Diabetic Complications Consortium

Application Title: 4D cine mri-assessed stomach motility in diabetic gastroparesis.

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1. Project Accomplishments:

Our manuscript introducing our MRI technique to evaluate gastric function in healthy controls was published in *Neurogastroenterology and Motility* and selected for the journal cover. We have since refined our gastric MRI sequence and processing pipeline. Work to generate data from diabetes mellitus gastroparesis (DMgp) patients is ongoing, with one DMgp participant having completed all study visits. While funding is ending, we will continue to recruit participants, perform scans, and analyze data.

2. Specific Aims:

Specific Aim 1. Apply 4D cine gastric MRI to assess gastric physiology in DMgp patients.

Results: Three participants with DMgp have been enrolled in the study. We have completed all study visits with one participant. One participant completed two of three study visits before experiencing claustrophobia during the MRI scan and chose not to complete the third visit. The third participant was found to have a contraindication for MRI after enrollment and subsequently withdrew from the study. We aim to enroll fourteen more participants.

Since the publication of our manuscript introducing the gastric MRI technique in healthy controls, we have modified the 4D gastric MRI sequence, providing improved spatio-temporal resolution compared to our previous pulse sequence, and developed a processing pipeline based on low-rank tensor decomposition of abdominal images, which effectively removes respiratory noise without affecting spatial resolution (i.e. without introducing blurring).

Specific Aim 2. Link gastric measures in DMgp with other accepted cardiac autonomic neuropathy (CAN) measures.

Results: Once more data from our DMgp cohort is collected, we will correlate gastric outcomes identified in Aim 1 with CAN scores. Specifically, we will evaluate heart rate variability (HRV) at rest and during deep breathing, extracting both time- and frequency-domain indices, as well as Expiratory/Inspiratory ratio during deep breathing, and 30:15

ratio during sit-to-stand. The CAN score will be defined for each subject as the ratio between abnormal metrics and total number of evaluated CAN parameters.

3. Publications:

Sclocco R, Nguyen C, Staley R, Fisher H, Mendez A, Velez C, Kettner NW, Kuo B, Napadow V. Non-uniform gastric wall kinematics revealed by 4D Cine magnetic resonance imaging in humans. Neurogastroenterology and Motility. 2021 Aug; 33(8): e14146. https://doi.org/10.1111/nmo.14146