Current results of Transoral Incisionless Fundoplication in the Management of Chronic Refractory GERD

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Introduction

Refractory gastroesophageal reflux disease (GERD) to medications and lifestyle modifications remains a major disease burden in the medical community. The standard of care remains fundoplication. Laparoscopic fundoplication has been the standard for many years, but with the introduction of Transoral incisionless fundoplication (TIF) in the late 2000s, treatment outcomes have been closely followed. The TIF procedure has since then undergone many changes with newly evolved equipment and updated guidelines for optimal patient satisfaction. This novel method of fundoplication has evolved through three eras as classified for this study; pre TIF 2.0 (Era 1), TIF 2.0 (Era 2), and cTIF for Hill 3 or greater with an axial displacement > 2.0 cm (Era 3). Data showing improvement of GERD outcomes with the evolution of TIF has not yet been analyzed. The aim of this study is to evaluate and compare GERD outcomes with the evolution of TIF through these three Eras.

Methods and Materials

- EMBASE, PubMed, and Cochrane Library databases (from Feb. 2008 to Sept. 2021) were used to conduct a systematic review identifying studies investigating the outcomes of TIF and cTIF.
- The outcomes analyzed for this study include: Gastro Esophageal Reflux Symptom Scale (GERSS), GERD Health-Related Quality of Life Questionnaire (GERD-HRQL), Acid Exposure Time (AET), DeMeester scores, Reflux Symptom Index (RSI), and percentage of PPI cessation.
- Results are expressed as differences in means. Statistical analysis was done using Microsoft Excel (Microsoft, Redmond, WA) to compare the mean averages of the three groups

Era 1

Author (year)	GERD-HRQL		DeMeester		AET		% PPI Cessation
	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Post-TIF
Chimukangara (2019)	24	7					47
Smeets (2015)	26	10					67
Muls (2013)	24.2	7.9					74
Witteman (2013)	32	23			7.1	9	
Witteman (2012)	33	4	21	17	7.4	5.5	
Svoboda (2011)	21.2	5.8					50
Romario (2011)	45	10					
Demyttenaere (2010)	22	10					
Repici (2010)	40	7					
Cadière (2009)	17	7					
Bergman (2008)	8	3.3					
Cadière (2008)	24	58	34	28	10	7	85
Cadière (2008)	17	6					82

Table 1. Characteristics of studies included in Era 1 of the meta-analysis

Era 2

Author (year)	GERSS		GERD-HRQL		RSI		DeMeester		AET		% PPI Cessation
	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Post-TIF
Huang (2015)	32.4	6.7	27.4	10.9	15.3	7.2					
Trad (2018)			26.4	6.9	22.2	6.3					
Trad (2017)							36	26.5	10.5	7.6	78
Trad (2015)			34	16					9.6	6.2	90
Håkansson (2015)									7.8	3.6	59
Hunter (2015)			25	5			33.6	23.9	9.3	6.4	72
Rinsma (2014)			27.5	13.2					10.9	7.3	67
Trad (2012)	26.8	4.6	26.4	6	19.2	6.1					82
Narsule (2012)			23	6.7							54
Petersen (2012)					10.5	6.2	32.5	19.3	8.9	3.8	43
Bell (2012)	29.6	8.3	26.2	7.8	21.2	7.9	40.3	21.9	10.5	6.2	90
Velanovich (2010)			25	5							79
Witteman (2015)			26.5	12.4					10.8	7.7	75
Witteman (2015)			27.1	10.3					11.0	9.1	66
Bell (2021)			19.6	3.5							
Testoni (2019)			46	10							
Fanous (2018)	17	2.4	29.6	4.8	22.3	6.1					100
Fanous (2017)	5	0	20	0	11	0					
Ebright (2017)			22	10							
Stefanidis (2017)			27	4							
Testoni (2015)			20	16			22	18			84
Rinsma (2015)			23.7	8.5					9.7	6.9	
Bell (2014)	35	5	26	6	24	6	34.4	19			
Bell (2014)			28	5							70
Trad (2014)			26.43	10.05	22.62	8.76	35.79	28.60	10.50	7.87	
Wilson (2014)	26	4	24	2	20	5					
Testoni (2012)			22	17			21	19			
Rosen (2012)			13.4	5.7							
Bell (2011)			15.3	5.0	22.8	12.9					
Barnes (2011)	46	0	28	2	29	4					
Testoni (2010)			20	16			20	18			

Table 2. Characteristics of studies included in Era 2 of the meta-analysis

Era 3

Author (year)	GERSS		GERD-HRQL		RSI		DeMeester		% PPI Cessation
	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Pre-TIF	Post-TIF	Post-TIF
Ihde (2019)			33.75	9.07	20.32	8.07	35.3	10.9	
Janu (2019)	25.8	5.3	25.1	4.6	28.5	8.9			
Snow (2021)									94
Ihde (2011)	28.9	8.3	26.2	6.3	20.2	7.7			
Choi (2021)			23.26	7.37	17.67	8.1	43.7	4.9	90
Gisi (2021)	9.23	2.84	38.6	9.46	25.6	11.7			81
Fanous (2020)	44	0	56	0	42	2			
Fanous (2019)	40	7	30	2					
Fanous (2019)			33.6	4.9					
Fanous (2018)			28.7	1.5	23	0.5			
Chang (2016)			26.4	5.9					
Choi (2020)			23.3	7.37	17.7	8.1			86
Wang (2018)									85
Janu (2017)					3.42	0.47			
Huang (2015)	24.7	4.9	22.4	5.2	12.1	3.4			

Table 3. Characteristics of studies included in Era 3 of the meta-analysis

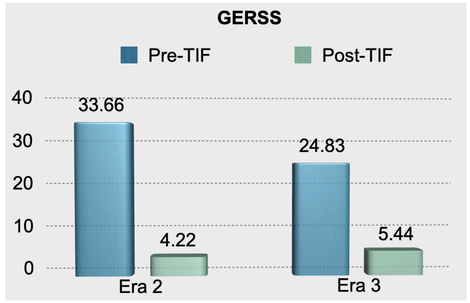


Figure 1. GERSS scores in Era 2 and Era 3 pre- and post-TIF

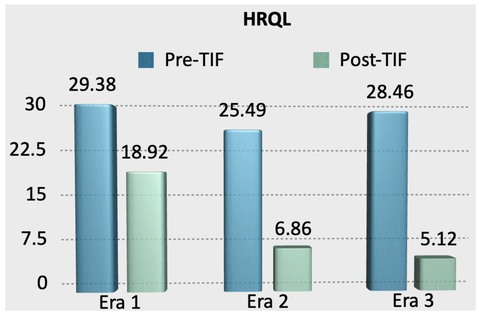


Figure 2. GERD-HRQL scores in Era 1, Era 2 and Era 3 pre- and post-TIF

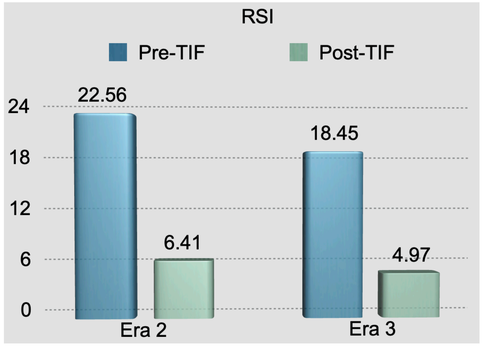


Figure 3. RSI scores in Era 2 and Era 3 pre- and post-TIF

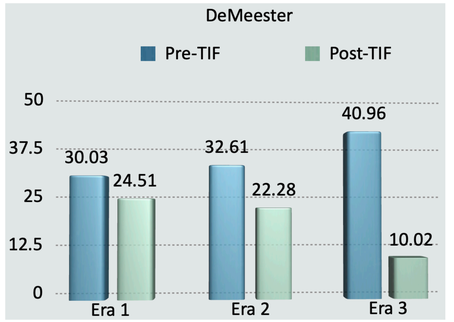


Figure 4. DeMeester scores in Era 1, Era 2 and Era 3 pre- and post-TIF

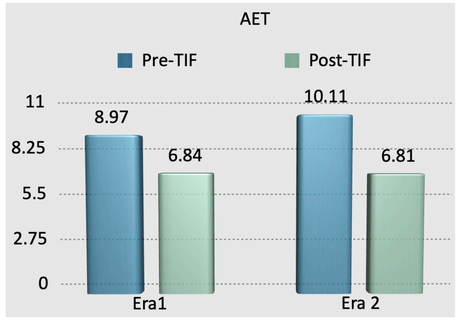


Figure 5. AET scores in Era 1 and Era 2 pre- and post-TIF

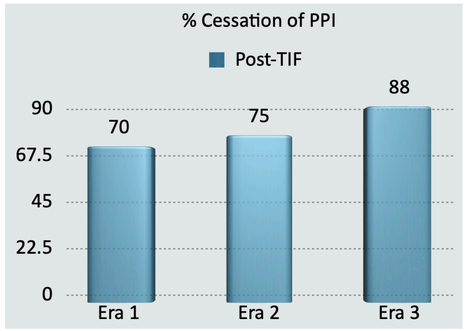


Figure 6. Percent Cessation of PPI in Era 1, Era 2 and Era 3 post-TIF (%)

Results

- In this meta-analysis, fifty-nine studies were quantitatively assessed.
- A total of 2,905 patients were included
- 782 patients underwent cTIF
- 1,695 patients underwent TIF 2.0
- 428 patients underwent TIF 1.0
- GERD-HRQL (18.92 vs. 6.86 vs. 5.12) improved significantly from Era 1 to Era 3
- % PPI cessation (70% vs. 75% vs. 88%) improved with the evolution of the Eras
- DeMeester scores (24.51 vs. 22.28 vs. 10.02) improved from Era 1 to Era 3
- RSI (4.97 vs. 6.41) was noted to be better in Era 3 compared to the other eras
- GERSS (4.22 vs. 5.44) was slightly better in Era 2
- No significant improvement in AET was noted (6.84 vs 6.81).

Conclusion

The evolution of the TIF procedure and criteria has produced improved outcomes in the management of patients with chronic refractory GERD symptoms.

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