Can semi-quantitative parenchymal MR imaging parameters be useful for monitoring the disease severity in chronic pancreatitis in a longitudinal study

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Hypothesis

Parenchymal MR imaging biomarkers T1 score, and arterio-venous enhancement ratio (AVR) would change with severity of chronic pancreatitis (CP).

Materials and Methods

This retrospective longitudinal study included 37 CP subjects (23 male 14 female) who either progressed (n= 22, mean age: 54 [range 21 - 75yrs]) or remained stable (n= 15, mean age: 56 [range 37 – 76yrs]) at the Indiana University Health System. Progression of disease severity was determined by changing the Cambridge classification grade from 0, 1, or 2 to 3 or 4. The average time difference between the MRIs was 6.7 years (range: 0.6 -15.3yrs). MR imaging was performed using the Institution's clinical MRI protocol. All studies included T1-weighted gradient echo sequence performed before contrast and after intravenous contrast injection of Gadobutrol (Bayer HealthCare Pharmaceuticals) during the arterial and pancreatic venous phases. T1 score is calculated by taking the ratio of the mean unenhanced T1-weighted signal intensity (SI) of the pancreatic parenchyma to the spleen. AVR is calculated using the formula $AVR = SI_{arterial} - SI_{unenhanced} / SI_{venous} - SI_{unenhanced}$.

Results

There was a significant decrease in T1 score between the initial (mean: 1.23, 95% CI:1.1 to 1.4) and follow-up MRI (mean: 0.96, 95% CI: 0.87 to 1.06) for the chronic pancreatitis (CP) subjects who had progressed disease severity determined by Cambridge classification (p= 0.0012). There was no significant difference in the T1 score of subjects who did not progress on follow-up imaging (p=0.052). There was a significant decrease in AVR of the subjects who progressed between the initial (mean: .93, 95% CI: 0.77 to 1.08) and the follow-up MRI (mean: 0.66, 95% CI: 0.48 to 0.83) for patients with progressed disease (p=0.02). However, those who remained in the same disease severity group did not show significant difference (p=0.066).

Conclusion

This longitudinal study suggests that semi-quantitative parameters T1 score, and arterio-venous enhancement ratio of the pancreatic parenchyma can be used to monitor progression of CP. Large population multi-center studies are warranted to verify these results.