

Introduction

- Incidence of dysphagia after total laryngectomy (TL) ranges from 10-90% ¹⁻⁵ and significantly impacts quality of life ^{1,4}
- 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).⁶
- 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

Figure 1

Results

- 307 patients met inclusion criteria (Table 1)

Table 1. Demographics				
	All Patients (n =307)	No Dilation (n=216)	Dilation (n= 91)	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%)	0.081
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:	n=304	n=214	n=90	<0.0001
Primary Closure	138 (45.4%)	99 (46.3%)	39 (43.3%)	
Local Flap Incorporated	16 (5.3%)	15 (7%)	1 (1.1%)	
Local Flap Onlay	20 (6.6%)	19 (8.9%)	1 (1.1%)	
Free Tissue Transfer	130 (42.8%)	81 (37.5%)	49 (54.4%)	
Inset				
-Incorporated	91 (29.9%)	61 (28.5%)	30 (33.3%)	
-Onlay	23 (7.6%)	15 (7.0%)	8 (8.9%)	
-Tubed	16 (5.3%)	5 (2.3%)	11 (12.2%)	

Results

Table 2: Dilation Summary	
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)

- 26% (n=26) of patients on TF pre-op 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.
- Overall, FOIS scores and diet improved with time after dilation; however FOIS did not significantly improve immediately after dilation

FOIS Score Pre + Post Dilation

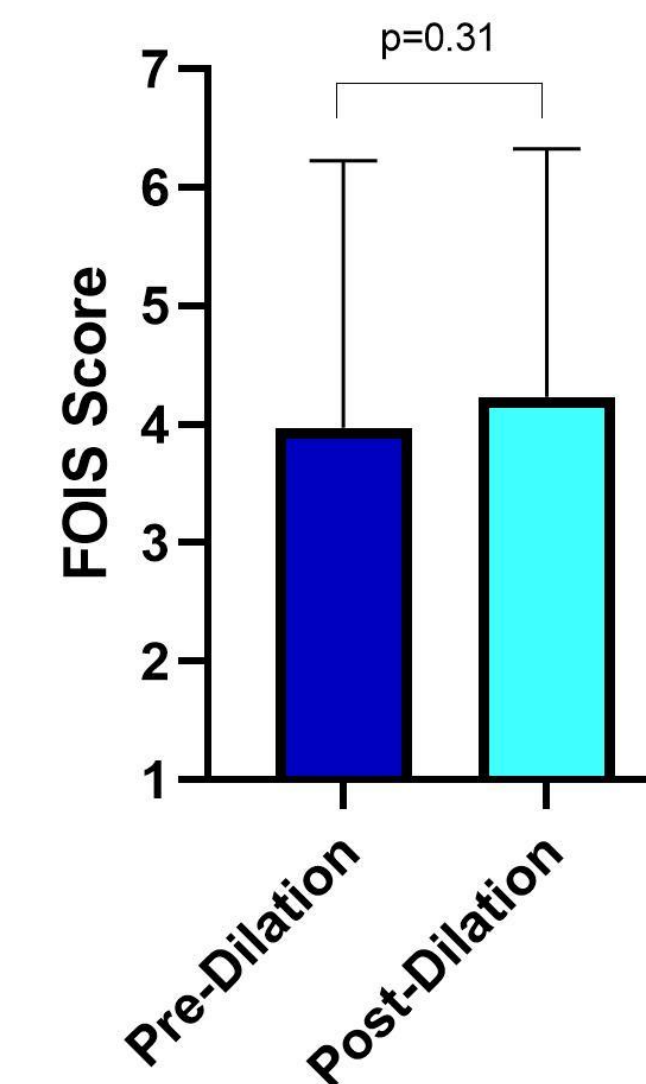
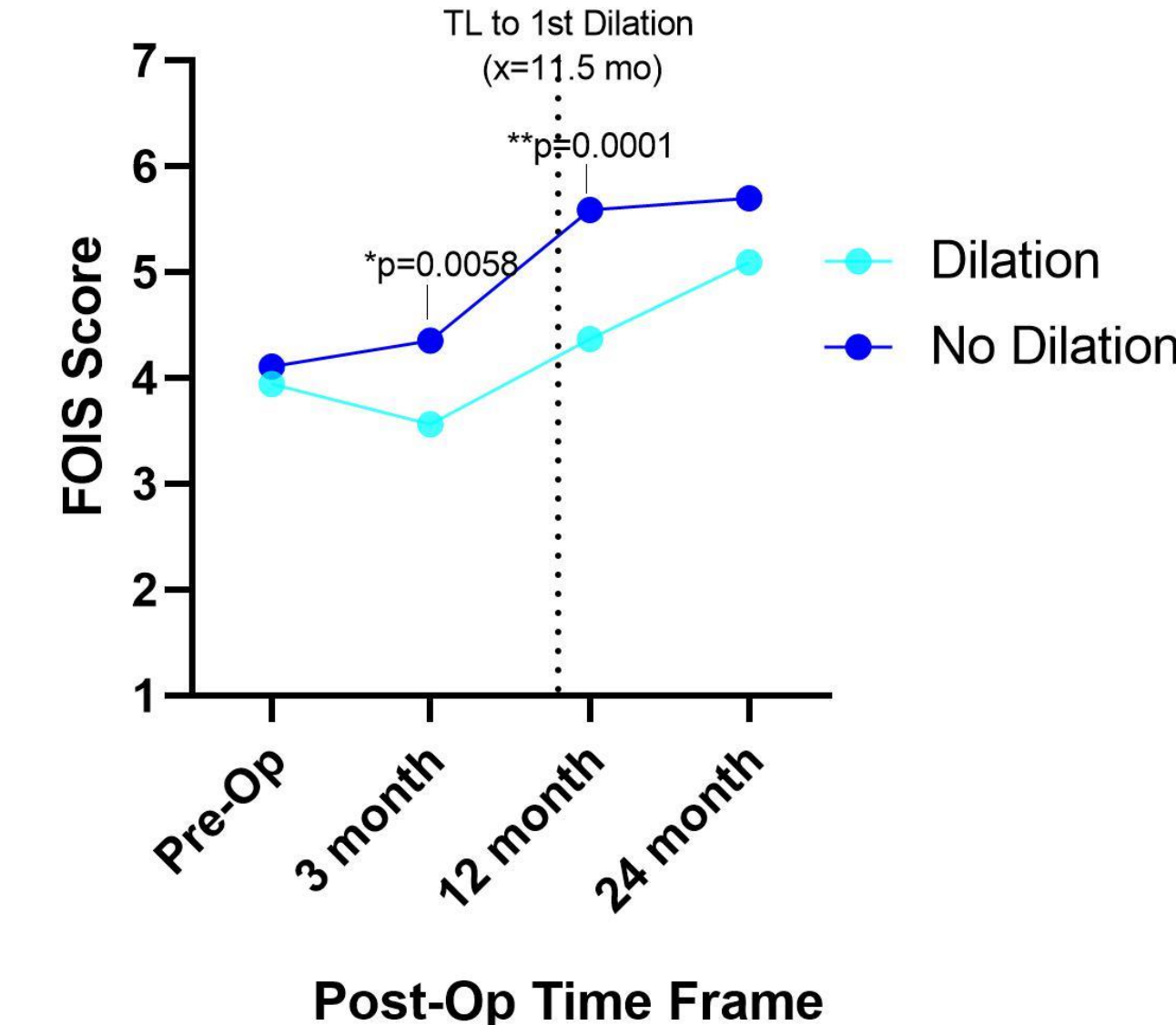


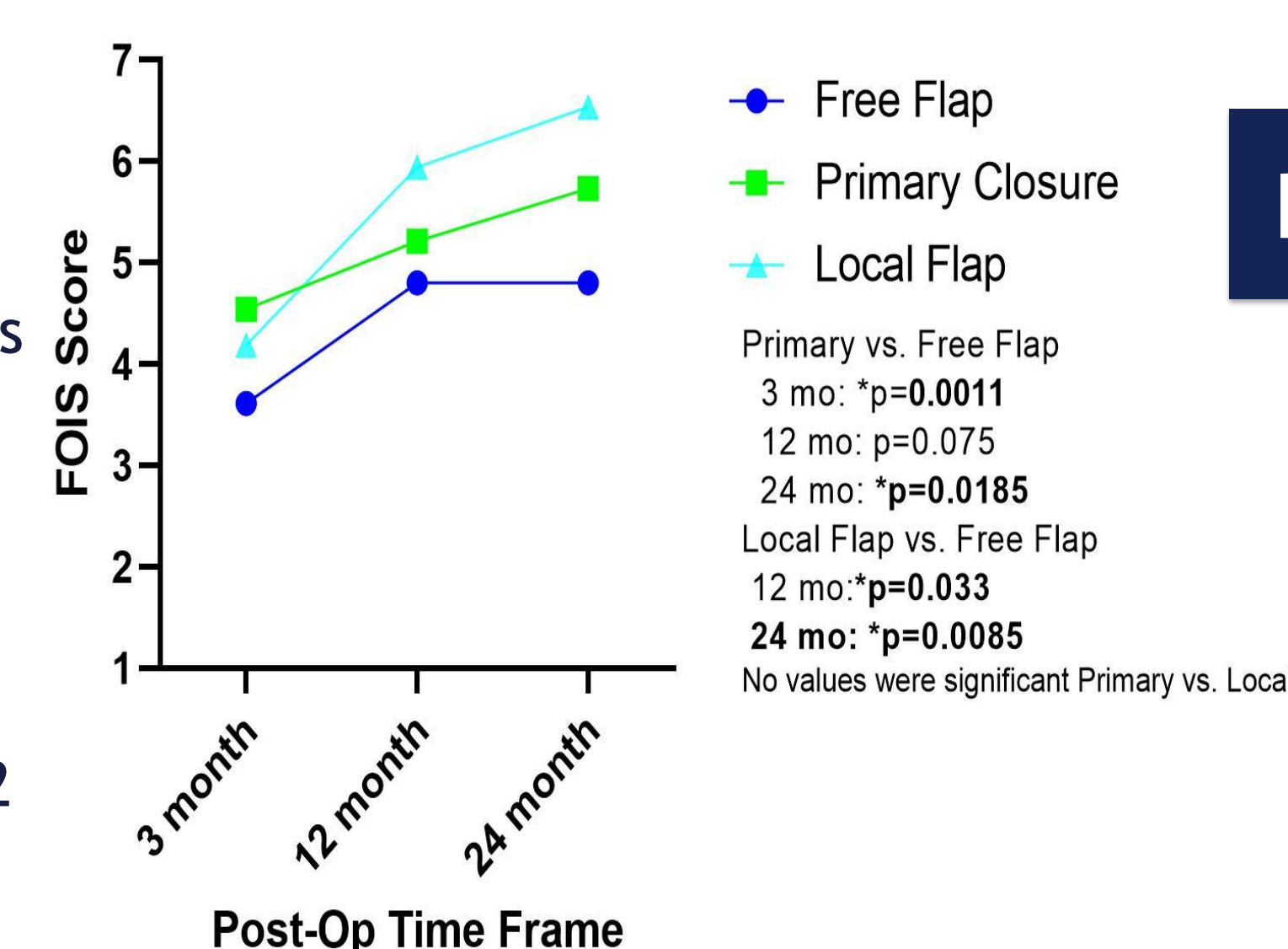
Table 3: Diet Summary					
	Pre-Op	Discharge	3 mo. post	12 mo. post	24 mo. post
Total with Tube Feeds	100 (32.8%)	264 (86%)	125/288 (43.4%)	52/223 (23.3%)	13/139 (9.4%)
Average FIOS Score	N=306 4.1 ± 2.7	-	N=283 4.1 ± 2.2	N=198 5.1 ± 2.2	N=126 5.4 ± 2
Diet:	N=307	N=284	N=288	N=203	N=140
NPO	86 (28%)	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%)	-	-	-

- As to be expected, FIOS at 3 month was significantly lower than pre-op [OR 0.580 95% CI (0.405~0.830), p=003]. Lower FOIS score correlated with need for dilation
- However, FIOS significantly improved after 3 months at both 1 year and 2 years (p<0.0001)
- FIOS was significantly higher at 1 year and 2 years than pre-op scores (p= 0.001)
- As predicted, total pharyngectomy and tubed free flap significantly increase the risk of worse swallowing outcomes
- Tubed free flaps significantly increased the need for dilation (Figure 2)
- Total and partial pharyngectomy associated with higher number of dilations (all p<0.041)
- Total and partial glossectomy significantly increased odds of having a lower FIOS score (p=0.013 and p=0.002, respectively)
- Interestingly, total thyroidectomy was associated with significantly lower FIOS scores (p=0.017)
- Post-op fistula increased odds of TF at 1 year (p= 0.018) and NPO at 3 months, 1yr, 2 yr (all p <0.017)
- Recurrent disease, comorbid GERD, and Diabetes significantly increase odds of TF at 2 years (all p<0.013)

Functional Oral Intake Scale



FOIS Score: Reconstruction Type



Results cont.

Outcome Predictors by Type of Reconstruction

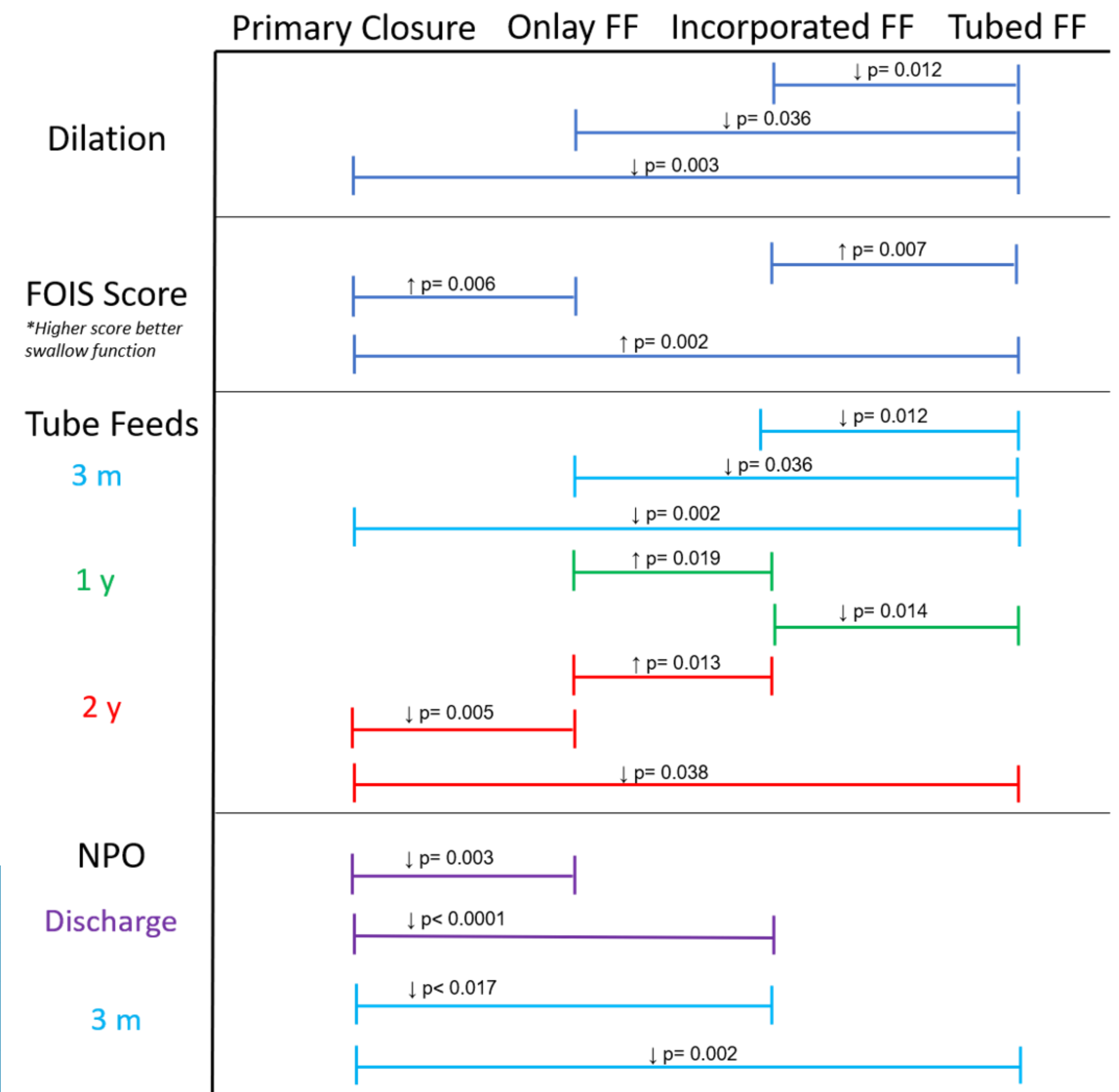


Figure 2: Multivariate model of outcome predictors based on type of reconstruction. Only significant values are displayed. Note: Comparisons are read left to right. P-values correspond to odds ratio

Conclusion

- Esophageal dilation is an effective treatment in improving swallowing outcomes after total laryngectomy.
- At all levels of analysis, tubed free flaps did worse due to circumferential loss of pharyngeal constrictors and an adynamic pharyngeal funnel.
- Patients with free flap reconstruction are at higher risk of receiving esophageal dilation and have lower FOIS scores than primary closure.
- Patients who were PEG tube dependent prior to laryngectomy and those who underwent radiation were able to achieve an oral diet after dilation.

References

- [1] Terlingen LT, Pilz W, Kuijper 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
- [2] 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
- [3] Lee MT, Govender R, Roy PJ, Vaz F, Hillari 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
- [4] 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
- [5] 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
- [6] 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