

Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin

Oropharyngeal Dysphagia in Oesophageal Cancer. Can it be rehabilitated?

Anna Gillman PhD Candidate - Trinity College Dublin Clinical Specialist in Dysphagia – Tallaght University Hospital, Dublin

Rehabilitation after Oesophageal Cancer Surgery



Agenda

- Systematic review on dysphagia rehabilitation following oesophageal cancer surgery
- How does dysphagia present and what should we be targeting in rehabilitation?
 - 1. Acute and chronic timepoints
 - 2. Impact on QoL
 - 3. Potential causes of dysphagia
- 3. Considerations for clinicians on the ground
- 4. Next steps for research



Gillman et al. BMC Cancer (2022) 22:53 https://doi.org/10.1186/s12885-021-09155-y **BMC** Cancer

RESEARCH ARTICLE



Open Access

Exercise-based dysphagia rehabilitation for adults with oesophageal cancer: a systematic review

Anna Gillman¹, Michelle Hayes², Greg Sheaf³, Margaret Walshe¹, John V. Reynolds⁴ and Julie Regan^{1*}



Trinity College Dublin, The University of Dublin Anna Gillman, Trinity College Dublin

Open Access

RESEARCH ARTICLE

To determine the effectiveness of dysphagia rehabilitation in improving clinical outcomes (swallow, pneumonia and oral intake status) and health related QOL outcomes in adults with oesophageal cancer across time points.

vsphagia rehabilitation

heaf³, Margaret Walshe¹, John V. Reynolds⁴ and Julie Regan^{1*} 💿





BMC Cancer

RESEARCH ARTICLE

Open Access

1114

Exercise-based dysphagia repfor adults with oesophageal review

Anna Gillman¹, Michelle Hayes², Greg Sheaf³, Margaret Walshe¹, Jo



To identify key elements of rehabilitation (delivery, dose, intensity, timing, adverse events and fidelity) which may inform future research of dysphagia rehabilitation in oesophageal cancer.

Aim 2

Trinity College Dublin, The University of Dublin Anna Gillman, Trinity College Dublin

Gillman et al. BMC Cancer (2022) 22:53 https://doi.org/10.1186/s12885-021-09155-y **BMC** Cancer

RESEARCH ARTICLE



Open Access

Exercise-based dysphagia rehabilitation for adults with oesophageal cancer: a systematic review

Anna Gillman¹, Michelle Hayes², Greg Sheaf³, Margaret Walshe¹, John V. Reynolds⁴ and Julie Regan^{1*}



Trinity College Dublin, The University of Dublin Anna Gillman, Trinity College Dublin



Authors	Study Design	Dysphagia Assessment for Outcomes	Exercises with Rehabilitative Purpose	Mode, Frequency, Intensity, Duration, Dosage of Intervention
- Okumara et al 2016	Case Control Study (n= 27)	Non-validated: 1. Functional Outcomes Assessment Measure of Swallowing (FOAMS) Scal 2 Measured relevant biomechanical positions a volumes on x-axis and y-a from VFSS images	ificant increase in maxin the byoid bone during s erioperative swallow reh ificantly higher FOAMS s at discharge compared 0.049	mum superior excursion of wallowing $(p=0.046)$ abilitation resulted in cores for the treatment to the control group (p =).
Tsubosa et al 2005	Case Series (n = 9)	Non-validated: VFSS rating tool suggested by Logemann, 1998	Mendelsohn manoeuvre	'Intensively' however no further details provided.
Takatsu et al 2020	Retrospective case control study	 Start of oral intake Length of oral intake rehabilitation 	ect and direct rehabilitat	tion significantly shortened
	(n=276)	3. Length of postoperation treat	Significantly shorter return to oral intake in the treatment group compared to the control group (11 v 8 days; p=0.009)	

Authors	Study Design	Dysphagia Assessment for Outcomes	Exercises with Rehabilitative Purpose	Mode, Frequency, Intensity, Duration, Dosage of Intervention
Okumara et al 2016	Case Control Study (n= 27)	Non-validated: 1. Functional Outcomes Assessment Measure of Swallowing (FOAMS) Scale. 2 Measured relevant biomechanical positions and volumes on x-axis and y-axis plots from VFSS images	Pursed lip breathing, Tongue exercises, Shaker "head lift" exercises	SLT & nurses in the surgical ward delivered initial verbal & written instruction. Exercises x5 a day at home and upon admission to the hospital, up until the day before surgery. Unclear if patient-led thereafter.
Tsubosa et al 2005	Case Series (n = 9)	Non-validated: VFSS rating tool suggested by Logemann, 1998	Mendelsohn manoeuvre	'Intensively' however no further details provided.
Takatsu et al 2020	Retrospective case control study (n=276)	 Start of oral intake Length of oral intake rehabilitation Length of postoperative stay 	Tongue exercises, Shaker exercise, Jaw opening, Thermal-tactile stimulation, Voice therapy	No details provided.

Systematic Review

Quality of Evidence: GRADE Approach.

Low to fair level of evidence due to:

- weak study designs
- high risk of bias
- differences in interventions and intervention settings
- uncertainty around the results.



Systematic Review Conclusion



So what should we do to rehabilitate these patients?



Oesophageal Cancer

Oesophageal cancer has one of the lowest 5 year survival rates (21.5%) (NCRI 2017).

Incidence rates are increasing but mortality rates are stable/ decreasing (Arnold et al 2019).

Survival Approximately 50% of patients who receive curative treatment survive (Donlon et al 2020). ...so there is a growing population of survivors needing support.

Donlon et al 2020, Van Hagen et al 2012, Cunningham et al, 2006, Homann et al 2019

Oesophageal Cancer Treatment



https://www.sciencephoto.com/media

Oesophagectomy Surgery

Oesophageal resection is one of the most invasive cancer surgeries. (Low et al 2019, Konda et al 2017, Ahmadinehad et al 2015)



Oesophagectomy Surgery

There are two main approaches for oesophageal resection:



Trinity College Dublin, The University of Dublin

Anna Gillman, Trinity College Dublin Barreto and Posner, 2010, https://pubs.rsna.org/doi/full/10.1148/rg.2016150126

National Oesophago-Gastric Cancer Audit 2017



One third of all patients undergoing oesophagectomy within the UK will experience post-operative complications

The most common complication post oesophagectomy are respiratory complications, affecting 16.9% patients within the UK

Table 9.3

Overall rates of postoperative in-hospital complications for patients with OG cancer in England from April 2014 to March 2016

	Oesophagectomy		Gastrectomy	
	Rate (%)	95% CI	Rate (%)	95% CI
Any complication	36.4	34.6-38.2	21.7	19.7-23.9
Anastomatic leak	6.3	5.5-7.3	3.0	2.2-4.0
Chyle leak	3.8	3.1-4.5	0.3	0.1-0.8
Cardiac complication	5.3	4.5-6.2	2.8	2.0-3.7
Wound infection	2.8	2.3-3.5	2.3	1.6-3.2
Respiratory	16.9	15.5-18.3	8.7	7.3-10.3
Unplanned surgery	10.2	9.1-11.5	6.5	5.2-8.0

National Oesophago-gastric cancer audit (2017)

Presence of dysphagia has been shown to increase the risk of aspiration pneumonia and mortality following oesophagectomy (Biere et al 2012)

Pneumonia is a common cause of death after oesophagectomy (Atkins et al 2006)



Trinity College Dublin, The University of Dublin Anna Gillman, Trinity College Dublin





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

(Gibbs et al 2007)





Pharyngeal Dysphagia <u>pre-</u> Oesophageal Cancer Treatment

Mildly reduced pharyngeal contraction (n=6), Mild delay in initiation (n = 8), Postswallow pharyngeal residue (N =10), Laryngeal penetration/ aspiration (n=2)

Martin et al, 2001

<u>Acute</u> Pharyngeal Dysphagia post oesophageal resection

Delayed onset of swallowing, Reduced hyolaryngeal elevation, Reduced UES opening, vocal fold immobility, Overt aspiration, Silent aspiration, Pharyngeal residue

Kaneoka et al, 2018

<u>Chronic</u> Pharyngeal Dysphagia post Oesophageal Resection

Pharyngeal swallow was <u>relatively intact</u> a median of 18 months post-surgery <u>(n=9)</u>. Chronic <u>mild to moderate</u> pharyngeal dysphagia a mean of 4.3 years post-surgery (n=29)

Koh et al, 2018, Yuen et al 2019



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)



Further research is warranted



Patient and Public Involvement (PPI)

Our research team's PPI Committee assisted with the selection of Outcome Measures for this study.



Similar Methodology

<u>Medical and surgical notes</u>: 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: MBSImP, DIGEST v2, PAS

Clinical Assessment: Tongue strength/endurance (IOPI), 3 oz water swallow test, CRT

<u>Dysphagia Questionnaires</u>: EAT-10, Mayo Dysphagia Questionnaire 2 week, Reflux Symptom Index

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

Inclusion Criteria	Exclusion Criteria		
Transhiatal or transthoracic surgery completed with curative intent (at least 12 months prior for my study).	History of neurological impairment, head and neck cancer, or oral/pharyngeal dysphagia.		
First time diagnosis of oesophageal cancer.	Evidence of metastatic or recurrent disease.		
Adequate language comprehension / cognition to participate.	Formal diagnosis of severe Chronic Obstructive Pulmonary Disease.		
Medical approval received to participate in our study.	Receiving palliative treatment.		

Videofluoroscopy Protocol

Lateral view

- IDDSI Level 0: 2 x 5ml, 2 x10ml, sequential sips
- IDDSI Level 4: 2 x 5ml
- IDDSI Level 7 : ½ cracker

Anteroposterior view

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

Frame Rate: 25 f/s

Videofluoroscopic swallow evaluation:

Penetration Aspiration Scale, DIGESTv2 & MBS-Imp

AP View: Bolus followed from oral cavity to stomach for up to 15 secs. Recommenced every 15 secs if residue remained up until 60 secs. (Miles et al 2016)



Main Results






RESULTS

4-5 days post-op

RESULTS

4-5 days post-op

N = 8/28: Silent aspiration (PAS 8)



Surgical Type Aspiration Protocol discontinued No Penetration penetration/aspiration 2-stage (n=10) 5 2 4 3-stage (n=10) 3 1 THO (n=8) 0 8 4 5

Moderate positive correlations were found between Cough Reflex Test findings and

- RLN injury (r=0.467; p=0.007)
- Silent aspiration (PAS 8) on VFS (r=0.356; p=0.034)

N = 24/28: Penetrated (PAS 5+)

RESULTS

4-5 days post-op





Min 12 months post-op





Frequency of impaired pathophysiology



Pathophysiology across MBSImP components

Severity of impaired pathophysiology

Median MBSImP Component Scores



Tube Reliance (FOIS)



- 7. Normal oral diet (n=23)
- 6. Avoid consistencies (n=12)
- 5. Modify consistencies (n=4)
- 4. 1 consistency only (n=1)

Tongue Strength & Endurance (IOPI)



Anna Gillman, Trinity College Dublin

Created with BioRender.com

Predictors of pharyngeal dysphagia

Predictor of Pharyngeal Dysphagia	p-value	Odds Ratio	95% CI
Age >65	.666	-	-
Type of cancer	.966	-	-
Stage of cancer	.880	-	-
Months since surgery	.336	-	-
Radiotherapy	.446	-	-
Surgical approach	.659	-	-
Site of anastomosis	.372	-	-
Days in ICU	.738	-	-
EAT-10	.064	-	-
Abnormal FOIS (<7)	.046	4.05	1.025-16.007

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)
RAR	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

'I'm just very much alone with this.'



'I'm just very much alone with this.'



"There's nothing Long-term impact of aerodigestive symptoms op a qualitative study "haven't a clue" (P1) or really in terms of st very support" (P39) "don't really understand" (P16), **DESIGN** TTC. Managing NEW symptoms "You have to The quality of life (QoL) kinda, learn to impact of chronic aerodigestive symptoms kinda deal with it solation Worrv (min 12 months) yourself"(P12) following oesophageal cancer surgery is still not well understood. Analysis Socialising (RTA) "It's hard ... there's two guys ... used to Conclusion: Survivors of op pact QoL for have conversations with them and eh many years. The over reater community sup two of them went belly up...didn't make it." (P1)

'I'm just very much alone with this.'





'I'm just very much alone with this.'





'I'm just very much alone with this.'



'I'm just very much alone with this.'





'I'm just very much alone with this.'



RECAP

- Dysphagia exists day 4-5 post-op, with 57% aspirating and almost all penetrating.
- 35% community-based survivors of esophageal cancer surgery present with **dysphagia** and 10% with **aspiration/uncleared penetration**.
- The most common physiological impairments are: Oral residue, Swallow initiation, Anterior hyoid excursion, Pharyngeal residue, Esophageal clearance.

Why?



Causes of Acute Oropharyngeal Dysphagia

Causes of Oropharyngeal Dysphagia Pre-surgery

"...normal oesophagogastric reflexive mechanisms responding to cancer related oesophageal alterations, which in turn modulate the oropharynx."

Martin et al 2001

Potential Causes of Chronic Oropharyngeal Dysphagia



Inter-Relationship between the pharynx and oesophagus

Oro-pharyngeal function can be significantly altered in patients with oesophageal motility disorders

Baha et al, 2020, Triadafilopoulos et al 1992, Jones t al 1987 Mendell & Logemann 2002, Miles et al 2015



Potential Causes of Chronic Oropharyngeal dysphagia



What evidence is there to guide our clinical practice?



Trinity College Dublin Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin

Dysphagia Management in Oesophageal Cancer

Current international clinical practice guidelines do not typically recommend referrals to swallow specialists for assessment so we need to advocate for our patients.

(Obermannova et al 2022, Kitagawa et al 2019)



Trinity College Dublin Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin

Dysphagia Management in Oesophageal Cancer

Compensatory strategies:

Systematic review (Kaneoka et al, 2018):

- 3 case series: chin tuck and/or supraglottic swallow (Kumai et al 2016, Kumai et al 2017, Lewin et al 2001)
 - Immediate improvement to airway protection
 - Pyriform sinus residue was significantly reduced
 - Increased UES opening and duration of laryngeal vestibule closure



Further Consideration

A **comprehensive swallowing evaluation** is needed to manage dysphagia appropriately. Note: Combined Contrast & VFS Swallow Assessment may be beneficial post-op to assess for anastomotic leak and aspiration (Berry et al, 2010).

No validated VFS protocol yet.

Oesophageal screen is an important component of VFS swallow evaluations. (Gaziano & Watts, 2018, Miles et al 2015)


Swallow Rehabilitation Rationale

Improving swallowing *may* prevent further deterioration of sarcopenia and malnutrition, and reduce surgical complications, aspiration pneumonia rates, treatment-related morbidity, and hospital length of stay and readmissions.

(Kaneoka et al 2018, Silver et al 2013, Tsimopolou et al 2015)

FurtherConsideration

Oral Hygiene

- 29-39% of patients present with poor oral hygiene prior to oesophagectomy. (Sato et al, 2016)
- Oral bacteria considered one of the major causes of postoperative pneumonia following oesophageal surgeries. (Asaka et al, 2019)
- Maintenance of oral hygiene before and after surgery reduced incidence of pneumonia post oesophagectomy. (Soutome et al, 2017)

Future Research

- Peri-rehabilitation interventions specifically targeting the most severely impaired pathophysiological components detected in this study.
- A comprehensive evaluation of sarcopenia would be beneficial to evaluate its association with dysphagia.
- Use HRM to assess for hypertension in the • upper oesophageal sphincter.
- ...A lot more!



To Summarise:

- Oropharyngeal dysphagia exists in this population in the acute and chronic stages.
- Quality of life can be significantly impacted.
- More research is needed on the cause of this dysphagia.
- Very limited 'low to fair' quality evidence that exercise-based dysphagia rehabilitation may result in functional swallowing improvements, faster return to oral intake and reduced postoperative length of stay in hospital (PLOHS).
- Compensatory strategies 'chin tuck' & 'supraglottic swallow' can improve airway protection.
- SLTs are valuable members of the oesophageal cancer MDT team yet current international clinical practice guidelines do not recommend referrals to swallow specialists.

Research Team







Prof Julie Regan Assistant Professor in Speech and Language Pathology

Trinity College Dublin

Prof Margaret Walshe Associate Professor in Speech and Language Pathology

Trinity College Dublin

Trinity College Dublin St James's Hospital

Prof John Reynolds

Professor and Head of

Surgery



Michelle Hayes PhD Candidate

Trinity College Dublin

Thank You



Trinity College Dublin Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin











Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin

References



Anna Gillman, Trinity College Dublin

References

- Gillman A, Hayes M, Sheaf G, Walshe M, Reynolds JV, Regan J. Exercise-based dysphagia rehabilitation for adults with oesophageal cancer: a systematic review. BMC Cancer. 2022 Jan 10;22(1):53. doi: 10.1186/s12885-021-09155-y. PMID: 35012495; PMCID: PMC8751332.
- Hambraeus, G, Ekbery P, Fletcher, R. 1987 Pharyngeal Dysfunction after Total and Subtotal Oesophagectomy. Acta Radiologica Vol 28 Issue 4.
- Roy A, DeMeester TR: Perioperative management of carcinoma of the esophagus: The reduction of operative mortality. In: Delarue NC, Wilkins EW, Wong J (eds.): International Trends in General Thoracic Surgery. Volume 4: Esophageal Cancer. St. Louis: CV Mosby Co., 1988, pp 101–109
- Peters JH, DeMeester TR, Stein HJ: Surgical therapy for cancer of the esophagus and cardia. In: Castell DO (ed.): The Esophagus, 2nd ed. Boston: Little, Brown, 1995, pp 293–335
- Heitmiller RF, Jones B: Transient diminished airway protection after transhiatal esophagectomy. Am J Surg 162:442–446, 1991

- Gibbs JF, Rajput A, Chadha KS, et al. The changing profile of esophageal cancer presentation and its implication for diagnosis. J Natl Med Assoc. 2007;99(6):620–626
- Martin RE, Letsos P, Taves DH, Inculet RI, Johnston H, Preiksaitis HG. Oropharyngeal dysphagia in esophageal cancer before and after transhiatal esophagectomy. Dysphagia. 2001 Winter;16(1):23-31. doi: 10.1007/s004550000044. PMID: 11213243.
- Kaneoka, A., et al., Presentation of oropharyngeal dysphagia and rehabilitative intervention following esophagectomy: a systematic review. Diseases of the Esophagus, 2018. 31(8): p. doy050.
- Barreto and Posner, 2010, <u>https://pubs.rsna.org/doi/full/10.1148/rg.2016150126</u> Barreto JC, Posner MC. Transhiatal versus transthoracic esophagectomy for esophageal cancer. *World J Gastroenterol*. 2010;16(30):3804-3810. doi:10.3748/wjg.v16.i30.3804
- Low, D.E., et al., Benchmarking Complications Associated with Esophagectomy. Ann Surg, 2019. 269(2): p. 291-298.



- Low, D.E., et al., Guidelines for Perioperative Care in Esophagectomy: Enhanced Recovery After Surgery (ERAS((R))) Society Recommendations. World J Surg, 2019.
 43(2): p. 299-330.
- Donlon NE, Ravi N, King S, Cunninhgam M, Cuffe S, Lowery M, Wall C, Hughes N, Muldoon C, Ryan C, Moore J, O'Farrell C, Gorry C, Duff AM, Enright C, Nugent TS, Elliot JA, Donohoe CL, Reynolds JV. Modern oncological and operative outcomes in oesophageal cancer: the St. James's hospital experience. Ir J Med Sci. 2021 Feb;190(1):297-305. doi: 10.1007/s11845-020-02321-4. Epub 2020 Jul 21. PMID: 32696244.
- Atkins, B.Z. and T.A. D'Amico, *Respiratory complications* after esophagectomy. Thorac Surg Clin, 2006. 16(1): p. 35-48, vi.

- Berry, M.F.A., B. Z.; Tong, B. C.; Harpole, D. H.; D'Amico, T. A.; Onaitis, M. W. , A comprehensive evaluation for aspiration after esophagectomy reduces the incidence of postoperative pneumonia. . The Journal of thoracic and cardiovascular surgery, 2010. 140(6): p. 1266-1271.
- Kauppila, J.H., A. Johar, and P. Lagergren, Postoperative Complications and Health-related Quality of Life 10 Years After Esophageal Cancer Surgery. Ann Surg, 2020. 271(2): p. 311-316-
- Taioli, E.S., R. M.; Lieberman-Cribbin, W.; Moskowitz, G.; Van Gerwen, M.; Flores, R.; , Quality of life after open or minimally invasive esophagectomy in patients with esophageal cancer-a systematic review. . Semin Thorac Cardiovasc Surg 2017. 29(29): p. 377-90
- Lagergren J, Smyth E, Cunningham D, Lagergren P.
 Oesophageal cancer. Lancet. 2017 Nov
 25;390(10110):2383-2396. doi: 10.1016/S0140 6736(17)31462-9. Epub 2017 Jun 22. PMID: 28648400.



- Van Hagen P, Hulshof MC, van Lanschot JJ, Steyerberg EW et al (2012) Preoperative chemoradiotherapy for esophageal or junctional cancer. N Engl J Med 366:2074– 2084 5.
- Cunningham D, Allum WH, Stenning SP, Thompson JN, van de Velde C, Nicolson M, Scarffe JH, Lofts FJ, Falk SJ, Iveson TJ, Smith DB, Langley RE, Verma M, Weeden S, Chua YJ, MAGIC Trial Participants (2006) Perioperative chemotherapy versus surgery alone for resectable gastroesophageal cancer. N Engl J Med 355:11–20 6.
- Koh, P., et al., Functional assessment of the cervical esophagus after gastric transposition and cervical esophagogastrostomy. Eur J Cardiothorac Surg, 2004. 25(4): p. 480-5.
- Yuen, M.T.Y., et al., Long-term pharyngeal dysphagia after esophagectomy for esophageal cancer-an investigation using videofluoroscopic swallow studies. Dis Esophagus, 2019. 32(1)
- Miles A, Clark S, Jardine M, Allen J. Esophageal Swallowing Timing Measures in Healthy Adults During Videofluoroscopy. Ann Otol Rhinol Laryngol. 2016 Sep;125(9):764-9. doi: 10.1177/0003489416653410. Epub 2016 Jun 10. PMID: 27287678.



Trinity College Dublin Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin

- Jeong DM, Shin YJ, Lee NR, Lim HK, Choung HW, Pang KM, Kim BJ, Kim SM, Lee JH. Maximal strength and endurance scores of the tongue, lip, and cheek in healthy, normal Koreans. J Korean Assoc Oral Maxillofac Surg. 2017 Aug;43(4):221-228. doi: 10.5125/jkaoms.2017.43.4.221. Epub 2017 Aug 24. PMID: 28875136; PMCID: PMC5583196.
- Kays S, Hind J, Gangnon R, Robbins J. Effects of dining on tongue endurance and swallowing-related outcomes. J Speech Lang Hear Res. 2010;53(4):898–907
- Vitorino J. Effect of age on tongue strength and endurance scores of healthy Portuguese speakers. Int J Speech Lang Pathol. 2010;12(3):237–43. doi:10.3109/17549501003746160

- Baha S, Sibel E, Duygu D, Ezgi K, Tayfun K, Serhat B.
 Oropharyngeal swallowing functions are impaired in patients with naive-achalasia. Eur Arch Otorhinolaryngol.
 2020 Apr;277(4):1219-1226. doi: 10.1007/s00405-020-05800-7. Epub 2020 Jan 24. PMID: 31980888.
- Mendell DA, Logemann JA. A retrospective analysis of the pharyngeal swallow in patients with a clinical diagnosis of GERD compared with normal controls: a pilot study. Dysphagia. 2002 Summer;17(3):220-6. doi: 10.1007/s00455-002-0056-5. PMID: 12140650.
- Triadafilopoulos, G, Hallsteone A, Neson-Abbott G, Bedinger K 1992 Oropharyngeal and Esophageal Interrelationships in Patientes with Nonobstructive Dysphagia Digestive Diseases and Scieneces Vol 37, No 4, pp 551-557.



- Okumura T, Shimada Y, Watanabe T, Nakamichi N, Nagata T, Tsukada K. Functional outcome assessment of swallowing (FOAMS) scoring and videofluoroscopic evaluation of perioperative swallowing rehabilitation in radical esophagectomy. Surg Today 2016; 46: 543–51.
- Yokoi, A., Ekuni, D., Yamanaka, R. et al. Esophagus (2019) 16: 300. https://doi.org/10.1007/s10388-019-00668-x
- Mafune, T., Mikami, S., Otsubo, T. *et al.* An Investigation of Factors Related to Food Intake Ability and Swallowing Difficulty After Surgery for Thoracic Esophageal Cancer. *Dysphagia* 34, 592–599 (2019). https://doi.org/10.1007/s00455-019-10010-3
- Kumai, Y., Samejima, Y., Watanabe, M. *et al.* Videofluoroscopic evaluation of pharyngeal swallowing dysfunction after esophagectomy with three-field lymph node dissection. *Eur Arch Otorhinolaryngol* 274, 321–326 (2017). https://doi.org/10.1007/s00405-016-4209-9

- Lewin JS, Hebert TM, Putnam JB, DuBrow RA Experiece with the chin tuck maneuver in postesophagectomy aspiratorys Dysphagia 2001 Summer: 16 (3):216-9
- Jones et al 2015 Feasibility And Safety Of Early Oral Feeding After Cervical Esophagogastrostomy 2000 Gastroenterology Vol 1 No 2
- Arun K Goel , Sanjay Sinha, Chattopadhyay TK Role of gastrograffin study in the assessment of anastomotic leaks from caevical oesophago gastric anastomosis Aust. N Z J Surg 1995;65:8-10.
- NCRI 2017 Cancer in Ireland 1994-2014: Annual Report of the National Cancer Registry. NCRI. Cork, Ireland; 2017. Retrieved March 19 th, 2019 from https://www.ncri.ie/sites/ncri/files/pubs/NCRReport_2016. pdf
- NCRI 2014 Cancer projections for Ireland 2015-2040 In: National Cancer Registry Ireland NCRI. Cork, Ireland; 2014. Retrieved March 19 th , 2019 from <u>https://www.ncri.ie/sites/ncri/files/pubs/Cancer%20project</u>

ions%20for%20Ireland%202015%20-%202040.pdf



- Atkins BZ, D'Amico TA. Respiratory complications after esophagectomy. Thorac Surg Clin. 2006: 16: 35–48.
- Biere SS, Van Berge Henegouwen MI, Maas KW, Bonavina L, Rosman C, Garcia JR, Gisbertz SS, Klinkenbijl JH, Hollmann MW, de Lange ES, Bonjer HJ, van der Peet DL, Cuesta MA. Minimally invasive versus open oesophagectomy for patients with oesophageal cancer: a multicentre, open-label, randomised controlled trial. Lancet. 2012:19; 379(9829):1887-92.
- Silver JK, Baima J. Cancer prehabilitation: An opportunity to decrease treatment-related morbidity, increase cancer treatment options, and improve physical and psychological health outcomes. Am J Phys Med Rehabil. 2013:92:715–27.
- Tsimopoulou I, Pasquali S, Howard R, Desai A, Gourevitch D, Tolosa I. Psychological prehabilitation before cancer surgery: A systematic review. Ann Surg Oncol. 2015:22:4117–23.
- Kaneoka, A., et al., Presentation of oropharyngeal dysphagia and rehabilitative intervention following esophagectomy: a systematic review. Diseases of the Esophagus, 2018. 31(8): p. doy050.
- Kauppila JH, Johar A, Lagergren P. Postoperative Complications and Health-related Quality of Life 10 Years After Esophageal Cancer Surgery. Ann Surg. 2020 Feb;271(2):311-316. doi: 10.1097/SLA.00000000002972. PMID: 29995688.

- Taioli, E.S., R. M.; Lieberman-Cribbin, W.; Moskowitz, G.; Van Gerwen, M.; Flores, R.; , *Quality of life after open or minimally invasive esophagectomy in patients with esophageal cancer-a systematic review.*. Semin Thorac Cardiovasc Surg 2017. 29(29): p. 377-90.
- Lagergren J, Smyth E, Cunningham D, Lagergren P. Oesophageal cancer. Lancet. 2017 Nov 25;390(10110):2383-2396. doi: 10.1016/S0140-6736(17)31462-9. Epub 2017 Jun 22. PMID: 28648400.
- Koh, P., et al., Functional assessment of the cervical esophagus after gastric transposition and cervical esophagogastrostomy. Eur J Cardiothorac Surg, 2004. 25(4): p. 480-5.
- Martin-Harris B, Brodsky MB, Michel Y, Castell DO, Schleicher M, Sandidge J, Maxwell R, Blair J. MBS measurement tool for swallow impairment--MBSImp: establishing a standard. Dysphagia. 2008 Dec;23(4):392-405. doi: 10.1007/s00455-008-9185-9. Epub 2008 Oct 15. PMID: 18855050; PMCID: PMC4217120.
- Miles A, Clark S, Jardine M, Allen J. Esophageal Swallowing Timing Measures in Healthy Adults During Videofluoroscopy. Ann Otol Rhinol Laryngol. 2016 Sep;125(9):764-9. doi: 10.1177/0003489416653410. Epub 2016 Jun 10. PMID: 27287678.



- Pertl L, Zacherl J, Mancusi G, Gächter JN, Asari R, Schoppmann S, et al. High risk of unilateral recurrent laryngeal nerve paralysis after esophagectomy using cervical anastomosis. *Eur Arch Otorhinolaryngol*. 2011;268:1605–10.
 <u>[PubMed]</u> [Google Scholar]
- Johnson PR, Kanegoanker GS, Bates T. Indirect laryngoscopic evaluation of vocal cord function in patients undergoing transhiatal esophagectomy. J Am Coll Surg. 1994;178:605–8. [PubMed] [Google Scholar]
- Wright CD, Zeitels SM. Recurrent laryngeal nerve injuries after esophagectomy. *Thorac Surg Clin*. 2006;16:23–33.v.
 <u>Scholar</u>]
- Hulscher JB, Tijssen JG, Obertop H, van Lanschot JJ. Transthoracic versus transhiatal resection for carcinoma of the esophagus: a meta-analysis. *Ann Thorac Surg.* 2001;72:306–13. [PubMed] [Google Scholar]
- Scholtemeijer MG, Seesing MFJ, Brenkman HJF, Janssen LM, van Hillegersberg R, Ruurda JP. Recurrent laryngeal nerve injury after esophagectomy for esophageal cancer: incidence, management, and impact on short- and long-term outcomes. *J Thorac Dis*. 2017;9:S868–S78. [PMC free article] [PubMed] [Google Scholar]

- Gockel I, Kneist W, Keilmann A, Junginger T. Recurrent laryngeal nerve paralysis (RLNP) following esophagectomy for carcinoma. *Eur J Surg Oncol*. 2005;31:277–81.
- Zhao WT, Yang M, Wu HM, Yang L, Zhang XM, Huang Y. Systematic Review and Meta-Analysis of the Association between Sarcopenia and Dysphagia. J Nutr Health Aging. 2018;22(8):1003-1009. doi: 10.1007/s12603-018-1055-z. PMID: 30272106.
- Staniszewska S, Brett J, Simera I, Seers K, Mockford C, Goodlad S et al. GRIPP2 reporting checklists: tools to improve reporting of patient and public involvement in research *BMJ* 2017; 358 :j3453 doi:10.1136/bmj.j3453
- Yokoi, A., Ekuni, D., Yamanaka, R. et al. Esophagus (2019) 16: 300. https://doi.org/10.1007/s10388-019-00668-x
- Kojima K, Fukushima T, Kurita D, Matsuoka A, Ishiyama K, Oguma J, Daiko H. Perioperative Decrease in Tongue Pressure is an Intervenable Predictor of Aspiration After Esophagectomy. Dysphagia. 2022 Dec 1. doi: 10.1007/s00455-022-10541-2. Epub ahead of print. PMID: 36456848.



- Sato, *et al*. Esophageal cancer patients have a high incidence of severe periodontitis and preoperative dental care reduces the likelihood of severe pneumonia after esophagectomy Dig. Surg., 33 (6) (2016), pp. 495-502
- Asaka S, Shimakawa T, Yamaguchi K, Katsube T, Usui T, Yokomizo H, Shiozawa S, Naritaka Y. Postoperative Pneumonia After Esophagectomy and Systemic Inflammatory Response Syndrome. Anticancer Res. 2019 Feb;39(2):979-985. doi: 10.21873/anticanres.13202. PMID: 30711984.
- Soutome S. Effect of perioperative oral care on prevention of postoperative pneumonia associated with esophageal cancer surgery: a multicenter casecontrol study with propensity score matching analysis. *Medicine*. 2017;96(33):e7436. e7436.
- Low, D.E., et al., *Benchmarking Complications Associated with Esophagectomy*. Ann Surg, 2019. 269(2): p. 291-298.
- Ahmadinejad, *et al*.Incidence and risk factors of an intraoperative arrhythmia in transhiatal esophagectomy Iran. Red Crescent Med. J., 17 (12)(2015)
- Taioli, E.S., R. M.; Lieberman-Cribbin, W.; Moskowitz, G.; Van Gerwen, M.; Flores, R.; , Quality of life after open or minimally invasive esophagectomy in patients with esophageal cancer-a systematic review. . Semin Thorac Cardiovasc Surg 2017. 29(29): p. 377-90.

- Lagergren J, Smyth E, Cunningham D, Lagergren P. Oesophageal cancer. Lancet. 2017 Nov 25;390(10110):2383-2396. doi: 10.1016/S0140-6736(17)31462-9. Epub 2017 Jun 22. PMID: 28648400.
- Kumai, Y., Samejima, Y., Watanabe, M. *et al.* Videofluoroscopic evaluation of pharyngeal swallowing dysfunction after esophagectomy with three-field lymph node dissection. *Eur Arch Otorhinolaryngol* 274, 321–326 (2016). https://doi.org/10.1007/s00405-016-4209-9
- Kumai Y, Yoshida N, Kamenosono N, Matsubara K, Samejima Y, Baba H, Yumoto E, Effects of Chin-Down Maneuver on the Parameters of Swallowing Function After Esophagectomy With 3-Field Lymphadenectomy Examined by Videofluoroscopy, Archives of Physical Medicine and Rehabilitation, Volume 98, Issue 6, 2017, Pages 1174-1179, ISSN 0003-9993,
- Miles A, Clark S, Jardine M, Allen J. Esophageal Swallowing Timing Measures in Healthy Adults During Videofluoroscopy. Ann Otol Rhinol Laryngol. 2016 Sep;125(9):764-9. doi: 10.1177/0003489416653410. Epub 2016 Jun 10. PMID: 27287678.



Acute SLT Management Information

- Day 4POD post 3 stage or transhiatal oesophagectomy: Routine dysphagia assessment only trial regular fluids and yoghurt
- Fluid/Diet Modification
- Postural/compensatory Strategies
- Swallow Rehabilitation

Fluids/Diet Modification

Day 1 – 60mls/hr/water only Day 2 – 1L water only Day 3 – soup/jelly/ice-cream Day 4 – half portions of soft diet

Of note:

Team will progress patient onto soup, jelly and ice-cream and then $\frac{1}{2}$ portions of soft diet as they improve.

