hospital, residents and examinees unanimously evaluated the process positively.

Discussion: The purpose of EPAs is primarily to evaluate special skills of the residents and not to evaluate the person himself. Development of the EPAs should be integrated into the European Training Curriculum program.

Conclusion: EPAs are a useful tool in radiological specialist training.

Prediction of age older than 18 years in sub-adults by MRI-segmentation of 1st, 2nd and 3rd molars

Mai Britt Bjørk, Cand.Odont[1], Sigrid Ingeborg Kvaal, BDS, dr.odont[1], Øyvind Bleka, PhD[2], Tomas Sakinis, MD[3], Frode Alexander Tuvnes, PhD[3], Mari-Ann Haugland[3], Peter Mæhre Lauritzen, MD, PhD[3,5], Heidi Beate Eggesbø, prof, dr. med[3,4]

Purpose: We aimed to develop a method for MRI segmentation of tooth tissues in the entire 1st, 2nd and 3rd molars in order to predict the probability of a sub-adult being older than 18 years.

Material and method: We scanned 99 healthy volunteers in a 1.5 T MRI scanner with a single customised T2 sequence yielding 0.37 mm high resolution iso-voxels. The scanning time was 5 min and 4 s.
Segmentation of pulp, predentine and hard tooth tissue was performed with SliceOmatic (Tomovision$^{©}$) based on MRI signal intensity thresholding, and the volumes were estimated. Linear regression was used to analyse the association between mathematical transformation outcomes of tissue volumes, age and sex. Performance of different outcomes and tooth combinations was assessed based on the p-value of the age variable. The predictive probability of being older than 18 years was obtained by a Bayesian approach.

Results: 1st molars from 87 (F/M: 59/28), 2nd molars from 93 (F/M: 60/33) and 3rd molars from 67 (F/M: 45/22) participants were included. Median age was 18 years, range 14-24 years. The strongest association with age was shown for the transformation outcome (Pulp + Predentine) / Total volume for the lower right 2nd molar (M: $p=9.44*10^{-7}$ / F: $p=7.4*10^{-10}$) and the upper 3rd molars (Both sexes: $p=3.4*10^{-9}$).

Conclusion and clinical relevance: MRI segmentation of tooth tissue volumes might prove useful in the prediction of age older than 18 years in sub-adults and may be combined with other methods for age estimation in the future.

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Efficacy of endovascular treatment for completely occlusive acute-subacute portal and mesenteric vein thrombosis with severe complications in patients without cirrhosis

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Purpose: Completely occlusive acute-subacute portal and mesenteric vein thrombosis (PVMVT) with severe complications is fatal. Endovascular treatments (EVTs) of acute-subacute PVMVT are not standardized. Here, we aimed to evaluate the outcome of EVTs of completely occlusive acute-subacute PVMVT with severe complications in patients without cirrhosis.

Materials and Methods: Nineteen patients (nine men and 10 women; age, 60.1 ± 16.8 years) with completely occlusive acute-subacute PVMVT were retrospectively assessed. The patients were treated with EVTs, a combination of thrombectomy (including aspiration thrombectomy, plain old balloon angioplasty, single injection of thrombolytic agents, and stent placement) and continuous catheter-directed thrombolysis. Kaplan–Meier analyses were performed to assess all-cause mortality, acute-subacute PVMVT-related mortality, and portal vein (PV) patency. The degree of recanalization and patency of PV, complications, factors related to acute-subacute PVMVT-related mortality, and factors related to patency of PV were also evaluated.

Results: The all-cause and acute-subacute PVMVT-related mortality rates were 36.8% and 31.6%, respectively. Seven (36.8%) and 11 (57.9%) patients achieved complete and partial recanalization, respectively. Among the patients who achieved recanalization, and 53.3% of these patients achieved patency of PV. Seven patients (36.8%) developed complications, and two (10.5%) required interventional treatment for complications. Deterioration of liver function significantly worsened the prognosis ($P = 0.046$), while anticoagulation therapy significantly maintained portal patency ($P = 0.03$).

Conclusion: This endovascular method for acute-subacute PVMVT, which combines thrombectomy and continuous catheter-directed thrombolysis EVT approach was effective for thrombus resolution. However, further studies must define conditions that improve patient prognosis.

Postprocedural complication of central venous (CV) port systems: comparison of upper arm and subclavian ports

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Purpose

Although there have been some reports of intraprocedural complications for upper arm and subclavian central venous (CV) port implantations, data regarding postprocedural complications are limited.

The purpose of this study was to compare the postprocedural complications between the two CV ports implantation methods.

Materials and Methods

We retrospectively evaluated all patients who underwent CV port implantations in our institution from January 2012 to December 2021. The postprocedural complications were evaluated in all CV port removal cases. Postprocedural complication rates between the upper arm and subclavian CV ports were compared using the Fisher's exact test.

Results

A total of 1,232 CV ports (490 upper arm and 742 subclavian) were implanted, and 186 ports were removed afterward due to end of treatment (n=105); port-related infection (port pocket infection or blood stream infection) (n=39); venous thrombosis (n=2); catheter occlusion (n=3); catheter fracture (n=9); catheter malposition (n=3); skin dehiscence (n=5); or suspicion of port- related infection, in which the result was negative at catheter tip cultivation (n=21). The incidence of catheter fracture was significantly lower in the upper arm group (p=0.03), although there were no statistical differences in any other complications.

Conclusion

Catheter fracture occurred significantly lower in patients with upper arm ports, compared to those with subclavian ports.

Clinical Relevance/Application

Upper arm CV port implantation may benefit patients with respect to lower postprocedural complication rates, compared to subclavian CV port implantation

Endovascular treatment with Viabahn stent-grafts for peripheral arterial injury and bleeding at the visceral arteries: initial and midterm results

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Background/Purpose

Viabahn is a heparin-coated self-expandable stent-graft (SG) for peripheral arteries. Viabahn was approved for arterial injury use in Japan for the first time in the world. The purpose of the study is to evaluate the initial and midterm efficacy and safety of endovascular treatment (EVT) using Viabahn for arterial injury and bleeding (AIB) at the visceral arteries.

Methods

Consecutive patients with visceral AIB who underwent EVT using Viabahn between Jan 2017 and Sep 2022 were retrospectively reviewed. Technical success, clinical success, peripheral organ ischemia, periprocedural complications, bleeding-related mortality, 30-day mortality, neck length, re-bleeding, endoleaks, and SG patency at 1, 6, 12, and 24 months were evaluated.

Results

EVT using Viabahn was performed in 25 patients (mean age: 67.2 years; 20 males) and 26 visceral arteries. The technical and clinical success rates were 100%. The rate of peripheral organ ischemia and peri-procedural complications were 4% (one liver infarction) and 7.7% (one thrombus and one dissection). Bleeding-related mortality and 30-day mortality were both 0%. The mean neck length was 9.3mm. No endoleaks or re-bleeding occurred during the follow-up (mean: 23 months). The SG patency was confirmed after 1, 6, 12, and 24 months in 78.3%, 72.3%, 50.1%, and 41.7 of the patients, respectively.

Conclusion

EVT using Viabahn for AIB at the visceral arteries was safe and effective with low rate of peri-procedural complications and mortality. SG occlusions with low rates of ischemia often occurred at midterm.

A game changer of cancer treatment, KORTUC
(Kochi oxydol radiation therapy to unresectable carcinoma);
collaboration of IVR and radiotherapy

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Purpose: KORTUC is a Japan original new cancer treatment, a radiotherapy with a new radiosensitizer. We have experienced more than 300 cases of KORTUC for 12 years in our institute under the recognitions of the ethics committee and informed consents from patients and patient's families. We introduce KORTUC to present the method and our experienced cases.

Method And Materials: We recognize main cancer treatment resistant factors are hypoxic state and excessive antioxidant enzymes of cancers. Before irradiation, we soak or inject the solution of 0.5 % hydroxy peroxide and 0.83 % sodium hyaluronate (KORTUC) to the tumors directly to omit aforementioned resistant factors and strengthen effect of radiotherapy.

Results: We show the representative cases of KORTUC, for example advanced breast cancer, bone metastasis from lung cancer, spinal osteosarcoma and malignant peripheral nerve sheath tumor etc. KORTUC is effective and safety.

Conclusion: KORTUC is thought effective and safety as cancer treatment method. It is already performing the phase 2 clinical study of KORTUC in England and will spread in the world near future.

Clinical Relevance/Application: KORTUC has not been approved as drug in any countries. Currently, Phase 2 study for locally advanced/recurrent breast cancer is ongoing in UK and India.

Imaging at primary diagnostic work-up in uterine cervical cancer

Prof. Ingfrid S. Haldorsen, Head of Mohn Medical Imaging and Visualization Center, Haukeland University Hospital, Bergen and Head of Bergen Cancer Imaging Research Group, University of Bergen/ Norway.

For uterine cervical cancer, the revised International Federation of Gynecology and Obstetrics (FIGO) staging system (2018) incorporates imaging and pathology assessments in its staging. This presentation will summarize reported staging performances of conventional and novel imaging methods and provide an overview of promising novel imaging methods and techniques relevant for cervical cancer patient care.

Diagnostic imaging during the primary diagnostic work-up is recommended to better assess tumor extent and metastatic disease and is now reflected in the 2018 FIGO stages 3C1 and 3C2 (positive pelvic and/or paraaortic lymph nodes). For pretreatment local staging, imaging by transvaginal or transrectal ultrasound (TVS, TRS) and/or magnetic resonance imaging (MRI) is instrumental to define pelvic tumor extent, including a more accurate assessment of tumor size, stromal invasion depth, and parametrial invasion. In locally advanced cervical cancer, positron emission tomography-computed tomography (PET-CT) or computed tomography (CT) is recommended, since the identification of metastatic lymph nodes and distant metastases has therapeutic consequences. Furthermore, novel imaging techniques offer visualization of microstructural and functional tumor characteristics, reportedly linked to clinical phenotype, thus with a potential for further improving risk stratification and individualization of treatment.

Diagnostic imaging by MRI/TVS/TRS and PET-CT/CT is instrumental for pretreatment staging in uterine cervical cancer and guides optimal treatment strategy. Novel imaging techniques may also provide functional biomarkers with potential relevance for developing more targeted treatment strategies in cervical cancer.

GLZLM_SZHGE from DWI may predict node metastasis in uterine endometrial cancer

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COI Disclosure
No conflict.

Purpose: To investigate correlation between histological findings and texture features extracted from MRI in uterine endometrial lesions.

Methods: The patients (n=1060) underwent hysterectomy between 2017 and 2021 in our hospital were enrolled. Of them, following patients were excluded: no endometrial lesion, treated with NAT, no MRI examination, MRI performed in other hospitals or without 3T unit, inappropriate DWI sequence, no detectable lesion, voxel number of ROI<64, or >90days between MRI and hysterectomy. Finally total 111 patients were analyzed, and 42 patients underwent two repeated DWIs. The ROI was assigned for the endometrial lesion by the radiologist, texture features were extracted from T2WI, DWI (b=1000 s/mm²), and ADC map using LIFEx ver.7, and correlation between histological findings and texture features were analyzed with SPSS and JMP-Pro. P <0.05 was considered statistically significant.

Results: About discrimination between benignancy and malignancy, ADC25% showed the best performance with AUC of 0.94. As for node metastasis, the gray-level zone length matrix short-zone high gray-level emphasis (GLZLM_SZHGE) from DWI predicted node metastasis with AUC of 0.77-0.78. Being limited to the cases with node size<10mm, AUC increased to 0.84-0.87. Reliability of GLZLM_SZHGE was analyzed for 42 patients underwent repeated DWIs. ICC, Pearson r, and 95% limits of agreement of Bland-Altman plot were 0.801, 0.817, and -15.8% to 10.9%, respectively.

Conclusion: GLZLM_SZHGE from DWI would be a practical imaging biomarker for predicting node metastasis in uterine endometrial cancer.

Clinical Relevance: Texture feature(s) may predict node metastasis and help prevent complications related to surgery.

Does abdominal fat distribution have an impact endometrial cancer prognosis and disease progression?

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Purpose

To quantify computer tomography (CT) assessed abdominal fat distribution at primary diagnosis and at follow-up in a large endometrial cancer (EC) cohort, and to explore its relation to disease progression and prognosis.

Material & Methods

From CT images of 293 EC patients at primary diagnosis, subcutaneous (SAV) and visceral abdominal fat volumes (VAV) were segmented using iNtuition (TeraRecon Inc., USA). SAV, VAV, total abdominal fat volume (TAV=SAV+VAV), VAV/TAV ratio and waist circumference (WC) were analyzed in relation to tumor histology from surgical specimen and patient outcome. The same CT markers were retrieved in patients having available follow-up-scans (median 13 months after primary treatment, n=152/293).

Results

At primary diagnosis, patients with high-risk histology (non-endometrioid (NEEC) and grade 3 endometrioid endometrial carcinoma (EEC)) had significantly lower TAV, SAV and WC ($p \leq 0.04$ for all), while higher VAV/TAV ratio ($p=0.001$) than patients with low-risk histology (EEC grade 1-2). High VAV/TAV ratio also predicted disease progression (hazard ratio 1.04, $p=0.02$). At follow-up, median VAV, SAV and TAV were significantly lower than at primary diagnosis ($p<0.001$ for all). Additionally, patients experiencing progression had a larger reduction in visceral fat compartments (δVAV=-19%, δVAV/TAV=-4%), than patients with no signs of progression (δVAV=-11%, δVAV/TAV=0%, $p \leq 0.02$ for both).

Conclusion

High VAV/TAV ratio is associated with high-risk histology and reduced survival in EC. Furthermore, patients with tumor progression have a more pronounced reduction in visceral fat than patients without signs of tumor progression at follow-up.

Clinical Relevance/Application: Abdominal fat measures, from clinically acquired CT examinations, may serve as markers of poor prognosis and disease progression in endometrial cancer.
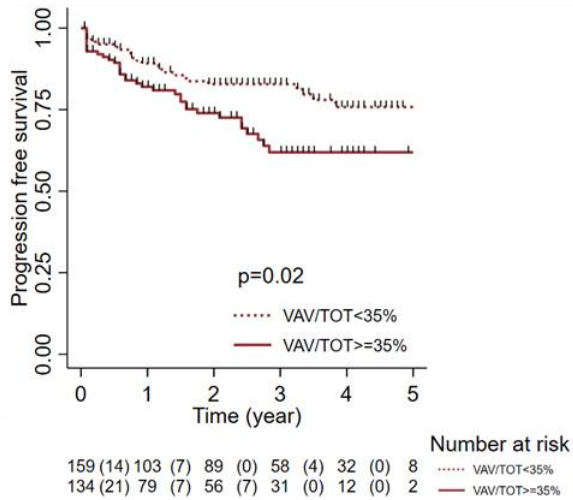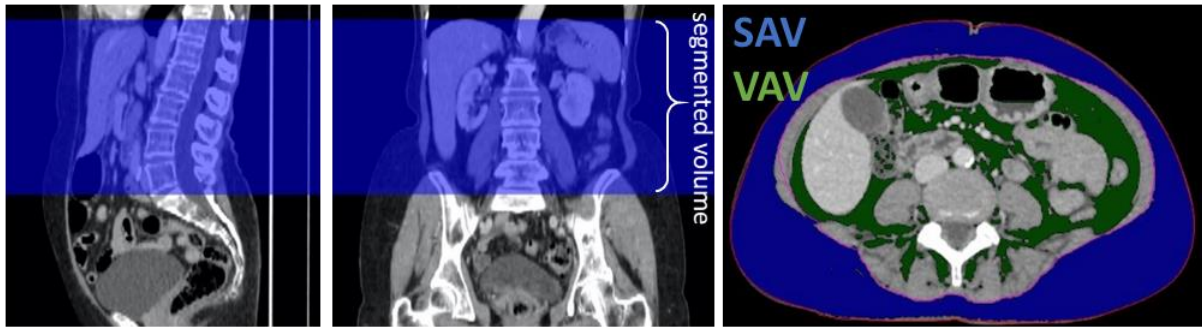
SJRS2023 Abstract Figure

Top: In CT-images from the upper right diaphragm to the L5/S1 level, subcutaneous- (SAV) and visceral abdominal fat volumes (VAV) were semi-automatically segmented using a predefined Hounsfield Unit (HU) range of -195 to -45 HU

Left: Patients with high visceral-to-total abdominal fat ratio (VAV/TAV≥35%) have reduced progression free survival compared to patients with VAV/TAV<35% (p=0.02)

Bottom: Median VAV, SAV and total abdominal fat volume (TAV=VAV+SAV) were significantly reduced at follow-up compared to at primary diagnosis (p<0.001 for all), while VAV/TAV ratio and waist circumference (WC) were unchanged
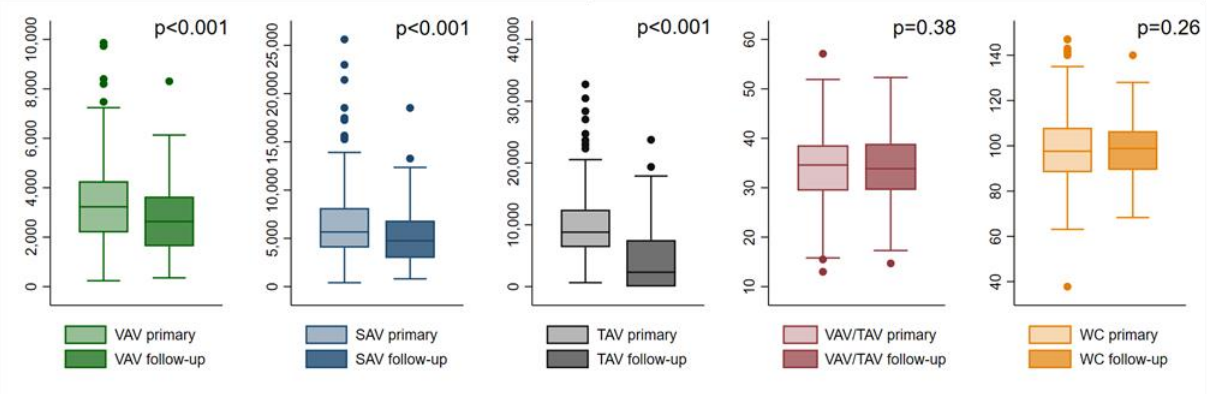
Imaging findings and performance of MRI-based surveillance for individuals at risk for pancreatic cancer.

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Purpose:
Imaging surveillance is recommended in individuals at risk (IAR) for pancreatic cancer (PC), as it seems effective in detecting premalignant lesions or stage I PC. However, some recent studies have shown some limits in the detection of such lesions.
This study aimed to describe imaging findings and performance of a mainly MRI-based surveillance program in the largest Scandinavian single-centre IAR cohort.

Method And Materials
Single-centre, retrospective study on 278 IAR (2002-2021). Surveillance was performed exclusively with MRI from 2010; MRI and/or CT in 2002-2009. Imaging, clinical, and histopathological findings were recorded. Diagnostic accuracy metrics for the surveillance program were calculated.

Results
The median follow-up was 4.5 years. Focal lesions were detected in 59% of the cases: cysts in 56% (155/278), cystic and solid lesions in 2.5% (7/278), solid lesions in 0.7% (2/278). Four patients (1%, 4/278) had suspicious cysts (3 resected; no malignancy at histopathology). Five patients (2%; 5/278) had PC, with equal prevalence of stage I and IV (0.7%). No premalignant lesions were diagnosed. Surveillance diagnostic accuracy metrics: sensitivity 60% (95% C.I. 15-95%), specificity 98% (95%C.I. 95-99%), PPV 37% (95%C.I. 16-65%), NPV 99% (95%C.I. 97-99%).

Conclusion
The prevalence of focal lesions detected by an MRI-based surveillance in IAR was very high. No premalignant lesions were identified. PC prevalence was low (2%), with equal proportion of stage I and stage IV PC. Sensitivity and PPV were low.

Clinical Relevance/Application
The early diagnosis of PC and neoplastic precursors in IAR represents a main challenge for an MRI-based surveillance program.

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Structured templates in reporting CT staging on colon cancer

A national survey

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Purpose: Computed tomography (CT) is a widely used method for staging colon cancer. Accurate reports could lead to a better preoperative evaluation and planning of the treatment of colon cancer. The aim was to evaluate the use of CT free text reports and structured report templates, when it comes to staging of colon cancer.

Material and Methods: A multiple choice questionnaire survey was conducted. Online questionnaire software was used, and a link was shared to MDT doctors with help from the Danish Colorectal Cancer Group (DCCG) and from a social media radiologist group.

Results: Clinicians preferred the template style (95%), whereas the support for template reports was less among the radiologist (76%). All female responders preferred the template style, this was only true for 84% of the male responders. Furthermore, the survey showed a slightly deficient level of national CT-reporting quality, only seven out of thirteen questions and sub questions, concerning CT report quality, achieved an approval rate of > 85%. The colorectal cancer multi-disciplinary team consultants who always or usually work with template style reporting of CT scans of colon cancer, tends to be more satisfied with the quality and content of the reports, compared to those who rarely use or read template reports.

Conclusion and application: The following indicators were insufficient reported: tumor invasion growth, number of hepatic metastasis, segment location of hepatic metastasis and retroperitoneal lymph node involvement. In the template reports group, nearly all participants found relevant information easily accessible. Standardized reporting is encouraged.

Prostate calcification as a predictor of future prostate cancer

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PURPOSE:

Prostatic calcifications , which commonly found on CT, have been suspected to be associated with prostatitis, chronic pelvic pain syndrome, and prostate cancer.

However, it is still unknown whether the presence of calcification is a risk for the development of future prostate cancer. The purpose of this study was to determine the clinical value of prostate calcification as a predictor of future prostate cancer development.

METHOD AND MATERIALS:

Male patients (≥50 years old) who underwent unenhanced CT of the pelvis from April 2010 to March 2011 were retrospectively reviewed and divided into two groups: with and without prostatic calcification. The follow-up period was defined as the time interval between the date of the CT examination and the date of prostate cancer diagnosis, death, or the last follow-up whichever occurred first prior to December 31, 2021. Kaplan–Meier, Cox proportional hazards and Log-rank test methods were used for a statistical analysis

RESULTS:

A total of 636 male patients were evaluated. At the end of follow-up, 6.5% (14/217) of patients with prostatic calcification and 2.6% (11/419) of patients without prostatic calcification had developed prostate cancer. In the multivariate Cox proportional hazards model analysis, prostate calcification was the only factor associated with prostate cancer development (hazard ratio, 2.7; 95% CI: 1.20-5.91; P = 0.016).

CONCLUSION:

Prostate calcification may be a predictor of future prostate cancer development in patients ≥50 years old.

CLINICAL RELEVANCE/APPLICATION:

Prostatic calcification may be used for risk stratification and to guide screening protocols.

Imaging side effects and complications of antineoplastic therapy in gastrointestinal tract – radiological review

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Purpose: to visualize complication of antineoplastic treatment.

Antineoplastic treatment can affect all organs and types of tissues, with manifestations that may appear acute or after prolonged treatment as a result of stochastic effects. Recognizing the side effects can have a big impact in the treatment itself but also save the patient's life, certain conditions can be life threatening (for example, pneumonitis, infections, sinusoidal obstructive syndrome, etc.)

Materials and Methods:

CT and MRI scan performed on cancer patients during the protocols therapy or in emergency room in comparison to published reports.

Results:

– Cancer treatments induce local and systemic changes on normal tissues, both on short and long term.

– complications can appear to be related to treatment but also cross-complications, often cancer patients have concomitant diseases.

Conclusion:

– imaging assessment of tumor response is adapting to atypical responses ,expected changes and complications of chemo/radiotherapy are still routinely encountered in post-treatment imaging examinations.

– radiology is a dynamic speciality contributing to a better treatment in cancer patients

– fast and highly performing CT and MRI technologies have opened new frontiers in oncology imaging, allowing tissue characterization, early diagnosis, prognostic evaluation, and accurate response assessment.

– the new era with AI breach the borders to understand, caracterisation and differentiating the complications from pseudoprogession or treatment response

Keywords: Neoplasia, Chemotherapy, Immunotherapy, Radiotherapy, CT scan, MRI, Ultrasound, Iodine Contrast, toxicity

Contrast Media Dose in Abdominal Computed Tomography Scans of Children with Suspected Appendicitis – a Retrospective Quantitative Study

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Purpose: To investigate if there is a relationship between body weight (BW) and contrast enhancement index (CEI) at pediatric abdominal computed tomography (CT) despite adjustment for body size.

Method and Material: This retrospective analysis included patients ≤16 years undergoing CT for suspected appendicitis between 2017-2020. According to national guidelines, pediatric patients are dosed 2 ml contrast media (CM) per kg up to maximally 100 ml, ie a fixed dose >50 kg BW. Patient characteristics, scan-parameters and CM dose were recorded. The hepatic CEI was measured. Optimal CEI was defined as enhancement between 50-75 ΔHU.

Results: 496 patients were included (BW-adjusted dose, n=388, range=10-49 kg. Fixed dose n=108, range=50-97 kg). There was a significant positive correlation between BW and CEI in those receiving the BW-adjusted dose (r=0.4, P<0.001 for 70 kV and 80 kV, n=150/n=87 and r=0.3, P<0.05 for 90 kV, n=120) except the 100 kV group (r=0.3, P=0.12, n=31). In the fixed dose group, the correlation was inverse (r=-0.4, P<0.05 for 90 kV and 100 kV, n=42/n=59) except for the 80 kV group (r= -0.2, P=0.14, n=7). The fixed dose group had a greater proportion of examinations with suboptimal and inadequate CEI (22% vs 4%).

Conclusion: Despite CM protocols adjusting for BW, a clear relationship between BW and CEI remains.

Clinical Relevance: Current CM dosing protocols adjusting for BW give the highest attenuation in children weighing 50 kg, resulting in less attenuation in those deviating from 50 kg. The optimal CM dose for abdominal pediatric CT needs to be established.

Post-contrast acute kidney injury (PC-AKI) in patients with multiple myeloma undergoing contrast-enhanced CT

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Purpose: Non-ionic iodinated contrast media (ICM) may have a lower risk of post-contrast acute kidney injury (PC-AKI) compared to ionic contrast media for patients with multiple myeloma (MM). The purpose of this study was to evaluate the effect of non-ionic ICM on renal function in patients with MM.

Method and Materials: Changes in serum creatinine (sCr) before and after CT examinations were evaluated in MM patients who underwent contrast-enhanced CT (75 CE-CTs) or non-enhanced CT (121 NE-CTs) at our hospital from April 2012 to March 2021. PC-AKI was defined as an increase in sCr>0.3 mg/dl, or 1.5 times baseline within 48-72 hours. Since many patients did not have sCr data within 48-72 hours after CT, the highest sCr value within one week after examination was also assessed. As a long-term prognostic factor, the presence or absence of new hemodialysis induction within 6 months was also investigated.

Results: The incidence of PC-AKI was 0 of 32 CE-CTs in cases of sCr data within 48-72 hours. The incidence of renal dysfunction equivalent to PC-AKI within 1 week in NE-CT and CE-CT was 3.1% (1 of 31 and 2 of 64, respectively; odds ratio [OR], 1.0, p = 0.997). There was one case of hemodialysis induction within six months of CE-CT, and none for NE-CT.

Conclusion: CE-CT with non-ionic ICM was not significantly more likely than NE-CT to cause AKI.

Clinical Relevance/Application: ESUR guidelines state that the risk of PC-AKI is not increased in MM patients with normal renal function.

The correlation between sarcopenia and muscle quality to survival in kidney transplant recipients

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Purpose:

To evaluate the correlation between sarcopenia and survival in kidney transplant recipients.

Methods:

Medical records for all adult kidney recipients transplanted between 2010-2017 in Stockholm with no previous ipsilateral transplantation were reviewed. Patients with ESRD and pretransplant abdominal CT scan within 36 months of transplantation were included. Muscle area was measured using CT images at L3 level, and the skeletal muscle index (SMI) and fatty muscle index (FMI) were calculated by dividing the area by height squared. Sarcopenia was assessed using two SMI cut-offs: <= 32.8/44.7 for women/men and <= 38.5/52.4 for women/men.

Results:

Out of 673 adults transplanted between 2010 to 2017, 262 (39%) had CT imaging available. Using the two cut-offs for SMI 30 and 106 patients were diagnosed with sarcopenia. Univariate survival analysis showed no difference between the two groups. The study population was split into quintiles of the SMI and the ratio of SMI/FMI. A survival analysis comparing the first quintile to the fifth showed no significance for the SMI but showed that SMI/FMI significantly impacted the outcome, even when adjusting for age and gender. When comparing the Charlson comorbidity index (CCI) with SMI and FMI a correlation could be found between with FMI and SMI/FMI, but none with SMI.

Conclusions:

Our study found no significant impact of sarcopenia on survival in kidney transplant recipients but identified a correlation between SMI/FMI for both survival and CCI. Adjusting SMI for FMI could provide a more comprehensive evaluation of health outcomes, applicable beyond kidney transplant recipients.
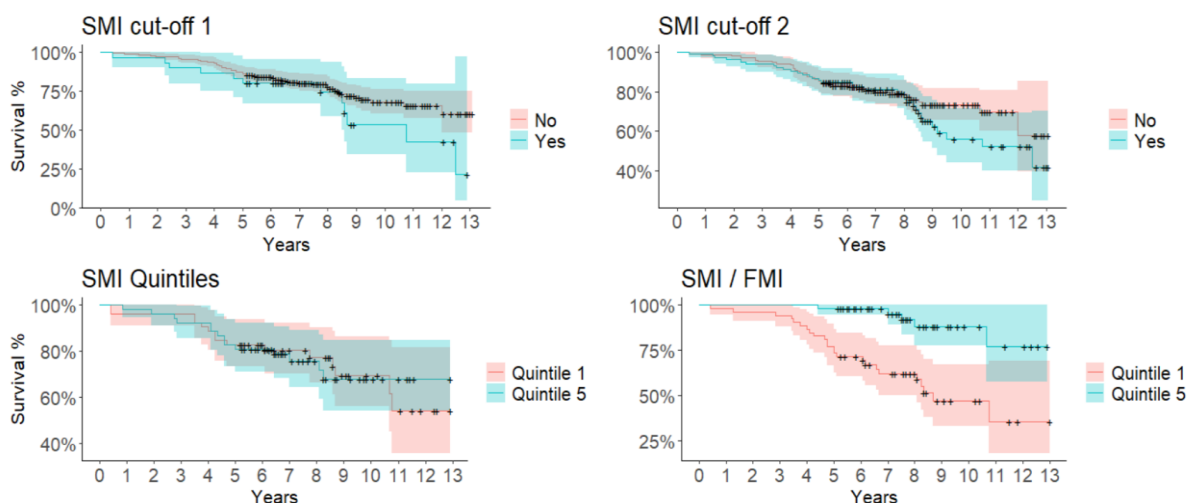
Evaluation of blood flow energy loss before and after endovascular aneurysm repair using 4D Flow MRI

Takahiko Mine[1], Shinpei Ikeda[1], Tetsuro Sekine[1], Masashi Abe[1], Seigoh Happoh[1], Shohei Mizushima[1], Kotomi Iwata[2], Hidemasa Saito[2], Tatsuo Ueda[2], Masahiro Fujii[3], and Shin-ichiro Kumita[2]

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Objective:
While endovascular aneurysm repair (EVAR) has been accepted as the standard procedure for abdominal aortic aneurysm (AAA), lung-term outcome is not always satisfactory. Hemodynamic analysis might indicate predictive factors of its durability, and we assessed using 4D Flow MRI especially regarding the change of blood flow energy loss (EL).

Methods:
4D Flow MRI were performed with thirty-one patients before and after EVAR. EL at the neck segment (from the level proximally to celiac artery to distally to renal arteries) and the treatment segment (from the proximal to the distal end of stent-graft landing) were analyzed and values pre and post EVAR were compared. Further, the relation between these elements and pulse wave velocity (PWV) were evaluated.

Results:
After EVAR, the degree of EL increased in all patients at the treatment segment (pre vs. post; 50.46 ± 8.39 vs. 283.5 ± 21.83 mW, $p < 0.001$) and at the neck segment (8.91 ± 1.18 vs. 22.71 ± 4.80 mW, $p = 0.003$). As the sub-group analysis, patients were divided into two groups according to the changes of PWV after EVAR: group of PWV increased (18 patients) and of PWV decreased (13 patients). The degree of EL at the neck segment significantly increased with the group of PWV increased (9.58 ± 1.51 vs. 26.12 ± 7.08 mW, $p = 0.015$).

Conclusion:
The change of EL after EVAR and the relation with PWV were partially demonstrated; further analysis indicating clinical outcomes are warranted.

Investigating photon-counting CT image quality and optimal contrast-media enhancement of hypo-attenuated leaflet thickening

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Purpose

Hypo-attenuated leaflet thickening (HALT) is a prevalent pathological finding after interventional or surgical valve replacement (TAVI) but can be difficult to accurately characterize depending on the level of contrast media (CM) and in presence of metal artifacts. Therefore, we sought to utilize the heightened sensitivity of the photon-counting CT (PCCT) to determine optimal CM enhancement for quantification of HALT and evaluate the image quality of bioprosthetic TAVI valve using a clinical dual-source PCCT in comparison with conventional dual-source energy-integrating CT (EID-CT).

Methods

The experimental setup includes a phantom and a bioprosthetic valve with artificial HALT made from polyethylene. The bioprosthetic valve was expanded in a plastic tube and scanned with different concentrations of iodinated contrast media. Prospective ECG-triggered protocol and ultra-high resolution scan mode was used at matched CTDI for PCCT and EID-CT. PCCT generated images at different keV levels and kernels compared with EID-CT at 100kV. MATLAB was used to quantitatively analyze how the level of CM affects volume determination. Two blinded reviewers assessed images with a 5-point Likert scale.

Results/conclusion/clinical relevance and application

The results will preliminary be finished at the end of May 2023.

# Nodules on chest radiography detected by artificial intelligence (AI): What We Need to Know, What We Can Ignore?

Nanako Furuta, Department of Medicine, Tsukuba University, Japan

[**Purpose**]

AI-based applications for chest radiography are becoming more prevalent in daily practice. It is important for radiologists to understand how to use it. The purpose of this study is to investigate 1) what types of lesions AI can detect and 2) what types of findings require follow-up and close examination of other modalities.

[**Materials and Methods**]

Lung nodule detection was performed by AI software on 10,000 outpatient and 10,000 inpatient examinations performed at University of Tsukuba Hospital from January to December 2020. Images of nodules ranging from 10 to 40 mm were extracted from the examination images after excluding duplicate patients. The grading scale was 1-5, with 1-3 being benign and 4 and 5 being lesions that required some action for possible malignancy. The decision was made by consensus of two radiologists.
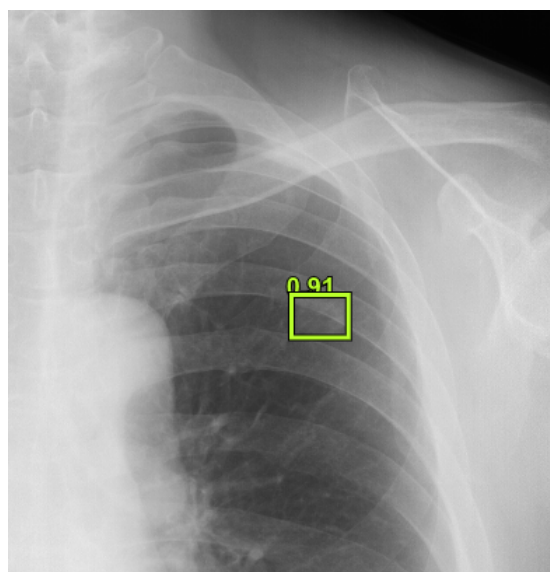
[**Results**]

A total of 326 outpatients and 307 inpatients were included. Lesions considered to be clearly malignant were single and multiple nodules and nodular lesions within pneumonia. For nodular lesions within pneumonia, chest radiography was considered the first necessary examination. Apparent benign lesions included healing sclerosed costal fractures, nipples, diffuse pleuritis, and catheter connectors.

[**Conclusion**]

The presentation will focus on the characteristics of lung nodules on chest radiography extracted by AI software.

[**Clinical Relevance/Application**]

It has become necessary for radiologists to consider what actions to take in response to AI-generated results.

Measurement of Turbulent Kinetic Energy in Hypertrophic Cardiomyopathy Using Triple-velocity Encoding 4D Flow MR Imaging

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Purpose

The turbulent kinetic energy (TKE) estimation based on 4D flow MRI has been currently developed and can be used to estimate the pressure gradient. The objective of this study was to validate the clinical value of 4D flow-based TKE measurement in patients with hypertrophic cardiomyopathy (HCM).

Material&Methods

From April 2018 to March 2019, we recruited 28 patients with HCM. Based on echocardiography, they were divided into obstructed HCM (HOCM) and non-obstructed HCM (HNCM). Triple-velocity encoding 4D flow MRI was performed. The volume-of-interest from the left ventricle to the aortic arch was drawn semi-automatically. We defined peak turbulent kinetic energy (TKEpeak) as the highest TKE phase in all cardiac phases.

Results

TKEpeak was significantly higher in HOCM than in HNCM (14.83 ± 3.91 vs. 7.11 ± 3.60mJ, P = 0.001). TKEpeak was significantly higher in patients with systolic anterior movement (SAM) than in those without SAM (15.60 ± 3.96 vs. 7.44 ± 3.29 mJ, P < 0.001). left ventricular mass increased proportionally with TKEpeak (P = 0.012, r = 0.466).

Conclusion

TKE measurement based on 4D flow MRI can detect the flow alteration induced by systolic flow jet and LV outflow tract geometry, such as SAM in patients with HOCM. The elevated TKE is correlated with increasing LV mass. This indicates that increasing cardiac load, by pressure loss due to turbulence, induces progression of LV hypertrophy, which leads to a worse prognosis.

Measurement of Turbulent Kinetic Energy in Hypertrophic Cardiomyopathy Using Triple-velocity Encoding 4D Flow MR Imaging
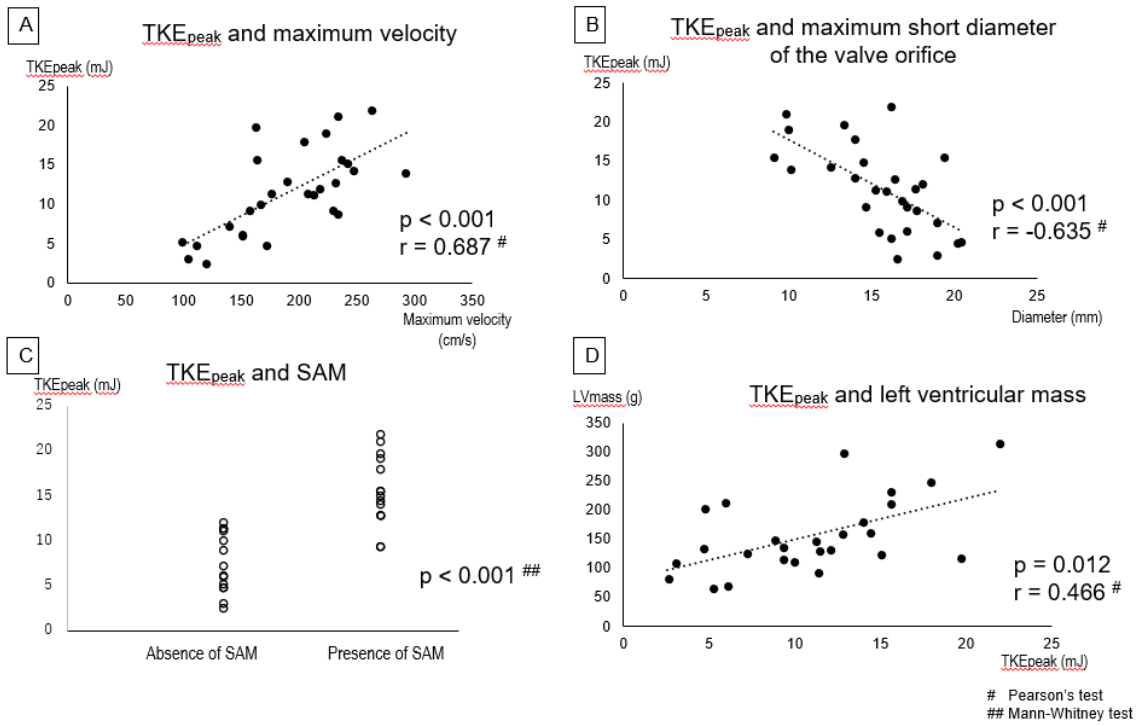
A Combined Approach Using 4D Flow MRI for Cerebral Blood Flow and Deep-Learning-Based Volumetry for Brain Volume

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[Objective]
Currently, reduced cerebral blood flow (CBF) caused by subtle Amyloidβ deposits has been considered as a biomarker for the early stage of Alzheimer's disease (AD). One of the determinants of CBF is brain volume (BV, grey matter plus white matter). The aim of this preliminary study was to test the combined evaluation of CBF using 4D Flow MRI and BV using deep-learning-based brain volumetry.

[Materials and Methods]
We recruited 101 cases with suspected cognitive impairment. A 1-mm^3 4D Flow MRI was performed in addition to the standard dementia MRI, which included 3D T1WI. The CBF was defined as the sum of bilateral ICA and BA blood flow volume. Commercial deep-learning brain volumetry estimated the BV (WM: White Matter, GM: Gray Matter, ICV: Intracranial Volume). AD was defined by MMSE score (< 24). We evaluated the correlation between CBF and anatomical variables.

[Results]
Six cases were excluded due to inadequate vascular anatomy. Of the remaining cases, 32 were defined as AD. In all participants, no correlation was found between CBF and BV (r=0.087), but a negative correlation was observed between CBF and Age (r=-0.279) and a positive correlation between CBF and WM+GM/ICV (r=0.291).

[Conclusion]
This preliminary investigation demonstrates that CBF correlates with age and the degree of brain atrophy. The results suggest that the combined analysis, accounting for these confounding factors, may be useful for CBF evaluation in dementia patients.

Evaluation of the diagnostic performance of three imaging modalities: A preliminary analysis of high-risk breast cancer screening program in southern Sweden

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Purpose: Women with inherited genetic mutations (*BRCA1*, *BRCA2*, etc.) and a family history of breast cancer (BC) are at increased risk for developing BC. Women with an increased risk of BC are recommended for screening using breast MRI in combination with other imaging modalities to detect small-size BC at an early period.

Methods: This retrospective study evaluates the BC high-risk screening program initiated in 1995 in the south Swedish area based at Skåne University Hospital. Annual screening was performed, including MRI, mammography, and US. The preliminary analysis included 147 women screened between October 1995 and May 2011. Women who had undergone all three modalities before intervention or surgery were included (Fig.1). All images and diagnostic reports were reviewed retrospectively by an experienced breast radiologist. Histopathological information was obtained from pathological reports. Sensitivity and specificity per imaging modality were calculated per breast lesion at the time of an interventional procedure.

Results: Of 98 lesions, 20 were BCs. The diagnostic performance (sensitivity/ specificity) of MRI + mammography was 85%/ 84%. Six (30%, 6/20) cancers were detected by MRI alone. Fig. 2 shows a representative case of MRI-detected BC. One BC was detected at mammography and MRI, 9 in MRI and US, and one at mammography only. Both cancers manifested as calcification and occurred in *BRCA2* carriers. Three cancers were not detected by any imaging modality and were detected by mastectomy alone.

Conclusion: Combining MRI and mammography is the most sensitive screening in women with an increased risk of BC.

Evaluation of the diagnostic performance of three imaging modalities: A preliminary analysis of high-risk breast cancer screening program in southern Sweden

Women who started screening between 1995/10 to 2011/5
MRI performed at least once at screening round
147 women, 149 lesions*

Exclusion:

31 women without any Interventional procedure performed
(Still ongoing screening, finalize screening without any intervention etc.)

13 lesions with no MRI before the intervention
5 lesions with no mammography before the intervention

2 lesions with insufficient information

Total
98 women (98 lesions) - 20 cancers

Inclusion: cases in which all three modalities
were performed prior to intervention

Fig. 1) Flow chart of the subset of the study cohort. *Two women had two lesions biopsied

Fig. 2) Representative case of MRI-detected cancer. 38 y.o., a lesion was detected on the second MRI screening round, 8 mm mass (white arrow), IDC, Luminal A-like subtype, Ki-67 <10%, historical grade 1. a) Axial MPR image, b) MIP image of an early phase of DCE MRI (1.5 T MRI). DCE dynamic contrast-enhanced, MPR multi-planar reconstruction, MIP minimum intensity projection, IDC invasive ductal carcinoma.

Clinical value of maximum intensity projection (MIP) images created from contrast-enhanced CT in breast cancer detection
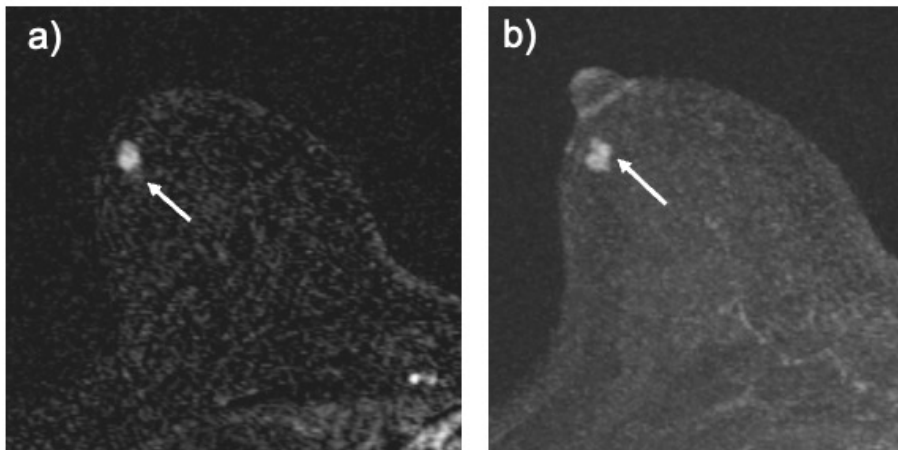
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Purpose: The aim of our study was to evaluate the clinical value of maximum intensity projection (MIP) images created from contrast-enhanced CT in breast cancer detection.

Materials and Methods: A total of 71 patients with breast cancer who underwent contrast-enhanced (CE) CT of the chest were included in the study. Axial source images were manually segmented to extract both breasts by a radiologist, and post processed by the MIP algorithm to produce seven projections rotating about the section axis. Breast MIP images and axial CE 5-mm images were interpreted independently by two radiologists. The reading time was recorded, and the sensitivity in cancer detection were calculated. In addition, for each pair, it was determined which was preferred for breast cancer detection. For statistical analysis, the Wilcoxon signed-rank test was employed, and $p<0.05$ was considered significant.

Results: The reading times of MIP and axial 5-mm images were 7.6 +/- 8.8; 2-60 and 9.2 +/- 4.4; 3-30 seconds (mean +/- SD; range, $p<0.001$), respectively. MIP images showed better sensitivity for tumor detection, compared to axial 5-mm images for both readers (Reader 1: 90.1% vs 80.3%, Reader 2: 95.8% vs 87.3%). Both radiologists preferred MIP images (Reader 1: 76.1%, Reader 2: 95.8%) than axial 5-mm images. **Conclusion:** Breast MIP images may improve the sensitivity in breast cancer detection, and reduce reading time, compared to conventional axial 5-mm images.

Clinical Relevance/Application: Breast MIP images could provide higher sensitivity for breast cancer detection along with shorter observation time.

Incidental imaging findings in the setting of hereditary cancer syndromes
– Experiences from a nationwide study on individuals with h*TP53* related cancer syndrome

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Abstract

Screening of individuals for pathological findings using whole body MRI (WBMRI) may be considered in certain settings in clinical trials and in patients with hereditary cancer syndromes, with a high life-time risk of developing cancer. WBMRI is an attractive choice for this purpose, since various types of cancers in all parts of the body can be detected. In addition, the modality can be repeated without use of ionizing radiation.

Early tumour detection may limit the need of DNA damaging tumor treatment modalities, and is of essential importance in hereditary cancer syndromes related with increased lifelong risk of multiple primary tumours. *TP53*-related cancer syndrome is, in particular, associated with increase tumour risk after radiotherapy.

Screening procedures themselves, as well as WBMRI, come with several challenges. In this presentation, an overview of challenges regarding incidental findings in screening procedures using WBMRI in general, and the particular experiences regarding challenges using WBMRI within a prospective observational nationwide multi-centre study (SWEP53) in patients with heritable *TP53*-related cancer syndrome also called Li-Fraumeni syndrome (LFS), will be covered.

Historic impacts of Scandinavian Japanese Radiological Society (SJRS)

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Kotomi Iwata*, Natsuki Tajima**

Saitama Medical University and Nippon Medical School*, Iri Clinic**

In May 1983, a plan for the establishment of the SJRS was informally talked at Nordic Congress of Radiology in Copenhagen by Professor Björn Nordenström, Karolinska Hospital and Associate Professor Tatsuo Kumazaki, Nippon Medical School. In July 1985, during International Congress of Radiology held in Hawaii, the foundation of SJRS was officially discussed, and the purpose was promotion of friendships, academic exchanges, liaison among Scandinavian and Japanese radiologists, and advancement of Radiology. In April 1986, SJRS was founded at Oslo, where the head officer established. In June 1986, during Nordic Congress of Radiology in Kuopio, Scandinavian board was officially established. The activities were invitation of specialists each other, overseas study grants (exchange young doctors and researchers), and symposiums. Professor Ivar Enge, Oslo, was invited as a guest speaker to Autumn Assembly of the Japan Radiological Society, September 1986, Tokyo. After this, bidirectional exchange of specialists had started. With the support of the grant program launched in 1986, a total of 37 Japanese radiologists had studied in Scandinavia, and Japan accepted 9 radiologists. After returning home, all of them started working as leading radiologists of their countries. The 1st Symposium of the SJRS and 4th Nordic Japan PACS Symposium was jointly held in Tokyo, Nob 1993, by Professor Takahiro Kozuka, Osaka University. After this, SJRS had been held in Scandinavia and Japan in turn every two or three years. And this time we will have the great 14th symposium in Stockholm by President elect, Professor Rimma Axelsson.

Fat-forming solitary fibrous tumor (Lipomatous hemangiopericytoma) of the spine: A case report and review of the literature

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Background & Objective

Solitary fibrous tumors (SFTs) are fibroblastic mesenchymal tumors, commonly benign but rarely can be malignant.
Although approximately 30% of cases occur in the pleura, they have been documented to occur at all anatomic sites [1].
Fat-forming SFT also known as lipomatous hemangiopericytoma, is a rare morphological variant of SFT [2, 3].
Fat-forming SFTs of the spine are extremely rare, with only a few cases reported so far [4, 5].
We present a case of fat-forming SFT in the lumber spine, along with a literature review.

Case Presentation

A 36-year-old male presented with a 2-year history of progressively worsening gait disturbances.
The patient had noticed his left lower extremity weakness one month prior to presentation.
He had no past medical history of significance and took no regular medications.
Physical examination revealed decreased muscle strength in both lower extremities and loss of the Achilles tendon reflexes.
Laboratory data, including tumor marker levels, were within normal limits.

Image findings
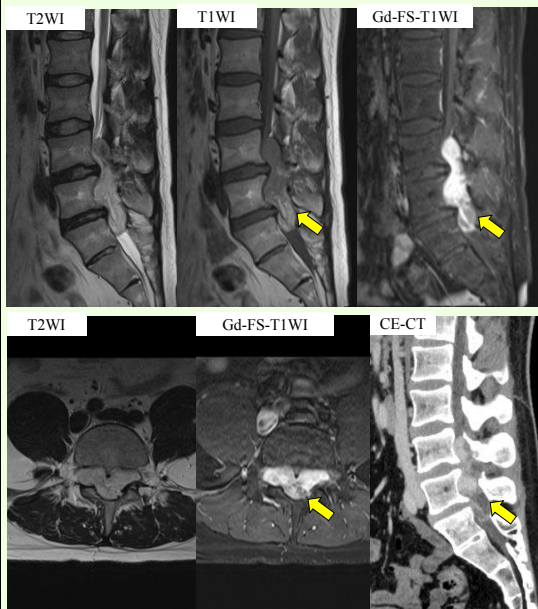
Fig. 1 - MR and CT images show a lobulated mass within the lumbosacral canal, accompanied by scalloping of the vertebral bodies and dural sac compression, indicative of an extradural location. T1-weighted MR images show areas of high signal intensity within the mass, which were decreased in fat-suppressed post-gadolinium T1-weighted MR images and corresponded to hypodense regions on CT images, thereby confirming the presence of fatty components (*arrow*). The remaining components show strong contrast enhancement.

Clinical Course

The clinical diagnoses considered as an ependymoma or a schwannoma.
However, the favored radiological diagnosis was of angiolipoma, considering the lesion extent and the presence of bone scalloping and fatty components.
The tumor was surgically resected via a posterior approach.
Intraoperative findings revealed the tumor was mainly localized in extradural space and partial defect of dorsal dura mater by the compression.
Pathology was consistent with a **fat-forming SFT (lipomatous hemangiopericytoma)**.
He was treated postoperative adjuvant radiation therapy with 54Gy in 30 fractions.
Any recurrence has not been observed at about three-year follow-up after the operation.

Pathological findings
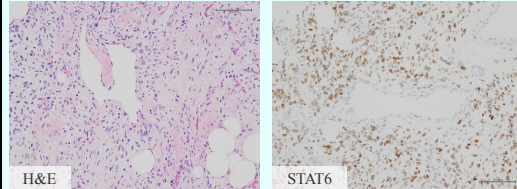
Fig. 2 - H&E stain shows spindle cells arranged haphazardly, with a vascular rich background. Many adipocytes are observed between. STAT6 immunostain shows diffuse nuclear positivity in the lesional cells, which is a specific cytogenic hallmark of SFT.

Discussion

Fat-forming SFT is a rare variant of SFT that was first reported in the early 1990s [2].
It is characterized by a mature adipocytic component mixed with a conventional SFT [3].
It is more common in middle-aged adults, with no gender predilection. The deep soft tissues of the retroperitoneum and thigh are predominantly affected [3].
Fat-forming SFT in the spine is extremely rare, with only two previously reported case was founded [4, 5].
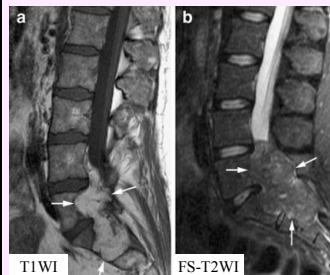
Fig. 3 – A 38-year-old man presented with a 10-month history of left lower limb pain. He had a fat-containing intraspinal mass within the lumbo-sacral canal with scalloping of both the L5 and S1 vertebral bodies.

[4] Aftab S, et al. Skeletal Radiol. 2010;39:1039-42.
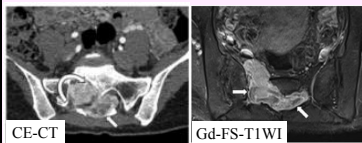
Fig. 4 - A 33-year-old with a mass containing fatty components and hypervascular solid components filling the sacral spinal canal and sacral foramen.

[5] Furuta T, et al. Radiol. Case Rep. 2021;16:1874-77.

Differential Diagnosis

- Angiolipoma
  A benign neoplasm comprising both mature fatty tissue and abnormal vascular elements [6].
  Predilection for the dorsal thoracic epidural space, but rarely the lumbar spine [6].
  Considered to have a high ADC value because the tumor is composed of fat and blood vessels [7].
- Liposarcoma [5]
- Melanotic schwannoma [8]

Conclusion

We present a case of fat-forming SFT affecting the lumber spine.
This rare tumor should be considered as a differential diagnosis for a lipomatous and hypervascular lesion in the spine.

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Evaluation of the diagnostic performance of three imaging modalities: A preliminary analysis of high-risk breast cancer screening program in southern Sweden

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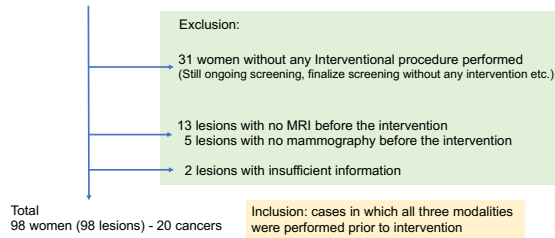
Introduction

Women with inherited genetic mutations (*BRCA1*, *BRCA2*, etc.) and a family history of breast cancer (BC) are at increased risk for developing BC [1]. Women with an increased risk of BC are recommended for screening using breast MRI in combination with other imaging modalities to detect small-size BC at an early period [2-3].
In the current poster, a preliminary analysis of a subset of the cohort of the study during the first 16 years of the program is presented.

Methods

- Retrospective study
- High-risk breast cancer screening program in the south Swedish area based at Skåne University Hospital (initiated 1995) [4]

Women who started screening between 1995/10 to 2011/5
MRI performed at least once at screening round
147 women, 149 lesions*

Exclusion:

31 women without any Interventional procedure performed
(Still ongoing screening, finalize screening without any intervention etc.)

13 lesions with no MRI before the intervention
5 lesions with no mammography before the intervention

2 lesions with insufficient information

Total
98 women (98 lesions) - 20 cancers

Inclusion: cases in which all three modalities were performed prior to intervention

Increased risk of breast cancer
A carrier of pathogenic variants in breast cancer predisposition genes or a non-carrier with an elevated risk.

Imaging
Annual screening images (MRI, mammography, and ultrasound)
All images and diagnostic reports were reviewed retrospectively by an experienced breast radiologist.

Histopathological information
Pathological reports (tumor histology and immunohistochemistry status).

Evaluation
Sensitivity and specificity per imaging modality were calculated per breast lesion at the time of an interventional procedure.
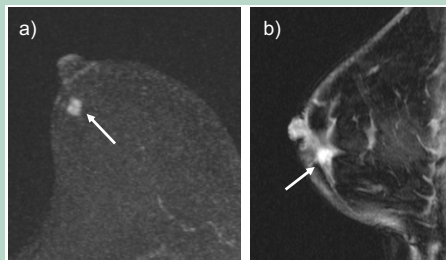
Results

98 women (average age 38 years, range 20-65 years)

	BRCA1	BRCA2	TP53	Family	Total
Number	59	23	1	15	98

20 breast cancers

	IDC	ILC	DCIS	Total
Number	13	3	4	20

Table 1) Diagnostic performance (sensitivity/specificity)

	Sensitivity	Specificity
MRI	80	84
MG	45	91
US	25	95
MRI and MG	85	84

Table 2) Detail information of cancers detected only by MRI

Lesion Number	MRI information		Histology information							
	Lesion size	Findings	Histology	Invasive lesion Size	Subtype	Ki-67	Histological grade	Lymph node	Mutation	Cancer detected modality
1	15mm	Mass	IDC	15	TN	83	3	0	BRCA1	FU-US/Biopsy
2	8mm	Mass	IDC+DCIS	8	LA	<10	1	0	BRCA2	FU-US/Biopsy
3	10mm	Mass	ILC+LCIS	16	LB	24	3	0	BRCA2	Mastectomy
4	18mm	NME	DCIS	-	-	-	-	-	BRCA1	Mastectomy
5	*		DCIS	-	-	-	-	-	TP53	Mastectomy
6	*	-	ILC	50	-	-	-	1	Family history	2nd look US (limited information)

- Six (30%, 6/20) cancers were detected by MRI alone (table 2).
- Among MR-detected cancers, three were pathologically diagnosed only after mastectomy, two were diagnosed by biopsy at follow-up US, and one were diagnosed by 2nd look US.
- One IDC was detected at mammography and MRI, and one was detected at mammography only. Both cancers manifested as calcification and occurred in *BRCA2* carriers.
- Nine cancers were detected in the US (45%, 9/20) and were also visible on MRI.
- Three cancers were not detected by any imaging modality and were detected by mastectomy alone (two DCIS and one 6mm IDC).

Representative case of MRI-detected cancer:
38 y.o., a lesion was detected on the second MRI screening round, 8 mm mass (white arrow), IDC, Luminal A-like subtype, Ki-67 <10%, historical grade 1. 1.5 T MRI. a) Axial MIP image of DCE MRI (early phase), b) Sagittal MPR image of DCE MRI (delayed phase). *MIP* minimum intensity projection, *DCE* dynamic contrast-enhanced, *MPR* multi-planar reconstruction, *IDC* invasive ductal carcinoma

Discussion

- Our results indicate that MRI was the most sensitive method for detecting BC (table 1). However, specificity was higher for mammography, as reported in other studies [5-6]. Combining MRI and mammography increased sensitivity; however, improving specificity is challenging.
- Mammography is suited for detecting BC that manifests as calcifications, especially in *BRCA2* carriers. However, while MRI in the screening program appears beneficial, the additional value of screening in the US needs to be clarified.

Limitation

The retrospective, the single-center study design

Conclusion

The combination of MRI and mammography seems to be the most sensitive screening combination in women with an increased risk of BC.

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2. Bevers TB et al. (2021) NCCN Guidelines : Breast Cancer Screening and Diagnosis.
3. Monticciolo DL et al. Breast Cancer Screening in Women at Higher-Than-Average Risk: Recommendations From the ACR. J Am Coll Radiol 2018 15:408–414.
4. Ohashi A, https://www.luci.lu.se/en/evaluation-high-risk-screening-breast-cancer-south-swedish-health-care-region.
5. Leach MO Screening with magnetic resonance imaging and mammography of a UK population at high familial risk of breast cancer: A prospective multicentre cohort study (MARIBS). Lancet 2005, 365:1769–1778.
6. Mann RM et al., Contrast-enhanced MRI for breast cancer screening. J. Magn. Reson. Imaging 2019 Aug, 50:377–390

Solna sjukhusområde

Legend:

Symbol	Description
▲	Huvudentré
▲	Entré
🏥	Intensivakut
🏥	Barnakut
✚	Närakut Vuxen / Barn
F	Förlossning / BB
📘	Information

Symbol	Description
CK	Centralkassa
Ⓐ	Hissbeteckning
🔵	Apotek
🧘	Rum för stillhet
🍽	Café / Restaurang
◼	Busshållplats
TAXI	Taxi

Symbol	Description
Ⓗ	Helikopterplatta
♿	Handikappsparkering
P	Personalparkering
P	Personalparkering inomhus
P	Besöksparkering
P	Besöksparkering inomhus
⬤	Cykelpump

Park

Stockholms city

Meeting point, Eugeniav 18 C

Main entrance Eugeniavägen 3

Elite Carolina Tower Hotel

Karolinska

sjukhuset Eugeniav.

Patienten

Gävlegatan

Akademiska stråket

Bioclinicum

Framstegsgatan

Solnavägen

Olof af Acrels väg

Prostvä

Borgmästargaraget

Borgmästarvillan

Solna kyrkväg

Karolinska vägen

Karolinska v.

Visionsgatan

Anna Steckséns gata

Maria Aspmans gata

Eugenia-hemmet

Radium-hemmet

Q-huset

Eugeniatunneln

Eugeniavägen

Norrbäcken

locum.
VÅRDEN FÖR VÅRDEN

Region Stockholm

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UNIVERSITETSSJUKHUSET

Framstegsgatan

J NORRA

Bioclinicum
J3:06 Ulf von Euler

SÖDRA

J

Gävlegatan

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B

Framstegsgatan

Skyway plan 8

Skyway plan 6

Skyway plan 5

Gävleväg plan 3

Passage plan 3, 4, 5

Eugeniavägen 3,
Main entrance

Akademiska stråket

Gävlegatan

Akademiska stråket

Kulvert plan 2 till GKS

Skyway plan 7 och 8

G

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F

14

Passage plan 7

C

Norra korridoren, fri passage plan 4, 5, 8, 9

Passage plan 4

Skyway
plan 5

Gävlegatan

Södra korridoren, fri passage plan 4, 5, 6, 7, 8, 9

E

B

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8

Anna Steckséns gata

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Eugeniavägen

Solnavägen

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Conference room J3

COOR