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Nature, Predictors and Impact of Chronic Oropharyngeal Dysphagia Following Curative Resection for Esophageal Cancer: A Cross-Sectional Study

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Research Team



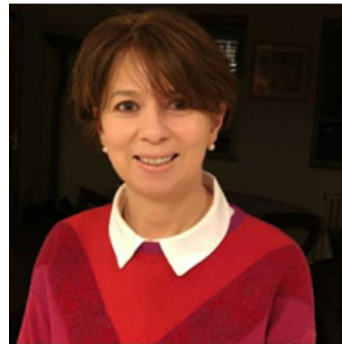
INGEST
IMPROVING SWALLOWING IN OESOPHAGEAL CANCER



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Esophageal Cancer

The **sixth leading cause** of cancer mortality with over 500,000 cancer deaths annually. (Huang et al 2021)

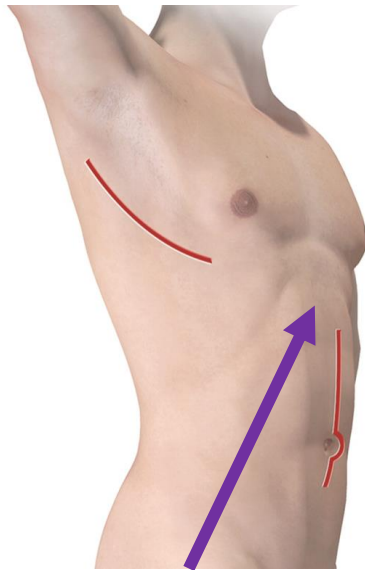
Aggressive in nature with a low overall **5 year survival rate below 20%**. (American Cancer Society Survival Rates for Esophageal Cancer 2020)

Esophagectomy Surgery

There are two main approaches for esophageal resection:

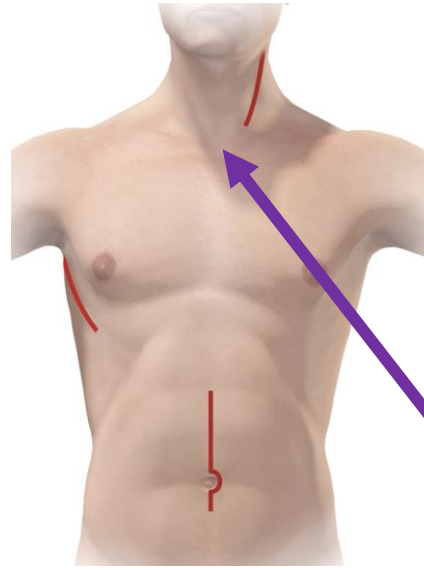
Transthoracic Resection

2 Stage Approach



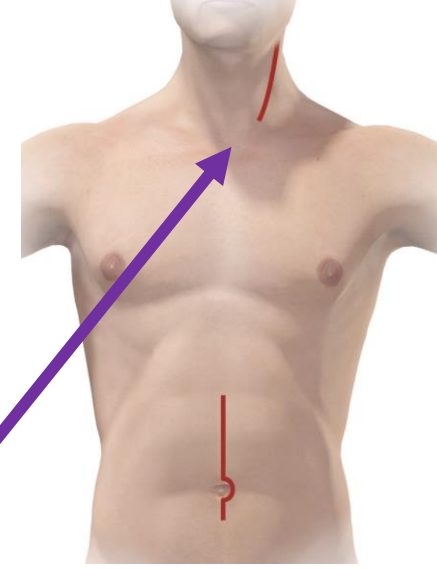
Thoracic anastomosis

3 Stage Approach



Cervical anastomosis

Transhiatal Resection



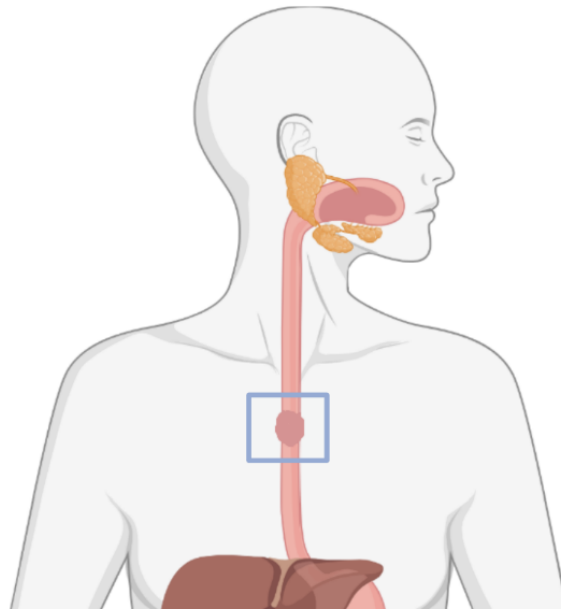
Study Background

Dysphagia is a common symptom of oesophageal cancer

(Hambreus et al 1987, Roy et al 1988, Peters et al 1995, Heitmiller & Jones 1991)

Prevalence: 93% of patients with scc, 79% of patients with adenocarcinoma

(Gibbs et al 2007)



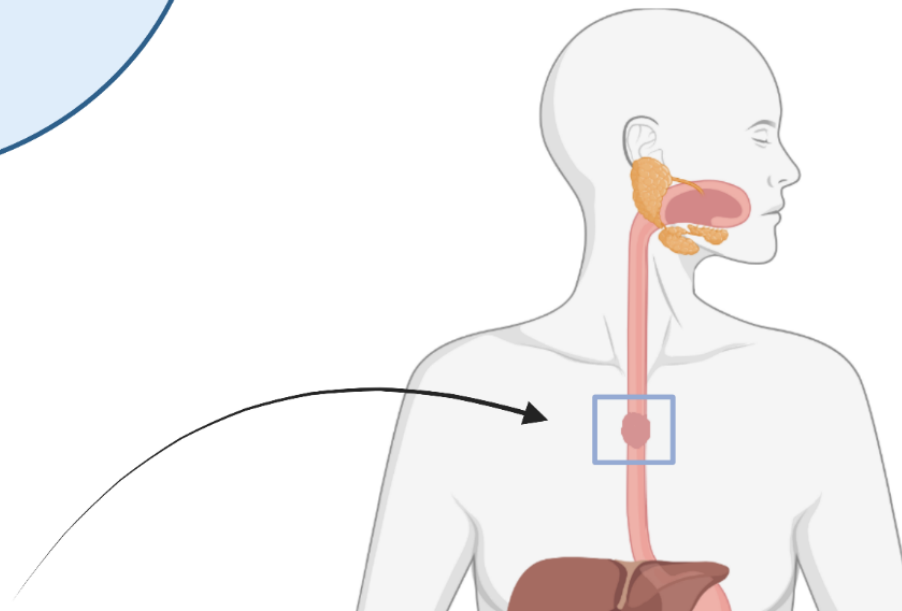
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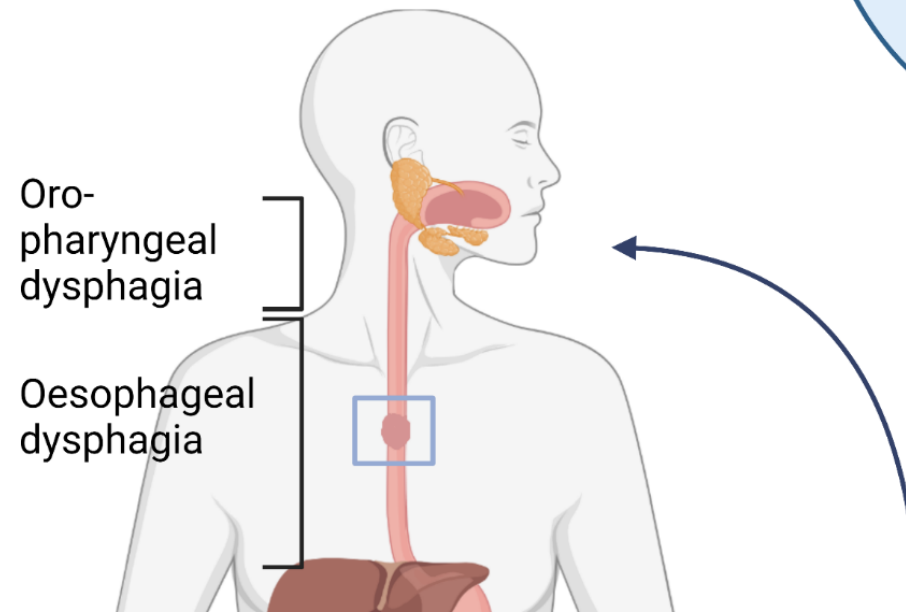
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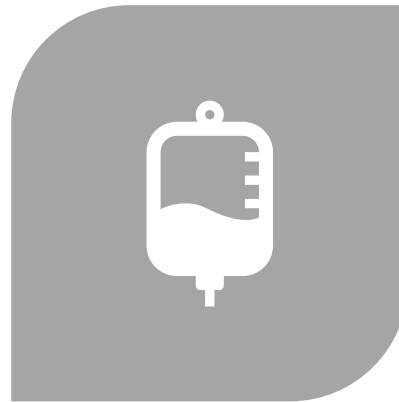
(Gibbs et al 2007)



Oropharyngeal Dysphagia exists




1. BEFORE SURGERY
(MARTIN ET AL, 2001)



2. ACUTELY POST-RESECTION
(KANEOKA ET AL, 2018)



3. IN THE LONG-TERM ?...



What do we know about the impact of dysphagia up to 10 years post surgery?

- Eating problems, choking, and trouble swallowing saliva. (Kauppila et al, 2019, Low et al 2019, Taioli et al 2017)
- Strong negative effect on HRQoL measures for dysphagia and 'eating difficulties'. (Lagergren et al, 2017)

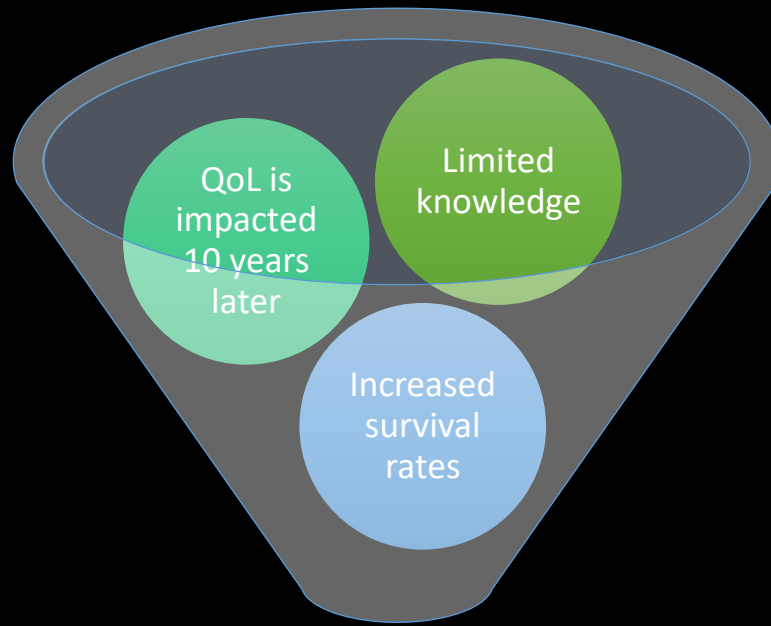
Only 2 published studies have evaluated chronic oropharyngeal dysphagia

Koh et al, 2004

Pharyngeal swallow was **relatively intact** a median of **18 months** post-surgery (n=9).

Yuen et al, 2019

Chronic **mild to moderate** oropharyngeal dysphagia a **mean of 4.3 years** post-surgery (n=29).



Further research is warranted



Study Aims

1. The **nature of chronic** oropharyngeal dysphagia post esophageal cancer surgery

2. If **differences exist** across surgical approaches

3. **Early surgical predictors** of chronic oropharyngeal dysphagia and aspiration

4. The **impact** of chronic dysphagia on quality of life

Methods: Study Setting & Participants

Design: Cross-sectional prospective observational study (Reported using STROBE reporting guidelines (von Elm 2008))

Patient and Public Involvement (PPI) as per GRIPP-2 Reporting Checklist (Staniszewska et al 2017)

Recruitment: Purposive Sampling from a National Esophageal Cancer Center

Methods: Eligibility Criteria

Inclusion criteria:

- Transhiatal or transthoracic surgery completed with curative intent at least 12 months prior
- First time diagnosis of esophageal cancer
- Adequate language/cognition to participate
- Medical approval

Exclusion criteria:

- History of neurological impairment, head and neck cancer, or oral/pharyngeal dysphagia
- Evidence of metastatic or recurrent disease
- Formal diagnosis of severe chronic obstructive pulmonary disease
- Palliative treatment



Methods: Data Collection

Medical and surgical notes: age, sex, type of cancer, location of cancer, stage of cancer, surgical approach, date of surgery, type of neoadjuvant treatment, post-surgical complications (RLNP), length of stay in ICU and hospital

Videofluoroscopy

QoL Questionnaires: MDADI, EORTC-QLQ-OES-18

Videofluoroscopy



Lateral view

- IDDSI Level 0 – 2x5ml, 2 x10ml , sequential sips
- IDDSI Level 4 – 2x5ml
- Other: ½ level 7 cracker

Anteroposterior view

- IDDSI Level 0 – 2x20 ml
- IDDSI Level 4 – 2x5ml
- Other: 13mm tablet

Frame Rate: **25 f/s**

Contrast Medium: Maxibar™ powder for oral suspension prepared to a **20% w/v** concentration

Outcomes measures

1.
The nature of chronic oropharyngeal dysphagia post esophageal cancer surgery

2. if differences exist across surgical approaches

3. Early surgical predictors of chronic oropharyngeal dysphagia and aspiration

4. The impact of chronic dysphagia on quality of life

Swallow safety, efficiency, physiology:
DIGEST-v2, MBS Imp, PAS, IOPI
tongue pressure

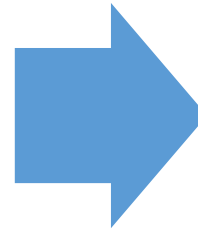
Swallow safety, efficiency, physiology:
DIGEST-v2, MBS Imp, PAS, IOPI
tongue pressure

Early surgical predictors:
Surgical approach, location of cancer, complications (RLNP), age, length of stay in ICU/hospital

Swallow related QOL:
EORTC-QLQ-OES-18
MDADI

Data Analysis

Descriptive Analysis was completed to determine the **nature and impact** of chronic dysphagia following esophageal resection for esophageal cancer



ANOVAs were completed to examine **mean differences** between surgical approaches.

Binary binomial regression analyses were completed to identify **predictors** of chronic oropharyngeal dysphagia and aspiration based on DIGEST2 and PAS findings: (Surgical approach, location of cancer, RLNP, time since surgery).

Results:

Baseline Data

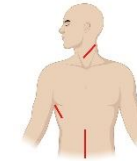
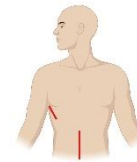


40
participants:
10 female,
30 male

Mean
months post
surgery: 52
+/- 30

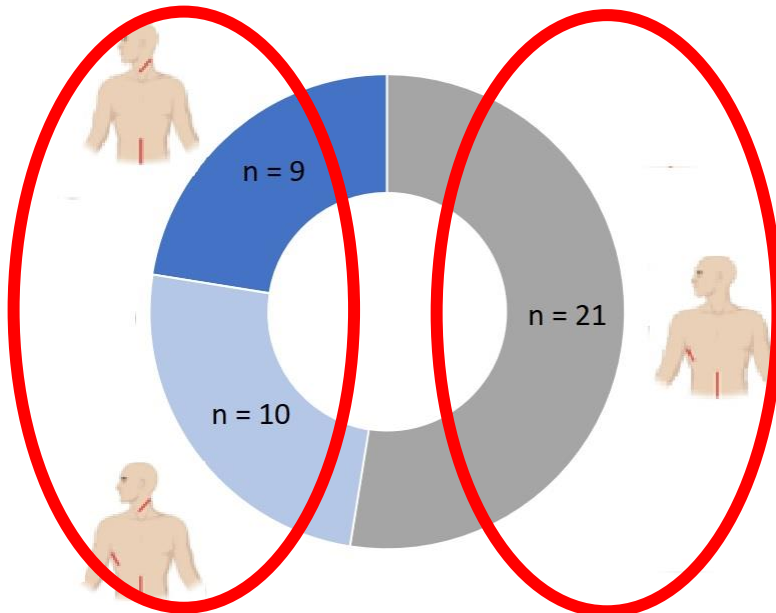
Mean age:
66.03 +/-
9.58 years

Results: Baseline Data

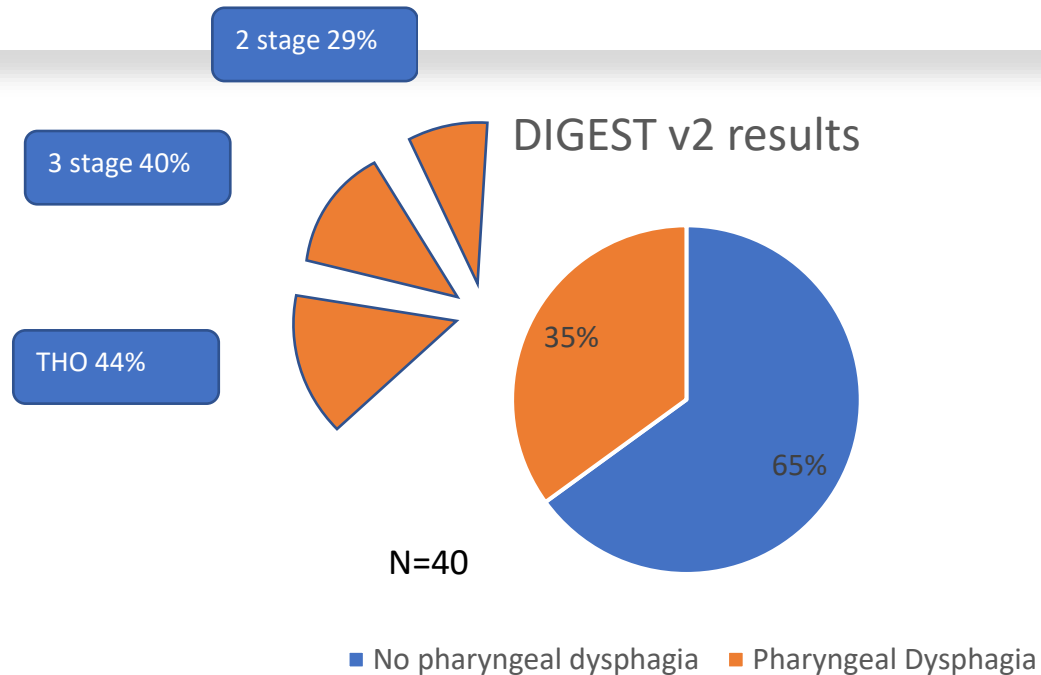


	2 stage n=21 (52.5%)	3 stage n=10 (25%)	Transhiatal n=9 (22.5%)	F, P value
Mean age	65.1	62.8	71.7	(2,37) 2.372, 0.107
Sex	3 females	4 females	3 females	0.259
Location of cancer in esophagus	Middle:2 Lower:3 EGJ:18	Middle :5 Lower:2 EGJ:3	Middle: 1 Lower:5 EGJ:3	(2,37) 11.015, <0.001
Extent of Lymphadenectomy	Minimal:4 Extensive:0 Unspecified:4	Minimal:12 Extensive:1 Unspecified:7	Minimal:5 Extensive:1 Unspecified:4	
Mean months since surgery	44	79	76	(2,37) 24.05 <0.001
RLNP	0	1	0	(2,37) 1.542, 0.227
Mean Length of stay in hospital post-surgery (days)	19.8	22.3	15.8	(2,37) .63, -.538
Mean Length of stay in ICU (days)	4.1	2.7	0.2	(2,37) 30.829, 0.09

Cervical Anastomosis [Transhiatal
3 stage
No Cervical Anastomosis — 2 stage



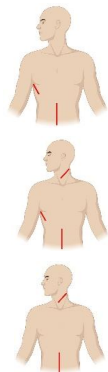
Results Aim 1 & 2: Presence & Nature of Pharyngeal Dysphagia



N = 40	DIGESTv2 mean
2 stage	0.3
3 stage	0.5
Transhiatal	0.89
F, pValue	(2,37) 1.963 0.155

Results Aim 1 & 2: Presence & Nature of Aspiration

5% (n=2)
aspirated
Level 0 fluids



	PAS Score: n		
	1: No pen or aspiration	2-5: Penetration	6-8: Aspiration
Total (n=40)	32	6	2
2 stage (n = 21)	17	4	0
3 stage (n = 10)	8	2	0
Transhiatal (n= 9)	7	0	2

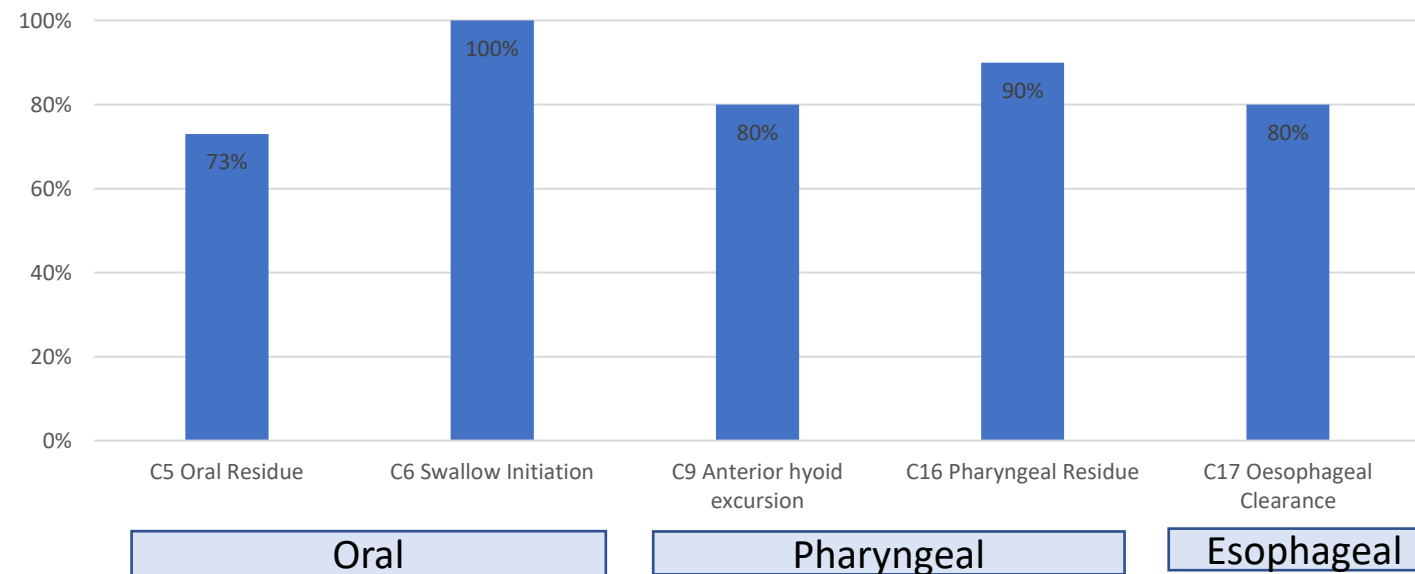


	Mean PAS score difference
Between groups	$\chi^2 (2)=7.07, p = .029$

Results Aim 1:

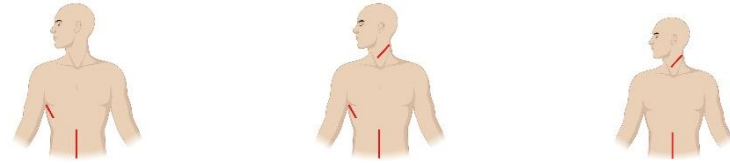
Presence & Nature of Oropharyngeal Dysphagia

Percentage of Participants with impairments across MBS
ImP Components (Martin-Harris et al 2008)



Results Aim 1:

Presence & Nature of Oropharyngeal Dysphagia

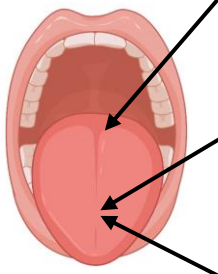


MBS Imp	2 stage mean (n=21)	3 stage mean (n = 10)	THO mean (n=9)	Total mean (n=40)	F, pValue	
C5 Oral Residue (0-4 where 4 is more severe)	1.38	1.3	1.2	1.33	(2,37) .089 .915	Oral
C6 Swallow Initiation (0-4 where 4 is more severe)	2.38	2.44	2.22	2.35	(2,37) .321 .728	
Total Oral Score Mean (0-22 where 22 is more severe)	5.57	4.1	4.22	4.9	(2,37) 1.95 .156	
C 9 Anterior Hyoid Excursion (0-2 where 2 is more severe)	.81	.89	.7	.8	(2,37) .514, .602	Pharyngeal
C 16 Pharyngeal Residue (0-4 where 4 is more severe)	1.38	1.8	1.33	1.48	(2,37) 1.419 .255	
Total Pharyngeal Score Mean	6.38	7.2	5.78	6.45	(2,37) .523 .597	
C17 Esophageal Clearance (0-4 where 4 is more severe)	1.62	1.1	1.11	1.38	(2,37) 1.695, .197	Esophageal

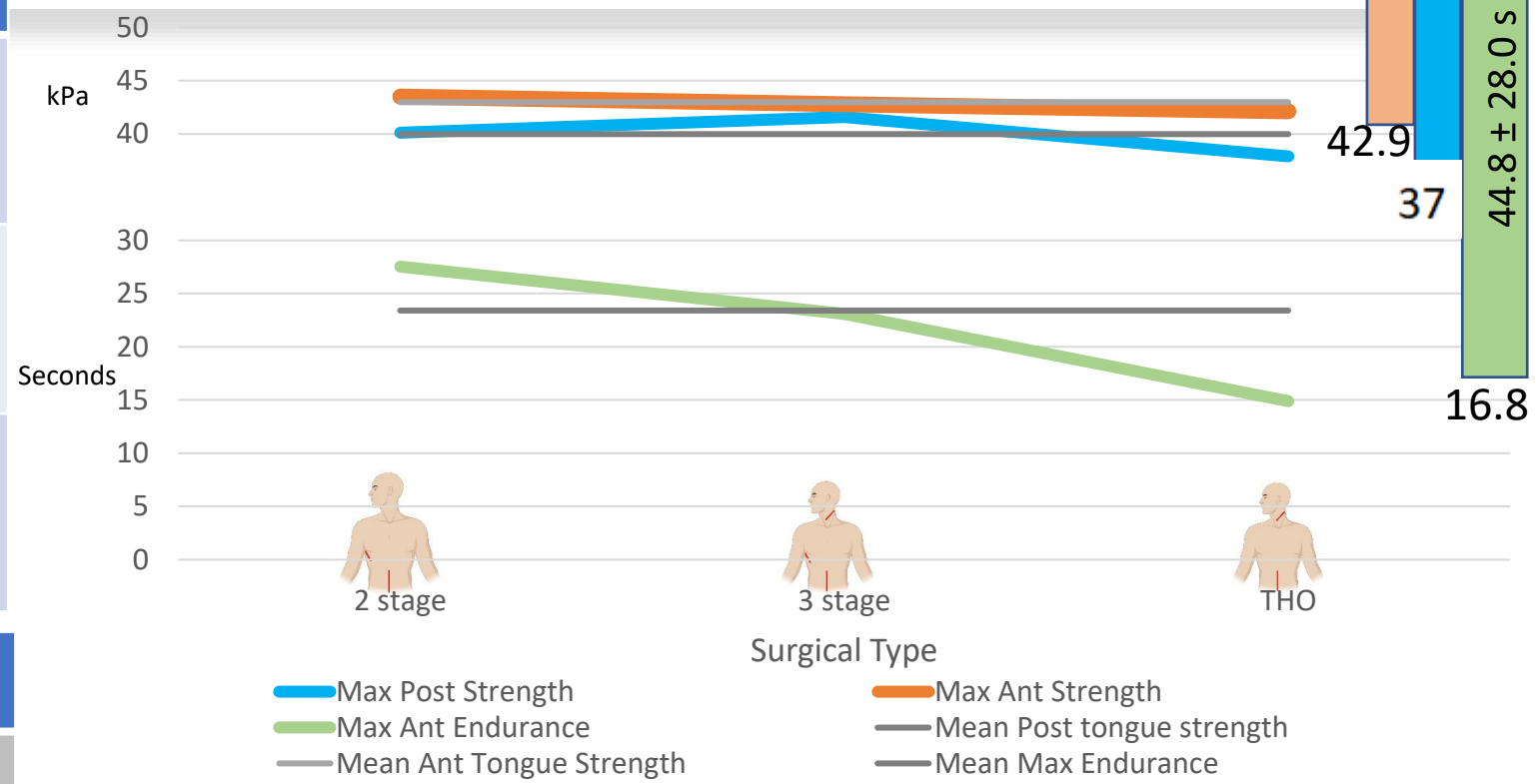
Results Aim 1 & 2:

Presence & Nature of Tongue Strength & Endurance

Normative Data
Adams et al 2013



IOPI	Overall Mean +/- Std Dev (Range)
Maximum posterior tongue strength	39.977 +/-11.193 kPa (Range 47: 15.7-62.7)
Maximum anterior tongue strength	42.9991 +/-10.98256 kPa (Range 51.6: 23.1 – 74.7)
Mean maximum anterior endurance	23.4713 +/-29.9033 seconds (Range 180.2: 1.4-181.6)



	IOPI Post Strength (kPa)	IOPI Ant Strength (kPa)	IOPI Ant Endurance (s)
F (2,36) & pValues	.251, 0.779	.048, 0.954	.541, 0.587

Results Aim 3:

Early Surgical Predictors of Dysphagia & Aspiration

Surgical Variables	Dysphagia (1-4 on DIGESTv2)			Penetration/aspiration (PAS 6-8)		
	ExpB	pValue	95% CI	ExpB	pValue	95% CI
Surgical approach	1.2	.659	.194-7.441	.000	1	.0000
Location of cancer	1.4	.713	.233-8.421	.217	0.595	.12 – 4.094
Complication (RLN)	.000	1	.0000	.000	1	.0000
Time since surgery	1.011	.336	.989-1.033	.95	0.085	.896 – 1.007

Results Aim 4:

Impact of chronic dysphagia on QoL

Mean MDADI Composite score was 76.302 +/- 18.9564 (Range 67.4: 32.6-100) n =39,

Mean EORTC score was 35.89 +/- 17.21 (Range 38: 20-58) n =39.



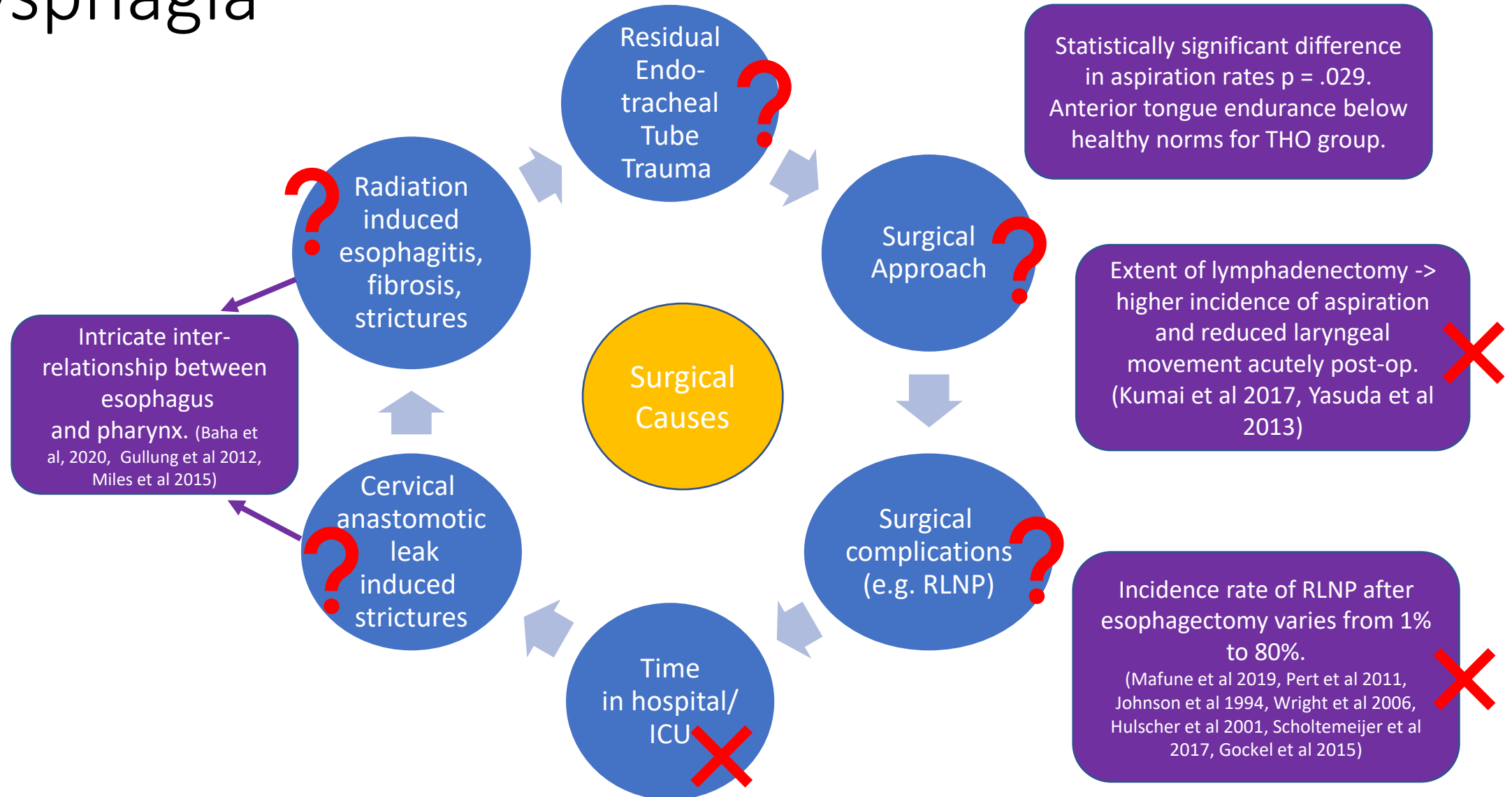
n = 40	Mean MDADI Composite (20 - 100. 100 = high functioning)	Mean EORTC-QLQ-OES-18 (0 – 100. 100 = many problems)
2 stage (n = 21)	71.7	22.83
3 stage (n = 10)	78	19.27
THO (n= 9)	77.05	18.9
F & p Value	(2,36) .341 .713	(2,36) .127 .881

Discussion

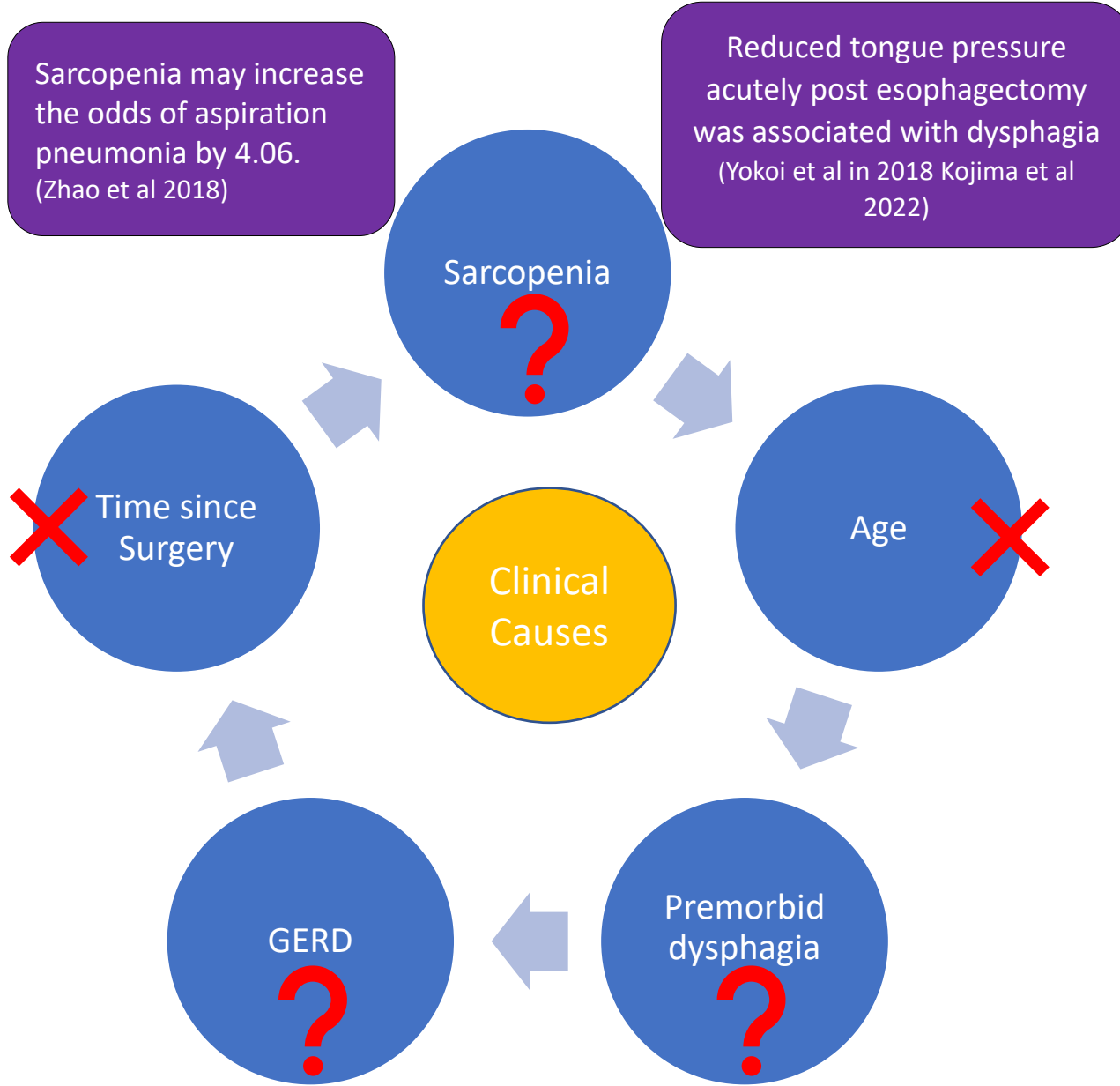
- 35% community-based survivors of esophageal cancer surgery presenting with **dysphagia** and 5% with **aspiration**
- The most common physiological impairments are: **Oral residue, Swallow initiation, Anterior hyoid excursion, Pharyngeal residue, Esophageal clearance**
- **Aspiration** and **tongue endurance below healthy norms** were present **only after transhiatal surgery**

Why?

Potential Causes of Chronic Oropharyngeal dysphagia



Potential Causes of Chronic Oropharyngeal dysphagia



Conclusion

Oropharyngeal dysphagia is prevalent in this population throughout survivorship.

QoL is impacted.

Dysphagia has already been found to be an independent factor of QoL in this population. (Wang et al 2022)

Further research of a larger sample size is needed to 1) investigate early predictors of chronic dysphagia and aspiration, 2) determine the diagnostic accuracy of clinical tools and 3) establish appropriate interventions.

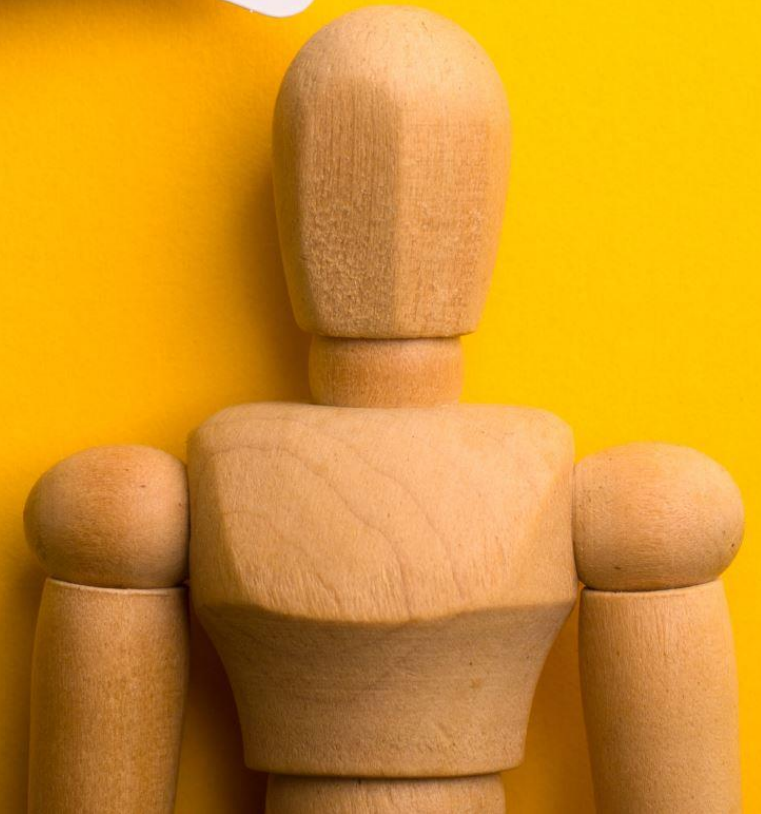
Thank you for listening



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