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Abdominal Radiology

ADDED VALUE OF CONTRAST ENHANCED ULTRASOUND IN SPLENIC FOCAL LESIONS

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Background / Objective

Abnormalities of the spleen are relatively uncommon but frequently encountered by ultrasound practitioners during routine abdominal scans. Conventional grey-scale and Doppler ultrasound often fail to accurately characterize focal splenic lesions, even when supplemented with clinical and laboratory data. Contrast-enhanced ultrasound (CEUS) offers a simple, cost-effective, and safe alternative that typically provides valuable additional information. It aids in achieving a definitive diagnosis or a focused differential diagnosis, and helps differentiate between lesions requiring further imaging or biopsy and those suitable for follow-up. CEUS is also useful in confirming accessory splenic tissue and assessing trauma-related splenic injuries.

Methods

This case series includes nine patients with focal splenic lesions evaluated at our center using conventional B-mode ultrasound and CEUS. Imaging characteristics of various lesions—including hemangiomas, splenic infarctions, lacerations, abscesses, granulomatous disease, and lymphoproliferative disease—were reviewed to assess the added value of CEUS.

Results

CEUS provided more detailed and accurate information compared to conventional ultrasound, significantly improving the ability to distinguish between benign and malignant splenic lesions. The use of refined diagnostic criteria could make CEUS a viable alternative to more invasive or expensive imaging techniques, such as CT or MRI.

Conclusions

Splenic abnormalities are rare and often asymptomatic, making careful evaluation essential during abdominal ultrasounds. Conventional grey-scale ultrasound struggles to characterize focal lesions, but CEUS significantly improves diagnostic accuracy. Benign lesions typically show no enhancement or persistent late-phase enhancement, while malignancies often display arterial phase hypoenhancement and late-phase washout, prompting further imaging or biopsy when necessary. As a safe, cost-effective tool, CEUS adds valuable diagnostic capability to a radiologists arsenal.

CASE STUDY OF A RENAL ALLOGRAFT ARTERIOVENOUS FISTULA WITH A POSTSTENOTIC ANEURYSM

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Background / Objective

Chronic kidney disease (CKD) is a progressive condition that affects at least 10% of the general population. Kidney transplantation provides a longer life expectancy and a better quality of life than dialysis. Despite improvements in surgical techniques, graft vascular and non-vascular complications still occur. Renal allograft aneurysm is a rare, most commonly asymptomatic complication, usually diagnosed incidentally, and it may lead to allograft loss and possible life-threatening haemorrhagic complications.

Methods

We report a 38-year-old female CKD patient with histologically proven focal segmental glomerulosclerosis (FSGS) in native kidneys. The patient had a renal allograft surgery at age 32 due to the loss of her first graft and the ensuing end-stage CKD. During the early postoperative period, the new allograft was biopsied, and acute antibody-mediated rejection was confirmed. After a successful treatment with plasmapheresis and rituximab, a second control allograft biopsy was done. The patient was discharged for outpatient care. At a regular check-up six years post-surgery, the patient reported no complaints and the renal function was stable. Routine allograft Doppler ultrasound (US) revealed an arteriovenous fistula (AVF) with a characteristic fistula flow spectrum and a high peak systolic velocity of 330 cm/s. The AVF had an aneurysm with a diameter of 2.8 cm, located at the central zone of the kidney. An MRA definitely confirmed the renal lesion. The parenchymal integrity and vascularization of the allograft was unaffected. Two years prior at the same site, B-mode US showed an anechoic collection with a diameter of 1.6 cm. In lieu of more recent evidence, this collection was most probably the same aneurysm, misidentified as a dilated pelvicalyceal system.

Results

Due to the indolent nature of the allograft aneurysm, a multidisciplinary team, including nephrologists, invasive radiologists and transplant surgeons, decided to not pursue any immediate direct treatment at the time being, opting for watchful waiting.

Conclusions

Renal allograft aneurysm is a rare vascular complication that requires diligent and regular evaluation with US for early identification. There is no consensus regarding the best management approach for such aneurysms. Albeit suggested direct therapeutic options include endovascular stenting or coiling, US-guided percutaneous thrombin injection, open angioplasty, and allograft nephrectomy, management planning requires multidisciplinary decision-making.

RADIOLOGICAL DIAGNOSTIC POSSIBILITIES OF ADRENAL LESIONS

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Background / Objective

Nowadays, with the increasing number of imaging radiological examinations (US, CT, MRI), the incidental finding of adrenal masses has significantly increased.

Learning Objectives: 1. To review the main radiological features of the most likely benign and malignant adrenal lesions. 2. To analyse the possibilities and limitations of the main CT and MRI protocols. 3. To present the challenges of differential diagnosis.

Methods

Learning about algorithm of radiological examinations (US, CT, MRI), main features and differential diagnosis of adrenal masses.

Results

1. Understanding of the imaging challenges in the radiological diagnostics of adrenal adenomas.
2. Analysis and differential diagnosis of radiological features of the main adrenal tumors
3. Pitfalls of adrenal lesions

Conclusions

CT and MRI scans are the most commonly performed radiological imaging tests for the differential diagnosis of adrenal pathology. Accurate diagnosis of adrenal masses depends on the correct choice of the examination protocol.

CASE STUDY OF A RENAL ALLOGRAFT ARTERIOVENOUS FISTULA WITH A POSTSTENOTIC ANEURYSM.

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Background / Objective

Chronic kidney disease (CKD) is a progressive condition that affects at least 10% of the general population. Kidney transplantation provides a longer life expectancy and a better quality of life than dialysis. Despite improvements in surgical techniques, graft vascular and non-vascular complications still occur. Renal allograft aneurysm is a rare, most commonly asymptomatic complication, usually diagnosed incidentally, and it may lead to allograft loss and possible life-threatening haemorrhagic complications.

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COMPARATIVE ANALYSIS OF B-MODE ULTRASONOGRAPHY AND MRI-PDFF IN THE DIAGNOSIS OF HEPATIC STEATOSIS

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Background / Objective

Metabolic dysfunction-associated steatotic liver disease (MASLD), or hepatic steatosis, has emerged as a significant health concern in recent decades, leading to severe consequences, including steatohepatitis, fibrosis, cirrhosis, and hepatocellular carcinoma, when not promptly diagnosed and managed. Liver biopsy has historically been the gold standard for assessing liver fat, but non-invasive imaging like ultrasonography, MRI, and CT scan now play a crucial role. Ultrasound B-mode imaging provides subjective estimates of liver fatty infiltration, but its accuracy varies with the expertise of the operator. Proton density fat fraction (PDFF) measured by chemical shift-encoded (CSE) MRI is recognized as a reliable biomarker for hepatic steatosis, offering superior accuracy in quantifying liver fat. This study's aim was to evaluate the accuracy of ultrasonography in assessing hepatic steatosis compared to MRI-PDFF.

Methods

Conducted at the Institute of Diagnostic Radiology, Pauls Stradiņš Clinical University Hospital, Latvia, this retrospective study analyzed data from 199 patients who underwent abdominal MRI-PDFF scans between May and December 2023. Excluding individuals without prior abdominal ultrasonography or with ultrasonography more than 1.5 years apart from MRI, the study focused on a cohort of 106 patients.

Results

Patients' ages ranged from 19 to 91 years ($M = 59.9$, $SD = 15.6$ years), with 62.0% being female. Among the 106 patients who underwent abdominal ultrasonography, hepatic steatosis was diagnosed in 32 (30.2%) patients. When comparing ultrasonography with MRI scan results, there were 14 true positives (TP), 17 false positives (FP), 59 true negatives (TN), and 5 false negatives (FN). Based on these figures, the positive predictive value was calculated as 45.2%, the negative predictive value as 92.2%, specificity as 77.6%, sensitivity as 73.7%, and accuracy as 76.8%

Conclusions

Over half (53.1%) of the patients diagnosed with hepatic steatosis using B-mode ultrasound did not meet the diagnostic criteria for steatosis on MRI, indicating a tendency of overdiagnosis of MASLD on ultrasonography. Our study shows that ultrasonography is less accurate and reliable compared to chemical shift-encoded MRI-PDFF for diagnosing hepatic steatosis. Notably, ultrasonography in this study was performed by physicians with varying levels of expertise.

THE CURRENT ROLE OF ABDOMINAL X-RAY

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Background / Objective

1. To review and illustrate the most common findings in abdominal X-rays.
2. To clarify the value of abdominal radiographs for diagnosing abdominal pathology.

Methods

An initial single-center retrospective review was conducted between the 1st and 31st of July, 2023, of all abdominal radiographs (ABX). A total of 272 ABX were performed, comprising 238 cases from the adult population and 34 patients from the pediatric. The most representative cases were selected to illustrate primary imaging findings.

Results

The study involved 272 patients: 120 (44.1 %) men and 152 (55.9 %) women. The mean age of patients was 52.4; the median was 57.5 (aged 5 months to 95 years). Of the total abdominal X-rays performed, 203 (74.6%) were reported normal, and 69 (25.6%) as abnormal. The most common finding was intestinal obstruction in 46 (16.9 %) cases. A foreign body was observed in 8 (2.9 %) patients, migrated stents in 4 (1.5 %) patients, pneumoperitoneum in 3 (1.1 %), and other findings (calcifications, fecoliths, drains) were seen in 8 (2.9%) patients.

Fig 1: The child was observed to swallow a coin. A coin was seen in the projection of the stomach (arrow).

Fig 2: Free air was visible on both sides under the diaphragm (arrows) due to gastrointestinal perforation.

Fig 3: A patient with severe ulcerative colitis. Abdominal roentgenogram showing thumbprinting (arrow)

Fig 4: Sigmoid volvulus - 'coffee bean' sign (arrow).

Fig 5: Stent in the projection of the duodenum (arrow).

Fig 6: An enteric stent (arrow) was placed after tumor surgery.

Fig 7: A right ureteric JJ stent (arrow) has been placed to relieve ureteric obstruction.

Fig 8: Two-year-old girl swallowed multiple magnets, which caused an intestinal obstruction.

Fig 9: Abdominal radiograph shows small bowel dilatation with multiple air-fluid levels. Air-fluid level wider than 3.5 cm (horizontal line).

Fig 10: The patient has swallowed wires (arrow) visible in the abdomen's central part.

Conclusions

Despite its limitations, ABX provides valuable information on the patient's clinical condition and has a role as a first-line imaging modality for initial patient assessment. It assists in determining the need for further imaging.

STRUCTURAL CHANGES OF MAGNETIC RESONANCE IMAGING OF TRANSPLANTED DECEASED DONORS KIDNEYS IN THE EARLY POST-TRANSPLANT PERIOD

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Background / Objective

This study investigates the microstructural changes in deceased donors kidneys post-transplantation by The Magnetic Resonance Imaging (MRI). The aim is to compare the MRI of transplanted kidneys (kTx) 7-10 days post-transplantation with healthy native kidneys (control group).

Methods

A prospective study was conducted at the Hospital of Lithuanian University of Health Sciences Kaunas Clinics. MRIs were performed on 34 kTx and 30 control group kidneys using a 3T Siemens Skyra scanner. Parametric MRI v1.2.31-b was used for T1, T2 Map, and Apparent Diffusion Coefficient (ADC) analyses. Two regions, the cortex and medulla, were defined for kidneys. Measurements were averaged across two observers, and corticomedullary difference (CMD) was calculated. Clinical and laboratory data were collected, and statistical analysis was performed using IBM SPSS Statistics version 29.

Results

The results showed a decrease in CMD on the T1 kTx map (140.55 SD 67.74 ms and 541.57 SD 217.54 ms, $p < 0.001$), primarily due to a significantly lower T1 relaxation time (rt) in the medulla of kTx (1710.50 SD 231.5 ms and 2068.27 SD 286.93 ms, $p < 0.001$). The T1 cortex rt was similar between groups (1569.95 SD 212.05 vs 1526.70 SD 116.00, $p = 0.243$). The T2 map of kTx showed significantly longer rt in both cortical and medullar regions, (79.1 SD 11.55 ms vs 72.41 SD 10.55 ms, $p = 0.003$) and (78.80 SD 10.03 ms vs 63.60 SD 10.56 ms, $p < 0.001$), resulting in a significant decrease in CMD (0.3 SD 4.93 ms and 8.81 SD 3.82 ms, $p < 0.001$). The ADC of kTx showed significantly reduced cortical values ($1927.53 \text{ SD } 236.67 \times 10^{-6} \text{ mm}^2/\text{s}$ vs $2037.78 \text{ SD } 73.48 \times 10^{-6} \text{ mm}^2/\text{s}$, $p = 0.01$) and significantly increased medullar values ($1884.66 \text{ SD } 159.17 \times 10^{-6} \text{ mm}^2/\text{s}$ vs $1730.36 \text{ SD } 69.69 \times 10^{-6} \text{ mm}^2/\text{s}$, $p < 0.001$). The ADC CMD of kTx was significantly lower than in the control group ($42.87 \text{ SD } 101.34 \times 10^{-6} \text{ mm}^2/\text{s}$ vs $307.41 \text{ SD } 59.14 \times 10^{-6} \text{ mm}^2/\text{s}$, $p < 0.001$).

Conclusions

According to the T2 map, kTx experience ischemia-reperfusion syndrome-induced edema. The cortex of the kTx is well perfused, which we presume is the reason the T1 map is similar to healthy kidneys. However, the relaxation time is significantly shorter in the medulla of kTx, possibly due to reduced blood flow in the peritubular capillaries or reduced urine production. Different ADC values in kTx are indicative of ongoing cell swelling and capillary leakage in the acute phase.

Interventional Oncology

IS RADIOFREQUENCY ABLATION (RFA) STILL A TOOL IN THE BOX? CURRENT APPLICATIONS.

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Background / Objective

Radiofrequency ablation (RFA) continues to be a significant tool in the medical field, especially for its minimally invasive nature and broad range of applications. RFA has been utilized in some form for about 70-80 years, with significant advancements over the last 40 years. It is one of several ablative therapies used to treat various medical conditions, particularly tumors. Each modality has its strengths and weaknesses, and the choice of treatment depends on factors such as tumor size, location, patient health, and specific clinical goals.

Methods

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Results

-

Conclusions

RFA is well-established, cost-effective, and suitable for a variety of tumor types but can be limited by tissue impedance and cooling effects from blood flow.

DOSIMETRIC OPTIMIZATION AND EVALUATION OF HEPATOCELLULAR CARCINOMA TREATMENT EFFECT PREDICTION IN Y-90 TRANSARTERIAL RADIOEMBOLIZATION

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1. Riga East Clinical University Hospital; ASST Papa Giovanni XXIII; The Abdus Salam International Centre for Theoretical Physics, 2. ASST Papa Giovanni XXIII

Background / Objective

This study aimed to optimize and standardize the pre- and post- dosimetry protocols for 90Y TARE at ASST Papa Giovanni XXIII Hospital (Bergamo, Italy) and assess the predictive value of voxel dosimetry for treatment outcomes, including radiological response, adverse events and patient overall survival in HCC patients.

Methods

In this retrospective study 133 HCC patients treated with 90Y microspheres from 2013 to 2021 were analysed. Of those 95 were treated with resin microspheres, 38 with glass microspheres. The pre- and post-dosimetry protocols were optimized based on EANM guidelines, utilizing the Planet Dose software. Pre-dosimetry was done for all the patients and the calculated doses were used for statistical analysis. Association between mean dose delivered to the lesion and complete radiological response (CR) was assessed by Wilcoxon-Mann-Whitney test and chi-square test. Univariate and multivariable Logistic Regression models were fitted to identify predictors of CR. Cox Proportional-Hazard Regression models were fitted to identify predictors of death.

Results

The optimal reconstruction for pre-treatment dosimetry with 99mTc-MAA with Siemens 'Symbia' SPECT/CT was determined as Flash 3D, 8 subsets, 8 iterations, and no filtering.

For resin microspheres from the ROC curve plotted for mean dose delivered to the lesion predicting CR, a cutoff dose was found to be 233.2 Gy (AUC = 0.6191). A significantly higher proportion of CR was found in the patients who received a dose ≥ 233.2 Gy (49.1% of CR with higher doses vs. 23.8% of CR with lower doses, $p=0.012$), as well as a reduction of risk of death by 42% (HR=0.58, 95% CI 0.34-1.01, $p=0.054$). The number of patients with complete radiological response treated with glass microspheres was too low to implement a statistical model.

No lung toxicity was observed for any of the patients involved in this study. No correlation between the dose delivered to the normal liver and adverse events was found during the statistical analysis.

Conclusions

Dose to the lesion is a significant predictor of CR for resin microspheres, the mean dose delivered to the lesion should be at least 233.2 Gy. In patients receiving at least this dose, a reduction of risk of death was observed.

The absence of lung toxicity and the lack of correlation between normal liver absorbed dose and adverse events suggests potential under-treatment, , advocating for increased delivered doses in future interventions.

PORT-A-CATH: A PRACTICAL GUIDE

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Background / Objective

The central venous port has been widely used for patients who require long-term intravenous treatment. The placement of a Port-a-cath is performed with a small surgical procedure under local anesthesia, which usually takes about 30 minutes. The presentation will be focused on the practical elements of the surgical procedure, emphasizing critical steps in Port-a-cath insertion. Our goal is to illustrate how to perform a Port-a-cath placement and what problems can arise along the way. The goal is to answer questions: how we do it, why we do it that way and what can we learn from each other.

Methods

We conducted a thorough literature search and will present our personal experience.

Results

We will provide a detailed step-by-step guide on the precise procedure involved in placing a Port-A-Cath. This guide will outline each crucial step.

Conclusions

Our presentation aims to guide healthcare professionals through the intricacies of performing a Port-a-Cath placement effectively.

Neuroradiology

INTERVAL MRI FOLLOW-UP IN SPINAL TUBERCULOSIS

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1. Nottingham University Hospitals Trust

Background / Objective

The preferred diagnostic imaging modality for spinal TB is MRI. However, the current evidence for utilising MRI to assess for resolution of inflammatory features after commencing medical treatment remains indeterminate. This is due to radiological signs visible on MRI lagging behind clinical improvement. In addition to the ambiguous clinical value of interval scans, it should be considered that the current demand for MRI in the NHS far exceeds the capacity to supply. The aims of this project were to review follow-up MRI requests in patients with spinal TB and the Radiology reports on changes in radiological features.

Methods

Patients who were admitted under the Infectious Diseases department with spinal TB from 2016 to 2022 were included in the study. Patients who did not have a subsequent MRI after an initial diagnostic MRI were excluded. The final study sample was 8 patients. MRI scan requests were reviewed using the Careflow Medway software and were then classified into 'interval' and 'structural concern' requests. Radiology reports were reviewed using the local PACS and further classified into one of four categories: radiological features improving, unchanged, worsening or indeterminate.

Results

There was a total of 16 MRI scans requested. Of these 9 scans were requested on the basis of structural concern and 7 were requested for interval follow-up. Of the scans requested for structural concerns, 7 scans indicated worsening of radiological features and 2 scans demonstrated an improvement of radiological features. Of the interval scans requested, 4 scans demonstrated improvement of radiological signs and 3 demonstrated no changes.

Conclusions

The majority of scans requested on the basis of structural concern indicated a worsening of radiological signs. There did not appear to be a clear trend in favor of either 'improving' or 'unchanged' in interval scans, which thereby did not change patient management. There is likely limited clinical value in utilising MRI to determine response to medical management. In contrast, interval scans are important for surgical management. Interval scans can help with planning for spinal intervention, assess post-operative structural changes and response to surgical treatment. It is interesting that there is interest in other modalities of imaging such as FDG-PET scans.

UNEXPECTED BILATERAL MIDDLE CEREBELLAR PEDUNCLE DEGENERATION FROM UNILATERAL PONTINE INFARCTION: A CASE STUDY

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1. Pauls Stradiņš Clinical University Hospital, 2. Riga East University Hospital, "Gaiļezers"

Background / Objective

Bilateral middle cerebellar peduncle (MCP) atrophy is a rare condition, making it challenging for radiologists to determine the cause among many possible pathologies. Wallerian degeneration (WD) of the MCPs is one potential cause, which needs to be taken into account especially in patients with a history of pontine infarction. WD is rarely detected due to the lack of follow-up MRI scans after a stroke, often being discovered accidentally after a long time. This clinical case highlights the importance of recognizing WD as a possible outcome of pontine infarction to avoid misdiagnosis.

Methods

We reported a case of unexpected bilateral degeneration in the MCP on T2-weighted images in a 62-year-old man who had presented with a unilateral pontine stroke 8 months earlier.

Results

A 62-year-old man experienced a sudden onset of instability, dizziness, speech impairment, and left-side numbness in the morning. The patient had cardiovascular risk factors such as hypertension, dyslipidemia, and type 2 diabetes. He was admitted to a regional hospital for examinations due to the suspicion of cerebral infarction, with a time window of 4.5 hours after symptom onset. The initial cranial CT and CTA scan revealed no pathological lesions of the brain; however, there was left vertebral artery hypoplasia and suggested weaker vascularization of the left cerebellar lobe. The patient underwent thrombolysis, and after the procedure, a control CT imaging showed no pathological findings. On the follow-up CT scan 9 days after the incident, there was a hypodense lesion in the right side of the pons, indicating a late subacute infarction. The patient was discharged for further rehabilitation in a rehab facility. At the follow-up MR scan 8 months after the stroke, we detected unexpected bilateral lesions in the MCP with atrophy, which is a rare finding in this area and suggested multiple differential diagnoses. Based on the history of infarction, it is more likely that we should consider a rare condition: bilateral MCP WD after unilateral pontine stroke. Bilateral atrophy following a unilateral pontine infarction occurs because the pontocerebellar tracts (PT) cross the midline in the upper part of the pons. Additionally, the MCP are more vulnerable because the majority of the PT are located there.

Conclusions

This case highlights the rarity of WD in both MCPs and the importance of further educating radiologists about this condition and considering WD in patients after a pontine stroke.

THE IMPACT OF ANXIETY AND AWARENESS ON THE DURATION OF GAMMA KNIFE TREATMENT IN RADIOSURGERY

Kristis Krivičius¹

1. LSMUL Kauno Klinikos

Background / Objective

Gamma Knife radiosurgery is a precise form of therapeutic radiology that uses focused beams of radiation to treat small to medium-sized lesions, primarily in the brain. Despite its precision and efficacy, the procedure can be anxiety-inducing for patients due to its intricate nature and the use of immobilization. This study aims to evaluate how pre-treatment anxiety and awareness affect the duration of Gamma Knife treatment sessions. Specifically, it investigates whether patients who receive detailed information and visual demonstrations about the procedure experience less anxiety and consequently require fewer Cone Beam CT (CBCT) scans, potentially reducing overall treatment time.

Methods

This prospective study will involve two groups of patients scheduled for Gamma Knife radiosurgery:

Control Group: Patients in this group will complete a questionnaire assessing their anxiety levels and knowledge about the Gamma Knife procedure without receiving additional information beyond standard clinical briefings.

Intervention Group: Patients in this group will be provided with comprehensive information about the Gamma Knife procedure. This includes detailed explanations, visual aids (such as videos), and demonstrations of the equipment and processes, including the stereotactic mask fitting.

Both groups will be assessed using the same anxiety questionnaire before the procedure. During the treatment, the number of CBCT scans required for precise targeting and alignment will be recorded, along with the total duration of the treatment session.

Results

Data will be analyzed to compare the anxiety levels, the number of CBCT scans, and the total treatment duration between the two groups. It is hypothesized that the intervention group, with enhanced awareness and reduced anxiety, will require fewer CBCT scans and shorter treatment durations compared to the control group.

Conclusions

Understanding the impact of patient anxiety and procedural awareness on the efficiency of Gamma Knife radiosurgery can lead to improved patient management strategies. By potentially reducing the need for multiple CBCT scans and shortening treatment times, healthcare providers can enhance the overall patient experience, increase throughput, and optimize resource utilization in radiosurgical practices.

BLOOD-BRAIN BARRIER PERMEABILITY TO WATER AND CEREBRAL BLOOD FLOW IN THE ANTERIOR CINGULATE CORTEX OF PATIENTS WITH MAJOR DEPRESSIVE DISORDER: EXPLORING THE INTERPLAY WITH NEUROMETABOLIC AND WHITE MATTER MICROSTRUCTURAL PARAMETERS

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1. Radiology Clinic, Lithuanian University of Health Sciences, Kaunas, Lithuania, 2. Laboratory of Behavioral Medicine, Neuroscience Institute and Psychiatry Clinic, Lithuanian University of Health Sciences, Kaunas, Lithuania, 3. Psychiatry Clinic, Lithuanian University of Health Sciences, Kaunas, Lithuania

Background / Objective

Alterations of blood-brain barrier permeability to water (kw) and cerebral blood flow (CBF) are implicated in the pathogenesis of major depressive disorder (MDD). We aimed to explore how these regional parameters in the anterior cingulate cortex (ACC) are associated with the neurometabolic environment of the dorsal ACC (dACC) and microstructural integrity of the dorsal cingulum bundle (dCB) in patients with MDD.

Methods

A cross-sectional study was conducted on a Siemens Skyra 3T MRI scanner. 64 MDD patients (age median [IQR] – 42 [25], females – 75%) and 37 controls (age median [IQR] – 38 [18], females – 73%) were included. Mean values of the left dCB mean diffusivity (MD) and fractional anisotropy (FA) were extracted from DTI data using FreeSurfer's TRACULA. Concentrations of total n-acetylaspartate (tNAA), total choline (tCho), total creatine (tCr), myo-inositol (mlns), and glutamate+glutamine (Glx) in the left dACC were extracted from single-voxel 1H-MRS data using LCModel. CBF and kw values of the left dACC and left rostral ACC (rACC) were extracted from DP-pCASL data. Correlation analysis with multiple comparison correction using FDR (for 28 comparisons) was performed, followed by regression analysis of significant correlations.

Results

In patients with MDD, rACC CBF was positively correlated with dCB FA ($r=0.380$, $p=0.002$, $pFDR=0.0315$) and dACC tCr concentration ($r=0.349$, $p=0.005$, $pFDR=0.0335$), while dACC kw was positively correlated with dCB MD ($r=0.365$, $p=0.003$, $pFDR=0.0315$). In linear regression, rACC CBF and age were both significant predictors of dCB FA ($R^2=0.325$; $bcbf_rACC=0.001$, $tcbf_rACC=-2.248$, $pcbf_rACC=0.028$; $bage=-0.001$, $tage=-3.627$, $page=<0.001$), while only rACC CBF was a significant predictor of tCr in a weak model ($R^2=0.170$; $bcbf_rACC=0.011$, $tcbf_rACC=3.481$, $pcbf_rACC=<0.001$); dACC kw was a significant predictor of dCB MD in a weak model ($R^2=0.182$; $bkw_dACC=4.3215 \times 10^{-7}$, $tkw_dACC=3.058$, $pkw_dACC=0.003$). In the control group, there were no significant correlations that survived multiple comparison correction.

Conclusions

In patients with major depressive disorder there were multiparametric associations in the anterior cingulate region between cerebral blood flow, blood-brain barrier permeability to water and white matter microstructural integrity, total creatine concentration. Further exploration of these interactions may lead to a fuller understanding of the underlying pathophysiology of major depressive disorder.

BLOOD-BRAIN BARRIER PERMEABILITY TO WATER AND CEREBRAL BLOOD FLOW IN THE ANTERIOR CINGULATE CORTEX OF PATIENTS WITH MAJOR DEPRESSIVE DISORDER: EXPLORING THE INTERPLAY WITH NEUROMETABOLIC AND WHITE MATTER MICROSTRUCTURAL PARAMETERS

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Conclusions

In patients with major depressive disorder there were multiparametric associations in the anterior cingulate region between cerebral blood flow, blood-brain barrier permeability to water and white matter microstructural integrity, total creatine concentration. Further exploration of these interactions may lead to a fuller understanding of the underlying pathophysiology of major depressive disorder.

CASE SERIES ON BRAIN MR AND ABDOMINAL ULTRASOUND FINDINGS IN ADULTS WITH TUBEROUS SCLEROSIS COMPLEX WITH DIFFERENT NEUROLOGICAL MANIFESTATIONS

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Background / Objective

Tuberous sclerosis (TS), also known as Pringle-Bourneville's syndrome, is a genetic disorder caused by mutations in the TSC1 or TSC2 genes. While approximately half of cases are inherited, the remaining cases are sporadic. TS is characterized by hamartomas in various organs, leading to diverse clinical symptoms, which can complicate diagnosis. Diagnostic criteria include two major or one major and two minor criteria, with nine of the twenty requiring imaging. Radiology, especially MRI, plays a vital role in diagnosing TS by identifying key manifestations such as intracranial subependymal nodules, cortical tubers, and other lesions. This review focuses on the brain MR and renal, liver US imaging findings in two patients with tuberous sclerosis complex.

Methods

A prospective observational study was conducted in a tertiary university hospital. Clinical and radiological findings were assessed prospectively. This case series involved two patients diagnosed with TS. The first patient was a 42-year-old female, and the second was a 41-year-old male. Both patients underwent comprehensive ultrasound and MRI examinations to follow up and characterize hepatic, renal, and brain lesions. Lesions were assessed for number, size, and presence of complications. The imaging findings were correlated with clinical data to analyze the characteristics of renal, hepatic, and brain involvement in TS and to plan the subsequent management of these patients.

Results

Both patients in this study have previously known TS and underwent follow-up ultrasound and magnetic resonance examinations.

First female patient, who primarily complained of frequent headaches and dizziness without exhibiting intellectual disability or seizures, MRI findings revealed subependymal nodules predominantly along the caudate nucleus and indications of subcortical tubers in the frontal and parietal lobes, along with linear changes in the brain's white matter. Notably, no significant MRI changes had occurred since 2017.

Conversely, the second male patient, experiencing frequent seizures, intellectual disability, and chronic insomnia, showed different MRI findings. Bilateral subependymal nodules, along with cortical and subcortical tubers in both hemispheres, were observed. Additionally, cortical dysplasia was noted in the left frontal lobe's dorsal parts, along with underdevelopment of the corpus callosum in the splenium region and polymicrogyria in the right temporal lobe's upper and middle gyri.

Renal ultrasound revealed multiple bilateral angiomyolipomas (AMLs), with the largest lesions measuring 4.6 cm and 1 cm in diameter, respectively. Additionally, both patients exhibited multiple small simple cysts in both kidneys, with no acute complications such as hemorrhage noted. Hepatic ultrasound findings included small hepatic AMLs in both patients, with the largest hepatic lesions measuring 0.5 cm.

Conclusions

Tuberous sclerosis presents multiorgan manifestations, where radiology plays a crucial role in diagnosing and managing patients. Ultrasound and MR imaging in two patients diagnosed with TS unveiled substantial brain involvement characterized by intracranial subependymal nodules, cortical tubers, and white matter heterotopia. Renal involvement was prominent, featuring bilateral angiomyolipomas (AMLs) and cysts, while minor hepatic AMLs were also noted. These findings are similar to those reported in the literature, underscoring the need for regular ultrasound and magnetic resonance monitoring for early complication detection. Further studies with larger cohorts are necessary to better understand the spectrum and progression of brain, hepatic and renal lesions in TS.

IMPACT OF DIFFERENT EXERCISE TYPES ON BRAIN MORPHOLOGY

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Background / Objective

The study aimed to investigate the impact of different types of exercise on brain morphology in healthy males. Specifically, two exercise groups were compared with a control group over a 12-week period, focusing on High Intensity Resistance Training (HIRT) and Blood Flow Restriction (BFR) training.

Methods

Seventeen participants underwent 12 weeks of HIRT, while 18 participants underwent BFR training. Fifteen males comprised the control group. Brain MRIs were conducted before and after the training period. Brain volumetric changes were analyzed using Freesurfer 7.4.1 software, and white matter integrity was assessed through DTI using ExploreDTI software.

Results

Significant volumetric changes were observed in the HIRT group post-training compared to the control group, with specific regions including the left hippocampal head, body, and surrounding areas showing notable changes ($p < 0.05$). In contrast, the BFR group did not exhibit significant volumetric changes post-training. Regarding white matter integrity, the HIRT group demonstrated a significant difference in the FA value of the whole brain ($p < 0.05$), particularly in the hippocampal regions. The BFR group did not show a similar significant change in FA values.

Conclusions

The findings suggest that High Intensity Resistance Training has a significant impact on brain morphology, particularly in the hippocampal regions and overall brain volume. In contrast, Blood Flow Restriction training did not result in significant changes in brain morphology post-training. Further research is warranted to delve deeper into the observed differences and understand the underlying mechanisms driving these effects.

STATUS EPILEPTICUS MIMICKING ACUTE ISCHEMIC STROKE: A CASE SERIES HIGHLIGHTING CROSSED CEREBELLAR DIASCHISIS

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Background / Objective

Crossed cerebellar diaschisis (CCD) is a rare occurrence characterized by diminished functional activity in the cerebellar hemisphere contralateral to supratentorial injury, resulting from decreased cerebellar blood flow and metabolism. While typically associated with ischemic stroke, this phenomenon may also manifest in cases of status epilepticus

Methods

A prospective observational study was conducted at a tertiary university hospital, wherein clinical and radiological findings were systematically evaluated

Results

The initial patient, a 45-year-old woman with a prolonged history of alcohol abuse, was admitted to a tertiary university hospital after experiencing a generalized tonic-clonic seizure. On admission, she presented with a severe condition, scoring a Glasgow Coma Scale (GCS) of-7. Despite administration of diazepam, no effect was observed. Non-enhanced computed tomography (NECT) of the brain revealed a mildly hypodense acute ischemic area spanning the left cerebral hemisphere, excluding the basal ganglia. Computed tomography angiography (CTA) highlighted pronounced vasodilation with no evidence of arterial occlusion. Epileptiform activity on electroencephalogram (EEG) was only detected on the fourth day of admission. Brain magnetic resonance imaging (MRI) unveiled extensive cytotoxic edema in the left hemisphere and a smaller lesion in the right cerebellum – a case of crossed cerebellar diaschisis (CCD). Despite therapy in the intensive care unit (ICU), the patient's clinical state deteriorated. However, gradual improvements were observed, leading to her re-admission to the neurology department. She was discharged with a partially reversible and suboptimal outcome.

The second patient, a 36-year-old man, presented with multiple generalized tonic-clonic seizures, fever, and a history of traumatic intracerebral hematoma in the right hemisphere, which had been surgically treated during adolescence. He also had a prolonged history of alcohol abuse, with a GCS score of 3 upon arrival at the emergency department. The patient was sedated and intubated upon admission. Brain NECT revealed pansinusitis and post-traumatic lesions in various brain regions, including both frontal lobes, the right parietal lobe, and temporal lobes. Subsequently, he was transferred to the ICU. Focal epileptiform activity was noted on EEG on the second day of admission, followed by a pattern of slow, disorganized background activity in subsequent EEG readings. Brain MRI confirmed extensive post-ictal damage in the right hemisphere and a smaller lesion in the contralateral cerebellar hemisphere, indicative of CCD. Although slight improvements were observed, the patient was re-admitted to the neurology department with limited hope for full recovery.

Conclusions

Status epilepticus, a life-threatening condition, can often resemble stroke, making accurate diagnosis crucial. These case series underscore the critical importance of timely and accurate diagnosis, as well as effective management of status epilepticus. Additionally, they shed light on the rare occurrence of crossed cerebellar diaschisis, which may manifest concurrently, emphasizing the need for comprehensive evaluation and treatment

DISTINCT CAUSES OF CEREBROSPINAL FLUID RHINORRHOEA: TWO CASE REPORTS

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Background / Objective

Cerebrospinal fluid (CSF) rhinorrhea refers to a CSF leakage extracranially into the paranasal sinuses, then into the nasal cavity, and exits via the anterior nares.

CSF rhinorrhea is often seen whenever there is an osseous or dural defect of the skull base, mostly caused by head trauma or a post-operative complication of skull base surgery, or due to congenital defects.

We present two cases of CSF rhinorrhea caused by diverse etiology and treated with different surgical technique.

Methods

A 72-year-old woman with a 6-month history of left-sided intermittent nasal discharge and mild headache. This was identified as CSF caused by intra-sphenoidal meningoencephalocele due to the persistence of the lateral craniopharyngeal canal (Stenberg's canal). The brain MRI identified a herniated temporal lobe through a bony defect that communicates the middle cranial fossa with the lateral recess of the sphenoidal sinus. Patient underwent a functional endoscopic sinus surgery – with the resection of meningoencephalocele and closure of the defect with fascia lata lever. There were no complications related to surgery and no recurrence of CSF leakage in 6 months.

A 41-year-old male with multiple skull and facial fractures (Le Fort III), a traumatic subarachnoid hemorrhage in the left frontal lobe, and traumatic brain injury resulting from altercations. He was primarily treated with subsequent facial bone osteosynthesis using mini and microplates. A month after this episode, the patient was re-admitted to another hospital due to progressive headache, subfebrile temperature, and persistent watery nasal discharge. Brain non-enhanced CT was repeated demonstrating diffuse pneumocephalus and cerebrospinal fluid circulation abnormalities with signs of transtentorial herniation and brain edema. Progressive widening of cerebral ventricles was noted, including temporal horns as well as periventricular edema. Most likely patient presented with acute communicating hydrocephalus due to meningitis. The patient underwent a right ventriculostomy with an antimicrobial drain, followed by a ventriculoperitoneal shunting procedure. Shortly after, the CSF rhinorrhea resolved.

Results

-

Conclusions

CSF rhinorrhea is relatively rare condition occurring secondary to different etiology, however, diagnosing its possible cause can be challenging. A comprehensive diagnostic assessment of individuals clinically suspected of having CSF rhinorrhea is critical, along with an understanding of CSF components and imaging abnormalities.

AI and ML in Radiology

AI-BASED TOOL FOR DETECTION OF ACUTE ISCHEMIC STROKE IN NON-ENHANCED CT (NECT) - FIRST EXPERIENCE

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Background / Objective

The growing demand for imaging studies has placed considerable pressure on radiologists, often leading to increased workloads and the potential for critical findings to be overlooked. Artificial intelligence (AI) models can assist radiologists in detecting subtle signs of acute ischemic stroke that may be missed by human observers, leading to more accurate diagnoses and reducing the workload on radiologists. The aim of this experimental study was to develop and test an AI tool for detecting acute ischemic stroke (AIS) in non-enhanced CT (NECT) scans.

Methods

To create a reliable AI model, we organized the dataset into three distinct groups:

- Patients with acute ischemic stroke (AIS) within 24 hours from symptom onset.
- Patients with other brain abnormalities.
- Patients without pathology.

Each group consists of 100 head NECT scans. Each scan has manually contoured lesion labels, which were used as ground truth for training.

Results

The trained model was evaluated using an independent test set of 150 NECT scans. The model successfully detected acute ischemic stroke signs (either hypodensity or hyperdense artery) in 84% of the cases.

- Examination Level: 84% accuracy
- Slice Level: 60% accuracy
- Segmental Level: 52% accuracy

The model missed hypodense areas in some cases, possibly due to subtle early changes or low contrast between the lesion and surrounding tissue (false negative). The model had a high false positive rate of 47%.

Conclusions

The AI tool demonstrated good performance in detecting acute ischemic stroke signs at the examination level (84% accuracy) but faced challenges at the slice level (60% accuracy) and segmental level (52% accuracy). The false positive rate of 47% is a significant limitation that needs to be addressed.

These results indicate that while the AI tool is promising, further refinements and optimizations are necessary, especially to reduce the false positive rate and improve detection accuracy at the slice and segmental levels. Future work will focus on enhancing the model's precision and sensitivity to ensure it can be reliably used in clinical settings.

ARTIFICIAL INTELLIGENCE IN CT IMAGING: PREDICTING OSTEOPOROTIC VERTEBRAL FRACTURES

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Background / Objective

Osteoporosis is a convoluted condition characterised by changes in bone microarchitecture, decreased bone density and, thus, an increased likelihood of fractures. Annually, around 10 million new osteoporotic fractures are diagnosed worldwide, primarily affecting the spine and imposing a significant burden on healthcare systems, society, and the economy. Currently, there are no reliable tools for predicting potential vertebral fractures in computer tomography (CT) images. Based on retrospective routine CT examinations and with the help of artificial intelligence (AI) our aim is to establish a tool that could accurately predict future osteoporotic fractures.

Methods

This study analysed CT examinations of 32 patients who had confirmed osteoporotic lumbar spine fractures. Both before and after fracture CT scans were analyzed. Deep learning techniques were utilized for binary segmentation and the analysis of the trabecular bone of lumbar vertebrae. A 3D densitometric model of each vertebra was created to assess structural integrity, using material resistance methods to estimate stress points and identify potential fracture sites. Furthermore, first-order texture features and "Haralick" features using machine learning methods were investigated to predict the potential likelihood of fractures.

Results

The segmentation of lumbar spine trabecular bone allowed for the calculation of individual voxel densities, resulting in the creation of 3D densitometric models for both healthy and fractured vertebrae. Density differences were visualized through 3D imaging models. Textural analysis underscored the significance of pre-processing and standardising pixels in everyday CT scans, which significantly improved analytical accuracy.

Conclusions

The findings of this pilot study indicate that 3D densitometric model analysis can be effectively applied to everyday standardised CT scans and is likely to be integrated into 3D simulations for material resistance testing, in combination with textural analysis of the lumbar spine. These simulations have the possibility to identify structural weaknesses in bones, allowing them to be analysed more precisely and potentially predict future fracture sites.

PROCANCER-I PROJECT: NCI INPUT

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1. NCI

Background / Objective

ProCancer-I project brings together over 20 different partners worldwide with the objective to design, develop, and sustain a cloud-based, secure European Image Infrastructure with tools and services for data handling. The aim of the project is to create a unique (in terms of data quantity, quality, diversity: 17,000, >1.5 million images) international open-access artificial intelligence (AI) platform for prostate cancer magnetic resonance imaging (MRI) image analysis and development of AI tools for prostate cancer for radiological cancer diagnosis, clinical stratification of patients, science and innovation.

Methods

NCI is one of the partners that brought and made analysis of more than 1200 different MRI prostate cancer cases which allows ProCancer-I project to answer PCa relevant clinical questions. To answer PCa relevant clinical questions ProCancer-I project worked with 20 partners from 11 countries, 13 prostate cancer reference centers, centers of technical excellence and world leaders in AI in order to collect and prepare database, complete ML Model Training & Validation, as well as Model Deployment.

Results

NCI will present various uploaded Use Cases which represent the drivers to answer PCa relevant clinical questions, ranging from PCa diagnosis and characterizations to prediction of treatment response and occurrence of side effects after treatment. Together with NCI and the rest of partners cases the ProCancer-I project should create a unique dataset in terms of data quantity, quality and diversity, and facilitate validation of the platform with its added value and usability for various users among the clinical and research community.

Conclusions

After the project is finished it should:

1. Contribute towards the creation of a EU-wide repository of health images dedicated to the most common forms of cancer.
2. Contribute to developing technical, organisational and ethical standards for AI for health imaging.
3. Promote access to anonymised health image datasets to be made more openly reusable across the EU for training AI applications.
4. Increase trust in AI solutions among users (including healthcare professionals and patients), investors and stakeholders at industry and academia.

Interventional Radiology

SINGLE CENTER EXPERIENCE ON TREATING PREVIOUSLY UNRUPTURED INTRACRANIAL WIDE-NECK ANEURYSMS USING ATLAS STENT SYSTEM

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Background / Objective

The use of stent-supported coil embolization has proven its efficacy worldwide for treating wide neck intracranial aneurysms. The Neuroform Atlas Stent System provides enhanced coil support, non-complex deliverability, conforms to the vessel wall, thereby enhancing its efficacy. The purpose of this work was to investigate whether previously unruptured intracranial wide neck aneurysm size and location contributes to the degree of occlusion, evaluated using Raymond-Roy occlusion scale (RROC) on follow-up examinations. We present our single center procedural, 6 month and 24 month follow-up efficacy and angiographic results.

Methods

From January 2016 to December 2023 in Pauls Stradiņš Clinical University Hospital, 142 intracranial unruptured wide neck aneurysms were treated with Atlas stent-assisted coiling system under general anesthesia with jailing or with sequential embolization techniques. The study's primary efficacy endpoint was the rate of 6-month complete aneurysm angiographic occlusion, which was evaluated using RROC (RR I). Main variables that were recorded: aneurysm size, location and follow-up imaging. Patients with multiple aneurysms were recorded as separate.

Results

106 (74%) patients were female, and the mean age of patients was 57.44 (+/-12.5 years). The mean diameter of the aneurysm sac and neck was 5.4 (+/-2.3mm), 3.8 (+/-1.2mm) respectively. Average aneurysm sack/neck ratio was 1.4 (+/-0.44). 52 (36.6%) aneurysms were localized in the ophthalmic segment of ACI. 121 (85.2%) aneurysms were treated with the jailing technique. Due to anatomical complexity, in 2 instances, a different stent-system was used. In total 6 (4.2%) complications during the procedure were recorded, of which 3 (2.1 %) were aneurysm ruptures. Average follow-up time was 14.42 months. There were no records of rupture during follow-up examinations. 68 (47.9%) aneurysms were classed as RR I after procedures, after 6 months 76 (75.2%) classed as RR I, and at 24 months 27 (81.8) classed as RR I. No statistically significant results were found regarding the applied embolization technique, aneurysm size and its anatomical location in regards to RROC at any evaluated timeframe.

Conclusions

In summary, our study highlights the efficacy and safety of the Neuroform Atlas Stent System for treating intracranial wide-neck aneurysms. Given these promising results, future research should focus on evaluating the long-term outcomes of treating ruptured aneurysms to further enhance treatment strategies.

PERCUTANEOUS MICROWAVE ABLATION OF BENIGN THYROID NODULE

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Background / Objective

We describe a case of a 44-year-old male patient with a visible neck mass and discomfort. Thyroid ultrasound examination revealed an oval-shaped heterogeneous nodule in the right lobe with a large central cystic component and smooth margins measuring ~6.2x3.2cm [Fig. 1]. The nodule exhibits no high-risk features and was categorized as EU-TIRADS 3. Two fine needle aspirations with cytological examinations showed no malignancy. Microwave ablation (MWA) was suggested for minimally invasive treatment of this symptomatic nodule.

Methods

The cystic component of the nodule was aspirated before the ablation. Ultrasound-guided percutaneous MWA was achieved under local anesthesia using an 18 G antenna. In total, 6 MWA sessions were performed using an overlapping technique of 15W power for 5 to 10 minutes.

Results

No complications occurred during the procedure and the patient was discharged on the same day. Follow-up ultrasound examinations displayed a gradual reduction in nodule volume of 59% within 8 months [Fig.2]

Conclusions

Benign thyroid nodules are a frequently encountered pathology in the general population. Minimally invasive treatment techniques such as ethanol injection, laser and thermal ablation have been developed as alternatives for partial or total thyroidectomy. A recent meta-analysis (J. Ding et al., *Ultrasound Quarterly*, 2023) of ultrasound-guided benign thyroid nodule thermal ablation demonstrated that minimally invasive techniques were safer and more efficient in terms of relief of symptoms, cosmetic effect, complication rate, and hospitalization duration compared to surgery.

Breast Imaging

BREAST IMPLANTS: THE VALUE OF ULTRASOUND IN DETECTING A RUPTURE OF IMPLANT

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Background / Objective

Breast implant surgery for cosmetic purpose is the most popular plastic surgery and it has been performed for over 100 years. The amount of these procedures has risen significantly in the past decade according to American Society of Plastic Surgeons. It is important to determine changes in implant integrity because most of implant ruptures do not cause any clinical symptoms. The aim of our study was to evaluate the diagnostic value of ultrasound (US) in the detection of intact and ruptured breast implants.

Methods

In this retrospective study the medical documentation of women who underwent breast implant surgery and US check-ups at Tautrimas Aštrauskas Clinic in Kaunas, Lithuania in 2015-2023 were analyzed. The study included 92 patients with breast implants who underwent breast ultrasound and suspected rupture of one or both implants. An intact breast implant was characterized by even and continuous implant shell and homogeneous intracapsular echo-texture. The signs of a ruptured breast implant were uneven implant shell and inhomogeneous intracapsular echo-texture. The implants were divided into two groups: intact breast implants and ruptured breast implants. Surgery followed every evaluation of implant rupture by US. The accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were evaluated.

Results

In this study 184 implants were evaluated. Ultrasound diagnosis of an intact implant was made in 40,8% cases, a certain or suspected implant rupture - in 59,2% of cases. The accuracy of US in diagnosis of implant rupture was 97,3%, sensitivity - 99,1%, specificity - 94,9%, PPV - 96,3%, NPV - 98,7% and of all cases only 0,5% of cases were false negative.

Conclusions

US is reliable in evaluating breast implant integrity. The reported sensitivity of US for predicting implant rupture varies widely in the literature, from 50 to 94%. In the current study, the sensitivity was very high (99,1%, 96,7% CI, 86% to 101,4%). It can be influenced by the radiologist's work experience. The new updated FDA 2023 guidelines state that magnetic resonance imaging (MRI) is the most effective method for detecting silent rupture of silicone gel-filled breast implants, but ultrasound is an acceptable alternative test for rupture in asymptomatic patients. The ultrasound is cheaper, faster, more affordable, and also very sensitive for assessing implant integrity. With reference to our study US examination after breast augmentation surgery with silicone gel implants is recommended annually.

PATIENT DOSE AND BREAST COMPRESSION, DIFFERENCES BETWEEN STANDARD AND CONTRAST ENHANCED MAMMOGRAPHY

Marta Uške¹

1. RAKUS

Background / Objective

The topic is "Patient dose and breast compression, differences between standard and contrast enhanced mammography". The relevance of the topic is determined by the increase in breast cancer incidence and the number of examinations.

The aim of the thesis is to compare the differences in radiation doses and compression between standard mammography and contrast-enhanced mammography examinations. The research tasks include analyzing literature sources on the significance of breast cancer diagnosis and the possibilities of early detection, as well as the significance of mammography examinations, compression, and received radiation dose, regarding contrast-enhanced mammography examinations, patient preparation, and received radiation. Analyzing the force of compression applied in mammography examinations, the impact of breast thickness, glandularity on the dose of radiation received by the patient. Summarizing the obtained data and drawing conclusions about the differences in dose and compression between 2D mammography and contrast-enhanced mammography examinations

Methods

The research instrument is a table created by the author of the thesis. The research method is a retrospective study.

Results

According to statistical analysis answering the research question, the applied compression force does not change the received radiation dose during standard and contrast-enhanced mammography examinations, but rather the thickness of the breast.

Conclusions

- 1) Breast cancer is one of the most common malignant tumors not only in Latvia but also worldwide, so early diagnosis and the initiation of treatment are important.
- 2) Mammography is a method of radiographic examination of breast tissue using low-intensity X-rays. In contrast, contrast-enhanced mammography is a relatively new method of functional breast examination that uses dual-energy acquisition, utilizing low and high-energy X-ray spectra after an intravenous iodine contrast injection.
- 3) Compression is important for several reasons, such as improving image quality, reducing the thickness of breast tissue, and consequently decreasing the radiation dose received by the patient as well as the exposure time.
- 4) The statistical analysis of the study data showed that the radiation dose of the examination is generally not dependent on breast density and the compression applied, but rather on breast thickness, which in turn is influenced by the woman's breast size.

[18F]FDG PET/CT IMPACT ON BREAST CANCER STAGING DETERMINATION

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Background / Objective

[18F]FDG PET/CT is a widely used method in oncology that allows non-invasive visualization of tissue metabolic and anatomical status. This method is primarily indicated for oncology patients to determine the metastatic spread of the primary tumor to lymph nodes and distant organs, subsequently establishing a more precise TNM stage and clinical stage of the tumor and aiding in the selection of appropriate therapy.

The aim of the study: to investigate whether [18F]FDG PET/CT is more sensitive and precise compared to conventional imaging methods in determining the N and M stages of primary breast cancer.

Methods

Retrospective study analyzing data of 128 patients with primary breast cancer. Information analysed was ultrasonography, contrast-enhanced computed tomography, [18F]FDG PET/CT, core needle biopsy and lymph node fine-needle aspiration biopsy findings, which was conducted at the ARS Nuclear Medicine Clinic, Pauls Stradiņš Clinical University Hospital Breast Disease Center, and the Breast Surgery Department of the Latvian Oncology Center. To analyze the data, Microsoft Excel was used. Prior to data collection for the study, approval was obtained from the Research Ethics Committee of the Faculty of Medicine, University of Latvia (Approval Nr. 19-25/259_1) to initiate the study.

Results

The study included 128 patients aged 26 to 92 years (mean age 58 years) with primary breast cancer. The most common location of regional lymph node metastases was axillary lymph nodes – 92.2% (n=118) of patients. The second most prevalent site detected by PET/CT was infraclavicular lymph node metastases: 35.2% (n=45), followed by supraclavicular lymph node metastases: 21.9% (n=28). With [18F]FDG PET/CT, the most frequently detected l/m metastatic sites were mediastinal (10.9%) and hilar (8.6%) lymph nodes. Distant metastases were found in 28% (n=36) of patients, with the most common locations being bones – 19.5% (n=25), lungs – 8.6% (n=11), liver – 4.7% (n=6), and mediastinum – 2.4% (n=3). [18F]FDG PET/CT demonstrated a sensitivity of 95.9% and specificity of 21.4% regarding lymph node biopsy conclusions.

Conclusions

(1) The study data indicate that [18F]FDG PET/CT has higher sensitivity rate (95.9%) in detecting regional lymph node metastases compared to contrast CT imaging, but its specificity is lower than that of ultrasound and contrast enhanced CT specificity (21.4%). (2) [18F]FDG PET/CT demonstrates a higher capability in detecting distant lymph node metastases compared to contrast CT imaging. (3) The most common sites of metastasis identified with [18F]FDG PET/CT were bones – 19.5% (n=25), lungs – 8.6% (n=11), and liver – 4.7% (n=6). (4) In 71% (n=10) of patients initially staged as M0 and later found to have distant metastases on [18F]FDG PET/CT, the stage was changed to M1 and clinical stage IV after the decision of the council of doctors.

Musculoskeletal Radiology

ACRO-OSTEOLYSIS: LOOSING FINGERTIPS

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Background / Objective

A 52-year-old female patient presented with a known history of systemic sclerosis (SSc) characterized by progressive skin thickening and severe Raynaud's phenomenon during the cold month of the year. Upon examination, she exhibited digital ulcers of the hands. Radiographic imaging revealed characteristic resorption of the distal phalanges, indicative of acro-osteolysis. Laboratory investigations were consistent with an autoimmune profile, including elevated antinuclear antibodies (ANA) and anti-Scl-70 antibodies.

Methods

Clinical Perspective:

In patients with systemic sclerosis, the presence of acro-osteolysis should prompt comprehensive evaluation for associated complications, including digital ulcers and joint contractures. Management strategies should focus on aggressive control of the underlying autoimmune process, optimization of vasodilatory therapy, and wound care to prevent complications.

Imaging Perspective:

Radiographic assessment plays a pivotal role in the diagnosis and monitoring of acro-osteolysis. Characteristic findings include bony resorption of the distal phalanges, tapering of the tufts, and soft tissue calcifications.

Results

Remarkably, following initiation of immunotherapy, the patient's digital ulcers showed significant improvement, with resolution of pain and decreased inflammation. Radiological follow-up revealed stabilization of bone resorption and soft tissue changes, indicative of treatment response and disease modification.

Conclusions

Acro-osteolysis is a clinically significant complication of systemic sclerosis, often associated with digital ulcers and severe Raynaud's phenomenon. Early recognition and multidisciplinary management are essential to reduce morbidity and optimize outcomes in affected individuals.

DYNAMIC CONTRAST ENHANCED MRI FOR PATIENTS WITH OSTEOARTHRITIS UNDERGOING GENICULAR ARTERY EMBOLISATION

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Background / Objective

Low-grade inflammation, especially synovitis, was latterly recognized as a substantial factor in osteoarthritis pathogenesis and pain inflicting components. One of the new pain relieving treatments in patients with knee osteoarthritis is genicular artery embolization (GAE). However, insights on patient selection vary between different authors. We present our approach to patient selection and follow up containing MRI examinations as well as dynamic contrast enhanced MRI (DCE MRI).

Methods

Twenty four patients with radiographic mild to moderate osteoarthritis, refractory to conservative treatment, are enrolled in a prospective study. DCE MRI is performed and evaluated for possible treatment with GAE. Knees with large meniscus tears, grade IV chondromalacia, avascular necrosis and rheumatoid diseases are excluded. Patients then undergo GAE. Follow up DCE MRI is repeated 3 months after embolization. WOMAC and VAS scores are recorded to observe clinical changes.

Results

On follow up DCE MRI examinations contrast enhancement intensity reduction in the treated area as well as synovial volume and joint effusion decrease are seen. Significant clinical improvement is also observed, with WOMAC score reduction approximately from 45 ± 11 to 15 ± 8 and VAS score reduction from 7 to 1.

Conclusions

DCE MRI is a useful and illustrative tool for patient selection and follow up in mild to moderate knee osteoarthritis. MRI is crucial for patient selection when planning GAE. Using DCE MRI adds valuable information about soft tissue perfusion and demonstrates its reduction after treatment. Further enrollment of patients as well as comparison with control group is planned to determine best imaging protocol for patient selection.

"SPINE RADIOGRAPHIC FEATURES IN PATIENTS WITH SCOLIOSIS"

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Background / Objective

The relevance of the topic is based on the most frequent localisations of scoliosis, the thoracolumbar spine, radiography and its peculiarities in order to explain the necessity of radiographs of the entire length of the spine in the diagnosis of scoliosis. Objective: to investigate the radiographic characteristics and image quality criteria of full-length spinal radiographs in patients with scoliosis.

Methods

Design: mixed method. Retrospective study.

Results

The spine is located in the centre of the radiation field in 90% of the X-ray images analysed. Locating the spine at the centre of the radiation field is important to allow positioning of all anatomical structures in the radiation field and accurate diaphragming. Accurate diaphragm placement was performed in 67% of the X-ray images analysed. Appropriate diaphragm application ensures a reduction of the radiation dose received by the patient.

The spine from the C3 vertebra to the os sacrum was visualised in 57% of the X-rays analysed. To achieve the criterion, the patient's head is slightly flexed during positioning (extension). Without correct positioning of the patient's head, the C3 and sometimes also the C4 vertebrae cannot be visualised because they overlap with other facial bone structures on the radiograph.

Caput femoris dextra et sinistra was visualised in 73% of the X-ray images analysed. To meet the criterion, the patient must be at the centre of the radiation field and the radiation field must be accurately diaphragmed to include the required anatomical structures. The patient's body in the upright position, without any rotation of the body, can be visualised in 97% of the X-ray images analysed. During positioning, attention should also be paid to the position of the shoulders and pelvis, with the coronal plane of the body parallel to the detector

Conclusions

1. According to the results of a survey of vertebrologists, the prevalence of scoliosis in the population is about 10-15%, with the most frequent location in the thoracolumbar spine. The assessment of scoliosis requires a full-length AP and LL radiograph of the spine.

2. The analysis of the data on the performance of the manipulation shows that in 35% of the analysed radiographs of the entire length of the spine, accurate diaphragm placement is difficult in patients with marked deformity of the spine and posture

3. The analysis of the data on the exact image criteria shows that the positioning is inaccurate in 21% of the cases. There are difficulties in positioning the patient in such a way that the symmetry of the patient is observed (no rotation of the pelvis or other parts of the body)

“IMAGE QUALITY INFLUENCING FACTORS IN COMPUTED TOMOGRAPHY EXAMINATIONS OF THE SPINE IN PATIENTS WITH SPINAL IMPLANTS”

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Background / Objective

The relevance of the topic is characterised by the widespread use of post-operative computed tomography scans of the spine to assess the condition and possible complications of metallic spinal implants. Post-operative CT scans of the spine often visualise not only artefacts caused by metal implants, but also artefacts related to patient positioning and inappropriate choice of imaging parameters. Therefore, the accuracy of patient positioning during the examination and the ability to adapt the exposure parameters in the examination protocol to the patient's body characteristics with an understanding of CT image artefact formation should be emphasised, maximising the quality of diagnostically useful examinations in post-operative patients.

Objective: to investigate factors influencing image quality in spinal CT scans with metallic spinal implants.

Methods

Design: mixed method. Retrospective study.

Methods:

Outcome measures: a table of image quality factors was compiled by the author, after which 50 CT scans of patients with metallic spinal implants were analysed and evaluated.

Process: a table of factors affecting image quality was created by analysing the scientific literature on CT of the thoracolumbar spine. The table was used to evaluate CT scans of the spine in patients with spinal implants, and the most common factors affecting image quality, including visualisation artefacts, patient positioning inaccuracies, were summarised and presented in charts.

Results

Main results and conclusions: in 20% of cases, patient positioning inaccuracies led to the formation of CT image artefacts or incomplete visualisation of the anatomical structures of the area to be imaged. Metal artefacts were the most frequent artefacts seen in the images.

Conclusions

1. The analysis of the scientific literature shows that the most frequent placement of spinal implants is in the thoracolumbar spine, which is related to the supportive function of the spine, flexion and extension movements and other clinical specificities.
2. Analysing the data obtained in the study on patient positioning and clinical conditions, it can be concluded that in 20% of cases inaccurate patient positioning was performed, which contributes to further factors affecting image quality.
3. Analysing the study data on the visualisation of foreign bodies and image artefacts, 100% of each examination visualised artefacts caused by spinal metal implants.
4. The hypothesis was confirmed. Patient positioning accuracy is a key determinant of examination quality.

Pediatric Radiology

MAGNETIC RESONANCE IMAGING AND COMPUTED TOMOGRAPHY FINDINGS OF HEPATOBLASTOMA IN PEDIATRIC PATIENTS

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Background / Objective

Hepatoblastoma (HB) is the most common primary malignant liver tumor for children under 5 years old. Diagnosis involves alpha-fetoprotein (AFP), imaging modalities, and histological examination. High AFP levels are found in 80-90 % of patients. Magnetic resonance imaging (MRI) is preferred as it is radiation-free and differentiates soft tissues effectively, while computer tomography (CT) has rapid scanning speed and high spatial resolution. Early detection is crucial, and imaging is indispensable. Imaging techniques play a key role in HB staging, deciding on treatment, monitoring the effectiveness of treatment, and identifying any recurrences. We aim to identify HB's MRI and CT radiological diagnostic features in pediatric patients.

Methods

A retrospective analysis of three pediatric patients with radiologically and histologically confirmed HB was performed. Data from physical examination and AFP levels were collected. Imaging findings from MRI and CT scans were reviewed. By analyzing MRI and CT imaging modalities, characteristic patterns of HB were identified.

Results

We present three pediatric cases: a ten-month-old, a two-year-old female, and a three-year-old male. Palpable abdominal masses and a heterogeneous mass in the right hepatic lobe in the US were found in all cases. Elevated AFP levels varied from 10089 to 332000 kU/l. In all cases, a diagnostic liver biopsy confirmed the epithelial type of HB. MRI detected large, heterogeneous, lobulated masses measuring 12x8x9 cm in the second case and 12x9x12 cm in the third case, accumulating contrast and displacing adjacent organs with heterogeneous hypotensive T1w, hypertensive T2w signal intensity, and DWI restriction in two cases. Hemorrhage, small cysts within the mass, and heterogeneous enhancement in postcontrast images were seen in a ten-month-old case. A chest MRI detected multiple diffuse lung metastases in a two-year-old girl. In the male case, the primary benign hepatic tumor measuring 11x10x7 cm diagnosis was later revised to HB. CT scan detected a heterogeneous nodule in the right lobe with multiple satellite tumor nodules. Also, a contrast washout was seen.

Conclusions

HB is often large due to rapid growth and late symptom onset. On MRI, HB appears hypointense on T1w and hyperintense on T2w images. On CT, HB appears as a hypoattenuating lesion, followed by contrast washout. Hemorrhage and necrosis contribute to heterogeneous appearance. MRI and CT define vascular anatomy and tumor invasion.

Head and Neck Radiology

MISLEADING IMAGING FINDINGS: BILATERAL MYLOHYOID DEFECT PRESENTING AS A SUBMANDIBULAR MASS DUE TO SUBLINGUAL GLAND PROTRUSION

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Background / Objective

The muscular base of the oral cavity is formed by the mylohyoid muscle that forms a sling inferior to the tongue. It is inserted into the slightly obliquely oriented mylohyoid line on the middle surface of the mandible, with the posterior aspect more cranial than the anterior aspect. In fact, the muscle is often discontinuous. Literature has shown that defects may include sublingual or submandibular salivary tissues, fat, blood vessels or all three components. Hypertrophic sublingual glands located in mylohyoid defects can be herniated into bilateral submandibular spaces and presented as palpable masses. Consequently, larger herniations can be mistaken both clinically and radiologically for pathological abnormalities. The aetiology of this condition may be congenital or acquired, and although such anatomical variations can be found in almost every fifth individual using ultrasound, they often go unrecognised in clinical practice. Sialoceles are cyst-like structures that are associated with conditions that restrict normal salivary function, indicating underlying problems with drainage efficiency.

Methods

Prospective observational study was conducted in a tertiary university hospital. Clinical and radiological findings were prospectively assessed.

Results

This case report presents a 44-year-old female patient who experienced a slowly enlarging mass in the right submandibular region for two years. Comprehensive imaging studies, including ultrasound and computed tomography (CT), indicated the presence of a submandibular mass; however, the definitive diagnosis was established through magnetic resonance imaging (MRI). The MRI revealed that the lesion was not a pathological mass but rather a herniation of the sublingual salivary gland through a defect in the mylohyoid muscle membrane. In addition, small sialoceles were observed medially to the right sublingual gland, suggesting a possible chronic process characterised by impaired salivary drainage. To clarify the changes, an ultrasound examination was performed, which confirmed the diagnosis.

Conclusions

This case highlights the importance of a thorough imaging evaluation in the diagnosis of submandibular masses to avoid misinterpretation and ensure appropriate management. Prolapsed sublingual gland hypertrophy should be considered in patients with submandibular masses to avoid unnecessary biopsy or surgery. Further discussion is warranted regarding the chronicity and management of sialoceles associated with salivary gland abnormalities.

MULTIPARAMETRIC ULTRASOUND IN DIFFERENTIATING PARATHYROID ADENOMA FROM HYPERPLASIA: A DIAGNOSTIC ADVANTAGE

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Background / Objective

Conventional B-mode ultrasound often face challenges in distinguishing parathyroid adenoma (PA) from hyperplasia (PH). This study aimed to assess the qualitative and quantitative characteristics of parathyroid gland lesions using multiparametric ultrasound (MPUS).

Methods

Consecutive 85 patients with 98 parathyroid lesions and biochemically confirmed hyperparathyroidism (HPT) were enrolled in our prospective study prior to parathyroidectomy. MPUS included B-mode ultrasound, colour-doppler (CD), elastography and contrast-enhanced ultrasound (CEUS) with the subsequent qualitative and quantitative evaluation of obtained data. The findings from MPUS were compared to histopathological results obtained post-surgery.

Results

Eighty parathyroid adenomas were well-circumscribed and hypoechoic with increased central echogenicity (47.1%), peripheral-central vascularization (53%), polar feeding vessel (98%). Fourteen PH observed to have similar ultrasound appearance but were smaller in volume ($p=0.038$). Hyperplasias had a tendency for marked enhancement in CEUS after quantitative analysis vs. peripherally enhanced adenomas with central wash-out. We achieved 91.2% sensitivity and 73.5% specificity, 94% positive predictive value (PPV), 87.5% negative predictive value (NPV) and 87.5% accuracy in the differentiation of parathyroid lesions prior to post-processing. Our sensitivity increased up to 98%, specificity 80%, PPV 98%, NPV 80% with an accuracy of 96.5% after quantitative analysis.

Conclusions

CEUS of parathyroid lesions showed potential in the differentiation of adenoma from hyperplasia. The quantitative analysis enhanced the sensitivity and specificity of differentiation between parathyroid lesions.

CONE BEAM COMPUTED TOMOGRAPHY VS ORTHOPNATOMOGRAPHY IN THE NORTH ESTONIA MEDICAL CENTRE

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1. The North Estonia Medical Centre

Background / Objective

Since a new Planmeca imaging system has recently arrived at the North Estonia Medical Centre, there have been cases where the radiology technician performed an examination that did not fit the standards of how radiologists want to see these images. Our aim was to collect all protocols in one and present them to our colleagues as an educational material.

Methods

The radiologist who describes CBCT and OPTG images explained to us how radiologists want to see done images. After collecting the data, we analyzed it and then structured all the information into protocols. Protocols include patient preparation, FOVs and the setting of resolution and other parameters.

Results

After collecting the protocols in one place, radiology technicians at the North Estonia Medical Centre could use these materials as a tool to find standards for any CBCT or OPTG study.

Conclusions

We believe that our work is going to provide radiology technicians to do more qualitative exams at the North Estonia Medical Centre.

UNCOMMON PRESENTATIONS OF OROPHARYNGEAL NECK MASS : DIAGNOSING ANKYLOSING SPONDYLITIS AND DIFFUSE IDIOPATHIC SKELETAL HYPEROSTOSIS

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Background / Objective

Ankylosing spondylitis (AS) is a type of arthritis that causes inflammation in the joints and ligaments of the spine, but can also affect peripheral joints. Inflammation of the joints and tissues of the spine can cause stiffness, and in severe cases, it can cause the spinal cord to fuse and can lead to an inflexible spine. Although researchers do not know the cause of ankylosing spondylitis, studies show that genes and the environment can lead to the development of the disease. Researchers know that the HLA-B27 gene increases the risk of ankylosing spondylitis, but environmental factors also play a role. Certain factors can increase the risk of developing the disease, such as family history and genetics, age (most people develop symptoms before 45 years of age) and people with Crohn's disease, ulcerative colitis, or psoriasis can be more likely to develop the disease. Diffuse idiopathic skeletal hyperostosis (DISH) is a systemic condition characterised by excessive new bone formation in the axial and peripheral skeleton. The pathogenesis of DISH is not well understood and is currently considered a noninflammatory disease and is observed mainly in adults over 45 years of age, with a predominance of men and associated with metabolic syndrome, obesity, hypertension, and diabetes mellitus, affects all populations; however, its prevalence is thought to be the highest in developed countries. DISH can be asymptomatic or manifest as back and cervical pain, dysphagia, pain at peripheral enthesal sites, and restriction of spinal column movement, often imitating AS.

Methods

In this case series, we present two patients who were referred for imaging investigations with suspicion of an oropharyngeal region lesion.

Results

The first patient presented to the physician with complaints of cough, and on examination by the otolaryngologist, a possible lesion was observed in the oropharynx region. Subsequently, magnetic resonance imaging of the soft tissues of the neck revealed prominent anterior spondylophytes of the cervical vertebrae at the level of C2-C3, causing compression of the oropharynx, suggesting ankylosing spondylitis in the patient. The second patient was referred by an otolaryngologist for a head and neck soft tissue examination with intravenous contrast, suspecting a cyst in the oropharynx region. A computed tomography scan showed massive anterior spondylophytes of the cervical vertebrae more involvement at the C2-C3 level, resulting in compression of the oropharynx, calcified anterior longitudinal ligament, and radiological appearance of DISH syndrome in the patient.

Conclusions

In these cases, we found that the complexity of the conditions highlights the importance of radiology as an indispensable tool to ensure accurate diagnoses, because the cause of the possible neck mass can be unexpected and the spine should be evaluated very carefully during examinations of the soft tissues of the neck, as sometimes what we see may not always be what appears, which makes these cases particularly intriguing.

Radiation Safety and Dose Optimization

ASSESSMENT OF RADIATION EXPOSURE FROM PAEDIATRIC THORACIC AND ABDOMINAL-PELVIC COMPUTED TOMOGRAPHY EXAMINATIONS

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Background / Objective

Owing to increasing use of computed tomography (CT) in diagnostic imaging, patients undergoing these examinations are subjected to significantly higher effective doses compared to other modalities, resulting in an increased risk of stochastic effects. Due to their anatomical and physiological features, children are more susceptible to the negative effects of ionising radiation. The objective of this study was to assess radiation exposure doses of paediatric thoracic and abdominal-pelvic computer tomography investigations in a hospital, to propose local diagnostic reference levels and to compare them with the currently standing European Guidelines on DRLs for Paediatric Imaging (PiDRL).

Methods

Retrospective dataset of thoracic and abdominal-pelvic CT scan series performed on children aged 0-17 years in Vilnius University Hospital Santaros Klinikos was analysed. Each scan series was grouped by patient age in the intervals: <1, 1-<5, 5-<10, 10-<15 and 15-<18 years and weight in the intervals: 5 to 14 kg, 15 to 29 kg, 30 to 49 kg and 50 to 79 kg. The minimum, first quartile, median, third quartile and maximum dose-length product (DLP) values were calculated. Local diagnostic reference levels (DRLs) were defined as the third quartile values of DLP. Spearman's rank correlation and a linear regression model were used to assess the relationship between patient weight and DLP.

Results

Data from a total of 327 scan series was assessed. For thoracic CT examinations the values of the first and the third quartile of DLP ranged from 32 to 38 mGy-cm in the weight group of 5 to 14 kg, 39 to 60 mGy-cm in 15 to 29 kg, 9 to 107 mGy-cm in 30 to 49 kg and 29 to 153 mGy-cm in 50 to 79 kg. For abdominal-pelvic CT examinations, the ranges were 10 to 80 mGy-cm, 33 to 159 mGy-cm, 16 to 201 mGy-cm and 36 to 353 mGy-cm in the respective weight groups. For both anatomical regions, a positive strong and statistically significant was observed. Compared to the dose reference levels proposed in PiDRL, local DLP values were similar or significantly lower than the guidelines.

Conclusions

The local practices currently used for thoracic and abdominal-pelvic CT imaging provide DLP values which conform to or are lower than DRLs proposed in PiDRL. A strong positive correlation between the weight of the patient and the DLP value received visualising/applying a linear regression model provides a tool for more individualised radiation exposure assessment.

PATIENTS UNDERGOING RECURRENT CT SCANS: ASSESSING DOSE AND MAGNITUDE

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Background / Objective

A single computed tomography (CT) scan results in a negligible increase in lifetime cancer risk. However, repeated investigations markedly increase the cumulative exposure to ionizing radiation. Concerningly, the number of patients who receive cumulative effective doses (ED) of at least 100 mSv is rising. Therefore, this study aimed to assess the most common indications for recurrent CT scans, evaluate cumulative radiation doses, and examine associated cancer risks.

Methods

A dataset of CT examinations performed during 3 years on adult patients was collected and analysed. A subset of patients who underwent three or more CT investigations was further inspected and grouped by the number of CT procedures performed per patient. For each group the average and maximum values of EDs were calculated by including the patients' age, gender and the anatomical sites of CT scans. The k factor values provided by the American Association of Physicists in Medicine for individual body regions were used. Lifetime attributable risk was calculated with the United States National Cancer Institute's online open-access calculator RadRAT. Additionally, an analysis of data from patients with the highest number of reports in the hospital information system was performed.

Results

At least one CT scan was performed on more than 20 thousand patients, among them 11 % had recurrent scans with the number ranging from 3 to 18 investigations per patient (were grouped). The cumulative average dose length product (DLP) for combined scans per patient in each group ranged from 4681 mGy*cm to 11620 mGy*cm while the maximum DLP was 42533 mGy*cm. Among 103 patients with the highest number of entries in the hospital information system, 83 % were investigated for oncological diseases 17 for multiple/other conditions. The cumulative ED of at least 50 mSv was reached in 92% patients and cumulative ED of at least 100 mSv was reached in 75% patients with the largest contributions provided by full-body CT scans to assess the extent of malignant disease.

Conclusions

Recurrent CT scans (3 and more) are performed on 11% of patients. The most prevalent indication for recurrent CT was oncological disease. The largest cumulative ED for a single patient 638 mSv. Recurrent CT scans may significantly increase the LAR certain steps and measures may be taken to optimise exposure for patients undergoing such procedures.

COMPARISON OF LEAD-EQUIVALENT PERSONAL PROTECTIVE EQUIPMENT VERIFICATION METHODS USED IN CLINICAL PRACTICE

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Background / Objective

Personal radiation protective equipment (PRPE), such as lead aprons, thyroid shields, vests, skirts and other means, minimise radiation exposure to personnel using X-ray systems and working in nuclear medicine departments. PRPE from lead or lead-equivalent material are essential in providing necessary shielding from secondary occupational radiation exposure. However, PRPE are prone to wear and tear which can result in inadequate radiation protection. The aim of the study was to evaluate a new mobile apron screening system as an alternative for evaluation of the integrity and lead equivalence of PRPE while comparing it with various PRPE verification methods used in clinical practice.

Methods

Quality assessment of 0.25, 0.35, 0.5 and 1 mm lead and lead-free PRPE from thirteen manufacturers was performed. Four calibrated X-ray units were used for inspecting the integrity and lead equivalence: Siemens Luminos dRF MAX 3D digital radiography, Philips Incisive CT computed tomography, Philips BV Endura mobile C-arm and FLOWD 8020 mobile apron screening system. A calibrated solid-state meter Piranha R&F/M 657 with RTI Dose Probe was used for checking the radiation attenuation. In order to check the integrity, PRPE were categorized into four categories: I (good quality measures), II (small cracks), III (large cracks not in critical areas and smaller than 5 cm²), IV (very large cracks, cracks in critical areas, bigger than 5 cm²). PRPE lead equivalence deviations were analysed and grouped into three categories: DI (less than 5 %), DII (from 5 to 10 %), DIII (more than 10 %).

Results

A total of 695 pieces of PRPE were evaluated over a 6-month period. The results of the integrity tests showed that 86.9 % of the PRPE were in good quality while the remaining had tears/cracks and were assigned to category II (8.8 %), III (3.3%) and IV (1%), respectively. The analysis of lead equivalence deviations revealed that 73.4 % of the PRPE met the criteria for category DI, 12.4 % for category DII, while 14.3 % of the measured PRPE exceeded the lead equivalence amount specified by the manufacturers by more than 10 %. Moreover, the results indicated that all the X-Ray units used for investigating the integrity and lead equivalence of PRPE had similar accuracy and can be used interchangeably. However, the specialized apron screening system stood out for its practicality, large fields of view, reduced scan times and close to the background dose rate exposure near the operating machine.

Conclusions

It is recommended that PRPE integrity be checked after the purchase and annually thereafter in order to maintain their effect on protection against ionising radiation. While calibrated radiographic, CT or C-arm equipment can be used for regular inspection of PRPE, this study showed that specialized apron screening systems offer a convenient alternative that can streamline the workflow for personnel.

THE MAIN ASPECTS OF THE MODERN PET/CT SYSTEMS

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Background / Objective

Positron emission tomography and computed tomography (PET/CT) play one of the major roles in current nuclear medical practice. For hybrid PET/CT imaging, ¹⁸F-FDG is considered the most common radiopharmaceutical in clinical routine, thus ¹⁸F is the most frequently used PET nuclide in clinical practice, and ⁶⁸Ga-based tracers are also becoming increasingly popular. Recent advances in PET/CT detector technology have led to the introduction of PET/CT scanners with extended axial fields of view (aFOV). The extended aFOV of new scanners, range between 32 to 200 cm, provides higher sensitivity and better signal-to-noise ratio (SNR). New technologies allow to reduce the radiation exposure to the personnel and patients, however, due to shorter examination times, the workflow may significantly increase resulting in higher doses for staff working with radiopharmaceuticals. The purpose of this study was to evaluate the main aspects and advantages of modern PET/CT systems.

Methods

Despite the fact that there are many different designs of scanners and vendors, each PET/CT scanner basically consists of three main parts: scintillation detectors, photodetectors, and high-performance computers. The current PET/CT systems are based on two types of scintillators: BGO (bismuth germanate) or LYSO (yttrium orthosilicate), a derivative of LSO (lead scintillation oxide) with a small percentage of yttrium. Photomultiplier tubes were the most commonly used photodetectors in PET scanners, nowadays, the systems are equipped with silicon photomultipliers (SiPMs)-based detectors. To get a visual first impression of the new generation PET/CT systems, PET images were evaluated with Omni Legend 32 PET/CT system.

Results

The new PET/CT systems allow to perform quick scans, utilize paediatric protocols, scan 90Y for post-therapeutic PET scans after trans-arterial radioembolization, to perform scans more efficiently using new tracers and isotopes, especially short-lived isotopes. The activity of the ¹⁸F-FDG dosage could be reduced to 1.0 MBq/kg or less. Systems with the aFOV depending on the range allow to have sensitivity higher than 45 kcps/MBq. Dedicated hardware for PET/CT image acquisition and reconstruction for respiratory motion can decrease the artefacts on PET images. Artificial intelligence (AI) helps to eliminate the negative effect of the motions and strengthen the SNR. The combination of all these properties results in a very good image quality.

Conclusions

The high sensitivity whole body PET/CT scanners can significantly reduce the activity of radiopharmaceuticals, however, the CT scan may result in higher radiation exposure to the patient. Future directions for hybrid imaging include the introduction of more AI techniques and the use of PET/MRI, however, MRI part will increase system and maintenance costs, as well as introduce more artifacts and slower workflow. New designs and software improvements help to decrease radiation exposure while ensuring better image quality. New detector technologies of the CT part, such as photon counting technology, will help to decrease the CT dose and significantly improve image quality.

RADIATION PROTECTION AND PHYSICAL CONSIDERATIONS DURING RADIOEMBOLIZATION

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Background / Objective

Radioembolization is a minimally invasive procedure for treating patients suffering from inoperable liver cancer. After treatment, there is a risk of complications of radiation pneumonitis. The scout dose is administered before treatment to simulate the distribution of the microspheres in order to minimise the risk of lung shunting. During the radioembolization procedure the significant concern is associated with personnel ionizing radiation exposure control, encompassing whole body extremity and eyes dosimetry, as well as the patient discharge procedure from the hospital. The aim of this study was to evaluate the main radiation protection and physical good practice aspects during the radioembolization procedure with Ho-166.

Methods

Ho-166 microspheres, composed of poly-L-lactic acid (PLLA) housing the isotope Ho-166, are utilized effectively in liver cancer treatment. Emitting high-energy beta particles and gamma rays with a 26.8-hour half-life, these microspheres are delivered via catheter to the hepatic artery. From 2022 to 2024, over 15 liver cancer patients underwent treatment at Vilnius University Hospital Santaros Klinikos.

Patient dosimetry calculation, treatment planning, and treatment evaluation were performed using the Q-Suite 2.1 software (Quirem BV). For the treatment planning, Ho-166 scout dose was used and the treatment dose of Ho-166 was administered to the patient approximately 2–3 weeks after the scout dose. Planar and SPECT/CT images were acquired using GE Infinia Hawkeye SPECT/CT.

The Philips Azurion 7 cath lab angiography system was used to perform interventional radiology procedures. To measure occupation dose rate, patient dose rate and contamination ATOMTEX AT1121, NuviaTech Healthcare CoMo 170, POLIMASTER PM1610B-01 and Mirion DMC3000 were used. The personnel constantly wear legal passive dosimeters TLD and OSL in order to measure personal dose equivalent Hp(10) and Hp(0.07) for individual monitoring. Moreover, NaCl pellets were placed in different locations for monitoring the working area exposure during one procedure.

Results

The quantitative assessment after the scout dose showed no radiation exposure risk of lung shunting (calculated lung dose < 25 Gy). The median Ho-166 administered activity, the average duration of the interventional procedure, average value of kerma-area product for treatment planning (scout dose) and treatment procedures were evaluated for 15 cases. The comparison of the doses between the NaCl pellets worn at various positions on the interventional radiologist and radiology technologists' hands showed dose heterogeneity. The residual activity in the re-usable administration Ho-166 system after the treatment procedure was less than 100 MBq. The dose rate near the patient after the treatment procedure was up to 110 microSv/h from 1 meter.

Conclusions

The correct treatment procedure can be achieved through careful pre-assessment, careful patient selection, and adequate dosimetry. The results show large dose distribution on the personnel extremities, further analysis and optimization is needed for more precise absorbed dose determinations using NaCl pellets. No radioactive contamination was found after the Ho-166 procedures in the operational theatre. Patients were discharged after one day of hospital stay and the dose rate was up to 30 microSv/h from 1 meter.

MEASURING PATIENTS' LEVEL OF KNOWLEDGE ABOUT CONTRAST AGENTS USED IN MEDICAL IMAGING

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Background / Objective

Substance allergy is uncommon but may have severe consequences, such as dyspnea, erythema, edema of the vascular system, discomfort, anaphylactic shock, and abrupt fatality. Prior to the administration of the contrast agent in medical imaging operations, the patient is just required to sign a permission form, without undergoing an allergy test. Regrettably, in the event that a patient has any kind of contrast allergy, they will become aware of it via personal experience. He may see weakly noticed allergy responses as a commonplace event. The possible adverse effects of the contrast chemical also include comparable responses, to a certain degree. Nevertheless, the distinction is in the magnitude of the response. There is a possibility that the patient may be unable to differentiate between the potential side effects and a genuine state of distress and toxicity.

The potential adverse effects of the contrast substance, or the financial implications of the patient's inability to receive an injection due to loss of consciousness, along with the detrimental outcomes of repeating the injection using a different protocol or method, subjecting the patient to additional radiation, the psychological impact of the distressing situation the patient is going through, and the wastage of resources, expenses, and time. The patient's understanding of the impact of the contrast agent is crucial for his well-being as well as for the hospital, especially the medical staff involved in the procedure.

The research seeks to assess the overall level of understanding of contrast agents and their associated side effects among all patients (including candidates) undergoing contrast imaging procedures in various modalities, as well as those who are not now undergoing such procedures but are likely to do so in the future

Methods

. This research has aggregated the survey data collected from a diverse sample of 504 individuals, including different genders and educational backgrounds.

We conducted statistical analysis of the research findings using the SPSS 26.0 statistics software. Initially, we analyzed the data pertaining to the demographic features of the individuals. Subsequently, we used the Pearson Chi-Square test and the Fisher's Exact test to compare the qualitative data. The statistical data have been assessed using a 95% confidence interval ($p < 0.05$).

Results

In the surveys, correlations such as education and consciousness level and age and consciousness level and their significance levels were examined and presented in tables in the article.

Conclusions

Considering that most of the participating students were medical students, it was observed in the evaluation that there was a significant difference between the education level and the patient's level of awareness about allergies to contrast materials. When looking at the relationship between age and level of consciousness, it can be said that there is no significant difference, taking into account experience and diseases.

MASTERING CT RADIATION SAFETY: PROVEN TIPS AND TECHNIQUES FOR DOSE REDUCTION

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1. RIGA EAST UNIVERSITY HOSPITAL

Background / Objective

With the entry into the market of newer equipment, possibilities of iterative reconstructions and various AI tools, it is possible to significantly reduce the radiation dose received by the patient during the examination. Dose reduction is possible by modifying and adjusting the technical data of each examination equipment, iterative reconstruction and AI tools, guided by the patient's constitution and examination indications.

Methods

Summarizing several proven facts, recommendations in dose optimization, iterative reconstruction and application of AI tools.

Results

Several proven facts were obtained, how by modifying various technical data of the examination, by applying iterative reconstruction and AI tools, it is possible to significantly reduce the radiation load received by the patient.

Conclusions

By observing and applying dose optimization recommendations in daily practice, using iterative reconstruction and AI tools, it is possible to significantly reduce the radiation received by the patient from 30%-60%, the dose reduction depends on the patient's constitution and examination indications.

DYNAMIC MONITORING AND LOW-DOSE CT SCANS FOR LUNGS, ABDOMEN, AND PELVIS IN ONCOLOGY PATIENTS

Kristaps Reimartuss¹

1. RIGA EAST UNIVERSITY HOSPITAL

Background / Objective

In order to reduce the radiation load received by the patient in oncology patients who perform regular dynamic monitoring, it is necessary to implement uniform standards in the clinic to reduce medical radiation by applying dose optimization guidelines.

Methods

Collect data on examinations and radiation doses received by patients, performed before and after the development and implementation of the guidelines.

Results

Obtained data on patient dose reduction and optimization following guidelines.

Conclusions

Following the developed guidelines and dose optimization recommendations, it is possible to significantly reduce the radiation load received by the patient from 30% to 60%, depending on the pathology.

Radiology Education and Training

MOST COMMON ARTIFACTS IN HEAD MRI EXAMINATIONS AND HOW TO PREVENT THEM?

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1. Vilnius University Hospital Santaros Klinikos

Background / Objective

Magnetic resonance imaging (MRI) is one of the most popular diagnostic methods in modern medicine. This diagnostic technique is widely used to examine various parts of the body. The brain is one of the most common areas examined by MRI. This test is useful for diagnosing tumors, inflammations, circulatory disorders, bleeding, nerve pathologies, multiple sclerosis, aneurysms, and similar conditions. Although very useful, the test has its drawbacks, one of which is sensitivity to artifacts. These occur due to various technical and patient-related reasons. The main artifacts encountered in practice include motion artifacts, metal sensitivity, flow artifacts, foreign objects, overlap, and other rarer artifacts related to the MRI equipment. In this presentation, we will review the main brain MRI artifacts encountered in practice and the possibilities of avoiding them, if possible. The frequency of artifacts in the practice of radiographers and their impact on their work will be assessed.

Methods

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Results

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Conclusions

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CONSTANCY TESTING OF CONVENTIONAL RADIOGRAPHY EQUIPMENT USING TEST PHANTOM DIGI-13

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Background / Objective

In order to guarantee quality in image diagnostics of conventional radiography in accordance with international standards, different physical measurement procedures and tests should be conducted. These tests serve as a quality check for performance metrics and imaging reliability of conventional radiography. The main goal of constancy testing is identifying and preventing significant changes in the functioning of a radiograph. Constancy tests are designed to be time efficient and simple, in order to make them accessible for radiographers, so they can be carried out independently or with minimal supervision by a medical physicist. The research objective of this study was to explain the importance of constancy tests in diagnostic radiology and radiographers role, describe the process of constancy tests and their quality criteria from literature and to conduct constancy test in Tartu Healthcare College, using Ysio Siemens radiograph and IBA Dosimetry test phantom Digi-13 and also evaluate and compare the results with criteria from the literature.

Methods

In this study, six different compliance criterias were evaluated: spatial resolution, dynamic range, low contrast resolution, artifacts, homogeneity and alignment of light field and the field of useful beam. The distance of a detector from the focal spot of the x-ray tube was fixed at 100 cm. The phantom was placed on the detector in such a way that the phantom's horizontal axis was parallel to the x-ray tube axis. Constancy tests were conducted at three different x-ray tube voltages: 70 kV, 50 kV and 121 kV. Exposure times and electric charges were chosen in accordance to voltages: 28 ms, 200 ms and 2 ms and 2,8 mAs, 40 mAs and 0,5 mAs.

Results

According to obtained results, the spatial resolution, dynamic range, low contrast resolution, artifacts, homogeneity and alignment of light field and the field of useful beam of the digital radiograph Ysio Siemens'i at Tartu Healthcare College comply with the quality criteria described in IEC 2022 and in IPEM 91/2005 and IPEM 38/2010 reports.

Conclusions

This study has shown that radiology technicians with sufficient professional training should be able to perform constancy tests for conventional radiography independently with optimal time cost, in order to detect technical issues early. This way, shortfalls in quality can be corrected before they have an impact on clinical x-rays or before the conventional radiograph should be removed from clinical use.

SPECIAL PROJECTIONS OF CONVENTIONAL RADIOGRAPHY: EXAMPLE OF THE NORTH ESTONIA MEDICAL CENTRE

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1. The North Estonia Medical Centre

Background / Objective

The work of a radiographer is a highly diverse field. For patients to receive an accurate diagnosis, collaboration between the radiologist and the radiographer is essential. The knowledge of the radiographer regarding patient positioning plays a significant role in enhancing the value of the diagnostic imaging. Visualizing the patient's body using conventional radiography method is a complex process since anatomical structures overlap with each other compared to computed tomography. There are situations where basic imaging is insufficient for diagnosis and special projections are required to visualize specific angles that do not appear in standard radiographs. These special projections are most in demand among orthopedists and traumatologists.

The aim of this work is to introduce radiographers at the North Estonia Medical Centre to the most commonly used special projections in conventional radiography. It explains the necessity and execution methods of these special projections to radiographers. Another purpose of this work is to create educational videos that can be used in clinical practice to improve quality of diagnostic imaging.

Methods

Data was collected using various secondary literature describing conventional radiography projections (for example "Merrill's atlas") and websites (for example radiopaedia.org). Consultations were held with radiologists. Both non-empirical methods (literature review) and empirical methods (video recordings of special projections and creation of educational material) were used.

Results

During the course of the work, educational material was created for radiographers at the North Estonia Medical Centre. This material can be used in clinical practice to guide and perform special radiography projections, which meet quality criteria. Based on the literature, an educational video was created to provide radiographers with a better visual understanding of the nature of these special projections and their execution.

Conclusions

This work provides an overview of the most frequently used special projections in conventional radiography at the North Estonia Medical Centre. It explains how to perform special radiography projections according to quality criteria and what benefits they provide in clinical practice to radiologists, orthopedists and traumatologists.

Future Trends and Challenges in Radiology

THE CHALLENGES OF EMERGENCY COMPUTED TOMOGRAPHY FOR A YOUNG RADIOLOGIST

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1. Vilnius University Hospital Santaros Klinikos

Background / Objective

The emergency department (ED) is a high-pressure environment where, despite difficult conditions, precise diagnostic imaging is crucial for patient care. Young radiologists, typically defined as those with less than five years of post-residency experience, often face challenges in this setting. Because of this, both the quality of work and professional ambition might be diminished. The aim of this study is to present, evaluate and discuss the challenges faced by young radiologists in ED computed tomography (CT) diagnostics. Understanding these challenges is essential for improving training programs and support systems to alleviate the pressure found in such settings.

Methods

The information for this study was found in the following databases: Science Direct, Pubmed, Springer. The final selection was done according to the following criteria: released from 2014 to 2024, written in English, freedom of access, relevance. 10 studies were chosen.

Results

According to the researched studies, young radiologists in the ED face a range of challenges that can impact their performance and stress. One of the difficulties is managing the intense time pressure, as they must quickly interpret images to make urgent clinical decisions. This is compounded by diagnostic uncertainty, where limited experience, as well as artefact related lower image quality can make it harder to identify and differentiate between subtle findings. High case volumes add to the stress, requiring sustained concentration and rapid decision-making. Communication also poses a challenge, as complex diagnostic information must be conveyed to physicians, who are often equally pressed for time. The relative lack of experience and the absence of immediate mentorship exacerbate these issues, leaving workers feeling unsupported. In addition, a lack of immediate information regarding the patient is often encountered in ED circumstances, decreasing the speed of work. Another variable is the lack of access to information stored in different systems and hospitals. Finally, artificial intelligence causes a lot of stress related to job safety and work changes.

Conclusions

The results show that there are significant hurdles for a young radiologist in an ED setting. Addressing these challenges requires training programs that focus on improving confidence, communication skills, and coping mechanisms for stressful situations, as well as fostering a supportive work environment through mentorship and teamwork.

A TECHNOLOGIST'S PERSPECTIVE: THE BENEFITS OF AN AUTOMATIC POSITIONING SYSTEM IN PET/CT

***Julija Macutkevičė*¹, *Gabrielė Klimavičiūtė*¹, *Gitana Spėčiūtė*¹**

1. Vilnius University Hospital Santaros Klinikos

Background / Objective

With the increasing benefits and demand for PET-CT examinations, technical advancements and quality standards have also risen. Automatic positioning technology (APS) has been introduced in the latest generation of PET scanners, enhancing efficiency, accuracy in patient positioning, and reducing staff radiation exposure, although it doesn't replace radiology technologists. In January 2024, the VUL SK Nuclear Medicine Department began using a new generation PET/CT scanner with APS, replacing the older digital PET/CT scanner.

Methods

The department's 10 radiology technologists (RT) work in rotating teams of 3-4 for PET/CT examinations. Over six months, different teams were trained to use the new automatic positioning system (APS), each working with it for at least two months. This allowed for a thorough evaluation of the technology.

To assess APS impact, a survey was conducted where RT shared their impressions, noting advantages and disadvantages. They answered three identical questions, and their written responses were analyzed and categorized. The summarized results provided insights into the APS effectiveness in their workflow.

Results

All radiology technologists agree that the automatic positioning system (APS) has improved working conditions and sped up the work process. Six out of ten technologists highlighted that APS aids in more precise localization of examined areas such as the heart and brain. However, three out of ten technologists who conducted PET/CT scans on patients without head hair and eyebrows noted that APS did not recognize these patients. Additionally, it was observed that the new technology is unable to position studies conducted with the whole-body protocol.

Conclusions

Radiology technologists feel more confident in their examinations due to the automatic positioning system, which reduces stress about exposure and the risk of improperly performed scans. However, it is noted that the automatic positioning system is not suitable for patients without head hair and eyebrows.

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Other Topics

ONCOLOGY TREATMENT OPTIONS IN LATVIA WITH M6

*Uģis Supe*¹

1. Latvijas Radiogrāferu un radiologu asistenta asociācija

Background / Objective

The advent of advanced radiotherapy technologies, such as the CyberKnife M6 system, has revolutionized oncological treatment options in Latvia, particularly at the Sigulda Stereotactic Radiosurgery Center. CyberKnife M6, a state-of-the-art non-invasive radiosurgical system, offers precise, high-dose radiation therapy for various tumor types with minimal impact on surrounding healthy tissues. This abstract explores the application of CyberKnife M6 for oncological treatment beyond oligometastases, including primary tumors and metastatic lesions in different anatomical locations, with emphasis on treatment accuracy, patient outcomes, and quality of life improvements.

Methods

CyberKnife M6 is equipped with a robotic arm that precisely delivers radiation therapy, allowing it to adapt to tumor movement during treatment (e.g., breathing). The system's integration of stereotactic ablative radiotherapy (SABR) enables high precision, which is critical for treating complex and hard-to-reach tumors. This technology is used for a wide range of oncological cases in Latvia, including cranial, spinal, prostate, lung, liver, renal, and uveal melanomas, among others, as documented in recent clinical reports.

Results

In Latvia, the CyberKnife M6 has been employed for treating various cranial pathologies, including meningiomas, neurinomas, gliomas, and pituitary adenomas. Between 2015 and 2022, 400 cranial cases were treated, with meningioma (105 cases) and neurinoma (101 cases) being the most prevalent. Similarly, extracranial treatments have addressed prostate cancers (298 cases), lung metastases (20 cases), liver metastases (9 cases), and renal or adrenal cancers (7 cases). CyberKnife's accuracy allows for targeting both primary and metastatic tumors with minimal side effects.

In clinical follow-ups, CyberKnife M6 has demonstrated promising results, with significant tumor size reduction and stabilization in most cases. In a study conducted between June 2016 and December 2017, 22 patients with oligometastases underwent SABR treatment. PET imaging was used for planning and post-treatment evaluation. The majority of patients experienced a decrease in pathological foci, and no local progression was observed during a six-month follow-up. These results reflect the potential for

Conclusions

In conclusion, the CyberKnife M6 system has significantly expanded oncological treatment options in Latvia, providing non-invasive, highly precise radiotherapy for various tumor types.

HISTOLOGIC TRANSFORMATION IN LYMPHOMA AND 18F-FDG PET/CT: LITERATURE ANALYSIS AND OUR EXPERIENCE.

Dina Reitere¹, ***Marika Kalniņa***², ***Elina Auziņa***³, ***Olga Korņilova***⁴, ***Arturs Uzars***⁴

1. Riga East Clinical University Hospital, Jekabpils Regional Hospital, 2. Medical center ARS, 3. Pauls Stradins Clinical University Hospital, 4. Riga East Clinical University Hospital

Background / Objective

Histologic transformations (HT) of indolent lymphomas are rare but clinically very important as they severely deteriorate a patient's prognosis, therefore timely diagnosis is essential for optimal therapy. Our aim was to investigate 18F-fluorodeoxyglucose (18F-FDG) positron emission tomography/computed tomography (PET/CT) role in prognosing and diagnosing HT, as well as to analyze our PET/CT HT patients.

Methods

We explored and summarized the existing literature about 18F-FDG PET/CT and its uses regarding HT. Furthermore we collected PET/CT data about a single medical center lymphoma and HT patients.

Results

In literature there are very few publications about PET/CT use in HT, and most include a small study group. Nevertheless, data tends to show that a high maximum standardized uptake value (SUVmax) on PET/CT can indicate a HT even in patients with no clinical suspicion of HT, with a reference SUVmax threshold ranging from 10-26,5. Furthermore, PET/CT can guide the biopsy to be taken from the most active site of disease to increase the likelihood of HT diagnosis. In our experience in a single medical center during almost 2 years 729 PET/CT scans were performed for lymphoma patients, and in only 17 (2%) cases the documentation mentioned a HT, including a broad variety of histological types. PET/CT was used for staging in 9 of these HT cases, in which the SUVmax astonishingly ranged from 1,6-31,8.

Conclusions

18F-FDG PET/CT can not only predict a possible HT, but also guide a more precise biopsy. HT may be underdiagnosed or underrepresented in Latvian lymphoma patients, and the existing patients show an extensive histologic and metabolic variety. Further research should focus on patient survival and time to next treatment.

CLINICAL VALUE OF [18F] FDG PET/CT IN SARCOMA PATIENTS IN LATVIA.

*Katrīna Daniela Gritāne*¹, *Marika Kalniņa*², *Ilze Eņģele*³

1. University of Latvia, Riga, 2. ARS Nuclear Medicine Clinic, Riga, 3. Oncology Center of Latvia, Riga East Clinical University Hospital

Background / Objective

Various non-invasive imaging modalities are available for assessing soft tissue and skeletal sarcomas. According to ESMO 2021 guidelines, primary imaging modalities for sarcomas are MRI and CT, with [18F] PET/CT serving as a supplementary problem-solving tool. On the other hand, both PET and MRI play reciprocal roles in this regard, but the exact role of [18F] PET/CT is not fully understood. Numerous studies have highlighted the benefits of PET/CT in the use of sarcoma patient management. However, advanced imaging technologies are not commonly utilized in Latvia, and the best uses of FDG PET/CT are not well defined. This analysis examines the current national use of FDG PET/CT for sarcoma patients. It aims to compare PET imaging results with those of traditional CT and MRI methods to assist in decision-making for managing sarcoma patients and to understand its importance.

Methods

A retrospective observational analysis performed at a single facility, encompassing 24 patients in 35 multimodal imaging episodes who received one or more [18F] FDG PET/CT, CT, and/or MR scans between November 2018 and September 2023 and had done a morphologic analysis and histological grading of the specimen.

Results

Our findings indicate that advanced imaging techniques were used to assess a diverse range of sarcomas (11 synovial sarcomas, 8 Ewing sarcomas, 7 leiomyosarcomas, and a few cases per other morphologies). PET/CT was mainly used for patients with grade 3 sarcoma accounting for 51.5%, grade 2 for 20%, and grade 1 for 28.5%. FDG PET/CT was utilized in the following situations: 54.3% for detecting recurrence, 25.7% for therapy effectiveness, and 20% for determining the stage of the disease. In more than two-thirds of cases (65.8%), PET/CT and conventional CT and/or MR imaging data were concordant. In these situations, PET served to assure diagnostic confidence. On the other hand, it changed the stage in more than a third of patients compared to CT and/or MR data in 17% it up-staged, and in the same percentage, it down-staged the disease. In cases where PET did not change the stage of the disease, the FNCLCC histological grading was 61% - grade 3, 26% - grade 1, and 13% - grade 2. And in cases where it changed the stage—when PET/CT was the reason for down-staging, for 66%, it was a grade 1 disease, and 17% for both grade 2 and grade 3. When PET/CT was the reason for up-staging, it was equal 50% for grade 2 and 50% grade 3 sarcoma.

Conclusions

PET/CT in Latvia is primarily used as a diagnostic tool to resolve issues that conventional methods cannot definitively address or for additional diagnostic confidence. Our findings show that FDG PET/CT in Latvia is mainly used for high-grade sarcomas, which corresponds to international recommendations and is the predominant histological type to upstage the disease and potentially change patient management. On the other hand, PET/CT in some patients downstages the disease, predominantly in grade 1 sarcoma, an aspect of further longitudinal analysis.

MOST COMMON ARTIFACTS IN HEAD MRI EXAMINATIONS AND HOW TO PREVENT THEM?

***Jurinda Merkevičiūtė*¹, *Aurėja Strolytė*¹**

1. Vilnius university hospital Santaros clinics

Background / Objective

Magnetic resonance imaging (MRI) is one of the most popular diagnostic methods in modern medicine. This diagnostic technique is widely used to examine various parts of the body. The brain is one of the most common areas examined by MRI. This test is useful for diagnosing tumors, inflammations, circulatory disorders, bleeding, nerve pathologies, multiple sclerosis, aneurysms, and similar conditions. Although very useful, the test has its drawbacks, one of which is sensitivity to artifacts. The aim of this presentation is, to review the main brain MRI artifacts encountered in practice and the possibilities of avoiding them, if possible. The frequency of artifacts in the practice of radiographers and their impact on their work will be assessed.

Methods

Brain artifact examples will be sampled from everyday practice. How to avoid them, examples from everyday practice and literature will be shared. A short survey of colleagues was conducted to find out how the artifacts affect their daily work.

Results

Artifacts usually occur due to various technical and patient-related reasons. The main artifacts encountered in practice include motion artifacts, metal sensitivity, flow artifacts, foreign objects, overlap, and other rarer artifacts related to the MRI equipment. The most common way to avoid artifacts is thorough communication with the patient, as well as sequence selection and minor adjustments if necessary. It is also useful to communicate with a medical physicist to correct the artifacts that occur. A short survey of radiographers showed that artifacts have a negative impact on both the work and the examination itself. The main problem is the prolongation of the examination.

Conclusions

In summary, the role of the radiographer in avoiding artifacts is critical. Sincere and clear communication with the patient, knowledge of the equipment, and focus can help avoid artifacts, and knowledge can help correct them.

CASE REPORT OF BIRT-HOGG-DUBÉ SYNDROME: EMPHASIZING THE CRITICAL ROLE OF RADIOLOGISTS IN DIAGNOSIS

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Background / Objective

Birt-Hogg-Dubé (BHD) syndrome is a rare, often underdiagnosed autosomal dominant multiorgan systemic disorder resulting from pathogenic mutations in the folliculin (FLCN) gene located on chromosome 17p11.2. This genetic condition manifests through a spectrum of clinical features, including characteristic cutaneous lesions such as fibrofolliculomas, multiple lung cysts with or without spontaneous pneumothoraces, and an elevated risk of renal neoplasms, predominantly chromophobe oncocytomas and chromophobe carcinomas.

Methods

This prospective observational study, conducted in a tertiary university hospital, assessed clinical and radiological findings prospectively. This case report involved one patient, a 33-year-old female, with a history of chromophobe renal carcinoma (pT1 N0 M0), lung cysts and genetically diagnosed BHD syndrome.

Results

The patient was admitted for a scheduled surgical procedure following MRI diagnostics revealing a multicystic and solid mass in the right kidney (October 6, 2021). On December 6, 2021, a laparoscopic resection of the right kidney was performed. Histopathological analysis confirmed the presence of chromophobe carcinoma. Five months later, follow-up CT scans of the abdomen and thorax were conducted, which showed no evidence of oncologic spread or recurrence in the abdomen and chest, but bilateral cysts were identified in the lungs. During a subsequent CT scan of the lungs in 2023, taking into account the patient's oncologic history and the presence of multiple peripheral lentiform, thin-walled pulmonary cysts, the radiologist recommended further genetic consultation to confirm Birt-Hogg-Dubé syndrome. Genetic testing subsequently confirmed a hereditary diagnosis of Birt-Hogg-Dubé syndrome (ORPHA:122; OMIM:135150).

Conclusions

A 33-year-old female with chromophobe renal carcinoma underwent a laparoscopic resection of a right kidney mass. Follow-up CT scans showed no cancer spread but detected bilateral pulmonary lentiform cysts, which led the radiologist to recommend genetic testing. This confirmed Birt-Hogg-Dubé syndrome (ORPHA:122; OMIM:135150), highlighting the radiologist's crucial role in identifying indicators for genetic evaluation in such clinical presentations.

QUANTITATIVE ASSESSMENT OF MYOCARDIAL PERFUSION IMAGING USING CZT SPECT SYSTEMS: A PHANTOM STUDY

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1. Vilnius University Hospital Santaros Klinikos, Vilnius, Lithuania; 2. Vilnius University, Faculty of Medicine, Institute of Biomedical Sciences, Vilnius, Lithuania, 3. Riga Eastern Clinical University Hospital, Riga, Latvia, 4. Riga Eastern Clinical University Hospital, Riga, Latvia.

Background / Objective

The new generation SPECT imaging modalities equipped with high-efficiency Cadmium-zinc-telluride (CZT) detectors have allowed a reduction of acquisition time and injected radiotracers dose, as well as improving image quality and diagnostic accuracy in myocardial perfusion imaging (MPI). Dedicated cardiac CZT cameras and all-purpose CZT SPECT cameras each have their own advantages and disadvantages. The possibility to precisely compose the camera setup and protocols for acquisition, reconstruction, and post-processing is crucial for obtaining uniform procedure outcomes in the diagnostic work-up of certain patients. Standardisation and harmonisation of procedures need to be further pursued and developed in both healthcare studies and clinical settings to improve the comparability of results between institutions. There are only limited scientific publications referencing detailed studies on MPI comparison between CZT gamma cameras. In the present study, we compared two whole body CZT SPECT/CT cameras and a dedicated cardiac CZT camera for MPI utilizing phantoms to evaluate and optimise protocols.

Methods

The acquisition was performed using two GE HealthCare SPECT/CT: StarGuide (installed in 2022) with whole-body 12 CZT technology swiveling detectors, NM/CT 870 CZT (installed in 2021) an all-purpose dual-detector system and dedicated cardiac D-SPECT cardio (Spectrum Dynamics, installed in 2017) systems. To simulate MPI scan acquisitions, three different phantom configurations were scanned. The cardiac insert phantom with an artificial defect imitation in the anterior wall on SPECT was scanned separately, then placed in the Philips PET/CT Uniform Cylinder Phantom 30CM, and finally, the liver insert was inserted additionally under the cardiac phantom. The cardiac insert phantom was filled with ~5 MBq of ^{99m}Tc solution in a myocardial 110 ml volume interstice, in contrast, ~1 MBq was used for a filling of 60 ml ventricle space. Philips PET/CT Uniform Cylinder Phantom 30CM for simulating a hot background activity was filled with ~30 MBq in its volume and the liver insert with ~25 MBq. Image quality was evaluated based on several essential figures of merit such as count rate, image uniformity, signal-to-noise ratio (SNR), and visual assessment. The evaluation of the total count and quantification was done by GE Xeleris 4 workstation. SNR was measured using the open-source software ImageJ.

Results

Image quality is assessed objectively based on physical measurements and subjectively through visual assessments. After the comparison of the three systems, the main differences in SNR, uniformity, and spatial resolution were found. Visual assessments of the images also showed significant differences between the systems. A comparison of the total number of counts showed that D-SPECT has the highest number of counts (26 and 13 times more compared to NM/CT 870 and StarGuide, respectively). Attenuation correction increases the number of counts (3 times more for NM/CT 870 and 4 times more for StarGuide compared to non-corrected images).

Conclusions

In order to harmonize the scanners, it is necessary to increase the radiotracer dose for the all-purpose CZT camera and the swiveling technology SPECT system. SPECT systems showed a significant improvement in image quality with attenuation correction.

THE IMPORTANCE OF PET/CT IN THE STAGING OF NON-SMALL CELL LUNG CANCER

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Background / Objective

Accurate staging of non-small cell lung cancer determines further patient treatment tactics and predicts survival. [18F]FDG PET/CT is used for radiological staging of lung cancer. The aim of this study was to evaluate the advantages and disadvantages of [18F]FDG PET/CT by comparing the visual diagnostic data of [18F]FDG PET/CT and contrast CT with histopathological results after surgery.

Methods

This retrospective study included patients who underwent [18F]FDG PET/CT and contrast CT examination and underwent surgery with pathomorphological results between 2020 and 2021. [18F]FDG PET/CT and CT results were compared with histopathology, taking it as the gold standard.

Results

105 respondents participated in the study, of which 27.6% (n= 29) were women and 72.4% (n=76) were men. These respondents ranged in age from 45 to 84, with an average age of 66.9. [18F]FDG PET/CT T stage with histopathology T stage matched 51.4% (n=54). In 52.9% (n=27) of cases [18F]FDG PET/CT underestimated the size of the tumor and in 47.1% (n=24) of cases [18F]FDG PET/CT it exaggerated it. [18F]FDG PET/CT N stage matched histopathology N stage in 68.6% (n=72). Respondents with a false-negative N stage on [18F]FDG PET/CT and later showed mediastinal spread, representing 50% (n=7) of 14 respondents, the mean tumor SUVmax value was 10.2. In the group of respondents who showed disagreement, comparing [18F]FDG PET/CT N stage with the N stage of histopathology, SUVmax tended to be higher than in the group of respondents with agreement. T stage CT examination with [18F]FDG PET/CT agreement was 57.7% (n= 30). CT N stage matched 64.8% (n=68) of respondents, but when combined with [18F]FDG PET/CT N stage matches, the match increased to 77.1% (n=81), calculated by Pearson Chi - Square test, the improvement is statistically significant (p<0.05; p=0.048). [18F]FDG PET/CT M stage and CT M stage matched in 91.4% (n= 96) of respondents.

Conclusions

[18F]FDG PET/CT is an effective diagnostic method in determining N stage. According to the author, [18F]FDG PET/CT should be included in the primary assessment of non-small cell lung cancer before starting therapy.

ASSOCIATIONS BETWEEN WHITE MATTER STRUCTURAL PROPERTIES AND GLOBAL COGNITION AS MEASURED BY MOCA SCORES IN OLDER ADULTS

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1. Department of Radiology, Lithuanian University of Health Sciences, 2. Department of Neurology, Lithuanian University of Health Sciences, 3. Lithuanian Sports University

Background / Objective

The Montreal Cognitive Assessment (MoCA) is a widely used tool for evaluating global cognitive function across multiple domains, including memory, attention, language, visuospatial skills, and executive function. White matter (WM) in the brain, composed of myelinated nerve fibers, is crucial for facilitating communication between different brain regions. Understanding the relationship between the structural integrity of WM and cognitive performance is essential for identifying biomarkers for cognitive decline and neurodegenerative diseases.

This study aims to investigate the associations between the structural properties of white matter and global cognitive function as measured by MoCA scores in older adults with mild cognitive impairment (MCI).

Methods

Participants included 59 apparently healthy older adults (34 females and 25 males) aged 60–85 years. All underwent whole-brain structural 3T MRI (T1W, T2W, DTI). DTI images were checked for artifacts by an experienced neuroradiologist. Tractography was performed using the Siemens “syngo.via” workstation (Siemens Healthineers, Erlangen, Germany). Circular voxels (1 cm radius) were manually placed on regions of interest, and the software automatically calculated the median values of fractional anisotropy (FA) and the number of tracts (NOT). For anatomical reference, a high-resolution T1W 3D structural image was acquired for all participants. Cognitive assessments were conducted by a qualified mental health care specialist, utilizing the MoCA test.

Results

Significant positive correlations were found between MoCA scores and the number of fiber tracts in the left and right temporal tapetum (NOT 21 and NOT 22: r -values ≥ 0.432 , uncorrected $p < 0.001$). Other correlations did not reach significance (all uncorrected p -values ≥ 0.003), though trends with moderate effect sizes were observed between MoCA scores and the whole-brain number of fiber tracts (NOT 1: $r = 0.375$, uncorrected $p = 0.005$), FA of the left external capsule fiber tracts (FA 6: $r = 0.361$, uncorrected $p = 0.007$), and FA of the left temporal tapetum fiber tracts (FA 22: $r = 0.342$, uncorrected $p = 0.011$). No significant associations were found when HC and MCI groups were analyzed separately (all uncorrected $p > 0.001$).

Conclusions

Our study confirms associations between WM structural properties and MoCA scores. Higher FA values in specific WM tracts, particularly from the hippocampus and cingulate cortex, correlate positively with cognitive function, while reduced FA values in regions like the right sensorimotor cortex are linked to cognitive decline. These findings suggest that FA values and the number of tracts (NOT) in key WM regions can serve as reliable markers for monitoring cognitive decline and disease progression in MCI.

RADIOGRAPHER = QUALITY LEADER IN THE RADIOLOGY DEPARTMENT

Edith Arumaa¹

1. Confido Medical Centre, Estonia

Background / Objective

In radiology departments, maintaining the quality of services, innovations and ensuring patient safety are important. Who is responsible for this in the radiology department? who is on the team?

Methods

An overview of how we have implemented things in our department.

Results

Quality leaders tasks in the department are unification of protocols, updating of operating instructions, manuals, evaluation examination quality.

Conclusions

It is important to involve the whole team and to constantly communicate with all the team members. Hold meetings and create an atmosphere in the department where radiographer, radiologists etc can discuss what is going on in the department without fear of accusation.

EXPERIENCE WITH 177LU-PSMA THERAPY FOR ADVANCED PROSTATE CANCER IN NORTH ESTONIA MEDICAL CENTRE

*Darja Jegi*¹, *Erika Mõttus*¹

1. The North Estonian Medical Centre

Background / Objective

The treatment using 177Lu-PSMA, a prostate-specific membrane antigen (PSMA) ligand labeled with Lutetium-177 (177Lu), has emerged as a highly promising therapy for metastatic castration-resistant prostate cancer (mCRPC). Extensive research, including clinical trials and prospective and retrospective studies, has been conducted to evaluate its effectiveness. Notably, this treatment received FDA approval on March 23, 2022, highlighting its efficacy.

It's worth mentioning that although 177Lu-PSMA therapy has demonstrated significant efficacy as we know, not all Baltic countries have integrated this treatment into their clinical practice. However, the North Estonia Medical Centre has recognized its potential and implemented it as a valuable therapeutic option for eligible mCRPC patients. This work aims to discuss the experience of 177Lu treatment at the Estonian North Medical Centre, including the preparation process, patient selection, and key aspects of patient preparation.

Methods

In the creation of this report, a method of examining relevant and reliable literature was chosen. European Association of Nuclear Medicine (EANM) guidelines, studies from the VISION trial, and the treatment protocol for 177Lu-PSMA therapy at the North Estonia Medical Centre were utilized as sources. Based on the acquired information, a concise overview was formulated, addressing different facets of the 177Lu-PSMA therapy phenomenon, encompassing patient preparation, treatment procedures, and post-treatment measures.

Results

At the North Estonian Medical Center, patients selected for 177Lu-PSMA therapy must have confirmed PSMA expression via PSMA PET/CT scan, with additional 18F-FDG PET/CT scans used if needed. Contraindications include an expected lifespan under 6 months (ECOG \leq 2), certain medical conditions, and recent radiation or chemotherapy. Preparation involves stopping prior therapies at least 4 weeks before starting 177Lu-PSMA, ensuring proper hydration, and obtaining informed consent. The treatment is administered via slow IV injection, followed by saline infusion. Post-treatment care includes diuretics/laxatives, cold packs for salivary glands, antiemetics, and corticosteroids for specific metastases. Safety measures and radiation precautions are strictly followed. Post-treatment monitoring includes regular blood tests, PSA monitoring, and liver and kidney function evaluations, alongside dosimetry scans and radiological follow-up.

Conclusions

At the North Estonian Medical Center, 177Lu-PSMA therapy for metastatic castration-resistant prostate cancer is rigorously managed. Careful patient selection, proper hydration, and adherence to safety measures are essential. The therapy involves slow IV administration of 177Lu-PSMA, followed by saline infusion. Post-treatment care includes diuretics, antiemetics, and cold packs for salivary glands. Regular monitoring includes blood tests, PSA levels, and liver and kidney function evaluations, along with dosimetry scans and radiological follow-ups. These protocols ensure optimal outcomes and effective side effect management, with dedicated staff strictly following all procedures.

PRACTICAL TIPS FOR WORKING WITH HOLMIUM166: A TECHNOLOGIST'S GUIDE

*Povilas Tirlikas*¹, *Rūta Urbanavičiūtė*¹, *Mindaugas Martinkus*¹

1. Santaros Klinikos

Background / Objective

Hepatocellular carcinoma is most frequent type of liver cancer from hepatocytes. When operating is impossible, one of available treatment options is radioembolization with Ho-166 marked microspheres, which deliver radioactive particles to the tumor and ionize it. Radiology technologist prepares kits and in operating theatre assists interventional radiologist in injection of Ho-166 marked microspheres.

Methods

Currently 4 radiology technologists are trained to participate in procedures (2 RTs per procedure). They prepare kits with Ho-166 microspheres and assist interventional radiologist in injection.

Before procedure kits are prepared in Nuclear Medicine departments hotlab according to aseptic and antiseptic regulations. Vials with Ho-166 are measured activity meter, 2 labels with patient's identification and dose in MBq are printed. One label attached to vial container, another put into patient registry. Prepared kits are transported to operating theatre.

In operating theatre radiology technologist assists radiologist in injection of Ho-166 microspheres. After procedure, the surfaces are checked for contamination. Nuclear medicine department's hotlab activity meter is used to measure in kit injection lines and Ho-166 vial. Therapy dosimetry form is filled out, indicating following: patients identification, height, weight, each used vial's serial number, best before date, activity of full vial, time of measurement, starting and end time of procedure, remaining activity of the vial.

Results

Between 2023 – 2024 May 16 patients have been treated. Patient ages: min. 33 years old, max. 77 years old. Scout procedures 22 vials injected: median 125MBq, min activity 80MBq, max activity 170 MBq. Therapy procedures 20 vials injected: median 5050MBq, min injected activity 3320MBq, max injected activity 16600MBq. Single scout vial injection duration ~10 min, one therapy vial injection took ~20 min. Procedures have been performed adhering to radiation safety guidelines and out of 16 performed procedures surface contamination of ~10 µSv Ho-166 has been recorded only once.

Conclusions

Proper Ho-166 microsphere delivery to the tumor affects treatment outcome. Ho-166 microspheres apply to wide range of patient ages. Therapy vial of Ho-166 microsphere injection takes twice as long as scout. Adhering with radiation safety guidelines contamination of operating theatre's floor happened only once. Well trained and experienced radiology technologists significantly contribute to good procedure execution.

PRACTICAL TIPS FOR WORKING WITH HOLMIUM-166: A TECHNOLOGIST'S GUIDE

Povilas Tirlikas¹, Rūta Urbanavičiūtė¹, Mindaugas Martinkus¹

1. Santaros Klinikos

Background / Objective

Hepatocellular carcinoma is most frequent type of hepatocyte liver cancer. If operation is impossible, one of available treatment options is radioembolization with Ho-166 microspheres, which deliver radioactive particles to the tumour and ionize it. Radiology technologist prepares kits and in operating room assists interventional radiologist in administration of Ho-166 marked microspheres.

Methods

Currently 4 radiology technologists are trained to participate in procedures (2 RTs per procedure) by preparing kits with Ho-166 microspheres and assisting interventional radiologist in injection.

Before procedure kits are prepared in Nuclear Medicine departments hotlab according to aseptic and antiseptic regulations. Vials with Ho-166 microspheres are measured activity meter, 2 labels with patients identification and dose in MBq are printed. One label attached to vial container, other put into patient registry. Prepared kits transported to operating theatre.

In operating theatre radiology technologist assists radiologist in injection of Ho-166 microspheres. After procedure, the surfaces are checked for contamination. Nuclear medicine department's hotlab activity meter is used to measure in kit injection lines and Ho-166 vial. Therapy dosimetry form filled out, indicating: patient's identification, height, weight, each vial's serial number, expiration date, full vial activity, measurement time, procedure's start and end times, remaining activity in vials.

Results

Between 2023 and May 2024 16 patients treated. Patient age: min 33 years, max 77 years. Scout procedures - 22 vials injected: median 125MBq, min activity 80MBq, max activity 170MBq. Therapy procedures - 20 vials injected: median 5050MBq, min injected activity 3320MBq, max injected activity 16600MBq. Single scout vial administration duration ~10min, one therapy vial administration duration ~20min. Procedures have been performed adhering to radiation safety guidelines and out of 16 performed procedures surface contamination of ~10 µSv Ho-166 has been recorded only once.

Conclusions

Proper delivery of Ho-166 microspheres to the tumour is important for treatment outcome. Ho-166 microspheres work on wide patient age range. Therapy vial of Ho-166 microsphere injection takes twice as long as scout vial of Ho-166 microsphere procedure. Adhering with radiation safety guidelines contamination of operating theater's floor happened only once. Well trained and experienced radiology technologists significantly contribute good procedure execution.

“A PATIENT WITHOUT A TATTOO” NCI’S DAILY ROUTINE

*Andra Gasiūnaitė*¹, Šarūnas Šulcas¹

1. Nacional cancer institute

Background / Objective

Over time, tattoos or permanent patient markings were traditionally used to prepare patients and ensure accurate patient positioning during treatment. However, the development of optical surface monitoring systems (OSMS) has reduced the use of additional markers or even the complete elimination of tattoos, offering a more patient-friendly approach to treatment.

OSMS was integrated and initiated at our treatment center in 2019, with the first non tattooed breast cancer patient commencing treatment on May 16, 2023. Subsequently, we have been conducting breast cancer treatments without the use of traditional markers. The system enables real-time monitoring of patients during both positioning and treatment. The OSMS, a non-invasive and contactless technology, using 3D stereo cameras to generate real-time 3D body images and compares them with the initial CT images obtained for treatment planning. This process reduces imaging requirements and minimizes patient preparation and positioning time.

Over time, we have optimized our workflow for breast treatment. We also use OSMS to treat oncology for lower and upper extremities and chest walls not only for adults but also for children also. OSMS is very useful in cases of TBI (Total Body Irradiation). Our goal is to integrate OSMS into our routine practice for treating other localizations as well and to abandon tattoos for treating breasts and chest oncology.

Yet, in everyday work using OSMS, we encounter specific issues, such as patient movement, surface shadows, selecting the region of interest, the absence of anatomical gradients in the patient and anatomical changes during treatment

Methods

40 patients who had radiotherapy to the left-side breast were evaluated. All patients received standard tattoos and were positioned by aligning these tattoos with lasers for the first fraction and positioning errors were evaluated by doing CBCT. During the remaining fractions, patients were positioned using OSMS and errors were evaluated by doing MV imaging

Results

The mean shift using the standard tattoos and laser setup were: vert 0.00 ± 1.67 , long 0.00 ± 2.29 , lat 0.00 ± 2.69 , compared with using the SGRT method, where the mean shift were vert 0.00 ± 0.08 , long 0.00 ± 0.02 , lat 0.00 ± 0.06

Conclusions

SGRT positioning and treatment, we have improved our breast treatment procedures by eliminating the use of markers, resulting in shorter patient positioning and treatment times.

Although we still face some limitations with our systems and experience, we recognize the value of utilizing both SGRT and IGRT as complementary tools rather than as substitutes

UTILIZING DYNAMIC MYOCARDIAL PERFUSION SCINTIGRAPHY FOR THE EVALUATION OF MICROVASCULAR CHANGES IN HYPERTROPHIC CARDIOMYOPATHY

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Background / Objective

Myocardial perfusion scintigraphy (MPS) with SPECT has been playing a crucial role in non-invasive investigation of ischemic heart disease. Almost all technological aspects of this study have been improved. From the initially used two-dimensional scanning to ring-shaped solid state gamma cameras with CZT detectors and computed tomography (CT) attenuation correction. As expectations for diagnostic precision rise, conventional MPS sometimes fails to deliver an accurate assessment of potential ischemia. The goal of our study was to assess the feasibility of dynamic MPS using a ring-shaped solid-state SPECT/CT camera.

Methods

This is a continuous prospective study of patients with clinically proven hypertrophic cardiomyopathy (HCM). All patients underwent dynamic MPS using a ring-shaped solid-state SPECT/CT camera (Veriton-CT, Spectrum Dynamics) to evaluate possible microvascular changes. MPS was conducted using a one-day rest-stress protocol, with standard 99mTc-Sestamibi doses. Dynamic and static image registration with ECG synchronization and low dose chest CT for attenuation correction were performed. Images were assessed by an experienced nuclear medicine physician using the QGS/QPS software package. Dynamic images yielded information of stress and rest coronary blood flow (CBF) and coronary flow reserve (CFR).

Results

22 patients were enrolled. 5 were omitted because of faulty bolus injection during dynamic imaging phase. For the remaining 17 patients, CBF and CFR data were obtained for all the coronary artery territories and a global score. Left ventricle was divided to 17 myocardial segments according to AHA for the regional analysis. Stress CBF was considered normal if it was $>1.5\text{g/ml/min}$ per coronary artery territory, rest CBF $>0.5\text{g/ml/min}$. CFR was calculated by dividing stress CBF with rest CBF and was considered normal >2.0 . 4 patients had decreased total CFR, 5 decreased CFR in LAD, 6 in LCX and 4 in RCA. Total stress CBF was decreased for 9 patients, 7 in LAD, 5 in LCX and 8 RCA. Total rest CBF was decreased for 9 patients, 9 in LAD, 9 in LCX and 10 RCA.

Conclusions

This is a small sample size prospective study with a very specific patient HCM population. Abnormal dynamic MPI findings occurred in around 47% of the patients. Discrepancy of abnormal regional perfusion findings and quantitative dynamic data in MPI need to be further evaluated, either by myocardial perfusion positron emission tomography or invasive testing.

HOW EFFECTIVE IS HYOSCINE BUTYLBROMIDE IN IMPROVING IMAGE QUALITY OF PROSTATE MRI COMPARED TO OTHER MODIFIABLE FACTORS?

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Background / Objective

Several modifiable factors may influence image quality and PI-RADS readings of prostate MRI. Although some of them, like injection of spasmolytics (e.g. hyoscine butylbromide, HB), or rectal preparation have conflicting evidence and contribute to patient's discomfort, they are used in daily practice. In this study we explored factors that influence image quality of prostate MRI in patients, who underwent two examination before and after introduction of administration of spasmolytics.

Methods

In this study, we evaluated mpMRI of the prostate before and after routine introduction of HB injection in 56 patients for image quality in several domains including motion artifacts and for PI-RADS scores in the peripheral and transition zones. Morphometry of the prostate, bladder, rectum, and abdomen was performed to assess further predictors of image quality.

Results

The image quality of T2 weighted images was rated better in HB+ examinations. Motion artifacts decreased when the examination were performed at an earlier hour. PI-RADS scores were influenced by bladder volume, breathing motion, and gas content in the rectum but not HB.

Conclusions

The injection of HB influences image quality of prostate MRI to a comparable extent as if the examination was performed earlier in the day or breathing motion was reduced. Bladder volume and rectal gas content but not HB influence PI-RADS scores. We suggest that at least in biparametric prostate MRI, the injection of HB should be reconsidered in favor of other factors that influence the image quality and PI-RADS scores.

WHEN IT GOES WHERE YOU DO NOT WANT IT TO GO - CONTRAST MEDIA EXTRAVASATION.

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Background / Objective

This presentation explores the causes, risk factors, clinical manifestations, and management strategies of contrast media extravasation. Emphasis is placed on the identification of high-risk patients, preventive measures, and the importance of prompt recognition and treatment to minimize complications. Contrast media extravasation is a potential complication during radiological procedures where contrast agents are injected into veins through a cannula. This issue arises when the vessel wall is compromised, leading to the leakage of contrast media into surrounding tissues.

Methods

The presentation will review current guidelines and best practices for handling extravasation incidents in radiology departments.

Results

The result is to update the knowledge of contrast media extravasation and to start a discussion about the radiographers' needs regarding contrast media extravasation.

Conclusions

Contrast media extravasation is an unwanted complication that can occur during radiographic examinations. It involves the accidental leakage of contrast media into the surrounding tissue rather than remaining within the intended blood vessels, potentially leading to adverse effects and complications. Therefore, radiologic technologists need to be prepared to identify and manage this condition effectively to ensure patient safety and minimize any potential harm. It is important to have a code of conduct for the radiographers and a leaflet for the patient how to manage contrast media extravasation

RADIOLOGIC APPROACH TO HEMOPTYSIS IN EMERGENCY SETTING: TACKLING CRITICAL POINTS IN PATIENT MANAGEMENT.

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Background / Objective

1. To overview the validity, timing and CT protocols appropriate in examination of hemoptysis. 2. To highlight imaging findings associated with pulmonary hemorrhage, that can help direct patients to suitable treatment. 3. To improve awareness about different types of mechanisms of hemoptysis and their impact to patient management.

Methods

Hemoptysis is described as coughing up blood from any part of the lungs and must be differentiated from other sources like upper airways or GI tract. It is generally graded into minor or massive and the rate of bleeding is associated with the risk of asphyxiation and blood loss. While chest x-ray may be appropriate in some clinical setting, CT is considered the golden standard in moderate or massive hemoptysis allowing noninvasive, rapid examination of the potential cause, that can aid the choice of further patient management.

Results

X-ray can help suspect initial diagnosis, however CT is usually appropriate for a stable patient. Scanning protocol includes arterial phase, with an increased coverage and native CT or venous phase can be included case-based suspecting foreign object or the need for tumoral or parenchymal enhancement. Common sources of bleeding can be divided into primary vascular origin like hypertrophied systemic vessels, pseudoaneurysms or AVM's, direct airway invasion or parenchymal destruction including bronchiectasis, tumor or infection and capillary-level bleeding relating to diffuse alveolar hemorrhage and vasculitis. Findings suggesting hemorrhage are usually nonspecific and appear as ground-glass or consolidation, bronchial plugging, that can be of higher attenuation and in subacute cases septal lines may be thickened, however contrast extravasation is rarely seen. The appearance and distribution of these signs can help direct radiologists to local or diffuse origin of bleeding and accordingly advise management by further examination, bronchoscopy, surgery, endovascular or conservative treatment.

Conclusions

1. CT is the modality of choice in detecting source of pulmonary bleeding and protocol should be directed using case-based approach.
2. CT allows visualisation of vascular sources, bronchial invasion, potential areas of parenchymal hemorrhage, in combination with the distribution of secondary findings helps directing targeted therapy.
3. Depending on the mechanism of bleeding including vascular, airway or parenchymal origin accordingly, endovascular treatment, bronchoscopy and conservative management may be appropriate.

MAGNETIC RESONANCE PATIENTS WITH TATTOOS AND PERMANENT MAKE-UP - POSSIBLE COMPLICATIONS AND ARTIFACTS, THEIR PREVENTION

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Background / Objective

Certain patients, when confronted with the necessity of magnetic resonance imaging, express apprehension about its feasibility if they bear tattoos or permanent make-up. These cosmetic enhancements often contain iron compounds and can react to intense electromagnetic fields. During the procedure, metallic objects may shift and heat up, potentially causing discomfort or skin damage. Moreover, metal can generate artifacts, compromising the quality of the examination.

Aims - The work aims to determine how often and how complications and artifacts occur in Magnetic Resonance patients with tattoos and permanent makeup.

Methods

A comprehensive questionnaire was administered to 50 patients.

The responses were meticulously collected and analyzed, and conclusions were drawn based on a thorough review of the literature and the obtained results.

Results

Due to the fact that 74% of respondents were unaware that tattoo/permanent makeup ink could contain metal particles, they did not inform the radiographer (90%) about the presence of tattoos/permanent makeup, thereby posing a risk to their health.

In 2% of cases, the patient experienced discomfort in the area of the tattoo/permanent makeup, and in another 2% of cases, visible artifacts were present. In these cases, the patients had permanent makeup on the eyelid line, where there is a high likelihood that it is related to metal particles in the ink.

Conclusions

The radiographer must pay special attention to the patient's skin during the MRI examination, especially if the tattoo or permanent makeup is located directly on the body parts being examined. This can cause the movement of metal particles, potentially harming the patient's health or creating artifacts in the MRI images.

Since the exact content of metal particles in specific tattoos/permanent makeup is not precisely known, it is advisable to include a question about tattoos/permanent makeup on the patient's body in the standard MRI informed consent form (survey).

During MRI, patients with tattoos and permanent makeup should avoid the use of sedatives as much as possible, and continuous visual and audio monitoring of the patient is necessary to promptly detect any side effects related to the tattoos.

ASSESSING THE IMPORTANCE OF FRAMELESS SRS MASK MOULDING EDUCATIONAL VIDEO FOR BRAIN CANCER PATIENTS DURING PRE-TREATMENT PREPARATION STAGE FOR STEREOTACTIC RADIOSURGERY

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Background / Objective

Aim in this research is to improve informational and educational needs of cancer patients undergoing stereotactic radiosurgery during pre-treatment preparation, effectively using educational tools.

Purpose is to assess effectiveness of frameless stereotactic radiosurgery mask moulding educational video for brain cancer patient during pre-treatment preparation stage.

Research questions:

1. What patients understood about the use of SRS mask after watching educational video?
2. How clearly SRS mask moulding process was demonstrated in the educational video?
3. How did patients feel after watching the educational video?

Methods

For necessary data collection educational video and anonymous questionnaire was made. Educational video about frameless SRS BrainLab mask moulding was created based on the theoretical background of this report and BrainLab SRS mask instruction leaflet to reflect mask moulding procedure in Riga East University Hospital, Oncology Centre of Latvia. Video was made according to Plan-Do-Study-Act (PDSA) model. Patients who were appointed for stereotactic radiosurgery BrainLab mask moulding during treatment preparation stage were shown educational video about SRS mask moulding and after watching video, survey was given, to assess patient experience and knowledge about stereotactic radiosurgery mask moulding during pre-treatment preparation stage. The anonymous survey consists of 26 statements from which 1-13 were composed about patient gained knowledge about SRS mask moulding procedure and 14-26 statements on how patient feels after watching a video. Patients were able to evaluate these given statements using Likert scale. Because of the research questions and small sample size, descriptive statistics was used to analyse results from this research.

Results

Most patients understood about the use of SRS mask after watching video, by agreeing or strongly agreeing given 1-5 statements in anonymous survey. Patients understood mask moulding process which was demonstrated in the educational video, by agreeing and strongly agreeing to given statements 6-13 in anonymous survey. Patients learned mask moulding process, new information related to the importance of SRS mask, they felt satisfied, emotionally prepared and comfortable for the procedure, did not think that video was scary, did not have questions and their stress level reduced after watching educational video.

Conclusions

Educational video can be helpful educational tool, to improve informational and educational needs, reduce anxiety and improve overall experience of cancer patients undergoing stereotactic radiosurgery during treatment pre-treatment preparation. Patients can gain information, emotionally prepare for the procedures, discuss their fears and concerns prior procedure, by watching educational video at home. Educational video is easily distributed and needs to be implemented in a daily practice and consultations, to make patients more attentive and increase compliance with the medical staff.

RADIOGRAPHERS CHALLENGES MRI IMAGING CONGENITAL HEART DISEASE IN ADULTS.

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Background / Objective

Congenital heart disease is a change in the heart or major blood vessels that a patient is born with, is most often detected early and can be major or minor. In most cases, congenital heart disease is corrected promptly in early childhood, but this requires regular follow-up for the rest of life; in rare cases, congenital heart disease is not detected until adulthood. By now Latvia does not have any reliable data on prevalence, morbidity, disability and mortality rates of ACHD patients in Latvia. The approximate estimates for the Latvian population could be around 6000 to 9000 ACHD patients in Latvia in 2020 for all pathologies, including bicuspid aortic valve. The development of diagnostic and therapeutic options over the last 20-30 years has led to a significant increase in patient survival and a significant reduction in early mortality, but the developmental abnormality requires regular diagnostic follow-up throughout life. Magnetic resonance imaging plays an important role in adult cardiac follow-up examinations by providing accurate anatomical structure and functional assessment.

Methods

To share our experience of performing cardiac MRI in patients with congenital heart disease from the radiographer's point of view. To analyse the MRI protocol used at the ARS Medical Centre for adult CHD patients and compare it with the information available in the literature. To compare the main differences between the protocol used for standard cardiac MRI and the protocol used for CHD patients. To identify and analyse the main challenges for radiographers when performing MRI in adult CHD patients.

Results

Since 2023, the Medical Centre ARS has performed a total of about 20 examinations in patients with various congenital heart diseases, the most common being congenital bicuspid aortic valve, but patients with tetrad of Fallot, aortic coarctation and pulmonary artery stenosis have also been examined. Standard cardiac MRI should include different sequences of 2-chamber, 3-chamber, 4-chamber view, as well short-axis views. Dynamic contrast enhancement is used for contrast agent injection, ~8-10min after injection resting perfusion sequence, and late gadolinium enhancement sequence. In patients with congenital heart disease, the basic protocol remains the same, but it requires additional LVOT, aortic valve, flow measurements in the aorta, and RVOT, pulmonic valve and flow measurements in the pulmonary trunk, also T1 and T2 mapping, ECV for post-operative assessment of myocardial structure. Depending on the pathology, additionally, serial pulmonary arteries and flow measurements in them, as well as series for aortic arch visualisation may be used. In cases of ACHD gadolinium contrast-enhanced MRI angiography is performed, given that in cases of CHD there may be changes in the large vessels and blood flow in them.

In Latvia, MRI of the heart is performed by <10 radiographers, which is the minimum number of radiographers practising in the country. The main challenges they face are altered anatomical structures, cardiac hypertrophy, which can complicate the planning of the examination, and arrhythmias.

Conclusions

Magnetic resonance imaging in adult patients with congenital heart disease requires used a special protocol to obtain information about the outflow tract, valves and major blood vessels, while the radiographer performing these examinations must have a good knowledge of the anatomy and pathology in order to be able to plan and perform the examination correctly on the basis of the pathology.

MODERN RADIOTHERAPY: FIRST MR LINAC IN LITHUANIA

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Background / Objective

MRI-guided radiation therapy represents a promising shift in cancer treatment, offering real-time imaging capabilities for improved target localization and treatment delivery. MR-linac simulation, positioning, and planning also have some differences compared to linear accelerators, which will be discussed. Working with MR-linac we have the opportunity for MR-guided hypofractionated radiotherapy. This abstract aims to provide a review of advancements in MRI-guided radiotherapy, including technological developments, clinical applications, and our first experience.

Methods

A systematic literature review was conducted to identify relevant studies and articles on MRI-guided radiotherapy. Data were summarized to key findings related to technical specifications, treatment planning, clinical outcomes, and MRI-guided radiotherapy safety considerations.

Results

The review highlights significant advancements in MRI-guided radiotherapy technology, including the integration of MRI scanners with linear accelerators, real-time adaptive planning, and magnetic resonance-based motion management. Clinical studies demonstrate the potential of MRI-guided radiotherapy in improving tumor control and sparing healthy tissues, particularly in challenging anatomical sites such as the prostate, liver, and pancreas. Safety considerations, including magnetic field interactions and quality assurance protocols are also discussed to ensure the safe and effective performance of MRI-guided radiation therapy in clinical practice. Workflow and MR-guided hypofractionated radiotherapy were discussed from personal experience.

Conclusions

MRI-guided radiation therapy represents a promising approach to increase the precision and accuracy of radiation treatment delivery while minimizing toxicity to surrounding normal tissues.

WORKFORCE CRISIS: IS IT ONLY IN RADIOLOGY?

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Background / Objective

The healthcare sector has been experiencing significant workforce challenges, with radiology often highlighted as a specialty under immense pressure. This study aims to compare these challenges within radiology to those in other medical fields to determine if the workforce crisis is unique to radiology or part of a broader healthcare issue.

Methods

A comprehensive literature review was conducted, focusing on studies and reports published over the last decade regarding workforce issues in healthcare. Data was collected on staff shortages, workload, burnout rates, and recruitment difficulties across different medical specialties, including radiology, emergency medicine, primary care, and surgery. Qualitative and quantitative analyses were performed to identify trends and common factors contributing to the workforce crisis.

Results

The analysis revealed that workforce challenges are prevalent across multiple medical specialties, not just radiology. Common factors contributing to these challenges include an aging population increasing demand for healthcare services, insufficient training and education pipeline to meet the demand, high levels of burnout and job dissatisfaction, and the impact of technological advancements requiring new skills. While radiology faces unique pressures due to rapid technological advancements and increased imaging demands, similar issues were identified in emergency medicine and primary care.

Conclusions

The workforce crisis is not confined to radiology but is a widespread issue affecting multiple medical specialties. Addressing this crisis requires comprehensive strategies that include increasing training capacity, improving working conditions, and implementing supportive policies across the healthcare sector. Specific attention is needed for specialties with unique challenges to develop targeted interventions.

HOW CAN HEALTHCARE LEADERS BEST IMPROVE PATIENT SATISFACTION WITH OUTPATIENT RADIOLOGICAL DIAGNOSTIC SERVICES? PATIENT SATISFACTION WITH OUTPATIENT RADIOLOGICAL DIAGNOSTIC SERVICES

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Background / Objective

(1) To explore patients' perspectives of outpatient CT and MRI services. (2) To explore patients' awareness of CT and MRI services and waiting times, evaluating overall patient satisfaction. (3) To analyze patient satisfaction with outpatient CT and MRI services according to socio-demographic aspects. (4) To identify the barriers and facilitators to improving patient satisfaction. (5) Find out how healthcare leaders can improve patient satisfaction with outpatient radiological services.

Methods

This study uses quantitative and qualitative methodology.

Results

: Quantitative research respondents were likelier to have had a CT scan (65.1%) than an MRI scan (34.9%). (59%) were satisfied with everything; (19%) had no response; (6%) lacked information; (5%) wanted shorter queues; (4%) lacked privacy; (3%) lacked communication; and (2%) would like newer equipment. The aspects of quality service, according to patients, are competent professionals (21%), information (14%), responsiveness (12%), patient respect and communication (11%) and safety (5%). Observing the queues for examinations, (50.5%) waited between 1 and 6 months; (31.7%) waited between one week and one month; (7.3%) waited between 6 and 12 months and (10.6%) waited up to one week. The information provided by the referring specialist about the examination and preparation for the examination was satisfactory (69%), the information provided by the radiology technologists was satisfactory (83%), and the information provided by the radiology receptionist was satisfactory (85%). Qualitative research showed that the funding, human resources, communication, and cooperations are the main barriers to improving patient satisfaction. Besides that, facilitators to improve patient satisfaction can be directed to improve healthcare specialist conditions or improve patient satisfaction. Furthermore, the seven main aspects of improving are queues and long waiting times, the radiological reception work, better service for the patients, improvement of the department, the staff, staff competencies, and better access to services.

Conclusions

: Most patients are satisfied with the radiological diagnostic services provided. However, interviews with healthcare professionals and leaders still highlight areas for infrastructure improvement, radiology technologists' competencies, radiology reception improvement, case and conflict management, and establishing service costs.

ASSESSMENT OF METRICS FOR AUTOMATED SEGMENTATION OF ORGANS-AT-RISK IN RADIOTHERAPY

Līna Lazdina¹

1. Doctor

Background / Objective

The delineation of organs at risk (OARs) and target volumes is an important stage in radiation therapy treatment planning. Automated algorithms for organ segmentation enable quicker delineation, yet evaluating contours for clinical relevance remains difficult. Various metrics are available for evaluating the accuracy of automatically generated contours, like volumetric Dice Similarity Coefficient (DSC) or Hausdorff distance. The aim of this study was to evaluate the accuracy of OARs auto-segmentation in comparison to the contouring of radiotherapy expert.

Methods

This is a retrospective research in Liepaja Regional hospital radiotherapy department. CT images of ten patients with prostate cancer from November 2023 until May 2024 were tested. Delineation of organs-at-risk in pelvis was performed by auto-segmentation (Smart Segmentation, Eclipse treatment planning system) and manual contouring by a radiation oncologist. Evaluation measures (volume, volume difference, overlap volume, volumetric Dice Similarity Coefficient (DSC) and Hausdorff distance) were calculated. Results were compared between Smart Segmentation and physician manually delineated contours.

Results

Mean rectum volume was 77.5 and 56.7 cm³, mean bladder volume was 222.2 and 228.0 cm³, mean right femoral head volume was 87.0 and 85.7 cm³, mean left femoral head volume was 87.2 and 86.3 cm³ for manual contours and auto-segmentation, respectively. Mean Dice Similarity Coefficient for rectum was 0.62 (min=0.37, max=0.72), bladder mean DSC was 0.92 (min=0.88, max=0.95), right femoral head mean DSC was 0.89 (min=0.87, max=0.91), left femoral head mean DSC was 0.90 (min=0.89, max=0.91). The highest mean Hausdorff distance was measured in bladder (2.04 cm) and rectum (1.34 cm). The least Hausdorff distance was measured for the right femoral head (0.54 cm) and the left femoral head (0.61 cm).

Conclusions

Dice Similarity Coefficient and Hausdorff distance serve as superior markers for assessing contour precision. Auto-segmentation tools can be used to generate contours for organs-at-risk, particularly for contours that maintain a consistent shape, such as bones or bladder, although it requires assessment and adjustments by physicians.

CARDIAC MR PROTOCOL FOR PACEMAKER WEARERS

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1. Institut de Diagnòstic per la Imatge (IDI)

Background / Objective

In recent years, the implantation of compatible pacemakers has meant a paradigm shift on all patients who wear one of them and have to undergo an MRI exam. In a very short time, it changed from the total prohibition of subjecting pacemakers to a high-grade magnetic field to the permissibility to perform an MR study with these electronic implants. Despite technological progress and the compatibility of materials, a whole series of circumstances must be taken into account that limit the exposure of these devices to high magnetic fields.

To perform any kind of MRI on a pacemaker wearer, it must be disconnected and the patient will not receive support from the device all along the duration of the exam. This is the reason why it is necessary to take into account the patient's own conditions and assess the dependence that he has on the device.

If we focus on cardiac MRI, we encounter the added difficulty that the electronic and metallic parts of the implanted device are located in adjacent anatomical areas to, or even inside, the organ we want to study, the heart. Inevitably, the dreaded metal artefact will appear in the resulting images.

Finally, it must be borne in mind that with the pacemaker in stand-by position we can find an added difficulty. It is very possible that the patient presents a cardiac arrhythmia that complicates the acquisition of images with heartbeat synchronization.

Facing all these adverse elements that work against the image quality, it is necessary to know which modifiable parameters are needed to be manipulated to minimize metallic and movement artefacts and offer an optimal image.

Methods

For the patient's protection, a flow diagram was created to verify the compatibility of the implanted devices and to follow all the security measures. Together with the electrophysiology department, a circuit has been organized to program the compatible devices before and after the MRI exam. Following the instructions of the implanted pacemakers' manufacturer, it is obligate to adapt the SAR and the power of the gradients so that they do not exceed the maximum values to perform the MRI exam in total safety.

Finally, it is necessary to take into account the modifiable parameters of the sequences used to minimize metallic artefacts and to adapt the synchronization of the sequences to possible cardiac arrhythmias.

Results

Carefully, with the creation of the circuit for patients with pacemaker, their safety is optimized to the maximum when performing an MRI. Furthermore, the adjustment of the magnetic field and the energy deposit together with the adaptation of the sequences allows offering diagnostic images with the best quality respecting the integrity of the patient's implanted electronic device.

Conclusions

The safety of the pacemaker wearer is paramount when performing an MRI. It is important to know all the risks that can arise when introducing an electronic implant in the MRI's magnetic field. The use of a flow diagram helps professionals to verify that the patient has passed all necessary precautions.

Cardio MRs are particularly sensitive to artefacts caused by metal pieces of the pacemakers, perhaps by the generator that is usually implanted on the patient's left side in a very close area to the cardiac silhouette. The same happens with the electrodes whose metal tips are inserted directly into the cardiac chambers. It is important to know the modifiable parameters to attenuate as much as possible all the artefacts without harming the patient and obtain images with diagnostic quality.

COMMUNICATION DURING RADIOTHERAPY CONSULTATIONS: HEAD AND NECK CANCER PATIENT'S PREFERENCES AND UNDERSTANDING OF THE INFORMATION

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Background / Objective

The aim of the study is to find out what are head and neck cancer patients preferences and their understanding of received information during radiotherapy consultation.

The purpose of the study is to improve communication between medical staff and head and neck cancer patients by finding out patients preferences in terms of information they want to receive during radiotherapy consultation.

Methods

Anonymous questionnaire with 20 questions was used. Questionnaire was created by the author, based on research evidence. It was translated with other translators help to Latvian language. Gained data from the questionnaire was analysed, using descriptive statistics – by calculating frequencies and percentages.

Results

Patients had difficulties with understanding received information during radiotherapy consultations. They were too nervous during consultations and information was given in difficult medical language, that made it less understandable. Patients would like to be more informed about psychosocial support during radiotherapy treatment and treatments outcomes.

Conclusions

Patients received a good amount of information during their radiotherapy consultation but had problems with understanding it. Information should be given in slower pace and in more understandable language, using less medical terms. Patients should always have an opportunity to ask questions. Additional information giving tools, like brochures, should be created for head and neck cancer patients to help them understand and remember the given information. Radiation therapists should involve themselves more in patient education and complement radiation oncologists.

REPRODUCIBILITY OF T1 MAPPING MEASUREMENTS OF INTERVENTRICULAR SEPTUM IN SHORT TERM FOLLOW UP ON 3T MRI SCANNER

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Background / Objective

T1 mapping is widely used for tissue characterisation of the myocardium in cardiac MRI scans. Additionally, it can be a quantitative criterion in follow-up scans to assess interval change. High reproducibility of T1 mapping is crucial to ensure its usefulness in clinical practice as a follow-up assessment. However, the T1 mapping values depend on various factors (MRI field strength, scan sequence, heart rate, etc.) and significant artifacts may occur. The aim of this study was to assess the reproducibility of myocardial regional T1 mapping measurements in the interventricular septum using identical scan parameters and slice positions over a short time period, which on the 3T scanner is quite sparse elucidated.

Methods

Study cohort consisted of 51 patients who underwent cardiac MRI on 3T scanner. Native T1 mapping images were acquired in short-axis plane at three levels (basal, middle, and apical locations) in two time points: after scout sequences acquisition and at the end of the study or before intravenous contrast injection. The identical planes and saturation region for these measurements were applied.

T1 mapping measurements were conducted by placing identical ROI's of 1cm² in the identical interventricular septum locations.

Results

The mean time interval between the two T1 mapping acquisitions was 19.4±5.6 minutes. No statistically significant difference between two T1 mapping values were observed. Reproducibility for interventricular septum was excellent for all slice position, with the highest one in the midventricular slice (intraclass correlation [ICC] 0.95), followed by basal slice (ICC 0.93) and apical slice (ICC 0.92). F-test (0.7) did not find a statistically significant difference in the ICCs for the midventricular and apical slices.

Conclusions

T1 mapping values in a short time follow-up demonstrated excellent reproducibility in all locations of interventricular septum, although the highest one was observed in the midventricular slice and the lowest in the apical slice. Our findings are in line with results of Dekkers et. al. (J. MAGN. RESON. IMAGING 2019), which also found best reproducibility in the midventricular slice of septum, although our study demonstrated better intraclass correlation and lower difference of the reproducibility to the basal and apical septal slices.

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