Prevalence and stratification of NAFLD/NASH in a UK and US cohort using non-invasive multiparametric MRI

Stephen Harrison1, Henry R. Wilman2,3, Matthew D. Kelly1, Andrea Dennis1, Cat J. Kelly1, Angelo Paredes1, Jennifer Whitehead1, Stefan Neubauer1, Rajarshi Banerjee3.


Background
- There is a clear need to assess the prevalence of NAFLD and NASH in the general population.
- MRI iron corrected T1 (cT1) and has been shown to correlate with liver inflammation and fibrosis, and liver-related outcomes [1], and distinguish NASH from simple steatosis [2].
- Proton density fat fraction (PDFF) and cT1 are being collected as part of the UK Biobank imaging study of 100,000 individuals, and as part of the US Prevalence study [3].

Aim
- To investigate the effectiveness of multiparametric MRI for the assessment and stratification of NAFLD/NASH in two large UK and US cohorts.

Methods
- Data is presented for 2895 individuals from the UK Biobank cohort. Each individual received multiparametric MRI (LiverMultiScan™ protocol, < 5 min.) to estimate liver fat fraction (PDFF) and cT1. LiverMultiScan™ uses MRI T2* combined with T1 to derive cT1. Values presented here are based on LiverMultiScan™ v2.0. High cT1 has been shown to correlate with inflammation, fibrosis, and liver-related outcomes [1]. The PDFF and cT1 values from the UK Biobank cohort were compared to those obtained in a general population, and can identify individuals less likely to benefit from a liver biopsy.

MRI identifies high risk NASH
- Of the biopsied subjects (n=139) from the US cohort, 98% (96%) with PDFF ≥ 5% & cT1 ≥ 800 ms had NASH, and 67% (67%) had NASH (Figure 3).
- 29% (25%) of subjects with PDFF ≥ 5% & cT1 ≥ 800 ms had high risk NASH (NASH and fibrosis F2-3).
- 90% (44%) of the US cohort with PDFF ≥ 5% & cT1 < 800 ms (750 ms) had NASH, and only 6% (11%) had high risk NASH.
- Adding cT1 (800 ms) improved PDFF-based stratification for NASH and high risk NASH with enrichment ratios of 116% and 253% respectively.

UK Biobank participants at high risk of NASH
- There is no biopsy data for the UK Biobank cohort but PDFF alone identifies patients with steatosis [4].
- Applying the prevalences from the US cohort to the UK Biobank cohort, we would expect a NASH prevalence of 12%.
- Similarly, we would expect 49% of Biobank participants with PDFF ≥ 5 to have NASH, and 15% to have high risk NASH.
- The US and UK cohort are ethnically different (27% Latino, 73% non-Latino vs 96% white), and the US cohort has a higher prevalence of diabetes (34.3% vs 5.4%), hypertension (41% vs 26%), and has a higher mean BMI (30 vs 25 kg/m²).

Conclusions
- Multiparametric MRI (LiverMultiScan™) is an effective non-invasive method to identify and stratify individuals with NAFLD and NASH at a population level.
- LiverMultiScan™ acquisition takes < 5 minutes, requires no contrast, can be used for high throughput analysis of a general population, and can identify individuals less likely to benefit from a liver biopsy.
- Iron corrected T1 can be used in addition to PDFF to further enrich a population for NASH with significant fibrosis.

References and acknowledgments

4 Perspectum Diagnostics, Oxford, UK

Contact: henry.wilman@perspectum-diagnostics.com