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Daily quantitative MRI for radiotherapy response monitoring

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Daily Quantitative MRI for Radiotherapy Response Monitoring

1. The daily acquisition of different types of qMRI on the Unity MR-linac in patients is feasible. Therefore, the MR-linac is an excellent platform to further QIB research with the goal of treatment response monitoring.
(This thesis)
2. To avoid any influence of eddy currents on ADC values when measuring DWI on the Unity MR-linac using an EPI sequence, only the z-direction gradient should be used for diffusion weighting.
(This thesis, Chapter 3)
3. IVIM can potentially be used as an imaging biomarker for treatment response in prostate cancer patients. As only some simple modifications to the widely used DWI sequence are needed to acquire IVIM, it is one of the most promising QIBs in terms of widespread adoption.
(This thesis, Chapter 4)
4. With some adjustments to the MRI pulse sequence, it is possible to accurately measure $T_{1\rho}$ on the Unity MR-linac.
(This thesis, Chapter 6)
5. QIB qMRI research on the Unity MR-linac can be summarized as the effort to measure small effects in the presence of noise.
6. The prostate can be considered as an excellent qMRI phantom, as it has clear boundaries, has many reference values for different tissue types and qMRI values, is positioned close to the iso-center, and is abundantly available.
7. Understanding the biological mechanism that underlies a successful qMRI biomarker is not essential, but it will help with the clinical adoption of the biomarker.
8. In the field of MRI, new pulse sequences, including those for quantitative MRI, have often been proposed in theory before the equipment was advanced enough to properly test them. Therefore, old papers should be discussed just as often as newly published papers.
9. The analysis of the large amount of data that is generated by daily imaging on an MR-linac is labor intensive and currently only feasible in a research setting.
10. The involvement of vendors, who have the most intimate knowledge about the systems they design, is crucial for the progress of qMRI research, and essential for widespread clinical adoption of qMRI biomarkers.
11. Exponential phenomena are almost impossible for humans to grasp.* Therefore, daily reporting of the current availability of hospital beds during a pandemic, as was done by many newspapers, is counter-intuitive and unhelpful.
*Kahneman D. (2021). Interview by Tim Adams, May 16.
12. Making music together universally creates a feeling of togetherness that cannot be achieved by anything else.