Measurement and Patterns of Secondary Esophageal Motility by EndoFLIP in Young Children with Pediatric Feeding Disorder (PFD) with and without Persistent Dysphagia

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Disclosures

- **None**

Background

- Pediatric Feeding Disorder (PFD) is defined as an impaired oral intake that is not age-appropriate and is associated with medical, nutritional, feeding skill, and/or psychosocial dysfunction.
- PFD - ?Inability or fear to swallow due to pharyngeal or esophageal dysfunction
- The EndoFLIP is a minimally invasive diagnostic tool- distensibility, diameter of the esophagus and to visualize patterns of secondary contractility.
- Esophageal motility is not feasible in young children
- EndoFLIP is performed at the time of upper endoscopy with the patient under general anesthesia.
- Gap: No literature on esophageal dysfunctional young patients with PFD.

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STUDY AIMs:

Primary objective	Secondary objective
To describe and compare the patterns of esophageal contractility in children ages 6 months to 72 months with symptoms of **PFD** +/- persistent dysphagia.	1. define pediatric EndoFLIP baseline parameters (Volume, Diameter, Distensibility and Pressures of LES and UES; presence of esophageal contractility i.e., RAC's VS RRC's;) 2. Response to treatment in patients with dysfunction by EndoFLIP (PFD symptoms: age appropriate intake of solids and liquids and weight gain at 3-4 months follow-up -**Project B**)

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Methods

Type of Study IRB approval	**Prospective and Retrospective cohort observational study**
Inclusion Criteria	Children ages 6 months – 72 months old diagnosed with PFD with or without dysphagia
Exclusion Criteria	Known history of documented motility disorder
Study Duration	January 2023 to January 2025 Aerodigestive Phoenix Children's
Methodology	Data is collected from patients who have undergone EGD with EndoFLIP from Allscripts EMR, gGastro and EndoFLIP reports.

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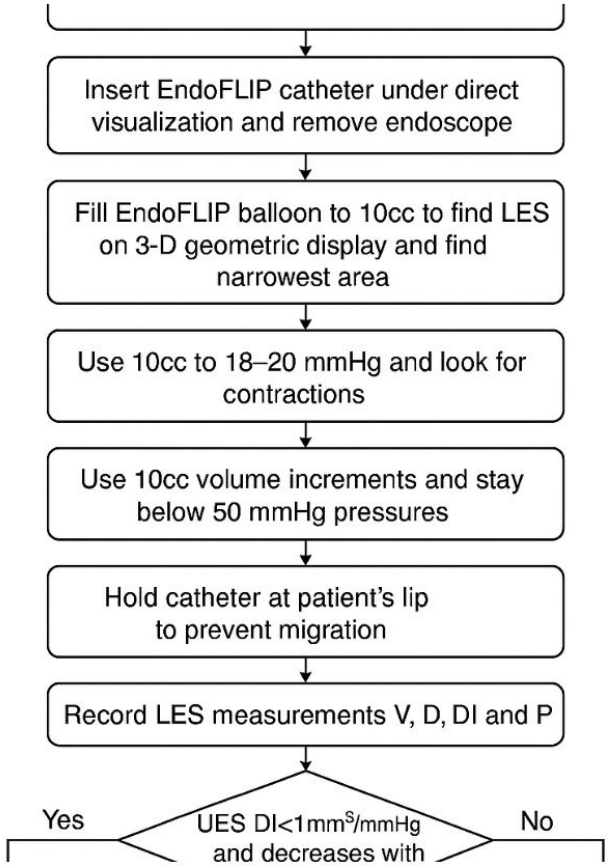
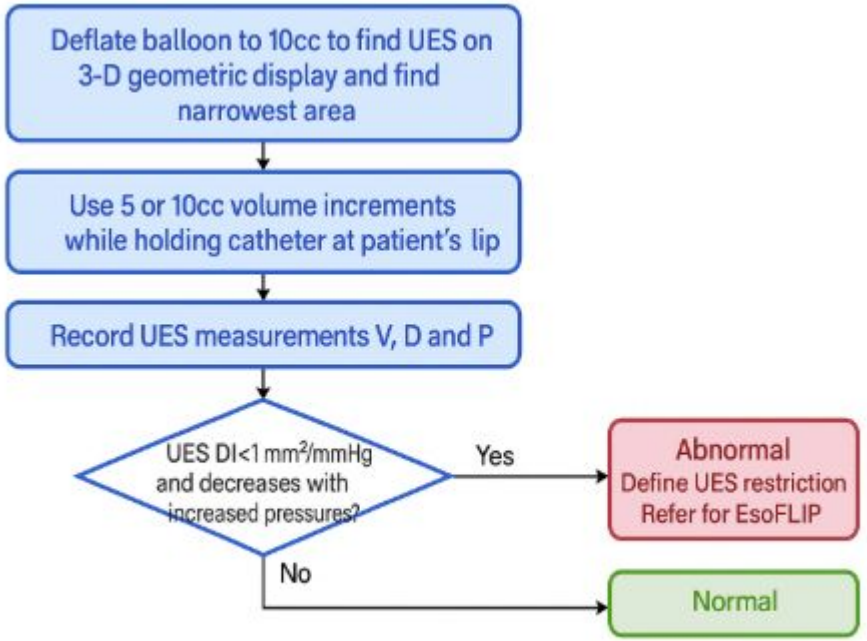
EndoFLIP Protocol

LES&EC



UES



Results

Demographics Highlights

- 150 patients with PFD
- 120 with persistent 0P dysphagia
- Predominant: male, English speaking, white, full term, DOSS 5, typical development, PO/GT, microscopic esophagitis, EOE 10%

1. Gender (N=150)	Male Female	64% 36%
2. Primary language (N=150)	English speaking Spanish speaking	94% 6%
3. Race/ethnicity (N=150)	White/Caucasian Hispanic/Latino Black African Native American Asian	59.3% 26% 10.7% 3.3% 0.7%
4. Gestational Age (N=144)	Full Term (>=37wks) Preterm (30-36wks) Extremely Preterm (<30wks)	68.1% 22.9% 9%
5. BMI/Weight for length (N=150)	>85% 5-85% <5%le	24.7% 60% 15.3%
6. DOSS-S on MBS (N= 113)	1 2 3 4 5 6 7	5.3% 12.4% 6.2% 18.6% 26.5% 17.7% 13.3%
7. Developmentally Delayed (N=150)	Yes No	39.3% 60.7%
8. Mode of Nutrition (N=148)	PO Fed Combo Fed Tube Fed	66.2% 16.9% 16.9%
9. Co-morbid GI Diagnosis (N=93)	Constipation Cow Milk Protein Intolerance GERD EOE	46.2% 25.8% 20.4% 7.5%
10. GI Medications (N=97)	Cyproheptadine Antacids Stool softeners Prokinetics	30.9% 29.9% 28.9% 10.3%
11. Prior esophageal surgeries (N=150)	Yes No	2.7% 97.3%
12. EGD Biopsies (N=145)	-Normal -EOE -Non-EOE microscopic esophagitis - Non-esophageal findings	21.5% 9.7% 61.1% 7.6%

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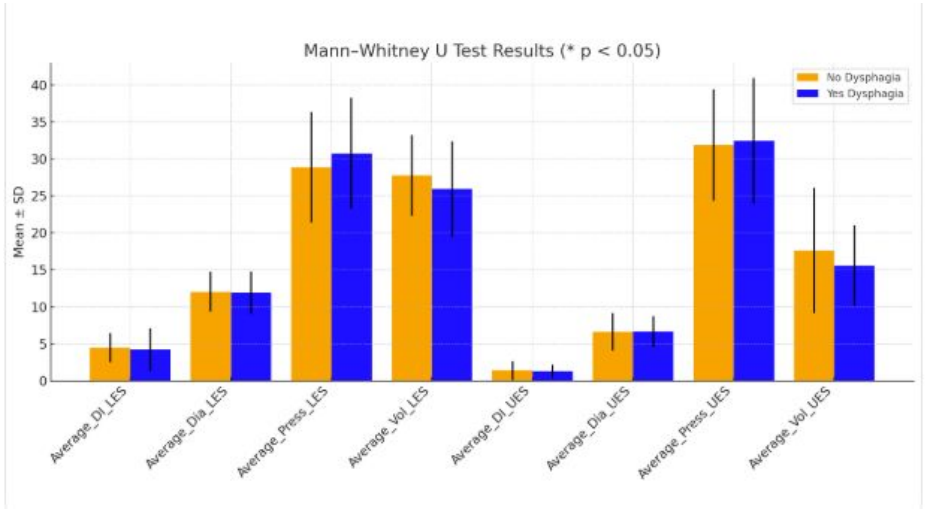
EndoFLIP Measurements in PFD Children < 3y

Statistical Comparison of Esophageal and UES Metrics by Dysphagia Status

Variable	Mean (No Dysphagia)	Mean (Yes Dysphagia)	T-test p-value	Mann–Whitney p-value
Average_DI_LES	4.46	4.21	0.676	0.646
Average_Dia_LES	12.03	11.90	0.185	0.242
Average_Press_LES	28.84	30.74	0.893	0.578
Average_Vol_LES	27.77	25.92	0.572	0.430
Average_DI_UES	1.38	1.28	0.354	0.441
Average_Dia_UES	6.62	6.66	0.401	0.534
Average_Press_UES	31.86	32.44	0.771	0.521
Average_Vol_UES	17.62	15.56	0.132	0.068 *

- values are close between groups, but some differences are noticeable:
  - slightly **higher LES pressure** in the dysphagia group
  - **UES volume consistently trends lower in** dysphagia patients suggesting a trend (p =0.13)

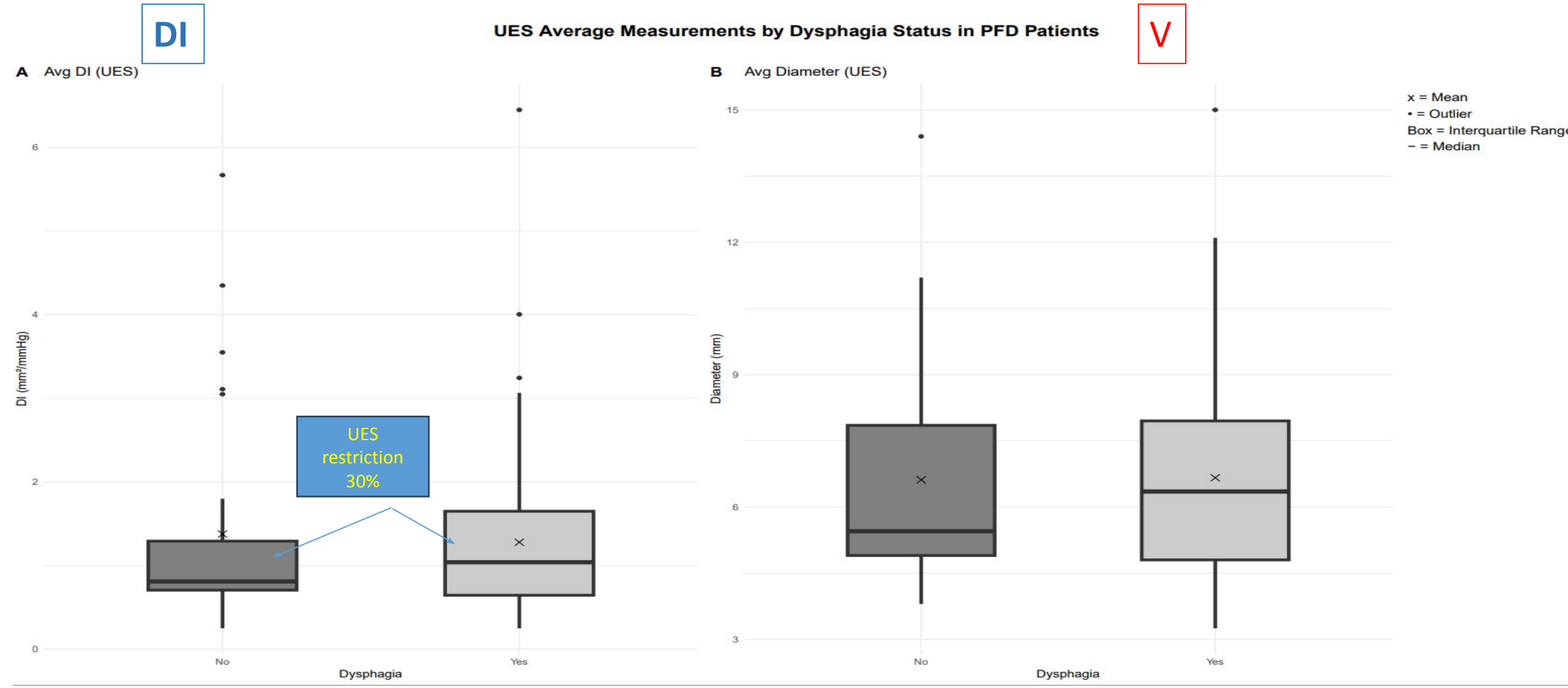
- Across both parametric (t-test) and non-parametric (Mann–Whitney) analyses, **no variables reach statistical significance**, but



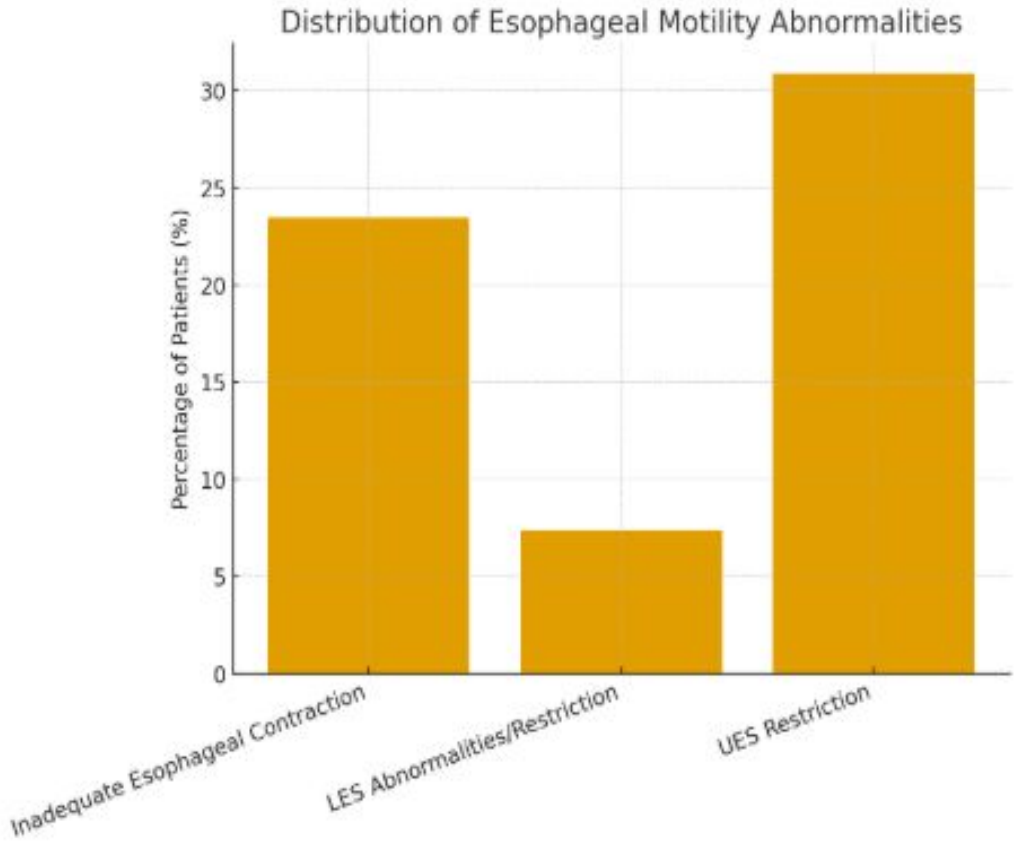
UES in PFD Patients

DI

V



Esophageal Contractility (EC) in 150 PFD children



Patterns of EC in PFD:

1. Ineffective EC frequency of RAC less than 5 per min, partial
2. Complete absence of RAC
3. Presence of RRC, absence of RAC

- **Inadequate contraction:** 23.5%
- **LES abnormalities/restriction:** 7.4%
- **UES restriction:** 30.9%

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LIMITATIONS/ NEXT STEPS

- Sample size (n = 150) -no statistical significance between dysphagia and non-dysphagia groups.
- Control group: patients without PFD
- Correlations between findings at EGD and PFD symptoms, aversion, esophageal dysphagia (Project B)

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Conclusions

1. First study of pediatric EndoFLIP baseline parameters (V, D, DI and Pressures of LES and UES) for patients ≤ 72 months old with PFD
2. PFD EndoFLIP patterns did not statistically differ between dysphagia and non-dysphagia
3. PFD patients with OP dysphagia DO not have more UES/LES abnormalities than controls without OPD
4. Endoflip in young children is easy to perform, and safe.
5. **Over 30% of young patients with PFD have UES dysfunction**
6. Clinical and pathologic characteristics of PFD with UES restriction are pending. (project B)

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This work has been presented at DDW 2025 and manuscript has been submitted

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THANK YOU

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Supplemental slides

EndoFLIP Measurements in PFD Children < than 3y

The SAS System 09:49 Thursday, May 8, 2025 1

The MEANS Procedure

Dysphagia	N Obs	Variable	N	Mean	Std Dev	Median	Lower Quartile	Upper Quartile	Minimum	Maximum
no	30	Average_DI_LES	24	4.46	1.99	4.11	2.85	5.60	1.80	10.90
		Average_Dia_LES	28	12.03	2.66	12.73	10.15	13.75	6.15	16.95
		Average_Press_LES	26	28.84	7.49	28.70	23.60	34.65	16.85	42.75
		Average_Vol_LES	28	27.77	5.46	27.50	25.00	27.50	17.50	42.50
		Average_DI_UES	30	1.38	1.28	0.81	0.70	1.30	0.25	5.67
		Average_Dia_UES	29	6.62	2.52	5.45	4.90	7.85	3.80	14.40
		Average_Press_UES	30	31.86	7.54	30.95	25.60	37.80	19.00	50.30
		Average_Vol_UES	30	17.62	8.47	15.00	12.50	17.50	10.00	50.00
yes	120	Average_DI_LES	109	4.21	2.90	3.70	2.68	5.00	0.53	26.25
		Average_Dia_LES	112	11.90	2.85	11.70	10.20	13.68	4.65	25.00
		Average_Press_LES	110	30.74	7.51	30.70	24.75	36.55	10.16	47.00
		Average_Vol_LES	112	25.92	6.47	25.00	22.50	27.50	12.50	47.50
		Average_DI_UES	113	1.28	0.90	1.04	0.65	1.65	0.25	6.45
		Average_Dia_UES	113	6.66	2.08	6.35	4.80	7.95	3.25	15.00
		Average_Press_UES	112	32.44	8.48	31.93	25.83	37.65	14.20	63.00
		Average_Vol_UES	113	15.56	5.48	12.50	12.50	17.50	6.50	37.50

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EndoFLIP Protocol

1. EGD with Biopsies, without using Sevoflurane or less than 0.3%).
2. Mark LES location on scope from incisors.
3. Insert EndoFLIP catheter (<5yo= 325N/80mm; >5yo= 322N/160mm) under direct visualization and remove the endoscope.
4. Fill in EndoFLIP balloon to 10cc to find LES on 3-D geometric display on screen and the find the narrowest area (Notice the sensor number for consistency of measurements).
5. Slowly fill in more volume to obtain pressures of 18-20mm Hg and look for contractions (RAC/RRC) or absence.
6. Use 10cc volume increments and stay below 50 mmHg pressures.
7. Hold the catheter patient's lip to avoid it being pushed to stomach with increase in volume, for accurate results.
8. Record LES measurements for V, D, DI and P.

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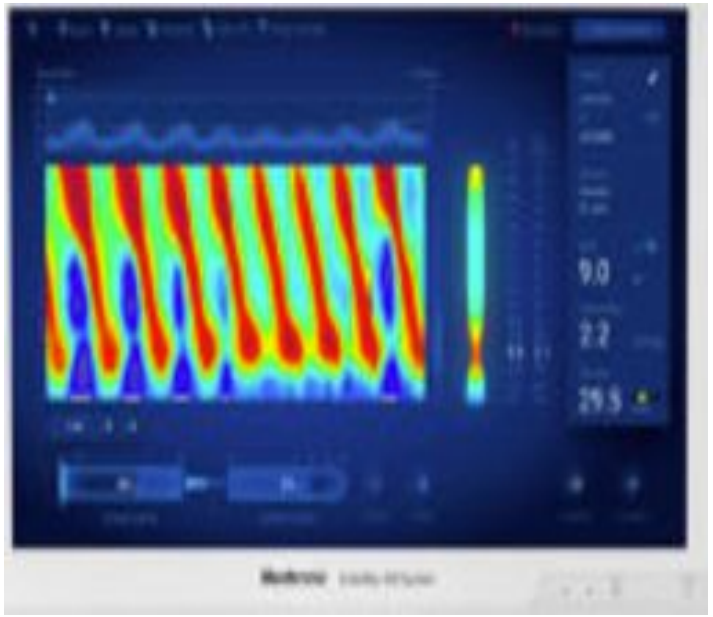
EndoFLIP Protocol (2/2)



9. RRC and absence of contractions were considered abnormal and started on treatment based on esophageal biopsies (EOE, GERD) and dysmotility (prokinetics).

10. LES DI <3 mm2/mmHg was considered abnormal and referred for EsoFLIP.

11. Deflate the balloon to 10 cc to safely move up the catheter to find UES on the 3-D geometric display on the screen and find the narrowest area (Notice the sensor number for consistency of measurements).

12. Use 5 or 10cc volume increments while holding the catheter safely at the patient's lip to prevent it from being pushed into the esophagus.

13. Record UES measurements for V,D, DI and P.

14. UES DI <1 mm2/mmHg and decreasing with increased pressures was considered abnormal , defined UES restriction and referred for EsoFLIP.

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Strengths, Limitations, Next steps

STRENGTHS	LIMITATIONS/ NEXT STEPS
1. First study to describe EndoFLIP baseline parameters (V, D, DI and P of LES and UES) for patients ≤ 72 months old 2. Procedure was safe, adding only 5-10mins to routine EGD 3. This pediatric PFD cohort showed a unique abnormality-UES restriction.	1. Sample size (n = 150) -no statistical significance between dysphagia and non-dysphagia groups. 2. Control group: patients without PFD 3. Correlations between findings at EGD and PFD symptoms, aversion, esophageal dysphagia (Project B)

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