

Introduction

- Laryngeal cancer accounts for one-third of all head and neck cancers, with approximately 13,000 new cases each year in the U.S. alone ^{1,2}
- Treatment options and mortality vary based on tumor location and stage at diagnosis. Advanced-stage disease often necessitates total laryngectomy (TL) ³
- Incidence of dysphagia after TL ranges from 10-90% ⁴⁻⁸ and significantly impacts quality of life ^{4,7}
- Elucidating the cause and features of dysphagia after TL can inform patient counseling as well as clinical efforts to mitigate this outcome.
- This study aims to determine the incidence of dysphagia after total laryngectomy, examine the frequency of esophageal dilation post-laryngectomy, and evaluate risk factors for requiring dilation.

Methods

- Retrospective review of patients who underwent total laryngectomy for head and neck cancer at a tertiary care hospital between 2007 and 2020.
- Variables recorded include: medical comorbidities, smoking status, surgery findings, pathologic staging, oncologic history, post-operative outcomes, and longitudinal dysphagia symptoms at post-operative increments of 3, 12, and 24 months.
- Swallowing outcome was measured with tube feed dependence and functional oral intake scale (FOIS). ⁹
- A multivariable regression analysis was used to analyze predictors of esophageal dilation.

Functional Oral Intake Scale (FOIS):

Crary, Mann, & Groher, 2005

- LEVEL 7:** Total oral diet with no restrictions
- LEVEL 6:** Oral diet, multiple consistencies, no special preparation, specific food limitations
- LEVEL 5:** Oral diet, multiple consistencies, requiring special preparation or compensations
- LEVEL 4:** Oral diet, single consistency
- LEVEL 3:** Tube dependent with consistent oral intake of food or liquid
- LEVEL 2:** Tube dependent, minimal attempts of food or liquid
- LEVEL 1:** NPO

Results

- 307 patients met inclusion criteria (Table 1)

	All Patients (n =307)	No Dilation	Dilation	P Value
Age	65.8±10.9	64.3±11.2	66.4±10.8	0.117
Sex	247 (80.5%) Male	183 (84.7%)	64 (70.3%)	0.006
Race				1.00
Caucasian	254 (82.7%)	179 (82.9%)	75 (82.4%)	
African American	40 (13.0%)	28 (13.0%)	12 (13.2%)	
Other	13 (4.2%)	9 (4.2%)	4 (4.4%)	
Oncologic History				
Primary	162 (52.8%)	120 (74%)	42 (26%)	0.084
Recurrent	145 (47.2%)	96 (66.2%)	49 (33.8%)	
Prior Radiation	148 (48.2%)	98 (45.4%)	50 (54.9%)	0.159
Prior Chemotherapy	85 (27.7%)	55 (25.5%)	30 (33.0%)	0.229
Surgery Details				
Pharyngectomy	n=305	n=214	N=91	0.420
None	192 (63.0%)	138 (64.5%)	54 (59.3%)	
Partial	77 (25.2%)	54 (25.2%)	23 (25.3%)	
Total	36 (11.8%)	22 (10.3%)	14 (15.4%)	
Glossectomy	n=306	n=215	79 (86.8%)	0.81
None	267 (87.3%)	188 (87.4%)	12 (13.2%)	
Partial	31 (10.1%)	19 (8.8%)	-	
Total	8 (2.6%)	8 (3.7%)	-	
Reconstruction:				
Primary Closure	140 (45.6%)	100 (46.3%)	40 (44.0%)	<0.0001
Local Flap	37 (12.1%)	35 (16.2%)	2 (2.2%)	
Free Tissue Transfer	130 (42.3%)	81 (37.5%)	49 (53.8%)	
Inset	n=157	n=108	n=49	0.131
-Incorporated	113 (72.0%)	75 (69.4%)	38 (77.6%)	
-Onlay	36 (22.9%)	29 (26.9%)	7 (14.3%)	
-Tubed	8 (5.1%)	4 (3.7%)	4 (8.2%)	

Incidence of Dilations after TL	33% (n=91)
Mean days from TL to 1 st dilation	11.5 months (345 ± 376 days)
Mean number of dilations	3.6 ± 5.2
Mean time between dilations	143 ± 329 days
Average maximum dilation size	54 ± 9 (French or Maloney)
Single Dilation	38.5% (n=35)
>3 Dilations	39.6% (n=36)
Dilations within 1 year of TL	67% (n=61)
Dilations within 1-2 years	22% (n=20)
Dilations >2 years after TL	11% (n=10)

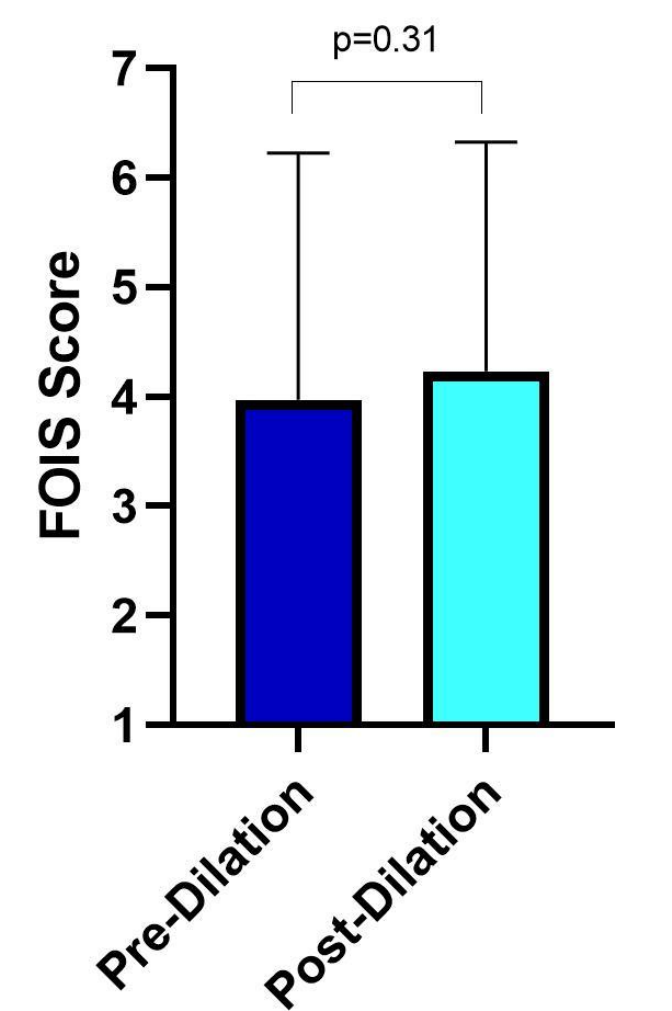
- At 12 months, 2.5% (n=10) of patients did not tolerate oral diet and 13.4% (n=41) had an FIOS score of <3 indicating tube feed (TF) dependence
- 33% (n=100) of patients had preoperative TFs and 26% (n=26) of them required dilations postoperatively
- Of these patients 69% (n=18/26) still required TFs at 3 months, but by 12 months 0% of patients required TFs, demonstrating improvement in diet after dilation
- 52% (67/122) of patients who had free flap reconstruction required tube feeds at 3 months, 25% (24/97) at 12 months, and 8% (8/55) at 24 months. Some patients were lost to follow-up.

	Pre-Op	Discharge	3 mo. post	12 mo. post	24 mo. post
Total with Tube Feeds	100 (32.6%)	264 (86%)	125 (41%)	52 (17%)	13 (4%)
Average FIOS Score	N=306 4.1 ± 2.7	-	N=283 4.1 ± 2.2	N=198 5.1 ± 2.2	N=126 5.4 ± 2
Diet:	N=307	N=284	N=288	N=203	N=140
NPO	86 (28%)	160 (52.1%)	23 (7.9%)	10 (2.5%)	4 (2.9%)
Soft, pureed, liquid	32 (10%)	76 (26.8%)	-	-	-
Regular Food	189 (62%)	48 (16.9%)	-	-	-

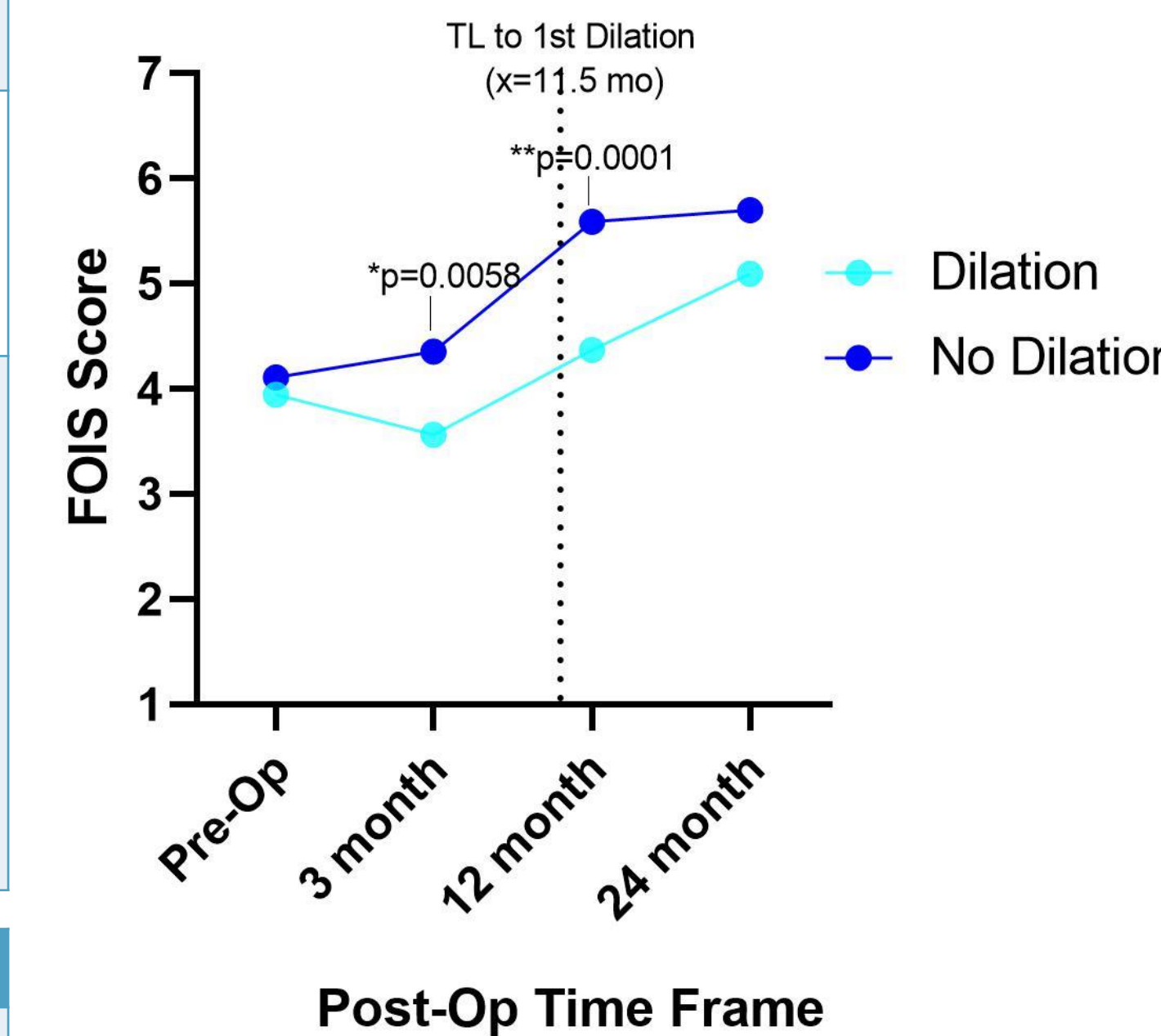
Results cont.

- Overall, FOIS scores and diet improved with time after dilation; however FOIS did not significantly improve immediately after dilation when comparing available pre/post timepoints
- Multivariate analysis:**
 - Free flap reconstruction (vs. primary closure; OR, 1.95; 95% CI, 1.10-3.46) as the only variable associated with need for dilation
 - No association between primary vs. salvage disease, additional pharyngectomy, glossectomy, preoperative enteric feed, and adjuvant therapy
 - Average FOIS at 1 year was lower in patients with free flap reconstruction vs. primary closure (4.8 ± 2 vs. 5.3 ± 2) and significantly lower than patients with local flaps (4.8 ± 2 vs. 5.9 ± 1.8)

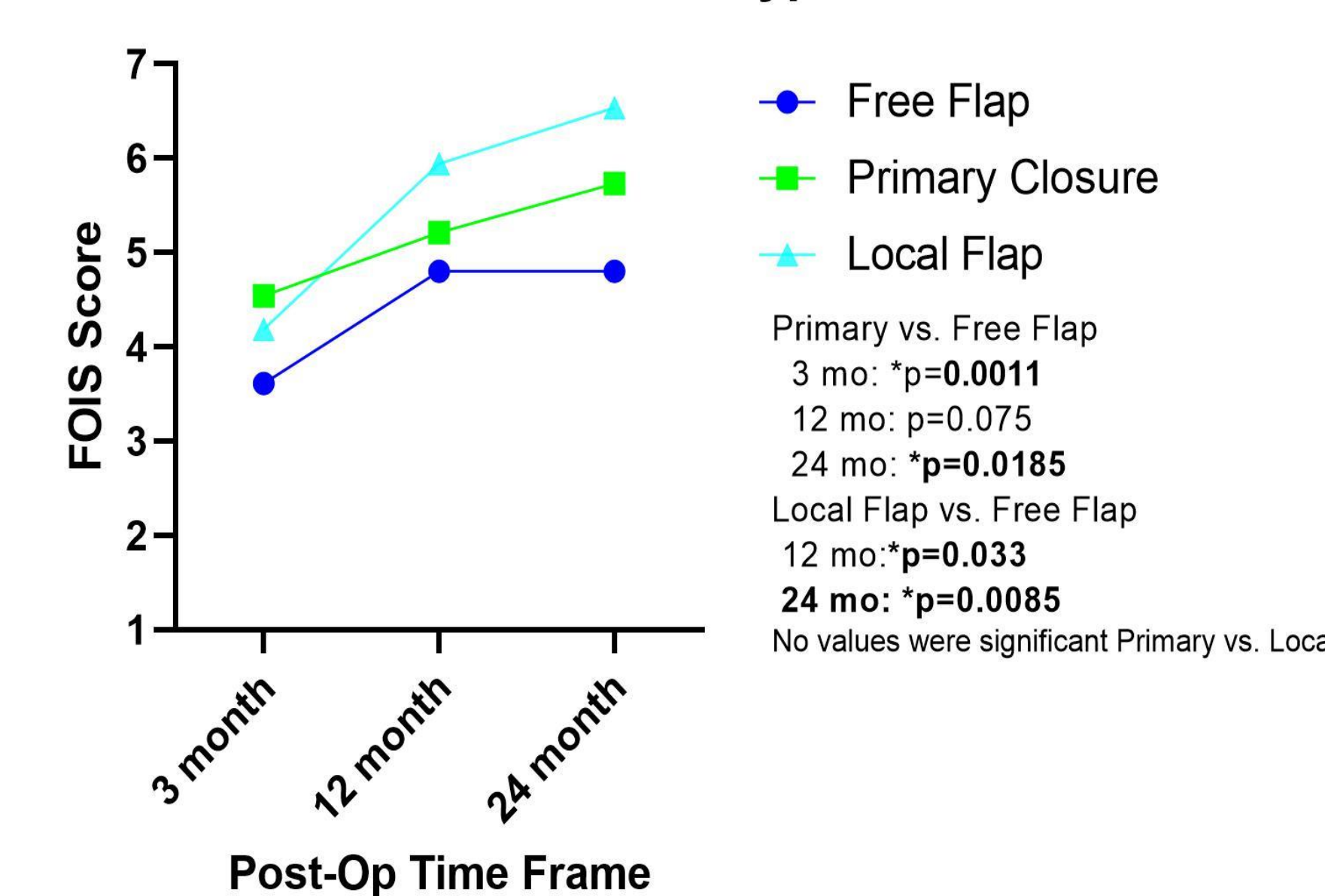
FOIS Score Pre + Post Dilation



Functional Oral Intake Scale



FOIS Score: Reconstruction Type



Conclusion

Esophageal dilation is an effective treatment in improving swallowing outcomes after total laryngectomy. Patients who needed dilation did not have significantly different FOIS scores by 24 months than those who did not. Patients with free flap reconstruction are at higher risk of receiving esophageal dilation and have lower FOIS scores. Patients who were PEG tube dependent prior to laryngectomy and those who underwent radiation were able to achieve an oral diet after dilation.

References

- Hutcheson KA, Alvarez CP, Barringer DA, Kupferman ME, Lapine PR, Lewin JS. Outcomes of elective total laryngectomy for laryngopharyngeal dysfunction in disease-free head and neck cancer survivors. *Otolaryngol Head Neck Surg.* 2012;146(4):585-590. doi:10.1177/0194599811432264
- American Cancer Society. Key Statistics for Laryngeal and Hypopharyngeal Cancers. <https://www.cancer.org/cancer/laryngeal-and-hypopharyngeal-cancer/about/key-statistics.html#:~:text=The%20American%20Cancer%20Society's%20most,will%20die%20from%20laryngeal%20cancer.> Published January 12, 2021. Accessed April 5, 2021.
- Theunissen EA, Timmermans AJ, Zuur CL, et al. Total laryngectomy for a dysfunctional larynx after (chemo)radiotherapy. *Arch Otolaryngol Head Neck Surg.* 2012;138(6):548-555. doi:10.1001/archoto.2012.862
- Terlingen LT, Pilz W, Kuijter M, Kremer B, Baijens LW. Diagnosis and treatment of oropharyngeal dysphagia after total laryngectomy with or without pharyngoesophageal reconstruction: Systematic review. *Head Neck.* 2018;40(12):2733-2748. doi:10.1002/hed.25508
- Schuman AD, Birkeland AC, Farlow JL, et al. Predictors of Stricture and Swallowing Function Following Salvage Laryngectomy [published online ahead of print, 2020 Nov 5]. *Laryngoscope.* 2020;10.1002/lary.29215. doi:10.1002/lary.29215
- Lee MT, Govender R, Roy PJ, Vaz F, Hilari K. Factors affecting swallowing outcomes after total laryngectomy: Participant self-report using the swallowing outcomes after laryngectomy questionnaire. *Head Neck.* 2020;42(8):1963-1969. doi:10.1002/hed.26132
- Perry A, Casey E, Cotton S. Quality of life after total laryngectomy: functioning, psychological well-being and self-efficacy. *Int J Lang Commun Disord.* 2015;50(4):467-475. doi:10.1111/1460-6984.12148
- Arenaz Búa B, Pendleton H, Westin U, Rydell R. Voice and swallowing after total laryngectomy. *Acta Otolaryngol.* 2018;138(2):170-174. doi:10.1080/00016489.2017.1384056
- Crary, Michael A, et al. Initial Psychometric Assessment of a Functional Oral Intake Scale for Dysphagia in Stroke Patients. *Archives of Physical Medicine and Rehabilitation, Volume 86, Issue 8, 1516 - 1520*