Commentary

In the first Highlights of 2015 it is appropriate to look back at 2014 and see what has been deemed the best of the best in Radiology Research. In this regard the Margulis Prize that is awarded to the best original paper published in Radiology in a calendar year is a good (if somewhat western centric) measure. For 2014 this was awarded to Zavodni et al for their paper of plaque morphology. Atherosclerosis is a major killer all over the world but particularly in our population with the high incidence of diabetes and hypertension reaching epidemic proportions. Carotid artery disease is a significant cause of neurological morbidity. All interventions (other than medical therapy) are associated with a risk and therefore there has been a constant search to identify those patients that will benefit from the interventions. Currently most decisions are based of percentage stenosis of the vessel. However we know that this is not a perfect system. In this context this paper contributes valuable knowledge regarding the risk of neurological events based on the morphological characteristics rather than size alone.

Zhanga et al look at another chronic disease, Ankylosing spondylitis (AS). There are emerging therapies that modify the course of this otherwise potentially debilitating disease. These are however expensive and need to be monitored. The monitoring strategies need for sensitive enough to detect small changes in disease activity so that treatments can be tailored. MR is an established modality in the diagnosis of AS. This paper looks at its potential role in monitoring disease activity with favourable results.

For most clinical radiologists the term Diffusion Tensor Imaging (DTI) conjures up colourful images of white matter fibre tracks in the brain. This is the widest applied application of this versatile techniques that lets us observe membrane processes in vivo. Feng et al remind us that Neuroradiology is not the only radiological discipline to make effective use of this technique. They describe its use in the grading and follow up of renal parenchymal disease and correlate it to histopathological findings. They find that not only are Apparent Diffusion Coefficient (ADC) values a useful guide in this context but interestingly so are Fractional Anisotropy (FA).

With the PET scan becoming available in Pakistan there has been increasing use of this modality in oncological imaging. Most clinical scans in the country are carried out using FDG. Although this is a very useful oncological tracer it is not universally applicable to all tumours. There are tumours that are not "FDG avid" such as prostate and other where the differentiation from the background may be difficult such as gliomas. It is therefore important that all requests are carefully evaluated to ensure that this (expensive) test is appropriately applied. Songa et al look at hepatocellular carcinoma (HCC) treated with Trans Catheter Chemo Embolisation (TACE). The find that FDG can be applied to the detection of residual tumor post treatment.

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Carotid Artery Plaque Morphology and Composition in Relation to Incident Cardiovascular Events: The Multi-Ethnic Study of Atherosclerosis (MESA)

PURPOSE: To determine if carotid plaque morphology and composition with magnetic resonance (MR) imaging can be used to identify asymptomatic subjects at risk for cardiovascular events.

MATERIALS AND METHODS: Institutional review boards at each site approved the study, and all sites were Health Insurance Portability and Accountability Act (HIPAA) compliant. A total of 946 participants in the Multi-Ethnic Study of Atherosclerosis (MESA) were evaluated with MR imaging and ultrasonography (US). MR imaging was used to define carotid plaque composition and remodeling index (wall area divided by the sum of wall area and lumen area), while US was used to assess carotid wall thickness. Incident cardiovascular events, including myocardial infarction, resuscitated cardiac arrest, angina, stroke, and death, were ascertained for an average of 5.5 years. Multivariable Cox proportional hazards models, C statistics, and net reclassification improvement (NRI) for event prediction were determined.

RESULTS: Cardiovascular events occurred in 59 (6%) of participants. Carotid IMT as well as MR imaging remodeling index, lipid core, and calcium in the internal carotid artery were significant predictors of events in univariate analysis (P < .001 for all). For traditional risk factors, the C statistic for event prediction was 0.696. For MR imaging remodeling index and lipid core, the C statistic was 0.734 and the NRI was 7.4% and 15.8% for participants with and those without cardiovascular events, respectively (P = .02). The NRI for US IMT in addition to traditional risk factors was not significant.

CONCLUSION: The identification of vulnerable plaque characteristics with MR imaging aids in cardiovascular disease prediction and improves the reclassification of baseline cardiovascular risk.

P. Zhanga, K. Yub, R. Guoa, S. Shaha, J.N. Morellic, V.A. Rungedd, X. Lia, Aim

Ankylosing spondylitis: correlations between clinical and MRI indices of sacroiliitis activity

To analyse the correlations between clinical and MRI sacroiliitis activity indices in ankylosing spondylitis (AS).

MATERIALS AND METHODS: Sixteen normal volunteers and 52 patients were enrolled. The clinical AS activity indices included the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) score, serum high-sensitivity C-reactive protein, and erythrocyte sedimentation rate. The MRI sacroiliitis activity indices included apparent diffusion coefficient (ADC) values of bone and the Spondyloarthritis Research Consortium of Canada (SPARCC) score.

RESULTS: The mean SPARCC score of the control group was 0 and of the AS group was 9.9 ± 9.1 (range 0–36). The mean ADC value of the AS group was statistically significantly higher than that of the control

group ($49.7 \pm 20.2 \times 10\text{-}5$ mm2/s versus $38.9 \pm 5.3 \times 10\text{-}5$ mm²/s, $p < 0.05$). The BASDAI score showed a statistically significant correlation with the SPARCC score ($r = 0.685$, $p < 0.05$) and with ADC values ($r =$ 0.329, $p < 0.05$). ADC values correlated with the SPARCC score ($r = 0.390$, $p < 0.05$).

CONCLUSION: ADC values and the SPARCC index may be useful activity indices in AS.

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DTI for the assessment of disease stage in patients with glomerulonephritis - correlation with renal histology

OBJECTIVES: To investigate whether DTI allows assessment of renal impairment and pathology in patients with chronic glomerulonephritis.

MATERIALS AND METHODS: Seventy-five patients and 20 healthy volunteers were enrolled in this study. Renal function and kidney biopsies were evaluated. For DTI, a respiratory-triggered coronal EPI sequence was performed (TR, 1400 ms; TE, 76 ms; diffusion direction, 6; NEX, 4; b values, 0 and 600 s/mm2; slices thickness, 6 mm, with no intersection gap). Renal ADC and FA values were calculated and compared between the groups. Correlations between ADC/FA and histopathology were evaluated.

RESULTS: ADC values decreased with increased stages. ADC differences in renal parenchyma at different disease stages were found, with the exception of the control group compared with stage 1 patients; similar results were obtained for FA. ADC values in the cortex and medulla in stage 1-3 patients were both statistically different, similar to the FA values. A significant negative correlation was found between the percentage of glomerulosclerosis and FA in the renal cortex ($r = -0.74$), similar to the degree of tubulo-interstitial fibrosis with FA in the medulla ($r = -0.76$).

CONCLUSIONS: ADC and FA values are correlated with the degree of renal impairment, the percentage of glomerulosclerosis, and area of interstitial fibrosis.

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Value of 18F-FDG PET/CT in detecting viable tumour and predicting prognosis of hepatocellular carcinoma after TACE

AIM: To evaluate the efficacy of combined PET/CT in the detection of viable tumour in patients with hepatocellular carcinoma (HCC) after transcatheter arterial chemoembolization (TACE). The correlation between 2-[18F]-fluoro-2-deoxy-d-glucose (FDG) uptake during PET and prognosis was evaluated.

MATERIALS AND METHODS: Seventy-three patients with 91 HCCs who had undergone TACE with lipiodol before 18F-FDG PET/CT were retrospectively reviewed.

The pattern of lipiodol deposition in the tumour was divided into three groups: grade I, lipiodol remaining in ≥ 60% of the tumour; grade II, 20–60%; and grade III, ≤ 20%. The performance of 18F-FDG PET/CT in evaluating the viability of HCC was assessed and compared with that of contrast-enhanced CT (CECT). The predictive value of maximal tumoural standardized uptake value (SUV) to mean liver SUV (TSUVmax/LSUVmean) ratio was tested.

RESULTS: Comparing the receiver-operating characteristic area, 18F-FDG-PET/CT was found to be superior to CECT for the detection of viable tumour in patients with HCC after TACE (p = 0.04). A high SUV ratio (TSUVmax/LSUVmean ≥ 1.65) correlated significantly with tumour size (p = 0.0096), the grade of lipiodol deposition (p = 0.0387) and serum α-foetoprotein (AFP) level (p = 0.0142), but did not correlate with pathological grade (p = 0.2626). The overall survival rate was significantly higher in the low SUV ratio (TSUVmax/LSUVmean<1.65) group (p = 0.024).

CONCLUSION: 18F-FDG-PET/CT is efficient in assessing the viability of HCC after TACE and is superior to CECT in grades I and II, and similar in grade III. It provides valuable information for prediction of prognosis and may aid decisions regarding treatment strategy.