

Relationship of Upper Esophageal Sphincter and GERD: Evaluation of pH Impedance and High Resolution Manometry

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INTRODUCTION

- PH Impedance monitoring can confirm the diagnosis of GERD by measuring distal acid exposure time (AET).
- Original diagnostic criteria set by Johnson and Demeester is total AET > 4.2%. The modern, Lyon's criteria, is more conservative with total AET > 6%.^{1,2}
- Manometry uses sensors to measure pressure throughout esophagus. High resolution manometry (HRM) uses more sensors in closer proximity which allows for better characterization of the upper esophageal sphincter (UES).³
- UES sustains a basal pressure to prevent reflux into pharynx while also allowing relaxation or residual pressure for ingestion.
- Lower esophageal sphincter (LES) is hypotensive and relaxed in GERD, but the effect on UES is less understood.⁴

AIM

- Retrospectively analyze results of patients that underwent both high resolution manometry (HRM) and pH Impedance monitoring to evaluate whether GERD is associated with elevated UES pressures.

METHODS

Sample

- Total 318 patients who have undergone both pH Impedance and HRM at WFBH between 2018-2022.
- Exclusion Criteria:** Patients less than 18 yo, on PPI therapy at time of testing, or with uninterpretable exams.

pH Impedance

- Primary measures:** Total Acid Exposure Time (AET)
- Secondary measures:** Recumbent AET, Upright AET, # of refluxes, Reflux Length, Demeester Score, Presence of Extraesophageal (extra-eso) Symptoms, or MNBI.

HRM

- Primary measures:** Basal and Residual UES Pressures
- Secondary measures:** Basal and Residual LES Pressures and Distal Contractile Integral (DCI)

RESULTS

Patient Demographics					
	GERD per Demeester		GERD per Lyons		
	GERD (n = 192)	No GERD (n = 126)	GERD (n = 147)	No GERD (n = 171)	Indeterm. (n = 50)
Females (%)	74	79	76	55	74
Males (%)	26	21	24	16	26
Age (Mean)	54	53	53	54	53
BMI (Mean)	32	30	32	30	32
Smoking Hx* (%)	26	20	23	15	16
Alcohol Hx* (%)	6	10	6	8	6
Opioid use* (%)	3	8	3	5	4

Table 1. Demographical data were recorded for patient with GERD or no GERD according to Demeester (AET > 4.2%) or Lyons criteria (AET >6%).

GERD Status and UES Pressure

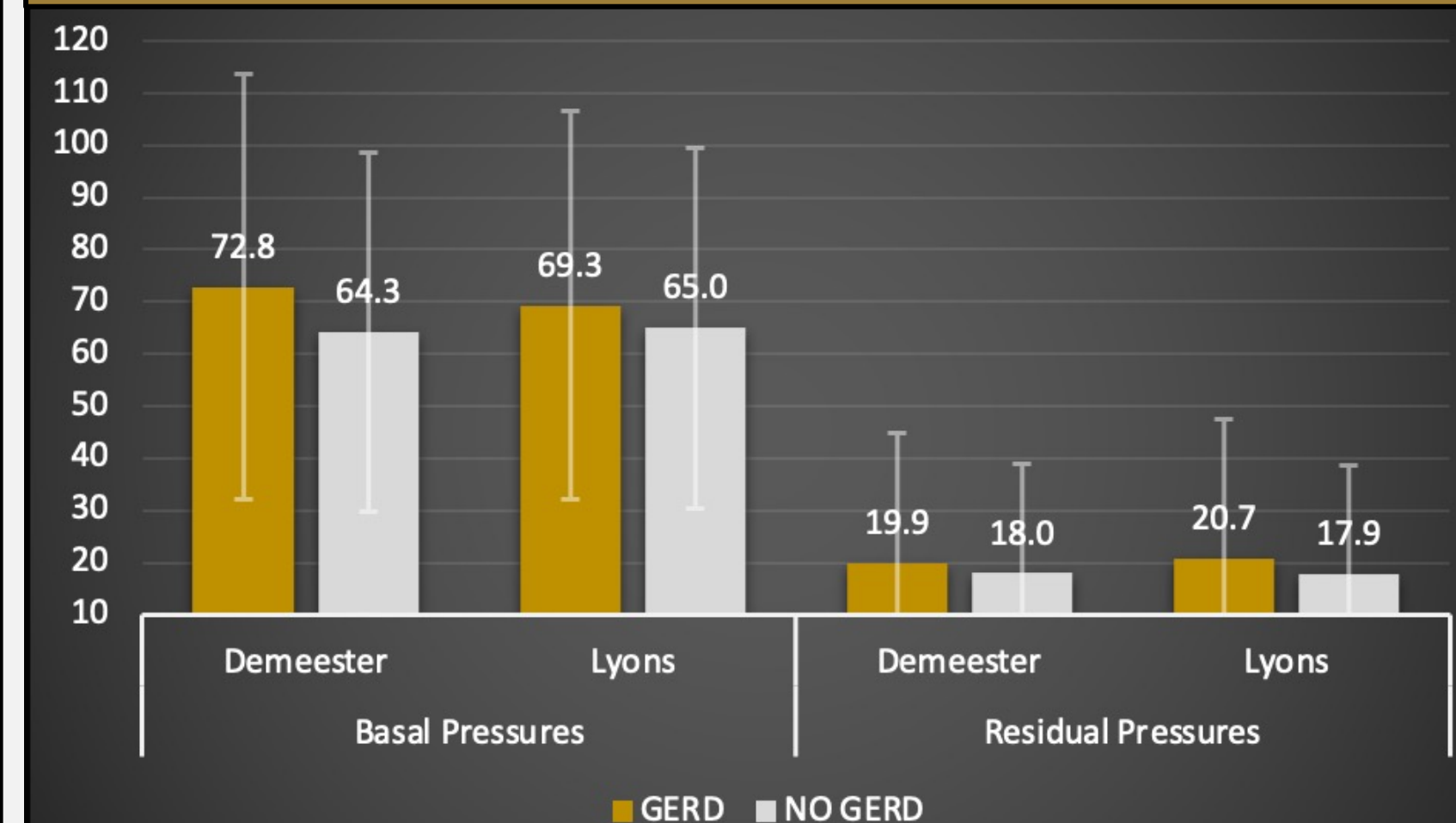


Figure 1. Both basal and residual UES pressure were increased in patients with GERD. This was only statistically significant when using Demeester criteria.

RESULTS (CONT.)

pH Impedance Variables and UES Pressures						
UES P	pH Impedance Variable		p	pH Impedance Variable		p
	Total AET ≤ 4.2%	Total AET > 4.2%		Total AET < 4%	Total AET > 6%	
Basal	64.26	72.83	0.04*	64.98	69.31	0.33
Residual	17.98	19.93	0.45	17.95	20.67	0.37
	Recumbent AET < 1.2% Recumbent AET > 1.2%			Upright AET < 6.3% Upright AET > 6.3%		
Basal	69.46	69.38	0.99	70.12	68.63	0.73
Residual	20.43	18.41	0.45	18.44	19.24	0.57
	# Refluxes < 40 # Refluxes > 80			Longest Reflux < 9.2 min Longest Reflux > 9.2 min		
Basal	67.82	69.89	0.88	67.11	70.67	0.43
Residual	17.92	18.69	0.44	19.03	19.22	0.94
	Demeester score ≤ 14.2 Demeester score > 14.2			MNBI > 2292 MNBI < 2292		
Basal	65.13	71.64	0.13	67.29	71.02	0.48
Residual	18.41	19.54	0.68	24.61	22.32	0.53
	Absent Extra-Eso Sx Present Extra-Eso Sx					
Basal	70.65	67.09	0.43			
Residual	19.46	18.59	0.75			

Table 2. Measures of increased acid exposure generally correlated with increased UES pressure. Although only elevated total AET per Demeester criteria was statistically significant.

DISCUSSION

- Results showed no significant change in UES pressures in patients with increased AET or other secondary measurements indicative of GERD.
- Previous studies suggest increased UES pressure in patients with GERD, along with association with globus sensation.^{5,6}
- UES was also shown to be significantly shorter and hypotensive in patients with GERD, especially in association with supraesophageal symptoms.⁷
- Further research controlling for factors such as chronicity of GERD or age should be performed to better characterize isolated impact of GERD on UES.

REFERENCES

- Johnson LF, Demeester TR. Twenty-four-hour pH monitoring of the distal esophagus. A quantitative measure of gastroesophageal reflux. *Am J Gastroenterol.* 1974;62(4):325-332.
- Gyawali CP, Kahrilas PJ, Savarino E, et al. Modern diagnosis of GERD: the Lyon Consensus. *Gut.* 2018;67(7):1351-1362.
- Norton P, Herbella FAM, Schlotmann F, Patti MG. The upper esophageal sphincter in the high-resolution manometry era. *Langenbecks Arch Surg.* 2021;406(8):2611-2619.
- Lippincott M, Velanovich V. The upper esophageal sphincter in gastroesophageal reflux disease. *Annals of Esophagus.* 2021.
- Kim HI, Hong SJ, Han JP, et al. Specific movement of esophagus during transient lower esophageal sphincter relaxation in gastroesophageal reflux disease. *J Neurogastroenterol Motil.* 2013;19(3):332-337.
- Tokashiki R, Funato N, Suzuki M. Globus sensation and increased upper esophageal sphincter pressure with distal esophageal acid perfusion. *Eur Arch Otorhinolaryngol.* 2010;267(5):737-741.
- Nadaleto BF, Herbella FA, Pinna BR, Patti MG. Upper esophageal sphincter motility in gastroesophageal reflux disease in the light of the high-resolution manometry. *Dis Esophagus.* 2017;30(4):1-5.