

4D CINE-MRI-DERIVED GASTRIC MOTILITY INDEX IS ASSOCIATED WITH REPORTED ABDOMINAL PAIN IN PATIENTS WITH FUNCTIONAL DYSPEPSIA

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Background & Aims: Functional dyspepsia (FD) is a common gastrointestinal (GI) disorder of the upper GI tract associated with a variety of symptoms, such as abdominal pain and bloating, but lacking identifiable organic abnormalities. Altered motility patterns in FD occur in the stomach, pylorus and small intestine during digestive or interdigestive periods, and up to 30% of symptoms are associated with migrating motor complexes-like activity, thus suggesting a link between gastric motility and sensory disturbances. However, gastric functional impairments have proven to be challenging to assess using conventional abdominal imaging, which typically evaluated anatomy at a single time point and relied on a variety of modalities with varying degrees of invasiveness. Magnetic Resonance Imaging (MRI) represents a promising tool for non-invasive assessment of multiple aspects of gastric function, which can be linked with pain intensity. **Methods:** We applied a novel 4D (volume + time), free-breathing MRI sequence at 3T with contrast enhancement achieved through a food-based meal in order to assess human gastric function. Twelve (12) FD patients (11F, 31.1±13.5 y/o) were asked to consume a high-caloric meal (470 ml semi-solid pudding) containing pineapple as contrast agent. 4D cine-MRI gastric scans were collected continuously for 5 minutes (temporal resolution: 7s) at 3 post-meal times (+15, +45, +75 minutes). Ratings of abdominal pain were collected prior to each scan using a numerical rating scale ranging from 0 ("unnoticeable") to 100 ("unbearable"). MRI gastric volumes were segmented using a semi-automated algorithm to isolate the stomach, and a deformation motility index (DMI) was extracted by dividing mean gastric wall deformation by gastric volume. Gastric emptying was estimated calculating percent gastric volume decrease from the first post-meal time. Associations between gastric outcomes and abdominal pain ratings were explored using Pearson's correlation (significance set at p<0.05). **Results:** DMI showed a significant positive correlation with abdominal pain ratings (r=0.39, p-value=0.018; **Figure1**). No significant correlations were found between abdominal pain and gastric volume or ingested meal volume, supporting the importance of dynamic gastric measurements when examining associations with abdominal symptoms ratings. Furthermore, DMI negatively correlated with gastric volume decrease (r=-0.54, p=0.006; **Figure1**), suggesting faster emptying for higher gastric wall deformation values. **Conclusion:** Our results support 4D cine-MRI as a clinically relevant tool for the identification of gastric abnormalities associated with FD symptomatology. This imaging approach is fully non-invasive and can capture complex dynamics of gastric motility inaccessible to other imaging techniques.

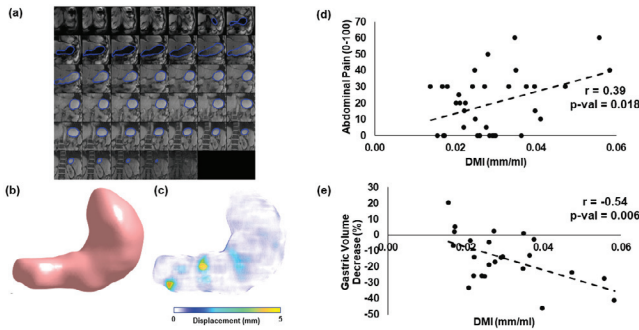


Figure 1 – (a) Segmentation of 4D (volume + time) gastric MRI images, with gastric volume delineated in blue. (b) Gastric 3D rendering for total volume estimation. (c) Gastric wall deformation map. (d) DMI (gastric wall deformation normalized by gastric volume) is significantly correlated to individual ratings of abdominal pain collected during the MRI scan and (e) to gastric volume decrease over time.

SLEEP DISORDERS ARE ASSOCIATED WITH A LOWER QUALITY OF LIFE IN FUNCTIONAL DYSPEPSIA

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Introduction: Sleep disorders are common in the general population and are even more frequent in patients with functional dyspepsia (FD) (1). Sleep disorders are associated with the severity of gastrointestinal (GI) symptoms, psychological distress, and decreased productivity at work in FD (2,3). Our aims were to identify factors associated with sleep disorders in FD and assess the relationship with quality of life (QoL).

Patients and methods: We assessed 1,220 patients referred to the motility clinic in our tertiary care center between December 2017 and June 2019. Overlap with irritable bowel syndrome (IBS) was defined according to the Rome IV criteria. The severity of GI symptoms (TSS), heartburn (5-point Likert scale), QoL (GIQLI), psychological distress (HADS), sleep quality (PSQI) and the insomnia (ISI) were assessed using self-questionnaires. A poor sleep quality was defined as a PSQI > 5 while insomnia was defined as an ISI ≥ 10. Gastric emptying was assessed by a 13C-octanoic acid breath test.

Key results: Among the 1,220 patients assessed by questionnaires, 355 patients had a diagnosis of FD according to Rome IV (subtypes: 63.9% of postprandial distress syndrome, 11.6% of epigastric pain syndrome and 24.5% of overlap). FD patients were mainly women (76.6%) with a mean age of 46.9 ± 15.7 years. Overlap with IBS was present in 44.8% of FD patients. In our FD population, 81.4% of patients had poor quality sleep. In this subgroup, quality of life was lower and overall symptoms were more severe (see Table, also reporting

results for other studied parameters). The quality of sleep was correlated with QoL (r = -0.43 [95% CI: -0.51 to -0.34], p < 0.0001; see Figure). Using logistic regression, independent factors predicting poor sleep quality were depression levels (OR: 1.40 [95% CI = 1.08-1.81]; p = 0.012) and the severity of dyspeptic symptoms (OR: 1.28 [95% CI = 1.02-1.62]; p = 0.036). Insomnia was found in 60.6% of FD patients, with similar results.

Conclusions: A subgroup of FD suffered from sleep disorders. The presence of sleep disorders is associated with altered QoL, higher overall symptoms and higher psychological distress. The identification of those patients could lead to better management of FD.

References 1. Fass R, Fullerton S, Tung S, Mayer EA. Sleep disturbances in clinic patients with functional bowel disorders. *Am J Gastroenterol*. 2000;95(5):1195-2000. 2. Lacy BE, Everhart K, Crowell MD. Functional dyspepsia is associated with sleep disorders. *Clin Gastroenterol Hepatol*. 2011;9(5):410-414. 3. Matsuzaki J, Suzuki H, Togawa K, et al. Burden of impaired sleep quality on work productivity in functional dyspepsia. *United European Gastroenterol J*. 2018;6(3):398-406.

	Good sleep quality (n = 66)	Poor sleep quality (n = 289)	p-value
Mean age, years (± SD)	41.4 (± 16.0)	48.1 (± 15.4)	0.0009
Mean BMI, kg.m ⁻² (± SD)	23.2 (± 4.4)	24.3 (± 5.3)	0.11
Sex ratio Male/Female (% women)	0.29 (77.3)	0.31 (76.5)	>0.99
TSS, mean score (± SD)	17.2 (± 3.9)	18.9 (± 3.61)	0.0007
Mean duration of FD symptoms, months (± SD)	65.6 (± 90.3)	78.6 (± 101.8)	0.28
GIQLI, mean score (± SD)	92.1 (± 15.4)	75.3 (± 18.5)	< 0.0001
Smoking, n (%)	7 (10.6)	53 (18.3)	0.15
HADS, mean score (± SD)	11.9 (± 5.1)	17.7 (± 7.2)	< 0.0001
HADS-A, mean subscale (± SD)	7.80 (± 3.5)	10.4 (± 4.3)	< 0.0001
HADS-D, mean subscale (± SD)	4.05 (± 2.9)	7.26 (± 4.1)	< 0.0001
FD subtypes:			
PDS, n (%)	43 (65.2)	184 (63.7)	0.89
EPS, n (%)	10 (15.2)	31 (10.7)	0.28
PDS+EPS, n (%)	13 (19.7)	74 (25.6)	0.43
IBS, n (%)	32 (48.5)	127 (43.9)	0.58
Heartburn, n (%)	17 (25.8)	79 (27.3)	0.88
Gastric half-emptying time, minutes (± SD) *	152.8 (± 37.9)	166.5 (± 61.8)	0.50

BMI: Body Mass Index, EPS: Epigastric Pain Syndrome, FD: Functional dyspepsia, GIQLI: Gastrointestinal Quality of Life Index, HADS: Hospital Anxiety Depression Scale, HADS-A and HADS-D: HADS Anxiety and Depression subscales respectively, IBS: Irritable Bowel Syndrome, n: number, PDS: Postprandial Distress Syndrome, SD: Standard Deviation, TSS: Total Symptom Score

* Only available for a subgroup of 78 (21.97%) patients.

Table. Comparison of FD patients with good vs. poor sleep quality.

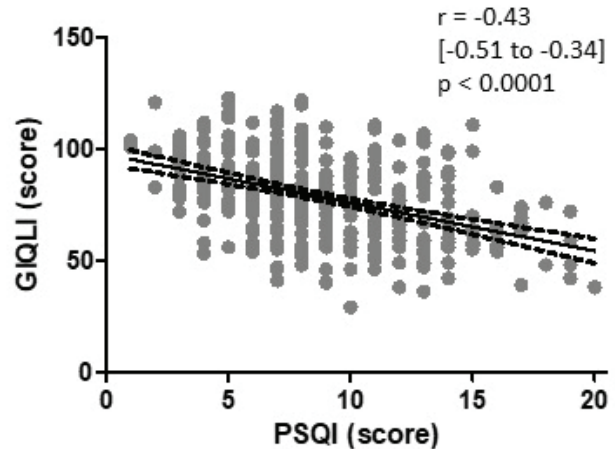


Figure. Correlation between the global PSQI and the GIQLI, with the regression line best predicting the model and its 95% confidence band.