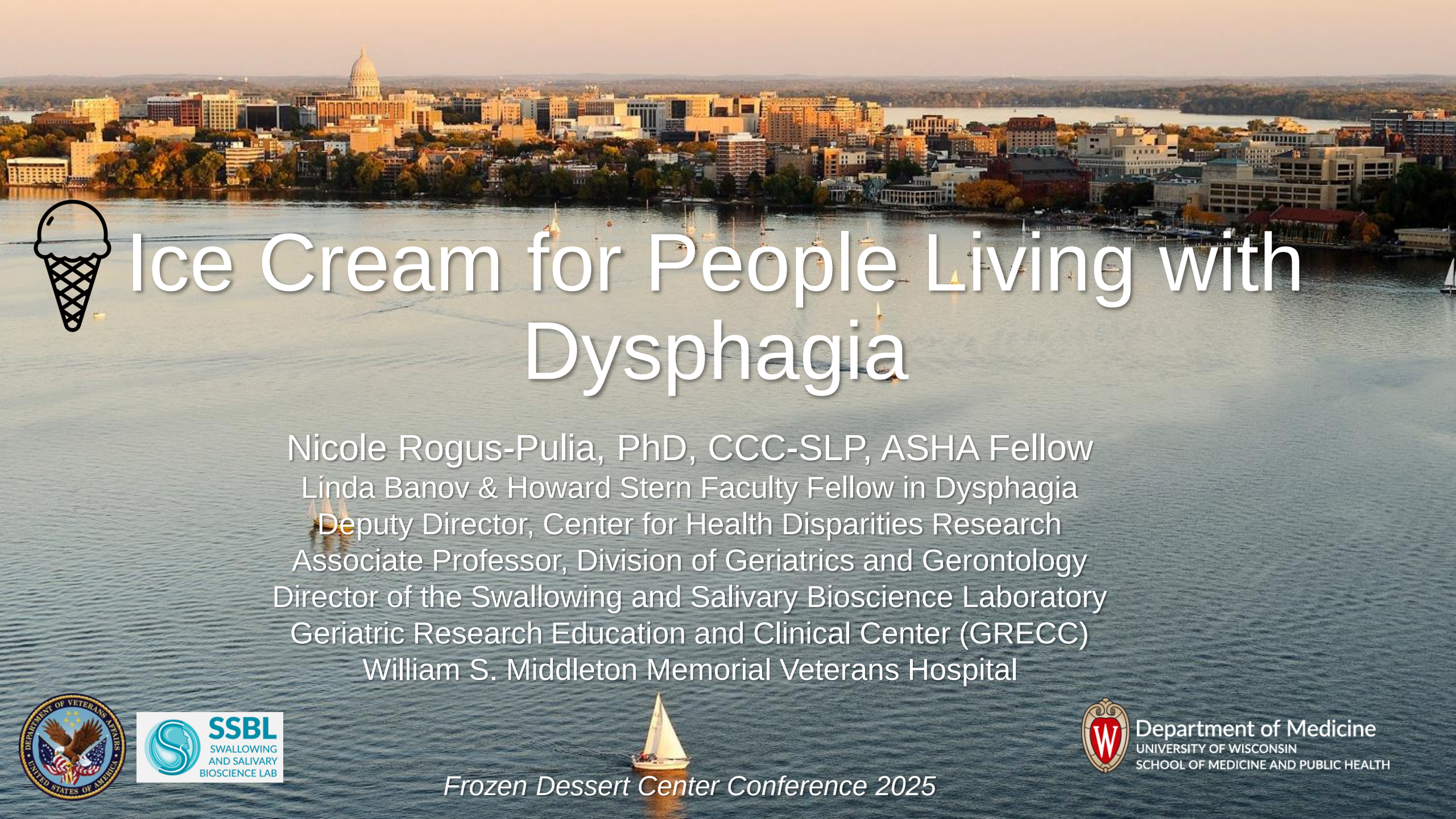

Ice Cream for People Living with Dysphagia

Nicole Rogus-Pulia, PhD, CCC-SLP, ASHA Fellow
Linda Banov & Howard Stern Faculty Fellow in Dysphagia
Deputy Director, Center for Health Disparities Research
Associate Professor, Division of Geriatrics and Gerontology
Director of the Swallowing and Salivary Bioscience Laboratory
Geriatric Research Education and Clinical Center (GRECC)
William S. Middleton Memorial Veterans Hospital

SSBL SWALLOWING AND SALIVARY BIOSCIENCE LAB

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Frozen Dessert Center Conference 2025

Disclosures

- None

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Swallow – to move material from the mouth through the esophagus into the stomach by a series of muscular actions

Dysphagia – a swallowing disorder characterized by difficulty moving…

- food
- liquid
- secretions
- medications

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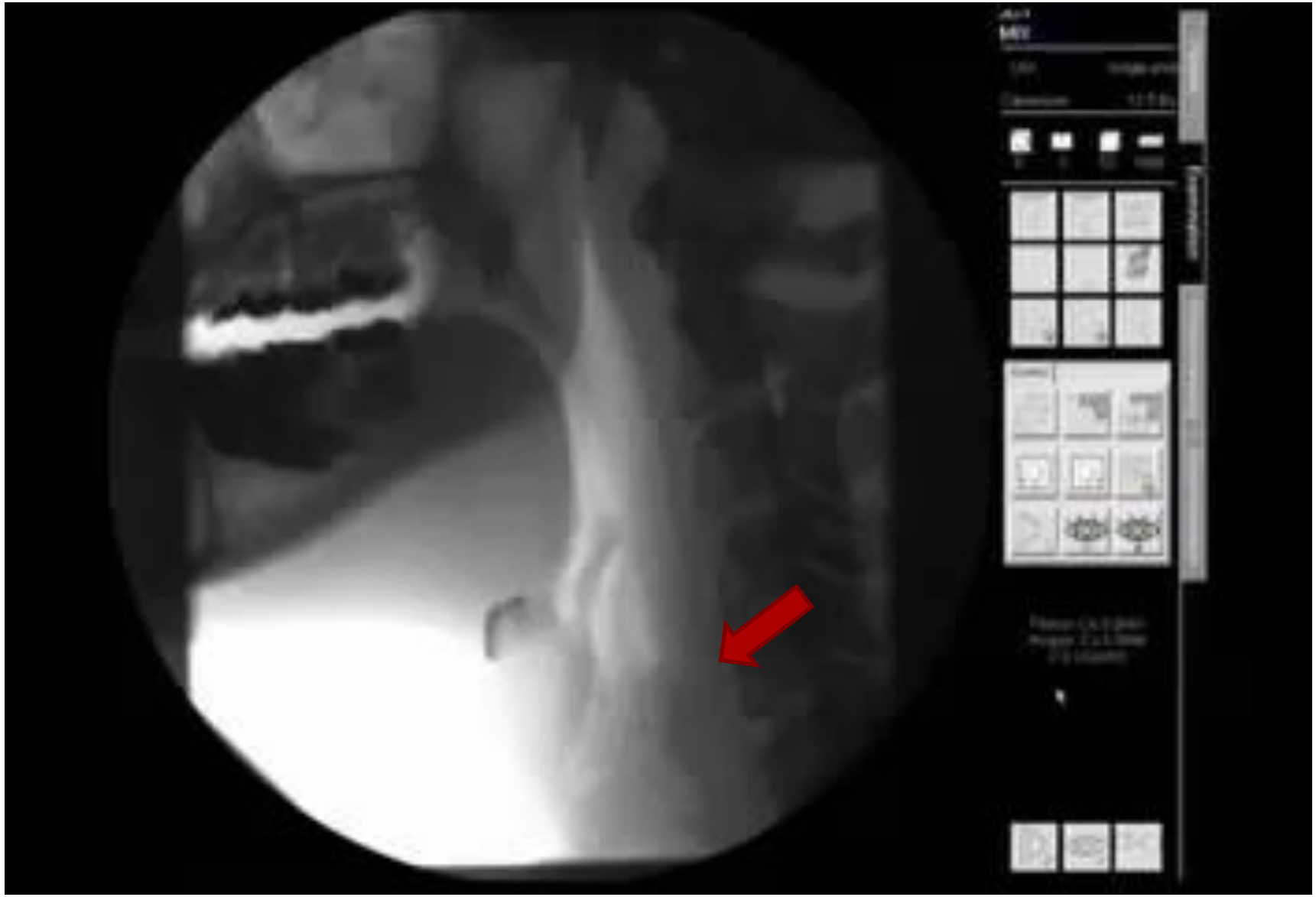
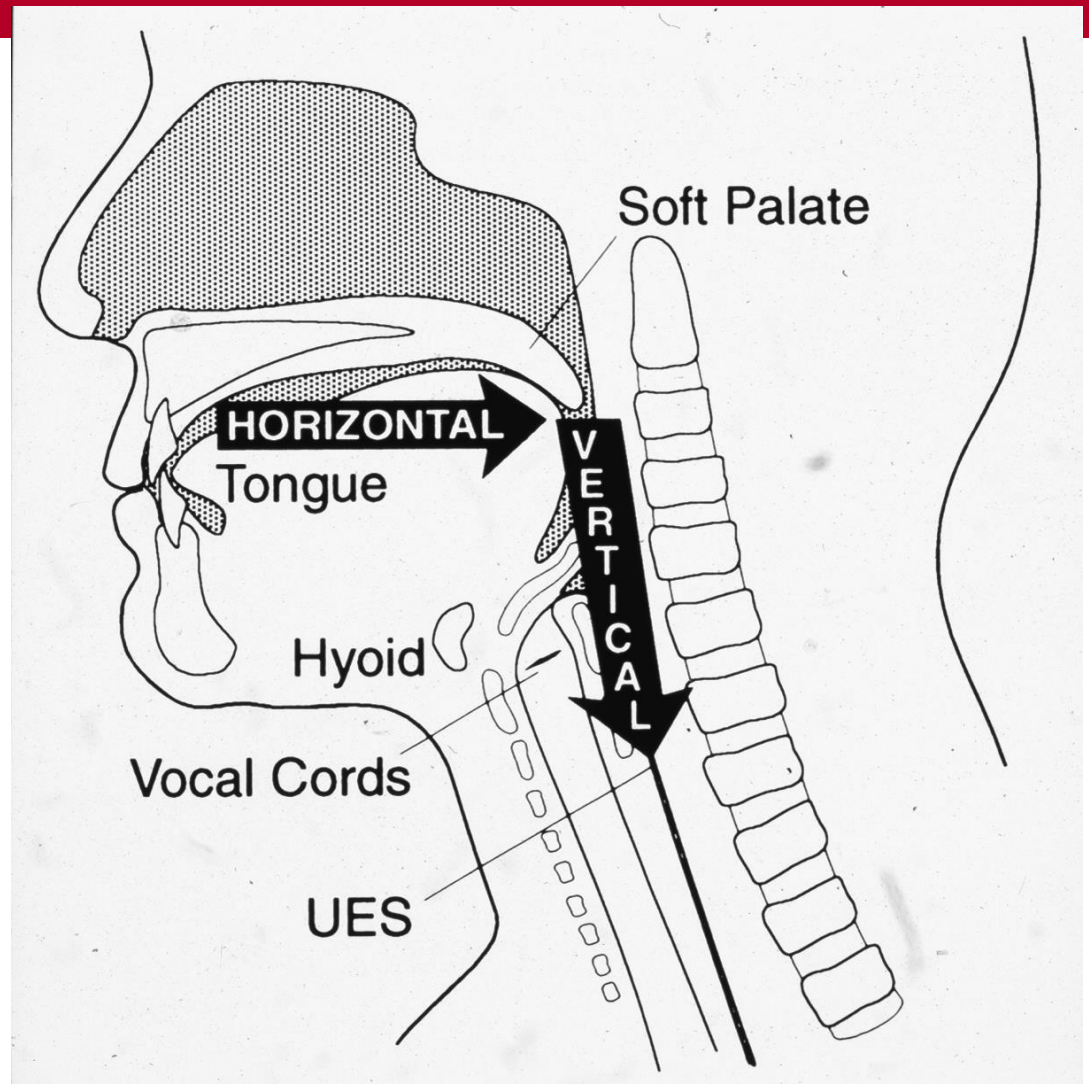
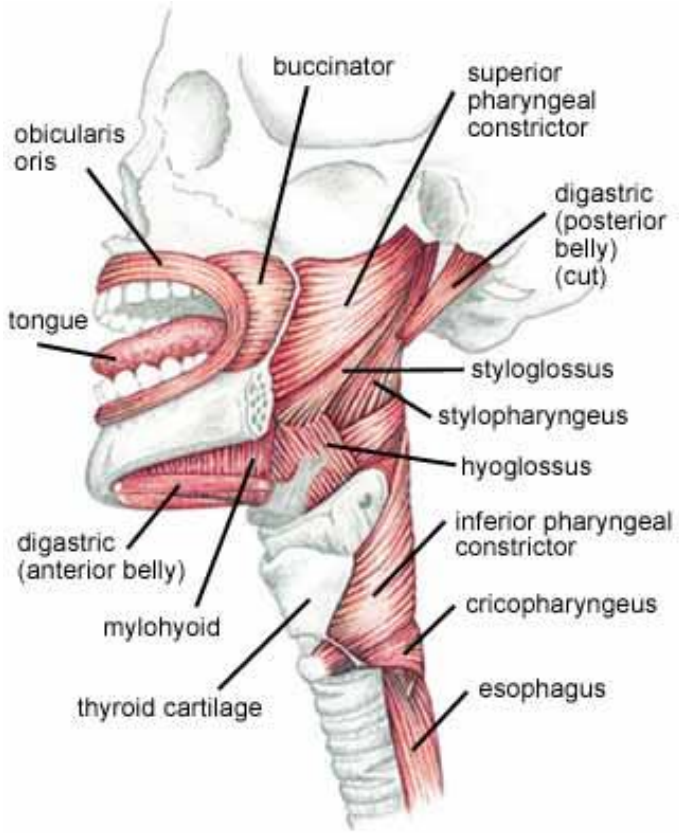
Normal Swallow- Young Adult

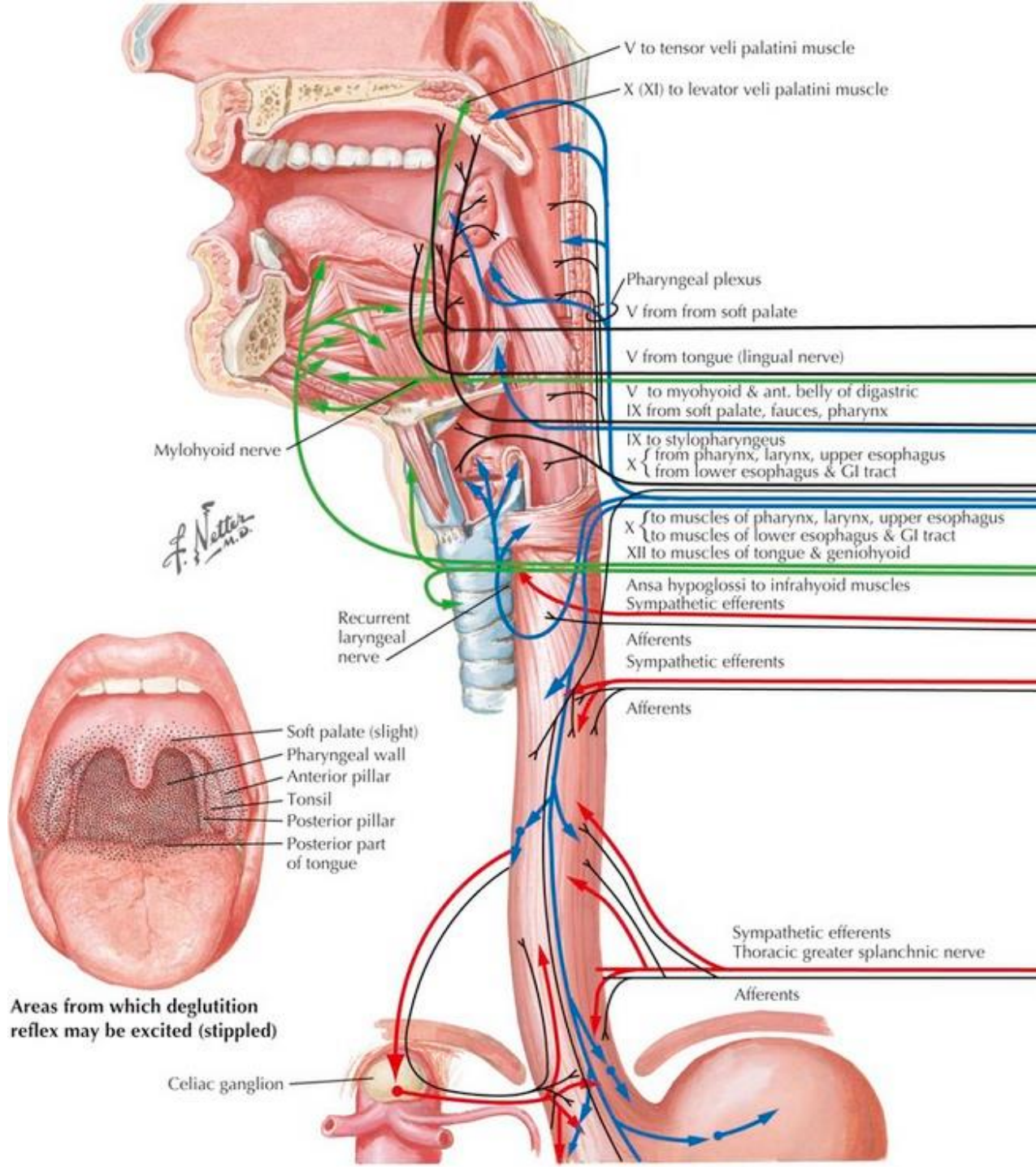


Physiology/Biomechanics - Stages

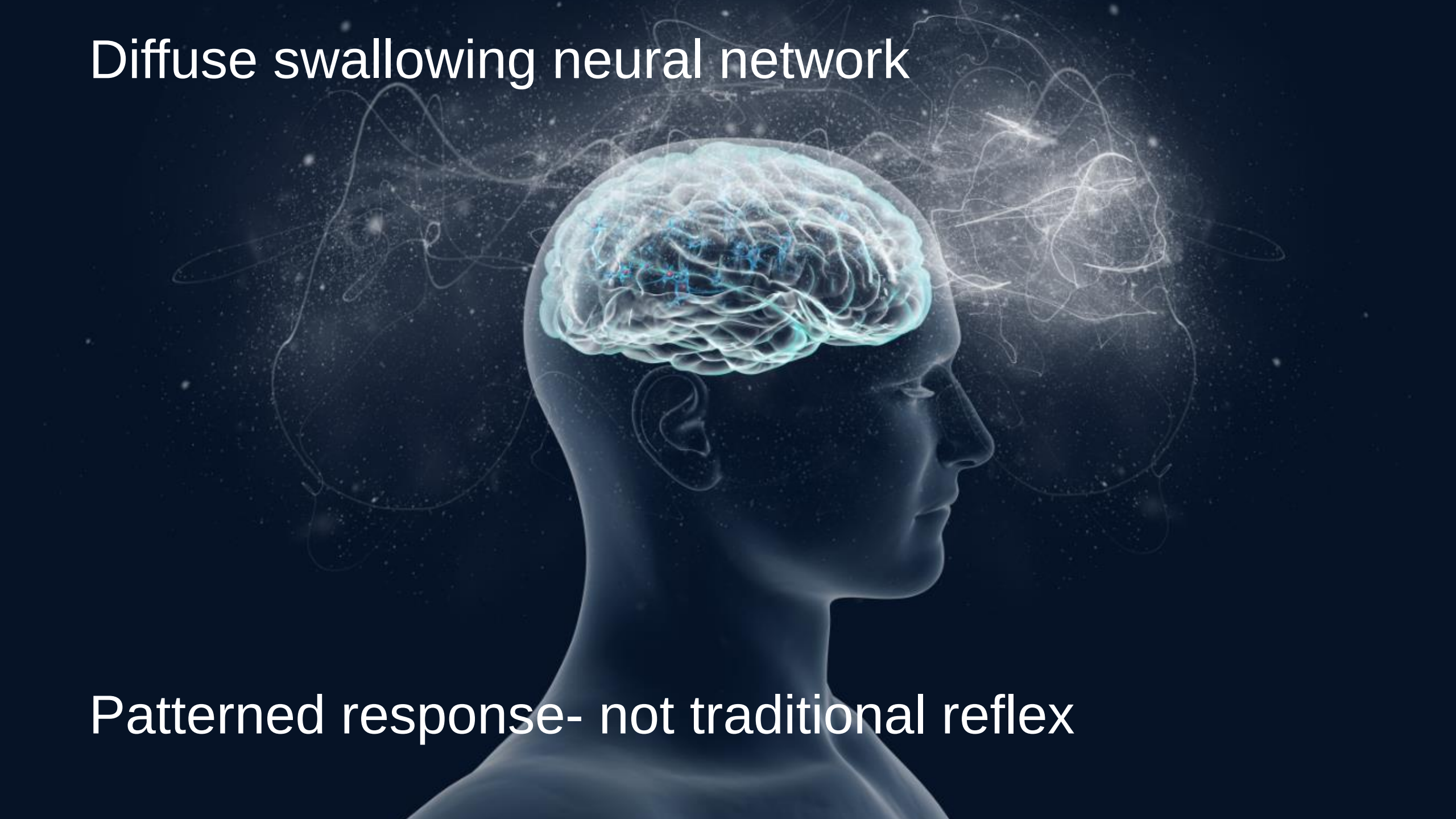


Complex swallowing process involves precise coordination of 50 muscle pairs and 6 cranial nerves





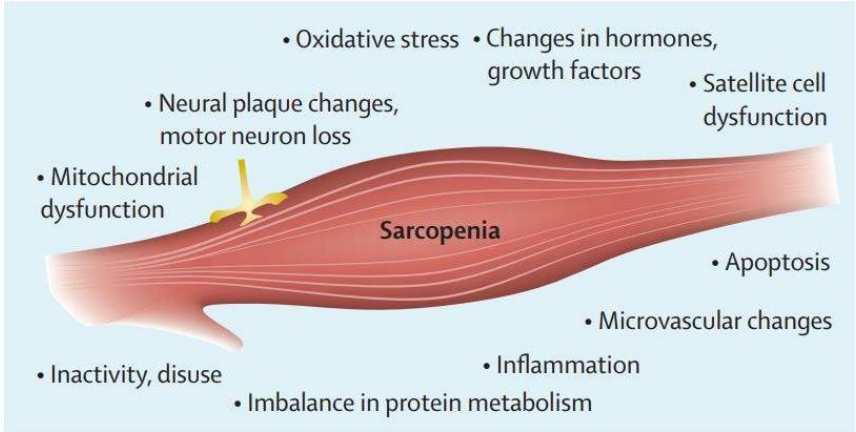
Diffuse swallowing neural network



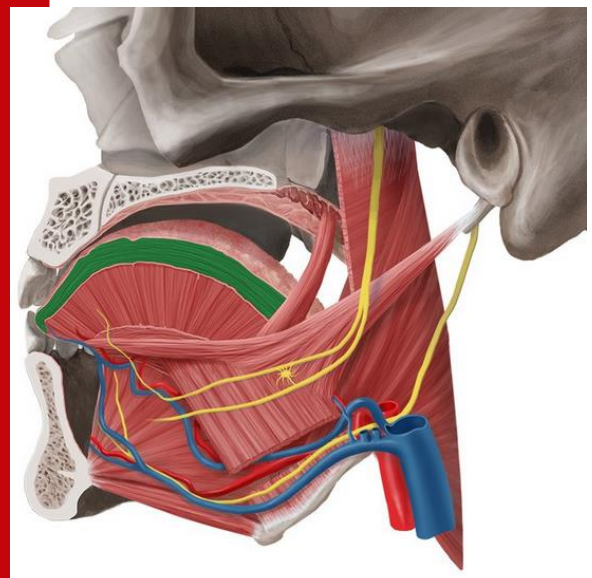
Patterned response- not traditional reflex

Sarcopenia- Head and Neck Muscles

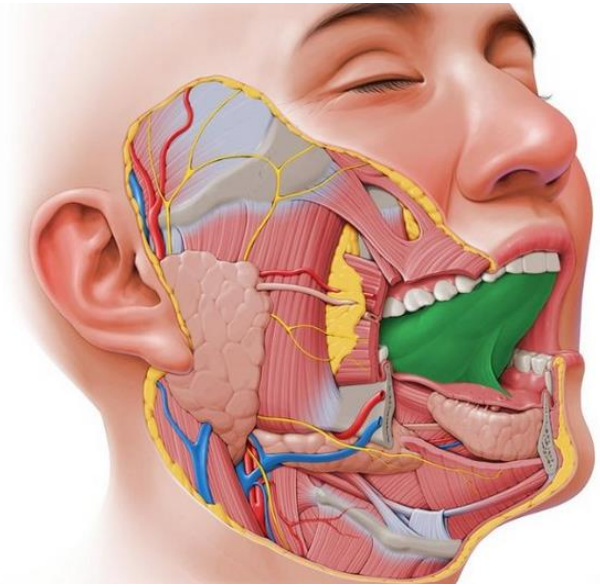
- Skeletal muscles of head and neck affected by systemic factors leading to sarcopenia



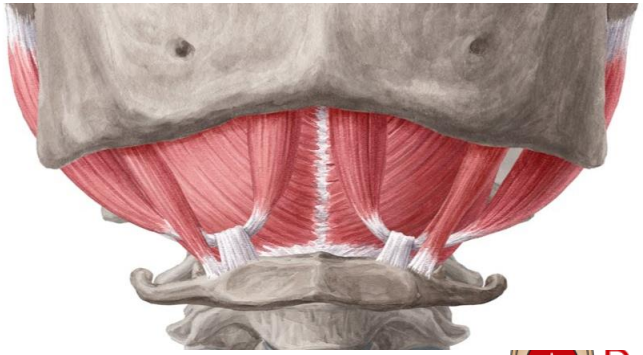
- Swallowing-related skeletal muscles



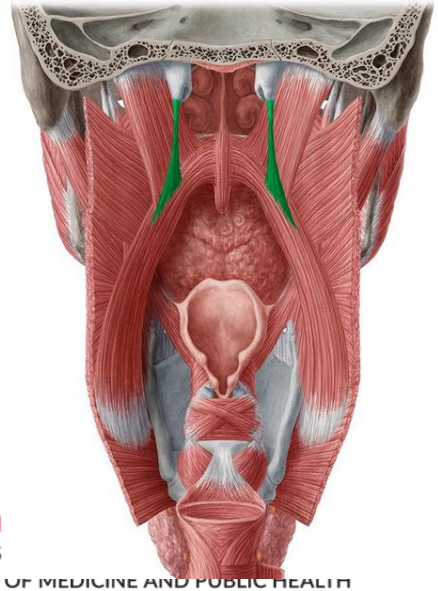
Intrinsic and Extrinsic Tongue Muscle



Muscles of Mastication



Suprahyoid Muscles



Pharyngeal and Laryngeal Muscles

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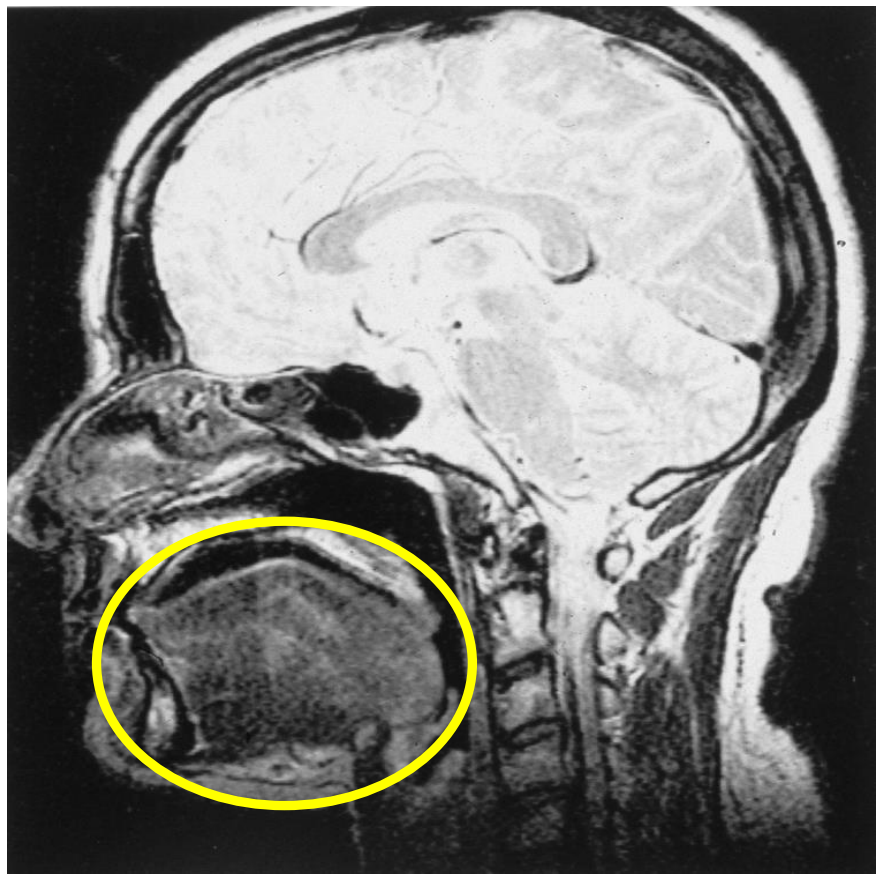
Images from kenhub.com

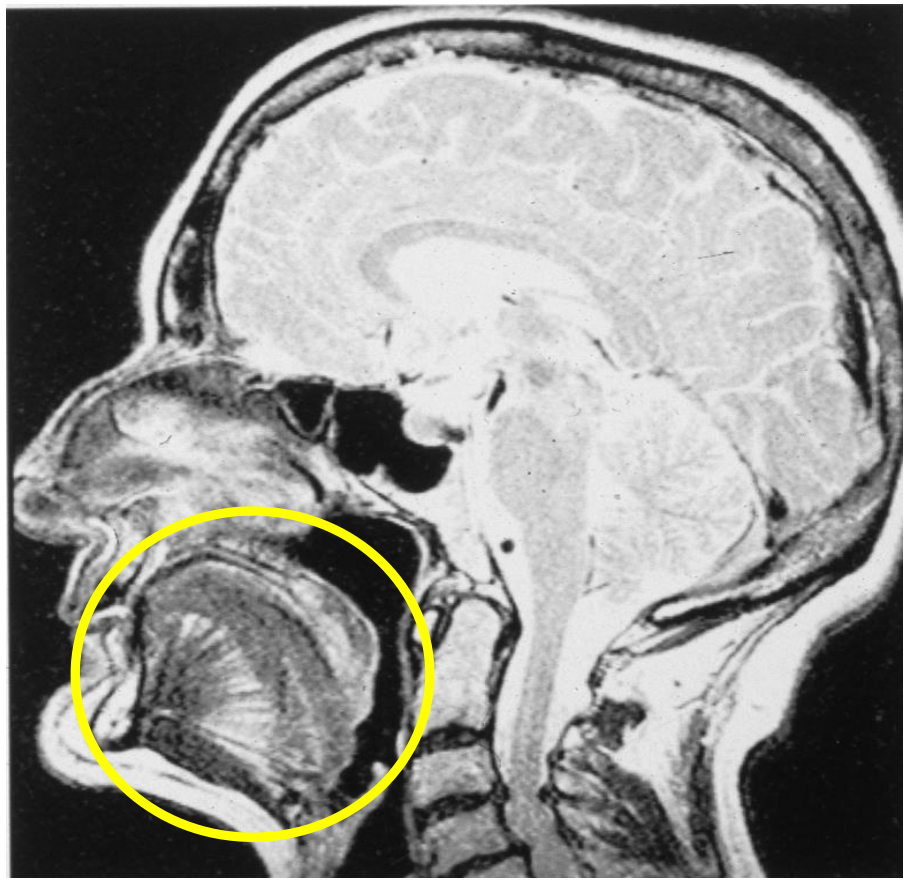
Sarcopenia- Head and Neck Muscles

- Reduction in tongue muscle fiber diameter

Nakayama et al., 1991

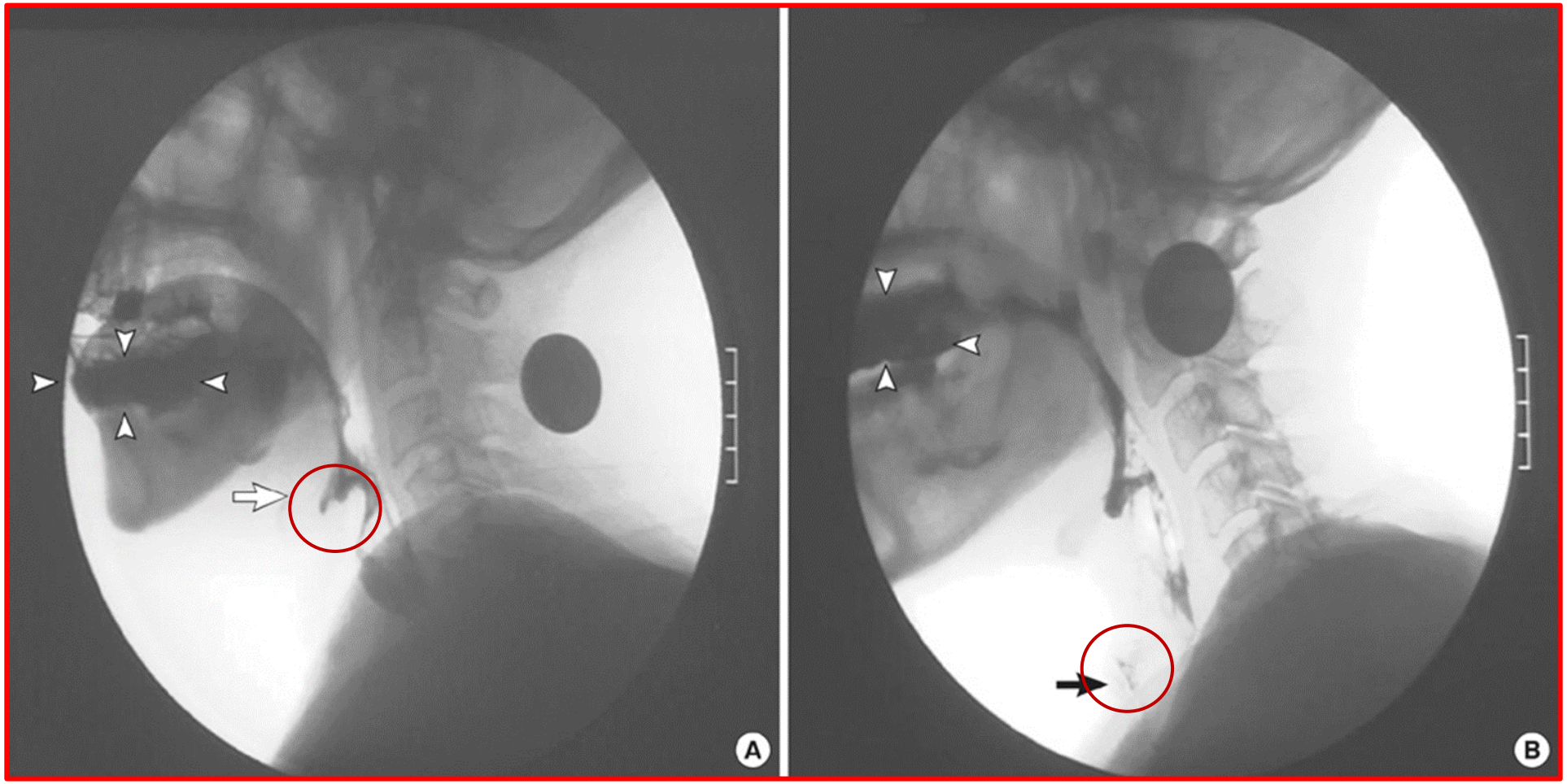


38 Yr Old Female



81 Yr Old Female

Safety- Airway Invasion



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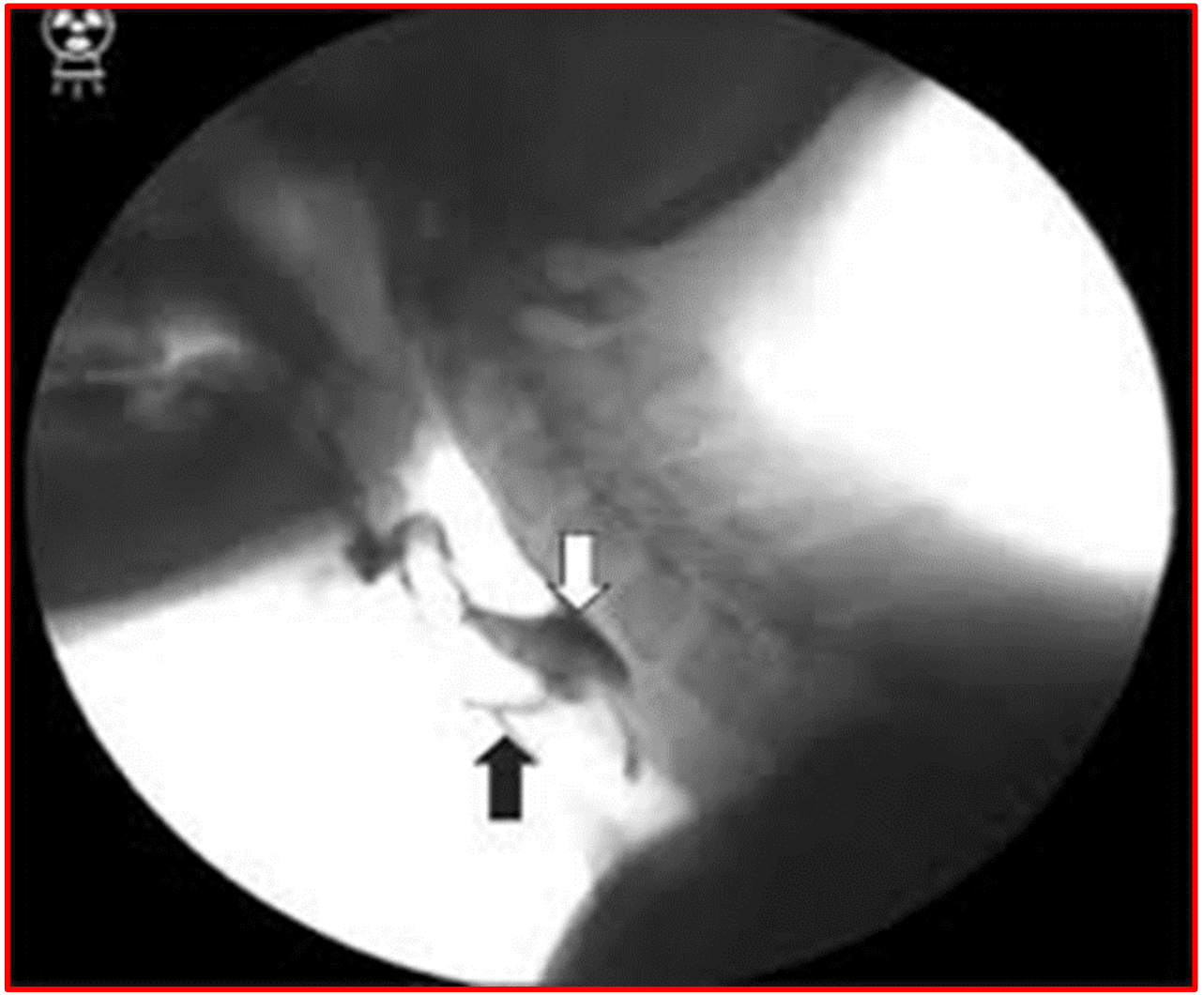
Efficiency- Oropharyngeal Residue



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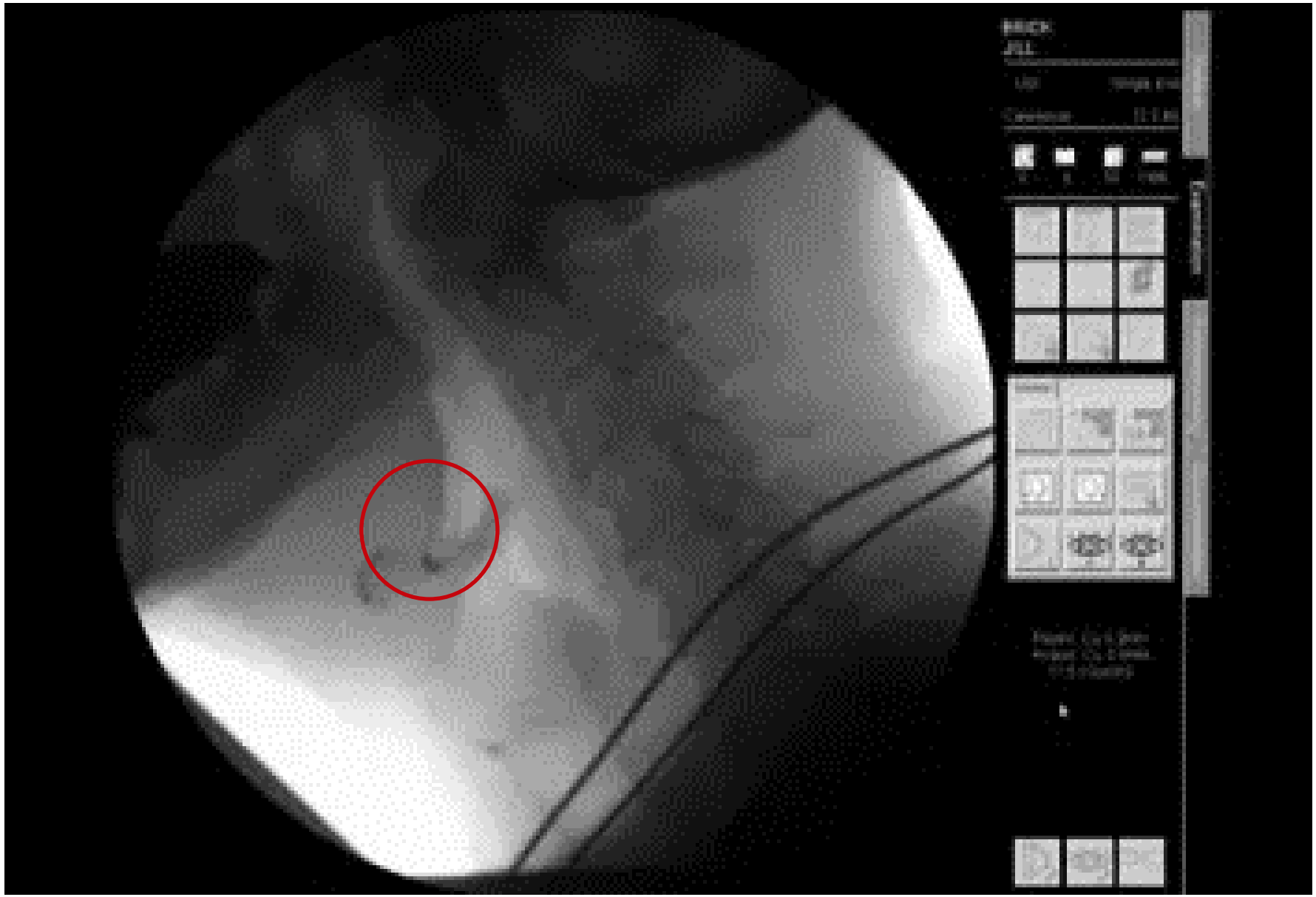
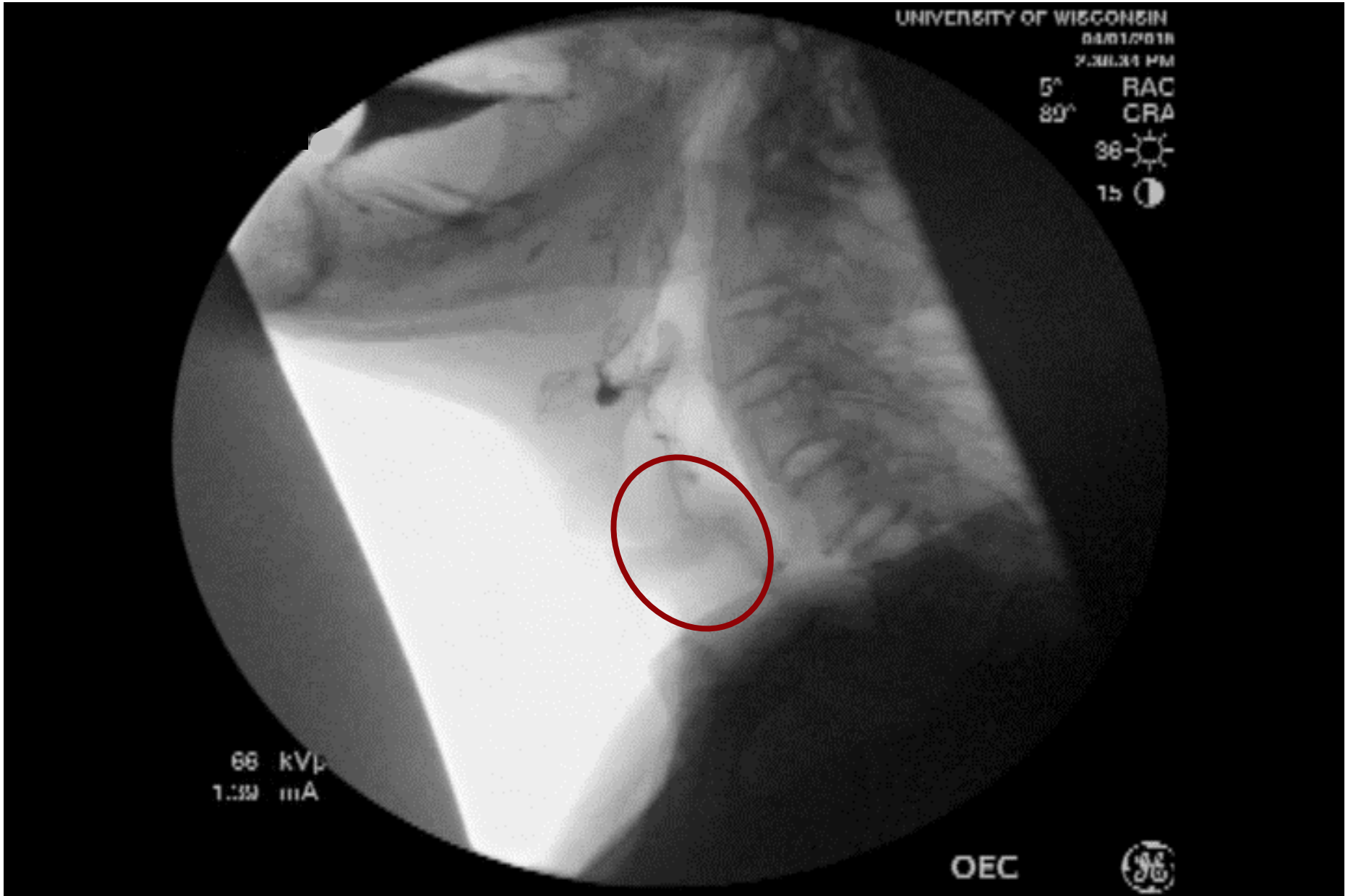
Normal Swallow- Older Adult

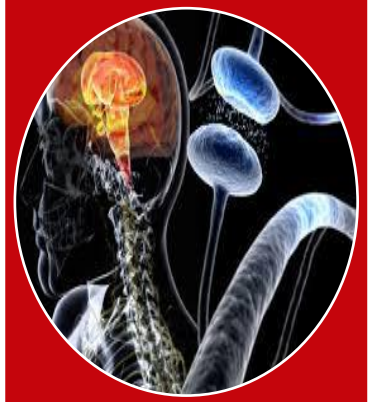


Abnormal Swallow



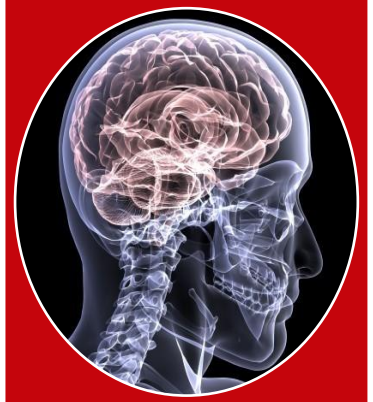
Medical Etiologies Associated with Dysphagia

Stroke

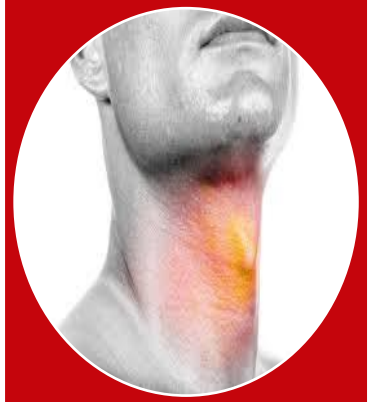


Progressive Neurologic Disease

Dementia



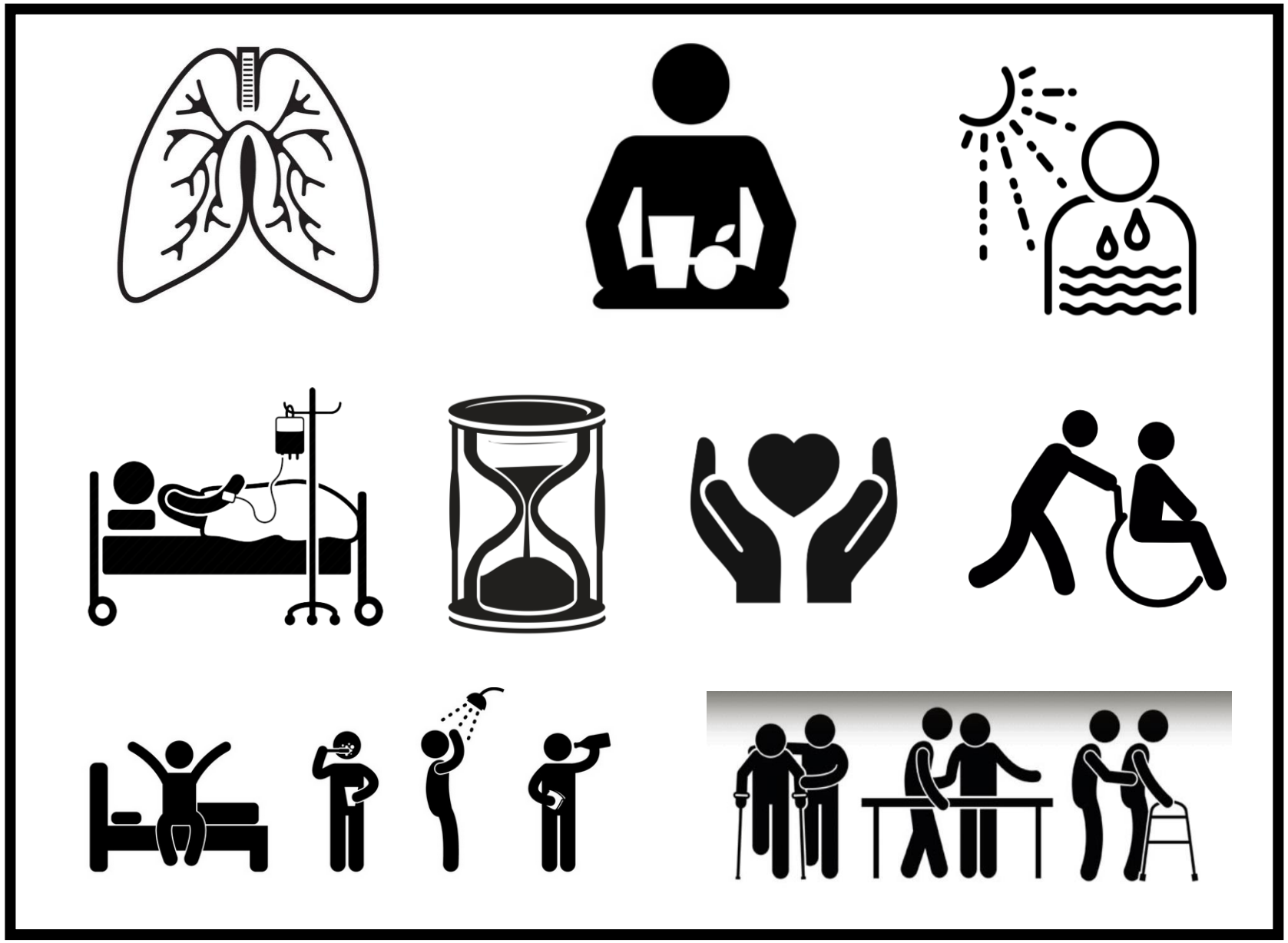
Traumatic Brain Injury



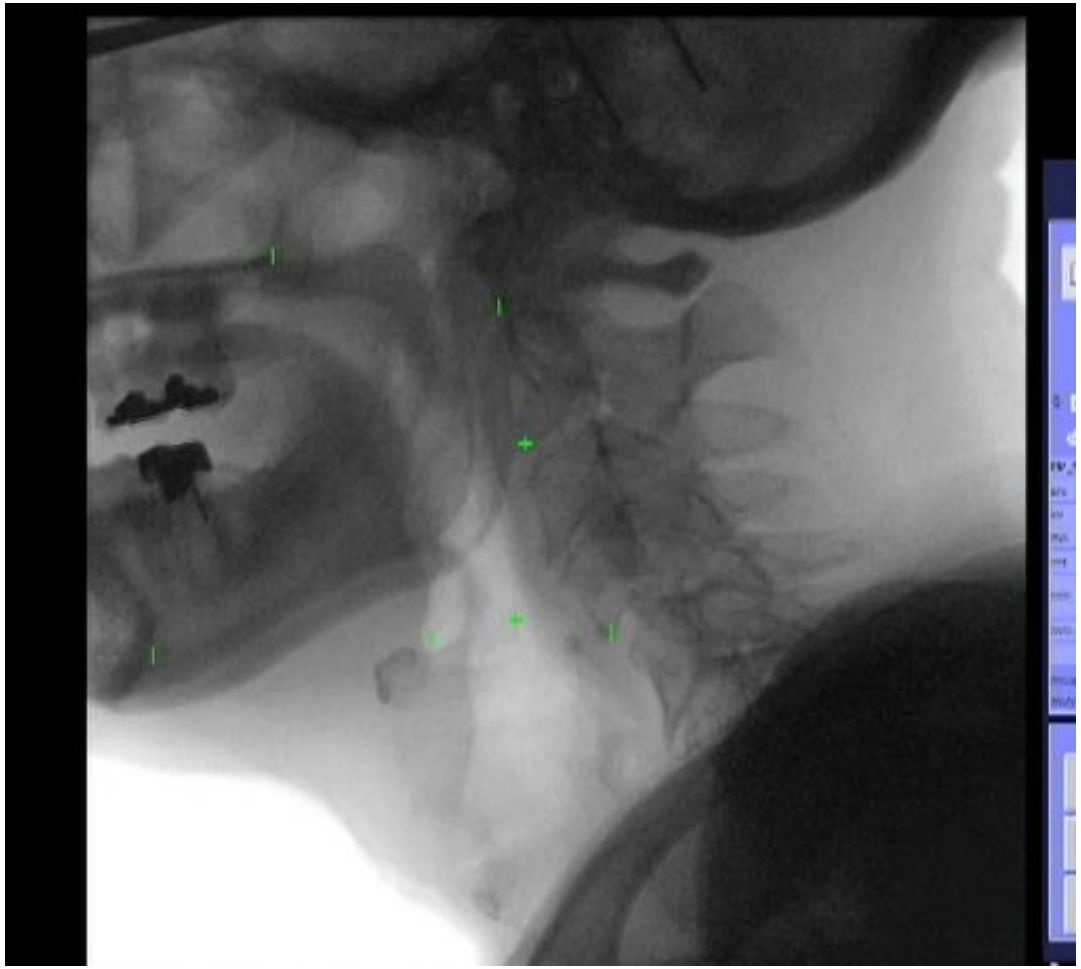
Head and Neck Cancer

Dysphagia

Dysphagia-Related Consequences



Imaging for Swallowing

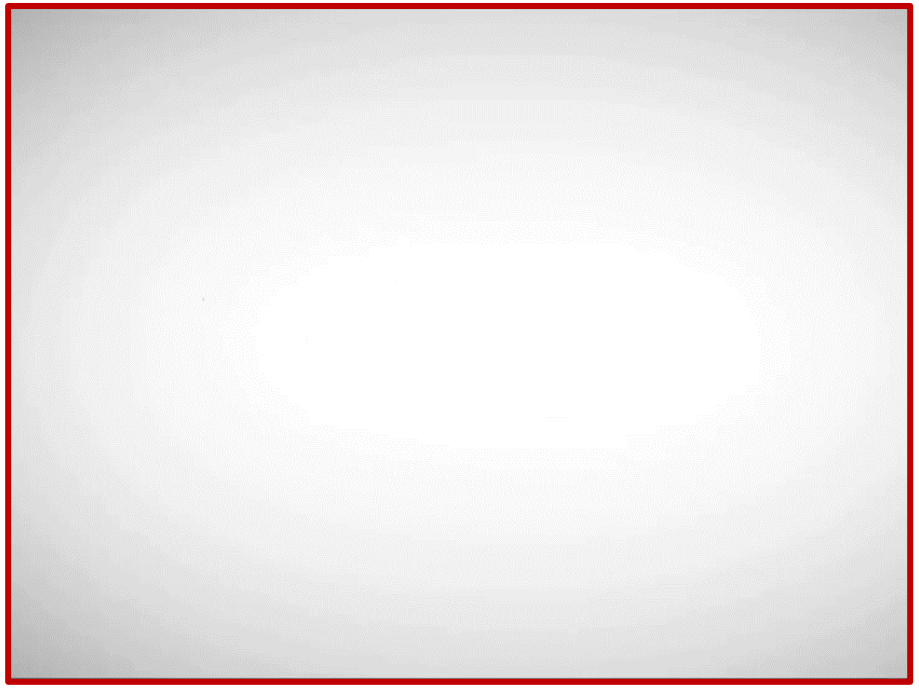


Videofluoroscopy

Fiberoptic Endoscopic Evaluation of Swallowing (FEES)

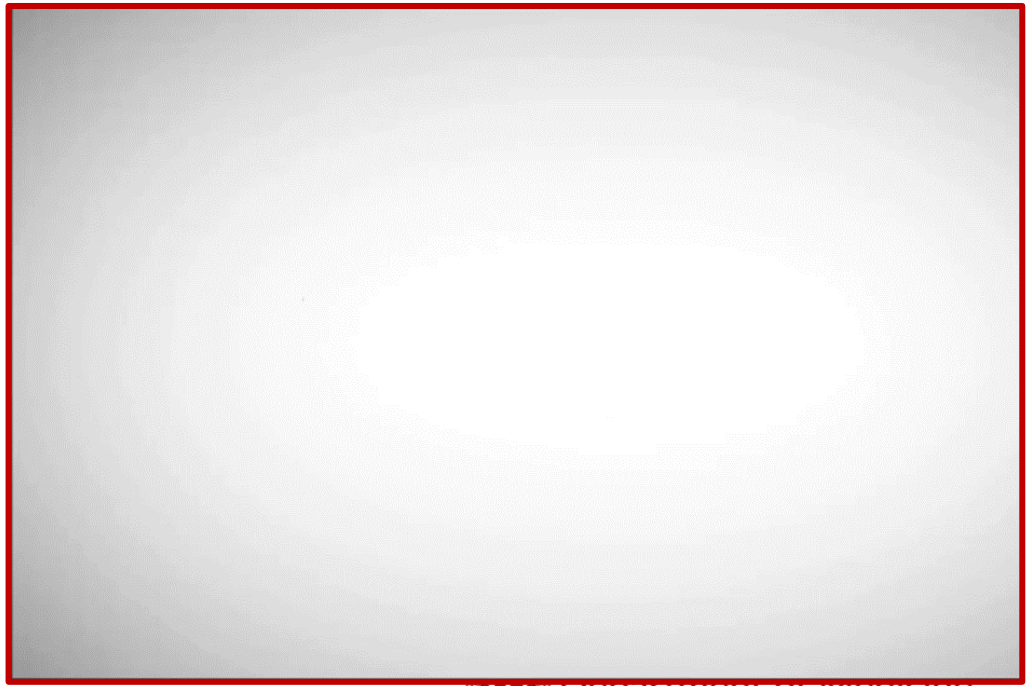
Intervention: Rehabilitative Approaches

- Strength and Skill Based Exercise Approaches
  - Target function of the muscles active during swallowing
  - Swallowing maneuvers used as exercise



Effortful swallow

Therapidia YouTube link: https://www.youtube.com/watch?v=wKmJdCe7aKs



Super supraglottic swallow

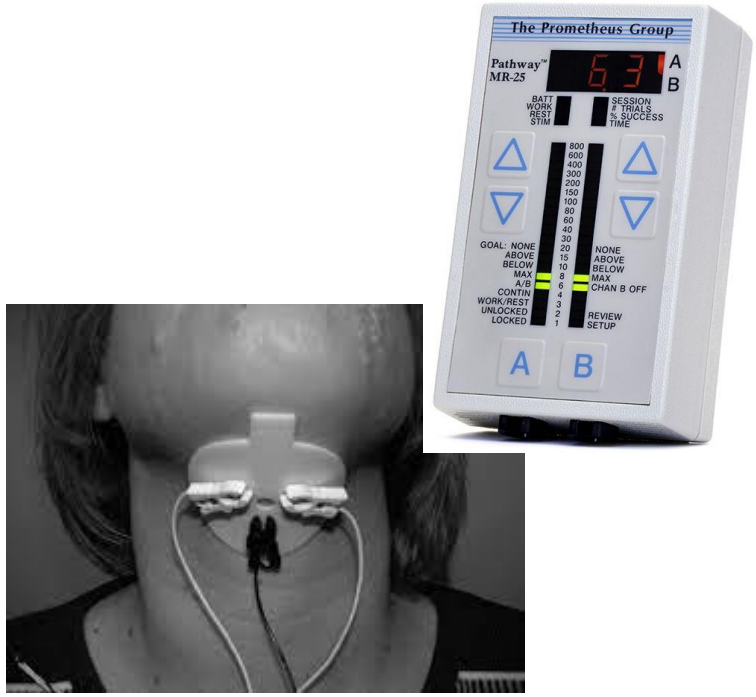
Therapidia YouTube link: https://www.youtube.com/watch?v=Ga5ijAKn9SI

Intervention: Rehabilitative Approaches

- Device-facilitated interventions

Lingual Strengthening

Expiratory Muscle Strength Training

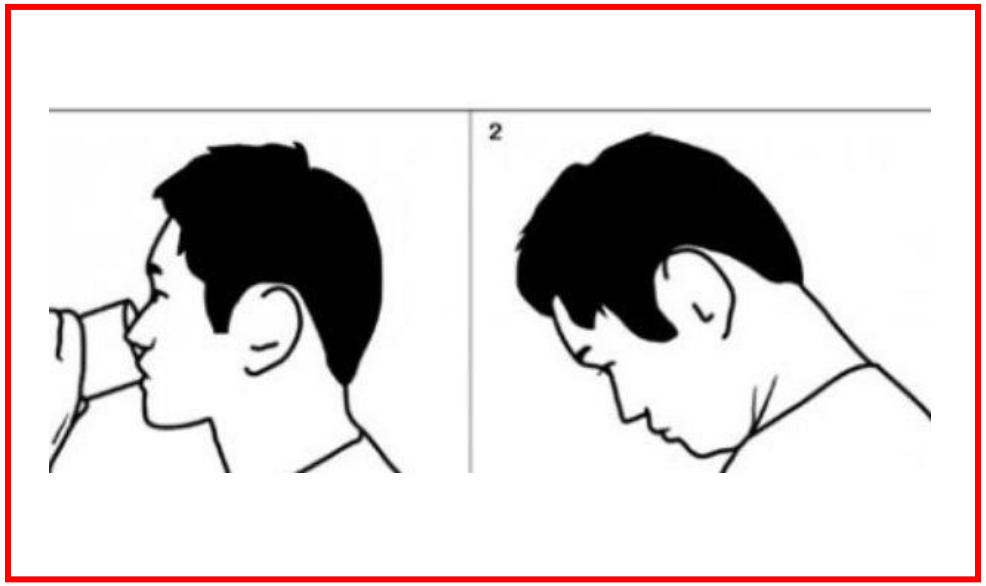


Surface Electromyography as Biofeedback

Intervention: Compensatory Approaches

- Compensate for abnormalities in swallowing biomechanics
  - Improve safety and efficiency but no lasting change in physiology

Dietary Modifications



Postural Adjustments

Eating Strategies

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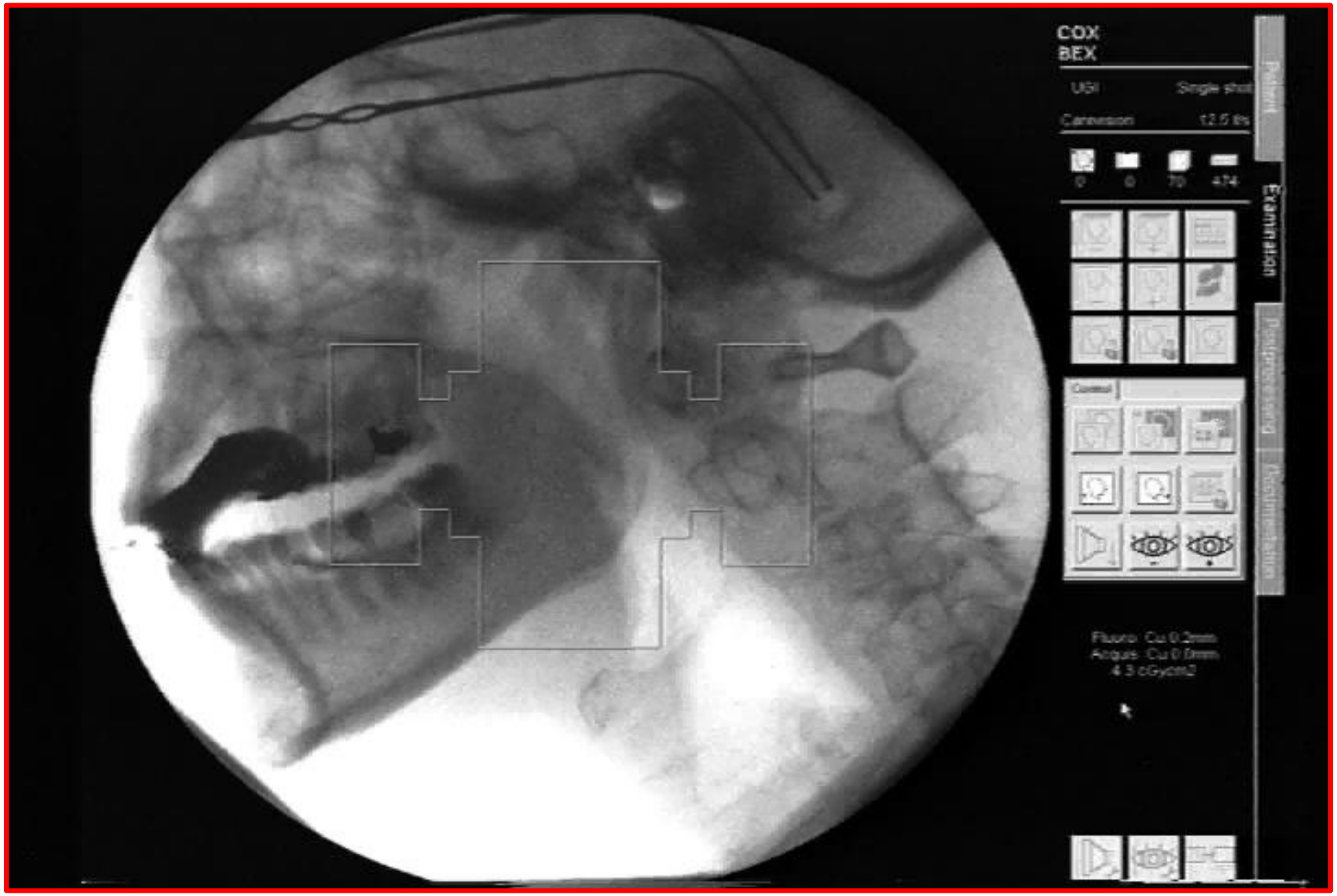
Thin Liquid



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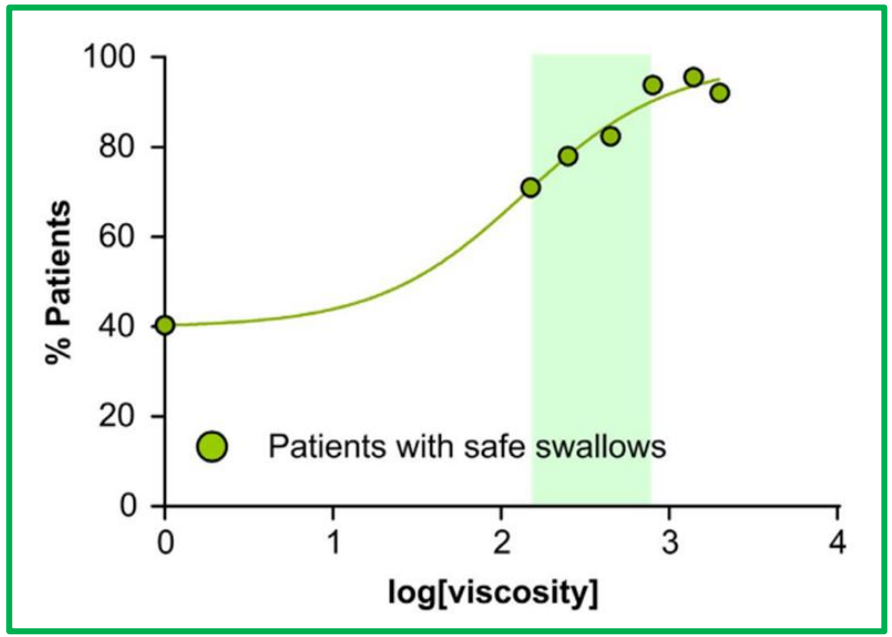
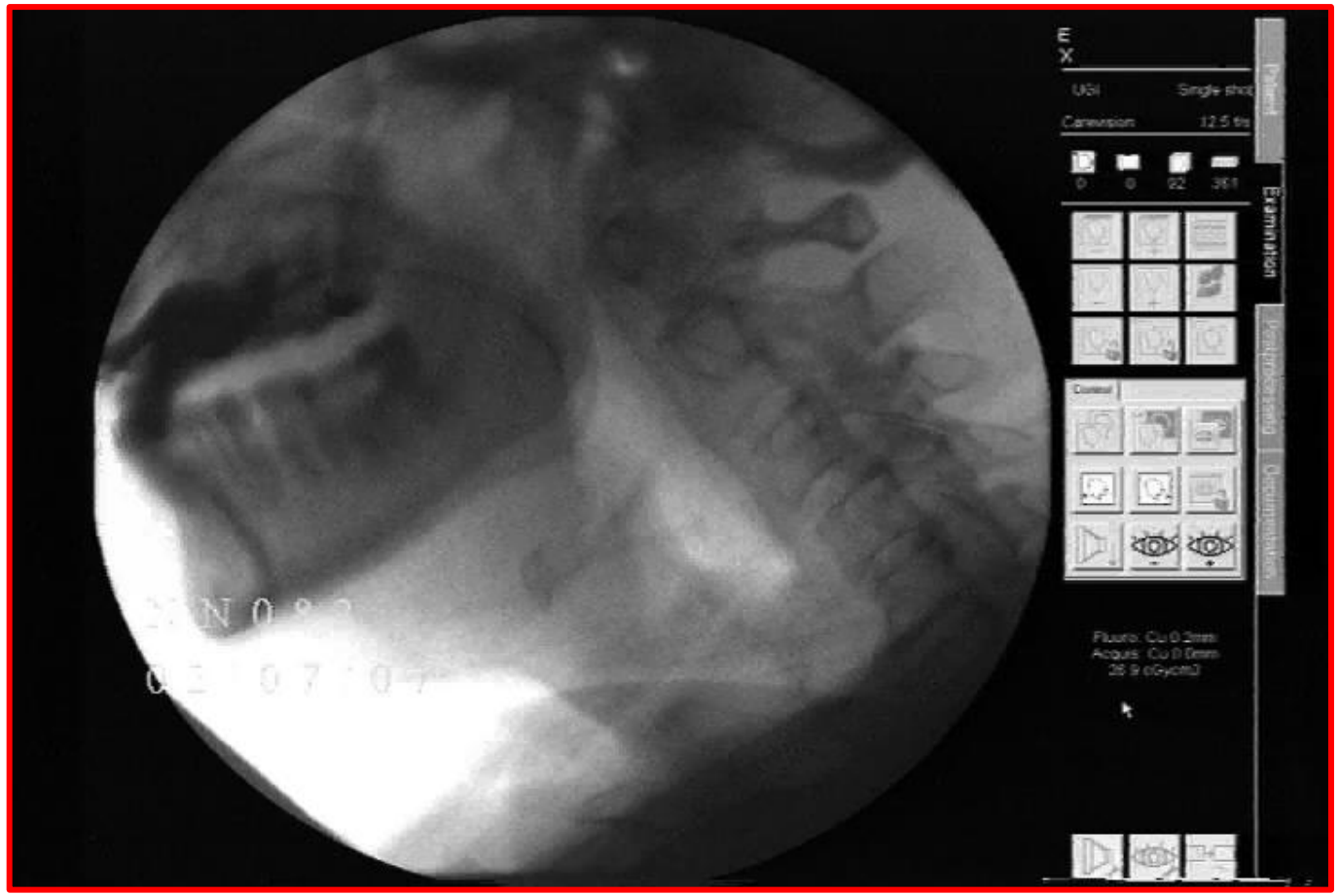
Thickened Liquids





ORIGINAL ARTICLE

Dysphagia WILEY

Effect of a gum-based thickener on the safety of swallowing in patients with poststroke oropharyngeal dysphagia

Mireia Bolivar-Prados[1] | Laia Rofes[2] | Viridiana Arreola[1] | Sonia Guida[3] | Weslania V. Nascimento[1] | Alberto Martin[1] | Natàlia Vilardell[1] | Omar Ortega Fernández[1] | Dina Ripken[3] | Mirian Lansink[3] | Pere Clavé[1,2]

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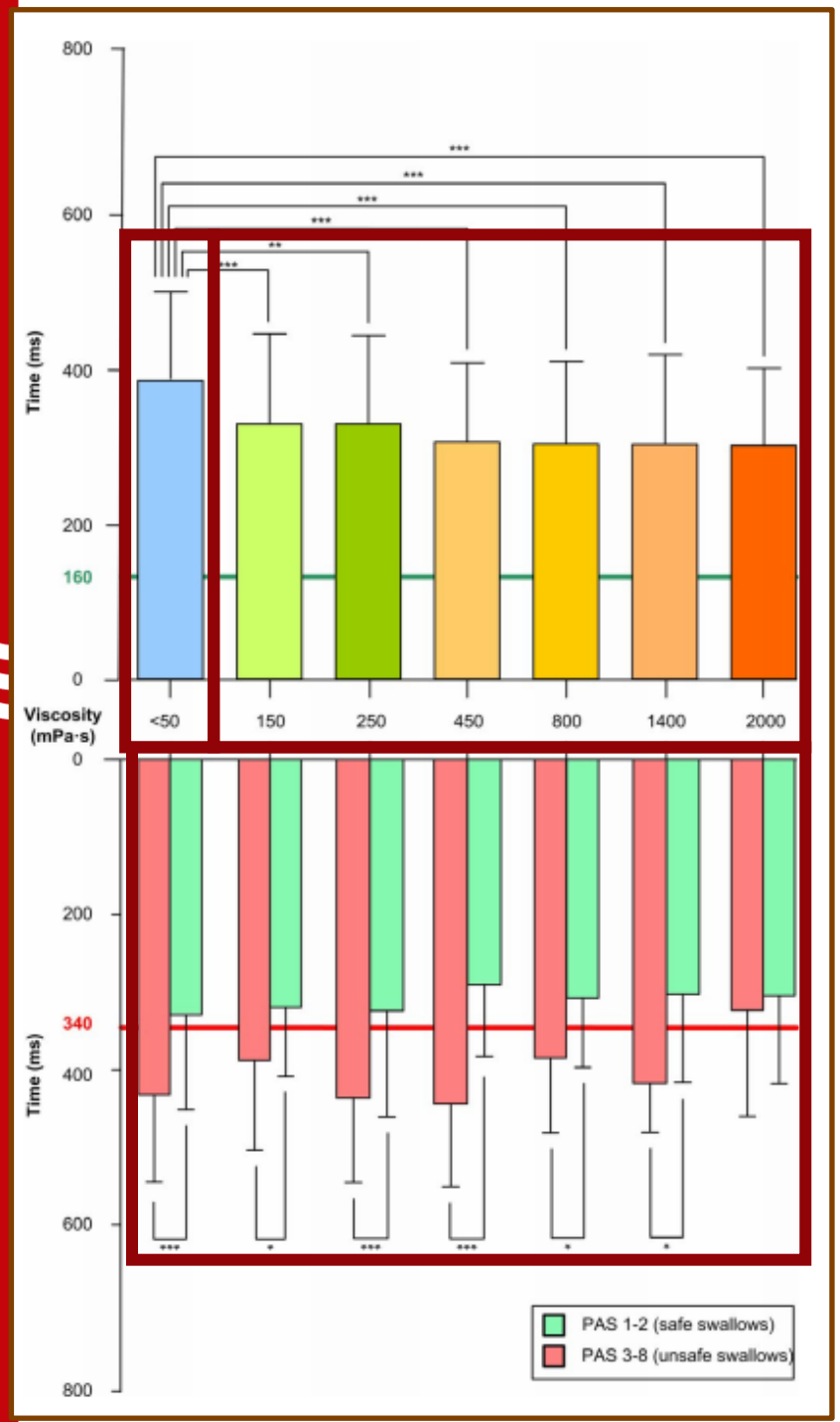
Swallowing Kinematics



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Time to Laryngeal Vestibule Closure

Delay with thin liquids

Time significantly decreased with all thickened liquids compared to thin liquid

Longer time with unsafe swallows regardless of consistency

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Texture-Modified Fluids and Foods

NHS Cambridge
University Hospitals

Miles et al., 2019

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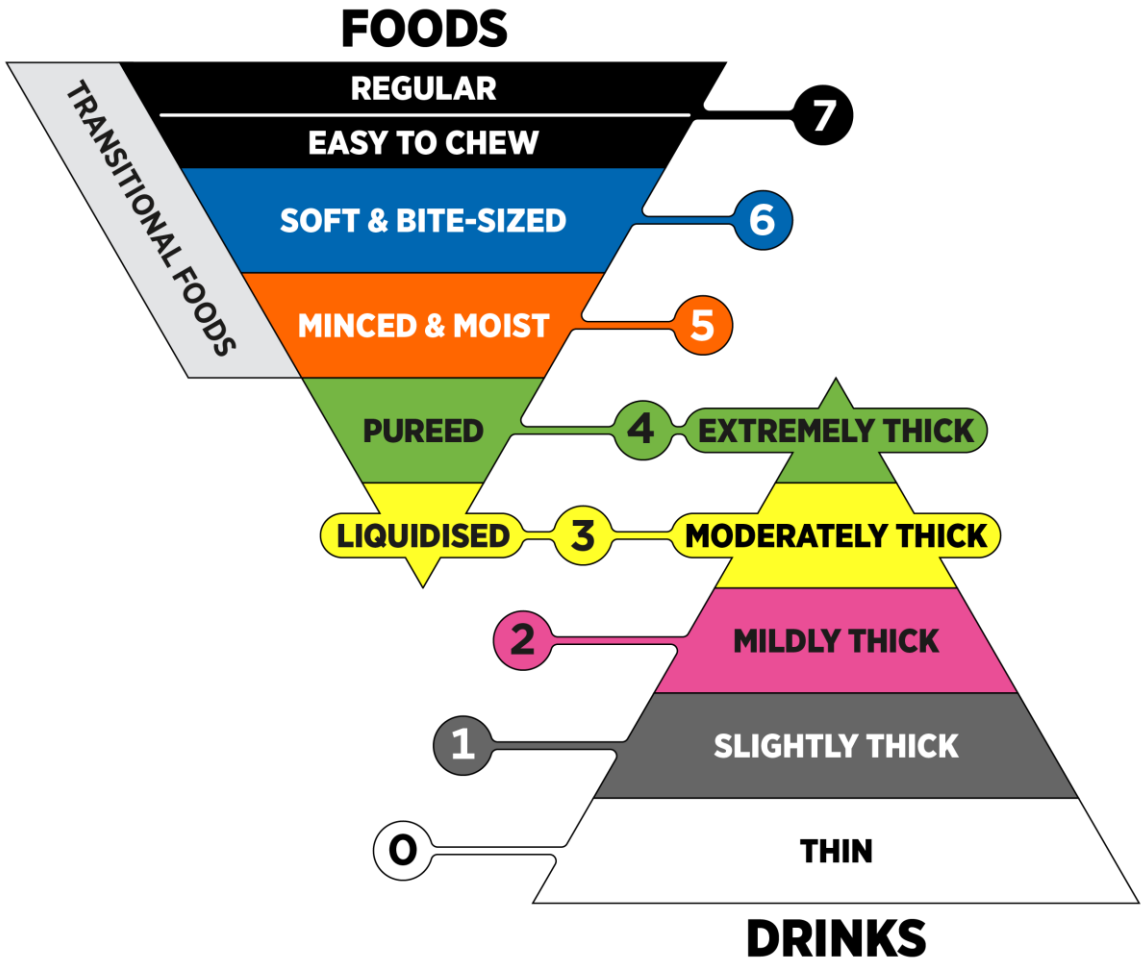
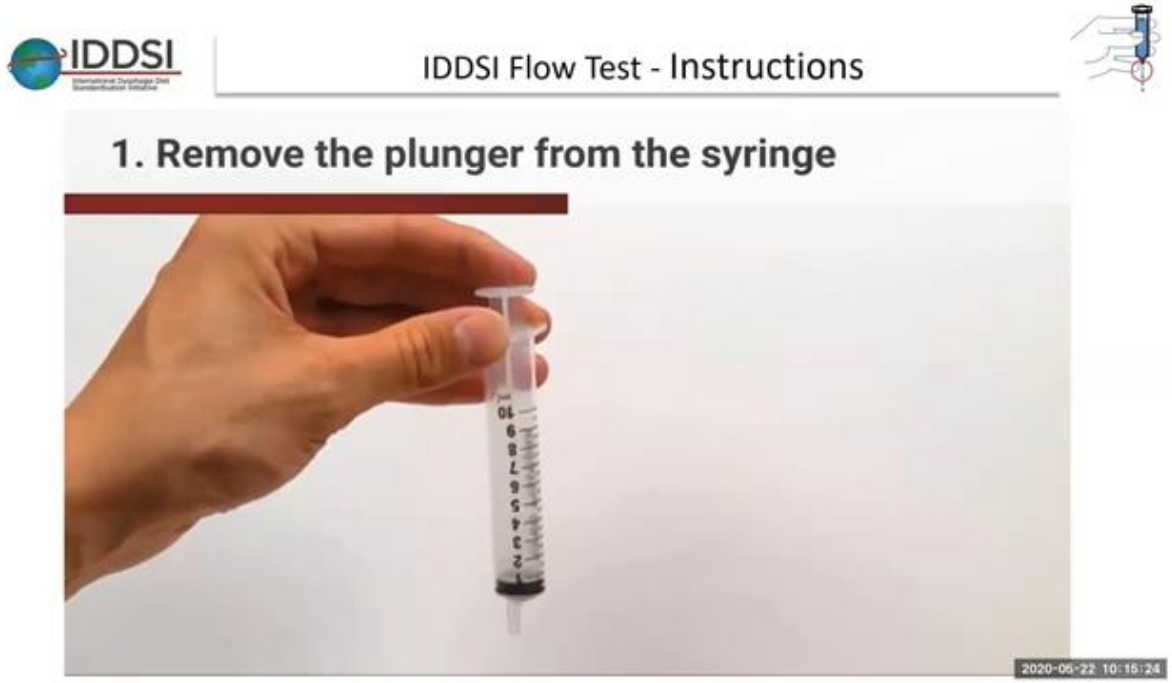
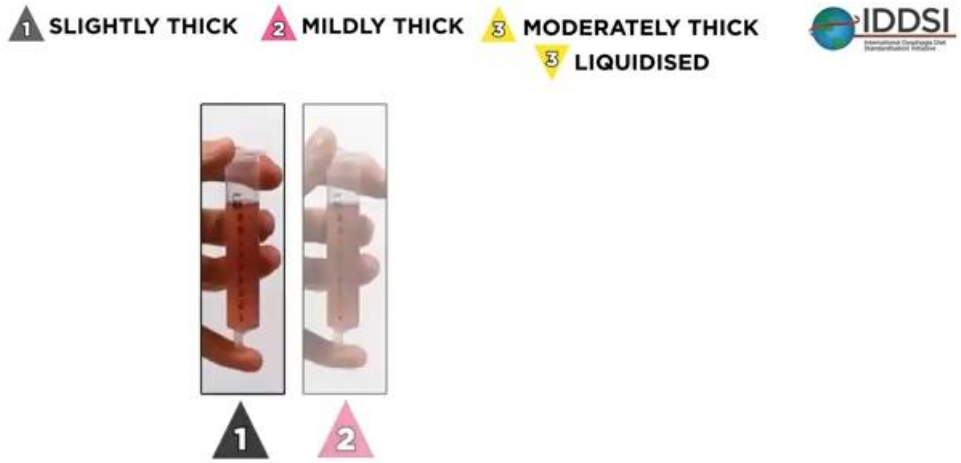
IDDSI
International Dysphagia Diet Standardisation Initiative







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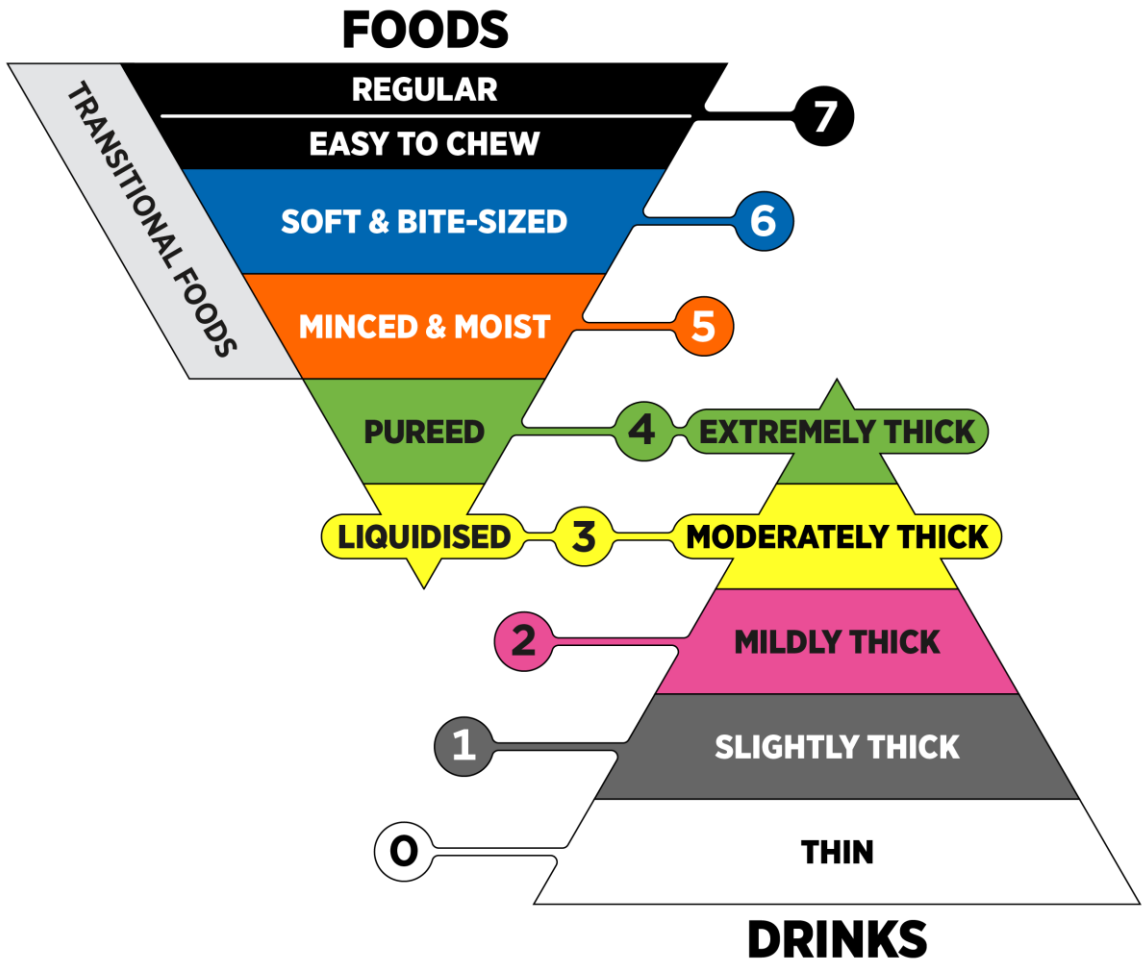
IDDSI
International Dysphagia Diet Standardisation Initiative



IDDSI Fork Drip Test – Level 3 Moderately Thick

21
2020-06-22 10:21:06

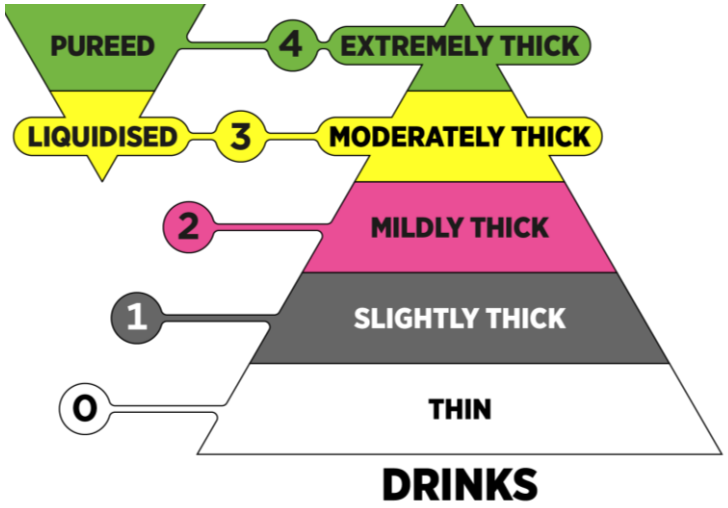
IDDSI Spoon Tilt Test – Level 4 Extremely Thick/Pureed

27
2020-06-22 10:23:25

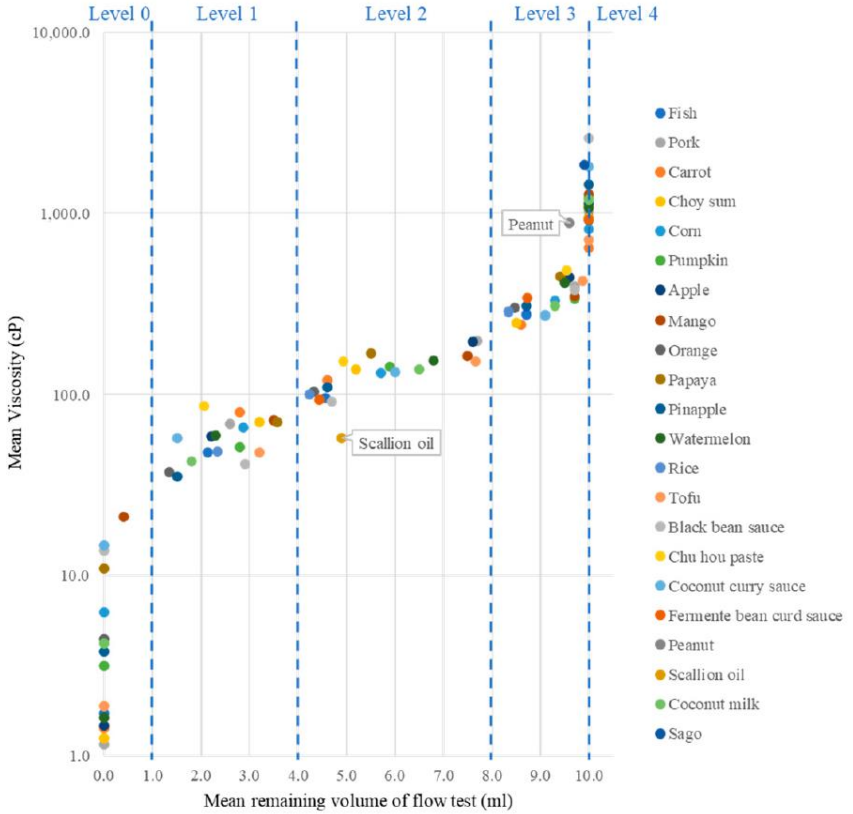
IDDSI
International Dysphagia Diet Standardisation Initiative

Quantitative Textural and Rheological Data on Different Levels of Texture-Modified Food and Thickened Liquids Classified Using the International Dysphagia Diet Standardisation Initiative (IDDSI) Guideline

Man Chun Wong [1], Karen M. K. Chan [2,*], Tsz Ting Wong [1], Ho Wah Tang [2], Hau Yin Chung [1] and Hoi Shan Kwan [1,*]



IDDSI Level	Viscosity Ranges (cP)			
	This Study		NDD	JSDR
	Thickened by Thick & EasyTM Clear	Thickened by Corn Starch		
4 (Extremely thick)	645.5–1440.0	929.6–2625.3	>1750	>500
3 (Moderately thick)	244.0–446.7	274.3–483.3	351–1750	300–500
2 (Mildly thick)	95.8–198.1	91.7–153.8	51–350	150–300
1 (Slightly thick)	35.4–79.9	41.6–86.9		50–150
0 (Thin)	1.2–21.2	13.6–14.6	<50	<50



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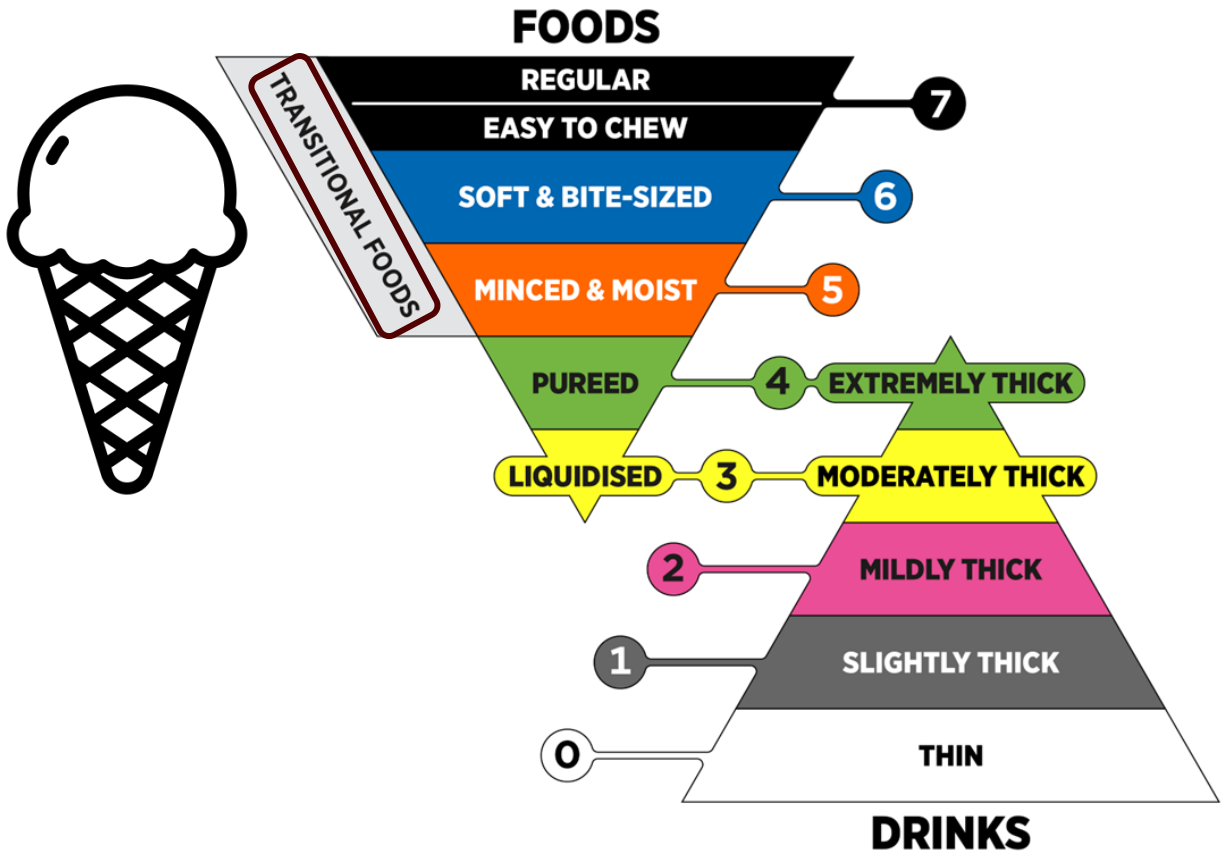
Where Does Ice Cream Fit in IDDSI?



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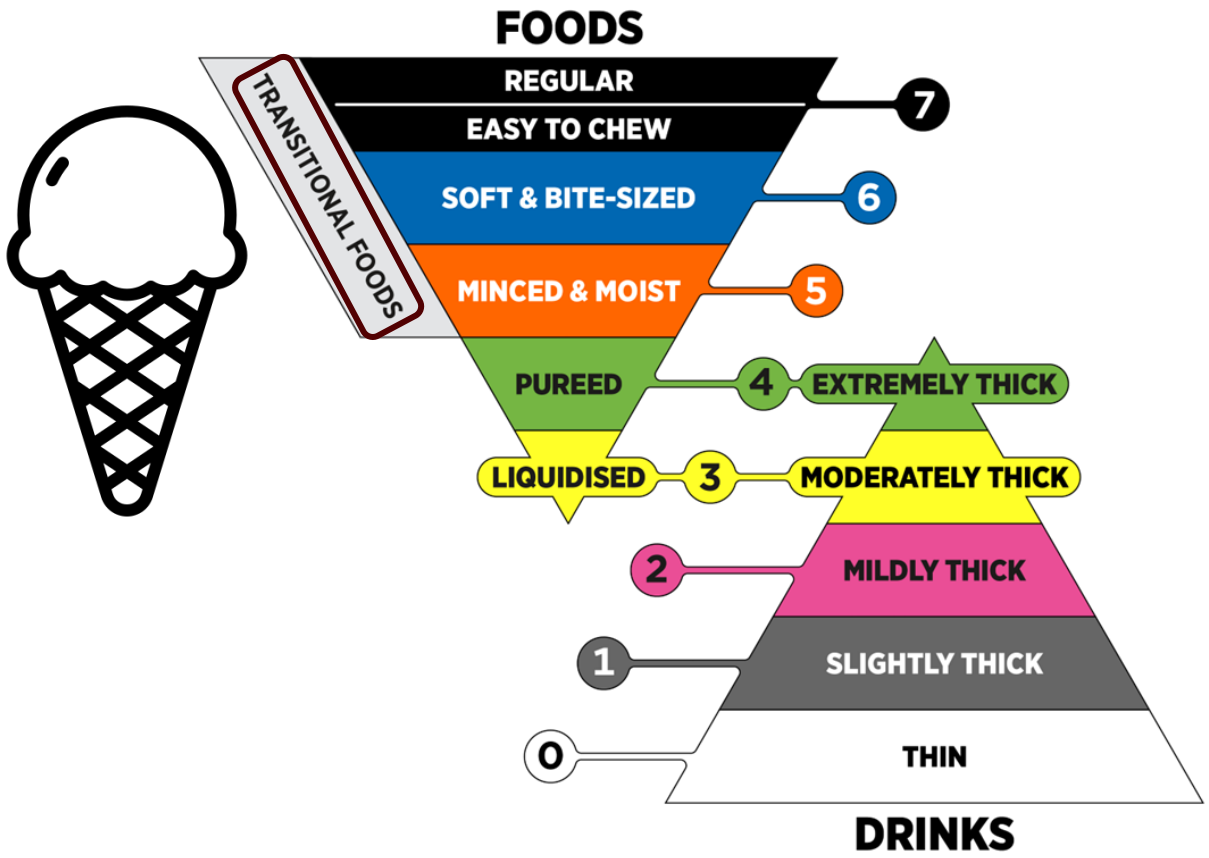
Where Does Ice Cream Fit in IDDSI?



Transitional Food= changes consistency when moisture is added or temperature changes.

- Ice cream starts as firm, solid food but melts quickly in mouth turning into a liquid.

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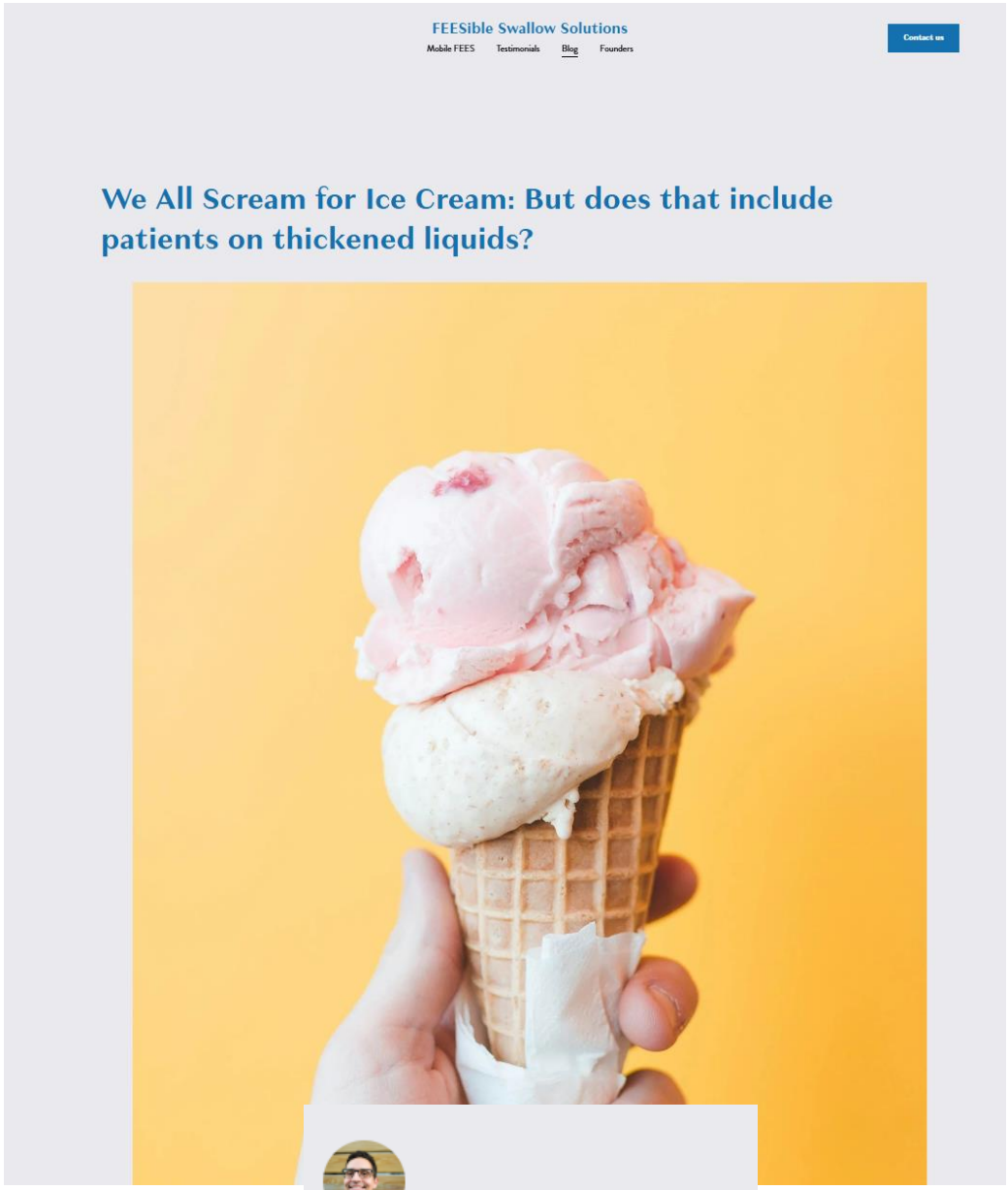

- The way ice cream melts depends on several variables- its content, processing methods, freezing and serving temperature, serving method

- Caroline Brindo (US Sales Manager, Dysphagia Specialist Bracco Diagnostics)
  - IDDSI flow test on range of ice cream brands after 30-second mouth hold
  - Ice cream brands ranged from IDDSI 3 to 4
  - Some brands melted to 0 and 1 after sitting out 2-6 hours-risk higher with more expensive brands

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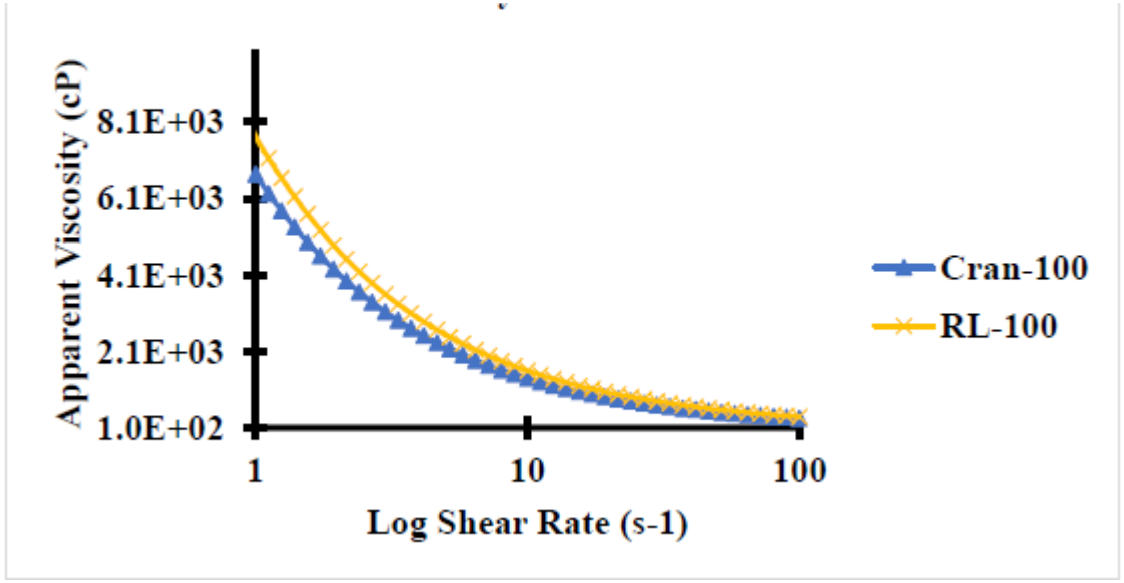
UW-Madison Frozen Dessert Center testing

Cranberry, Raspberry Lemon, Mango Thickened Frozen Dessert Products

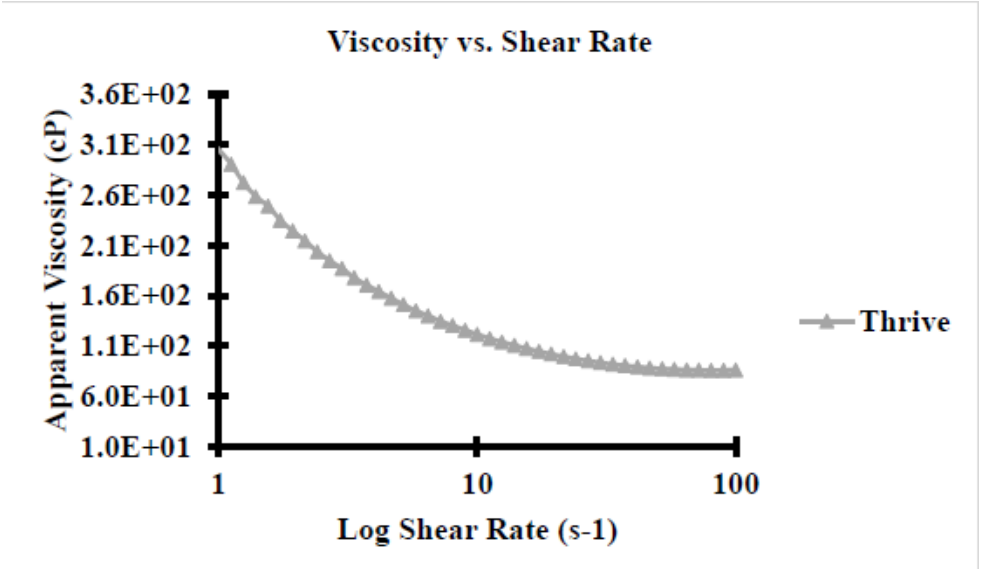
FDC FROZEN DESSERT CENTER

Swallow SOLUTIONS

	Stress Pa	Shear rate 1/s	Viscosity Pa.s	Viscosity at 30 (1/s) cP
RL-100	20.89	30	0.698	698
Cran-100	23.69	30	0.791	791



	Stress Pa	Shear rate 1/s	Viscosity Pa.s	Viscosity at 30 (1/s) cP
Thrive	2.80	30	0.093	93



UW-Madison Frozen Dessert Center Testing

Cranberry and Raspberry Lemon Thickened Frozen Dessert Products

FDC FROZEN DESSERT CENTER

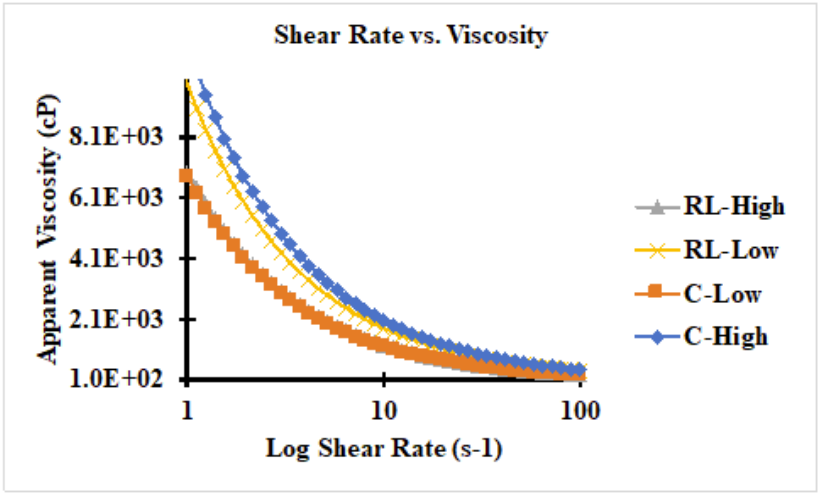
Swallow SOLUTIONS

- Two batches of frozen protein produce were made- both frozen on continuous freezer at a high and low overrun setting.
- Product collected into four-ounce cups and placed in hardening freezer
- Rheometer used to conduct sweep test on melted product of all four samples

Measured viscosity at a shear rate of 30 s^{-1}

	Overrun %	Stress Pa	Shear rate 1/s	Viscosity Pa.s	Viscosity cP
RL-Low	50%	16.96	29.94	0.567	567
RL-High	124%	25.1	29.94	0.838	838
C-Low	44%	16.22	29.94	0.542	542
C-High	151%	28.37	29.94	0.948	948

Shear Rate (logarithmic) versus Apparent Viscosity



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RESEARCH NOTES

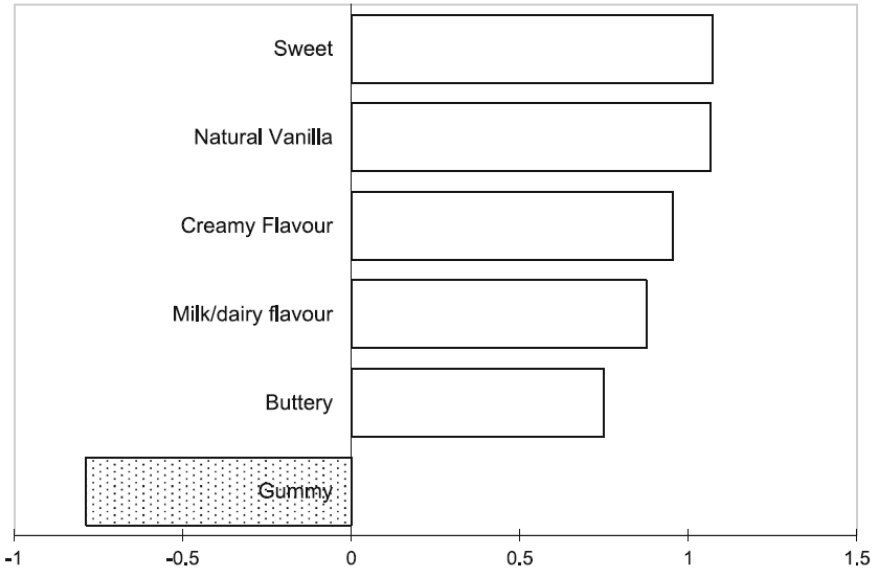
Journal of Texture Studies

WILEY

Acceptability of thickened and protein-enhanced ice cream for use in long-term care facilities

Taylor K. McDowell | Judith Lowe | Matthew B. McSweeney

- Whey protein sample: thickened and protein-enhanced
- Control: thickened but without whey protein
- Ice cream melted, protein & thickener added, and then placed in freezer for 24 hours until completely frozen
- Left for 30 minutes at room temperature
- Participant evaluation



		Control	Whey protein
Appearance	Mean ± standard deviation	6.5a[a,b,c] ± 1.7	6.6a ± 1.6
Flavor	Mean ± standard deviation	5.8a[a,b,c] ± 1.9	6.2a[a,b,c] ± 1.8
Texture	Mean ± standard deviation	3.9a[a,b,c] ± 1.8	4.1a[a,b,c] ± 1.9
Overall liking	Mean ± standard deviation	4.9a[a,b,c] ± 1.7	5.1a[a,b,c] ± 1.6

[a] $n = 56$.
[b] Means in the same row, with the same letter, are not significantly different at $\alpha = .05$.
[c] Data input on the 9-point hedonic scale, where 1 = Dislike extremely and 9 = Like Extremely.

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simplythick® EasyMix™

Thickened Ice Cream

Serves 8 (Serving = ½ Cup)

Ingredients	Measurement
Ice Cream	4 Cups
SimplyThick® EasyMix™	1 Bulk Packet (48g) 2 Mildly Thick Packet ***OR*** 8 Individual Packets (6g each) 2 Mildly Thick Packet ***OR*** 8 Strokes from Bottle & Pump

Special Equipment Needed: Food Processor

No Melt Vanilla Flavoured Ice Cream - More than 3.2kcal/mL

The Precise Ready-To-Eat No Melt Vanilla Flavoured Ice Cream is a high energy vanilla flavoured shelf stable, freeze-thaw stable ice cream. The Precise No Melt Ice Cream makes for the perfect ready-to-eat snack or dessert for those with swallowing difficulties or needing a high energy diet. It is suitable for those at home, in hospital or in Aged Care settings.

Category: Desserts | SKU: N/A Brand: Magic Cup®

Magic Cup® Frozen Desserts

MAGIC CUP® frozen dessert is like ice cream when frozen but is a pudding after thawing. It's a great option for adding calories and protein for those experiencing involuntary weight loss. Enhanced with skim milk and milk protein concentrate, MAGIC CUP® is rich in branched-chain amino acids, notably leucine, which has been associated with muscle growth. MAGIC CUP® desserts are a truly a secret weapon to fight malnutrition for clinicians and caregivers.

Future Directions & Discussion

- Influence of ice cream properties, freezing approaches, and melting time on viscosity (IDDSI level) and swallowing safety/efficiency
- Influence of thickener types on ice cream properties and viscosity
- Testing of products on the market
- Other ideas?

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Home Team

Clinical Swallow Service

Food Science & Engineering Collaborators

Thank you for your time and attention!