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Book of abstracts

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B

Scientific Programme

Clinical Trials in Radiology (CTiR)
My Thesis in 3 Minutes (MyT3)
Research Presentation Sessions (RPS)
Student Sessions (S)

to develop a computer-aided diagnosis (CADx) algorithm to predict the Gleason score (GS) of prostate cancers (PCa) in multiparametric MRIs of the prostate (mpMRI).
Methods and materials: 83 PCa reported in mpMRI were included in this retrospective study. Histopathology of TRUS-guided biopsy cores with reported GS served as a standard of reference (SOR). mpMRIs were performed following international guidelines and current practice. Imaging parameters included lesion size, T2w-signal intensity, diffusion restriction, prostate volume, and dynamic parameters (wash-in, wash-out, peak enhancement intensity, the initial area under the curve, and time-to-peak) along with zonal anatomy (peripheral zone vs central gland), patient age, and serum PSA level. Predicting the GS was defined as a regression problem. Using the above-mentioned parameters, an extreme gradient boosting algorithm was trained to predict the lesions' GS. A leave-one-out cross-validation was applied to ensure generalisability. Performance optimisation was focused on minimising the root-mean-square-error (RMSE). Inter-reader agreement of the imaging parameters was assessed using intraclass correlation coefficients (ICC).
Results: Histopathological assessment revealed n=17 Gleason-6 PCa, n=45 Gleason-7 PCa, n=8 Gleason-8 PCa, and n=13 Gleason-9 PCa. The CADx reached an RMSE of 0.653. Predicted and observed GS correlated significantly (P<0.0001, r=0.503). All imaging parameters featured excellent inter-reader agreement (all ICC≥0.87).
Conclusion: This study describes a CADx for GS prediction of PCa in mpMRI with high accuracy and excellent inter-reader agreement.
Limitations: Limitations include the retrospective and monocentric study design.
Ethics committee approval: The ethics committee approved this study, with a waiver of informed consent.
Funding: This work was supported by the German Research Foundation (DFG, CRC 1181-Z02).
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RPS 1307-13 09:42

Follow-up of patients within PI-RADS category 3: analysis of an advisable control interval

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Purpose: To analyse follow-up (FU) mpMRI in patients within a PIRADS category of 3.
Methods and materials: This retrospective single-centre study includes consecutive patients with a PIRADS category 3, ≥1 follow up mp-MRI (T2WI, DWI, DCE), and target plus systematic TRUS-guided biopsy or transurethral resection (TUR-P) as histological reference standard between 2012-2018. Study endpoints were analyses of PIRADS, PSAD, PSA, and prostate volume during FU MRIs with subgroup analyses of patients with a positive histology.
Results: Of 89 included patients (median PSA 6.6ng/ml; PSAD 0.13ng/ml/ml) with a FU period of 31±18 month, PCa was detected in 19 cases (median PSA 6.0ng/ml; PSAD 0.13ng/ml/ml) and csPCA in 5 cases (median PSA 5.5ng/ml; PSAD 0.13ng/ml/ml). Only the PI-RADS score, but not PSA, PSAD, or prostate volume, showed a significant difference in FU MRIs. Prostate volume rose in biopsy-negative cases (median initial 53 ml to 68 ml in FU; p=0.07). There was a significant PIRADS downgrade in cases with a negative biopsy during FU after 36 to 48 month (p=0.001) and a significant PI-RADS upgrade after 13 to 24 month in cases with verified PCa (p=0.02).
Conclusion: There was a very low rate of csPCA in PIRADS 3 patients. Patients with PCA and an initial PI-RADS 3 showed an upgrade to PIRADS 4 in FU MRI within 13-24 months. In cases with a negative biopsy, there seems no benefit to follow-up MRIs earlier than 36-48 months in cases of stable PSAD.
Limitations: n/a
Ethics committee approval: Review board approval and written informed consent obtained.
Funding: No funding was received for this work.
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RPS 1307-14 09:48

Fractal analysis of perfusion MRI for predicting prostate cancer grading: validation of previously established cutoffs

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Purpose: MRI is used for detecting prostate cancer (CaP), however, non-invasive grade prediction remains challenging. The perfusion pattern might allow non-invasive prediction of CaP-grading by quantifying chaos of perfusion. This study validates the fractal analysis of perfusion-MRI for CaP grade prediction.
Methods and materials: The openly available PROSTATEx2-dataset (testing cohort) was analysed with the Gleason grade group (GGG) from MRI-guided biopsies as a reference. Fractal analysis was applied to dynamic contrast-enhanced MRI-sequences (3Tesla, 3D-turbo-flash gradient-echo, resolution around 1.5x1.5x4 mm, each 3.5 seconds). Fractal dimension (FD) cutoffs were established in a previous study to predict low, intermediate, and high GGG1-4 CaP, and were validated in this study. GGG agreement with FD was assessed by quadratic-weighted kappa-statistics. Performance of fractal analysis was compared to an apparent diffusion coefficient (ADC) analysis.
Results: A cohort of 72 CaP in 64 patients was studied. Significant FD differences were found in pairwise GGG predictions (p<0.005), except for the highest groups (GGG4, n=8, vs GGG5, n=6). Using previously established FD thresholds, very good agreement of fractal analysis with GGG was achieved with quadratic-weighted kappa κ_{FD}=0.88 [CI: 0.79-0.98] for multi-class prediction. In comparison, ADC differences were significant for predicting GGG1 vs GGG2-5 CaP (p≤0.02) with moderate performance (κ_{ADC}=0.36 [CI: 0.12-0.59]). The differentiation of GGG4 from GGG5 CaP was neither reliable by fractal analysis nor ADC analysis.
Conclusion: Using previously determined FD thresholds for predicting CaP grading, fractal analysis achieved a high agreement with GGG and outperformed ADC analysis in an independent cohort.
Limitations: The differentiation of GGG4 from GGG5 CaP was neither reliable by fractal analysis nor ADC analysis.
Ethics committee approval: n/a
Funding: No funding was received for this work.
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H. Huisman: nothing to disclose
B. Hamm: nothing to disclose
M. Dewey: Grant Recipient at M.D. has received grant support from the Heisenberg Program of the German Research Foundation (DFG) for a professorship (DE 1361/14-1), the Digital Health Accelerator of the Berlin Institute of Health, and the DFG graduate program on quantitative biomedic, Other at M.D. was elected European Society of Radiology (ESR) Research Chair (2019–2022) and the opinions expressed in this article are the author's own and do not represent the view of ESR. M.D. is also the editor of Coronary CT Angiography and Cardiac CT, both p, Patent Holder at M.D. has filed a patent application on fractal analysis of perfusion imaging (together with Florian Michallek, PCT/EP2016/071551)., Speaker at M.D. has received lecture fees from Toshiba Medical Systems, Guerbet, Cardiac MR Academy Berlin, and Bayer (Schering-Berlex).

RPS 1307-15 09:54

mpMRI detection of suspected prostate cancer with a negative biopsy: can radiomic features help radiologists?

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Purpose: To investigate whether DWI-based radiomics features could differentiate patients with a clinical suspicion of PCa and negative TRUS-biopsy that have a positive mpMRI from patients where mpMRIs do not show any evidence.
Methods and materials: The records of 17 patients undergoing 3T-mpMRI for suspected PCa subsequently not confirmed at TRUS-biopsy were extracted from our institutional database. The ground truth was available for only a few. 7 patients did not report evidence at mpMRI, while 10 patients showed suspected PCa lesions, contoured in consensus by two radiologists. 84 image-based radiomic features were computed on high b-value DW-MRI sequences of all patients of the two groups. The ROC curve was computed for each feature and the one yielding the highest AUC was selected. Its discrimination power was also assessed via a Wilcoxon rank-sum test (p<0.001).
Results: The mean of local skewness (S_L-m), related to local inhomogeneities of DWI values, confirms radiologist reports in 94% of cases, with AUC=0.93 (95% CI, 0.56-1.00), specificity=100%, and sensitivity=86% (one false-positive only). Median S_L-m values in patients with suspected PCa were greater than 30% ($p \sim 10^{-4}$) with respect to patients showing no evidence at mpMRI.

Conclusion: DWI-based radiomic features strongly support mpMRI evidence in cases of suspected, and for some patients clear, PCa although TRUS-biopsy is negative. These outcomes suggest further investigation on the role that these extremely promising features could have in PCa patient's stratification.
Limitations: Although it confirmed the mpMRI evidence to be PCa for the few patients where the ground-truth was available, for most of them it was not at our disposal because patients did not belong to a dedicated study.
Ethics committee approval: IRB approval, written informed consent was waived.
Funding: No funding was received for this work.
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D. Barone: nothing to disclose
F. Ferroni: nothing to disclose

08:30 - 10:00 **Room Y**

My Thesis in 3 Minutes

MyT3 13

Abdominal and Gastrointestinal

Moderators:
A. Torregrosa Andres; Valencia/ES
M. G. Pezzullo; Brussels/BE

MyT3 13-1 08:30

Comparison of CT findings in successful and unsuccessful non-operative management of acute appendicitis

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Purpose: Although acute appendicitis standard treatment has been performed surgically, it has been seen that treatment is possible with antibiotic and non-operative observation in recent years. In this study, we aimed to determine whether CT findings in patients diagnosed with acute appendicitis should be used for directing treatment.
Methods and materials: A total of 60 patients, who underwent abdominal CT and antibiotic treatment for acute appendicitis were retrospectively evaluated. Patients who were treated with antibiotics were followed up for at least six months to determine the recurrent disease rate and CT findings of successful and unsuccessful medical treatment cases were compared. Appendiceal wall thickness, diameter, wall contrast enhancement, intraabdominal free fluid, periappendiceal fat stranding severity, perirectal lymph node, appendicolith and adjacent organ findings in CT of groups were compared with chi-square and Mann-Whitney-U tests.
Results: A total of 60 patients were evaluated. Because of 6 of the 60 patients who received medical treatment didn't complete the 6-month follow-up period, and 17 of them couldn't be followed-up, 23 patients have not been included in the research. As a result, at the end of the 6-month follow-up, 23 of the 37 medical treatment patients were successful and 14 of them were unsuccessful. Comparing the CT findings of the successful and unsuccessful medical treatment groups, just the severity of appendix wall enhancement was found statistically significant (p=0.005). After at least 6 months follow-up, the recurrent disease rate of patients who received medical treatment was 38%.
Conclusion: The likelihood of unsuccessful treatment increases when the severity of appendix wall contrast enhancement is evident in patients treated with medical therapy. The recurrent disease rate of medical treatment after at least 6 months follow-up was 38%.
Limitations: Retrospective study.
Ethics committee approval: Ethics committee approval obtained.
Funding: No funding was received.
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MyT3 13-2 08:34

Dynamic contrast-enhanced MR imaging of rectal cancer using a golden-angle radial stack-of stars VIBE sequence: pharmacokinetic analysis and associations with different histopathological findings

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Purpose: To explore the role of pharmacokinetic analysis of perfusion parameters derived from golden-angle radial stack-of stars VIBE sequence in discriminating tumour characteristics and the associations with histopathological findings.
Methods and materials: 56 pathologically confirmed rectal cancer patients who received radial VIBE DCE-MRI examination were enrolled in our study. Pharmacokinetic parameters were correlated with tumour histopathological findings including staging, perineural lymphatic invasion and Ki67. The comparison of K^{trans}, Kep, V_e and iAUC between tumour and normal tissue was performed. Correlation between different pharmacokinetic parameters and pathological findings were calculated. Logistic regression analyses were used to determine the association between PNI, lymphatic metastasis and pharmacokinetic parameters.
Results: The values of K^{trans}, V_e and iAUC were significantly higher in tumour than in normal tissue; all $P<0.05$, the same as K_{ep}, $p<0.05$. Those parameters did not demonstrate statistical signifcance in correlating with N staging and Ki67 except for T staging and K^{trans}; the correlation coefficient r_s was 0.374, p=0.038. Combined K^{trans}, K_{ep}, V_e and iAUC can predict PNI as high as 78.1%. Combined K_{ep}, V_e and iAUC reached 79.4% in predicting lymphatic metastasis.
Conclusion: Pharmacokinetic parameters derived from golden-angle radial stack-of stars VIBE sequence can distinguish tumour from normal tissue. The combination of K^{trans}, K_{ep}, V_e and iAUC can act as a potential predictor of PNI and in combination with K_{ep}, V_e and iAUC as a promising predictor of lymphatic metastasis in rectal cancer patients.
Limitations: Limitations are the small sample size, participants belonging to different staging and the classification and differentiation groups, which may affect the objective evaluation.
Ethics committee approval: The study was approved by our institutional review board and written informed consent was obtained from all participants.
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Y. Li: nothing to disclose
Z. Li: nothing to disclose
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MyT3 13-3 08:38

Computed tomography volumetric analysis of rate and factors affecting liver regeneration in liver transplant recipients

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Purpose: The purpose of this study was to assess liver regeneration with CT volumetry in patients who have undergone liver transplantation and to evaluate factors impacting liver regeneration in these patients.
Methods and materials: The study was done in the Department of Radiodiagnosis at Sir Ganga Ram Hospital. 34 patients were included in this study. Inclusion criteria: all adult patients who underwent living donor liver transplantation at our centre and gave consent for participation in our study. Exclusion criteria: paediatric liver transplant patients and acute liver failure patients. After taking valid consent, demographic, clinical and laboratory parameters, as well as pre-operative graft weight of these patients, were noted. CT was done on the 7th and 30th post-transplant day and The volume was calculated using CT volumetry software. Percentage and absolute growth of graft on these days were calculated. Correlation of various pre-transplant variables (age, sex, height, weight, BMI, BSA, MELD score, graft lobe, pre-transplant graft volume, graft to recipient weight ratio and indication for liver transplant) with graft regeneration was assessed.
Results: Rapid regeneration of graft was noted with a mean absolute and percentage regeneration on the 30th day being 685.4 ± 200.3cc and 119.2 ± 44%. Significant (p value <0.05) and positive correlation was found between weight, BMI, BSA, graft volume, graft to recipient weight ratio (GRWR) and 30th-day graft volume.
Conclusion: We concluded that graft regeneration in liver transplant recipients is a rapid and continuous process in the first thirty days. There is a positive and significant correlation between graft regeneration and pre-transplant variables as well as recipient's weight, BMI, BSA, graft volume and GRWR.
Limitations: The study is limited by the relatively small sample size of 34 patients and the fact that is was a time bound study.
Ethics committee approval: The study was approved by the institute's ethics committee.
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