Connecting the dots in atherosclerosis immunology by PET/MR imaging

Increasing evidence suggests atherosclerosis is intertwined with a variety of immune disorders mediated by a shift in balance of pro-inflammatory and regulatory/patrolling cells. This imbalance can be either a consequence of an acute event, as in stroke and myocardial infarction, or the cumulative result of a chronic condition, as depression and stress. These conditions and the immune system’s reactions often induce an immunological imbalance that favors overproduction and massive release of pro-inflammatory cells into the circulation. When distortions of this delicate hematopoietic balance result in cardiovascular events, patients often undergo a downward spiral characterized by aggravation and recurrence.

I will discuss a uniquely integrated systems imaging approach, using PET/MR, to evaluate functional, structural and morphological changes over time with high specificity and excellent soft tissue contrast. Although the technical know-how required for PET/MRI renders it unsuitable for widespread clinical implementation, we nevertheless anticipate that this method will significantly impact clinical research and drug development. To maximize PET/MRI’s utility, motion correction and limitations in both spatial resolution and sensitivity must be considered. Due to its unspecific nature, false interpretations have been reported in tumor detection and coronary plaque imaging can be hampered by avid myocardial uptake when using 18F-FDG-PET. Promising developments in the field of Immuno-PET can possibly solve these issues as this approach is highly specific.