

Swallowing and Parkinson's Disease

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OBJECTIVES:

- Discuss the role of Speech Pathology in the evaluation and treatment of Parkinson's Disease.
- Obtain a general understanding of swallowing function.
- Understand how swallowing can be affected by Parkinson's Disease.
- Learn basic strategies to cope with swallowing issues.
- Current treatment and research trends...

Speech Pathology: Evaluation and Treatment

- **Speech deficits:**
 - Imprecise articulation
 - Accelerated rate
 - Decreased intelligibility
- **Cognitive Deficits:**
 - Memory decline
 - Diminished attention
 - Difficulty with planning, abstract reasoning.
- **Voice/Respiratory Deficits:**
 - Limited vocal/pitch range
 - Low voice and volumes
 - Diminished respiratory support/coordination for voicing/speech.
- **Swallowing Deficits:**
 - Diminished oral control
 - Changes in the pharyngeal stage
 - Esophageal difficulties

DYSPHAGIA AND PD:

Parkinson's Disease Foundation:

- 1 million Americans live with Parkinson's disease.
- Approximately 60,000 individuals are diagnosed with Parkinson's each year. This does not include the thousands that go undetected.
- An estimated 7-10 million individuals worldwide are living with Parkinson's.
- Incidence of Parkinson's increases with age, but an estimated 4% are diagnosed before the age of 50.

American Speech and Hearing Association:

- 33% to 50% of patients with Parkinson's Disease have symptoms of dysphagia
- 90-100% show impaired swallowing behaviors on objective studies (i.e., MBS or FEES)
- Severity and duration of PD does not predict presence or severity of dysphagia.

MECHANICS OF SWALLOWING:

FOUR PHASES OF SWALLOWING:

- Preparatory Phase
- Oral Phase
- Pharyngeal Phase
- Esophageal Phase

***These four phases are dynamic and overlapping**

NORMAL SWALLOWING:

- **ORAL PHASE:**

- Lips (CN VII)
- Buccal muscles (CN VII)
- Mastication (CN V)
- Tongue (CN IX, XII)
- Soft Palate (CN X)
- Fauical arches

- **PHARYNGEAL PHASE:**

- Tongue (CN IX, XII)
- Soft Palate (CN X)
- Hyoid/Laryngeal elevation (CN V, IX, X, XII)
- Pharyngeal Peristalsis (CN IX)
- Vocal cords (CN X)
- Epiglottis
- Valleculae
- Pyriform Sinuses
- Cricopharyngeus (CN X, XII)

- **ESOPHAGEAL PHASE:**

- Cricopharyngeus (CN X, XII)
- Esophageal Peristalsis (CN X)

- **CRANIAL NERVES:**

- Trigeminal = CN V
- Facial = CN VII
- Glossopharyngeal = CN IX
- Vagus = CN X
- Accessory = CN XI
- Hypoglossal = CN XII

NORMAL SWALLOWING: (Liquid)



NORMAL SWALLOWING: (Pudding)



NORMAL SWALLOWING: (Solid)



PREPARATORY PHASE:

INCLUDES:

- Food preparation
- Hand to mouth
 - Food is bitten off or taken from a utensil
 - Liquids are sipped via cup or sucked through a straw

DEFICITS NOTED WITH PD:

- Tremor
- Dyskinesias
- Increased food prep time

ORAL PHASE:

INCLUDES:

- Oral manipulation /mastication
- Bolus formation
- Bolus propulsion

DEFICITS NOTED WITH PD:

- Excessive manipulation time
- Lingual pumping
- Difficulty forming the bolus
- Difficulty throwing the bolus
- Oral residue post swallow

ORAL DYSPHAGIA:



PHARYNGEAL PHASE:

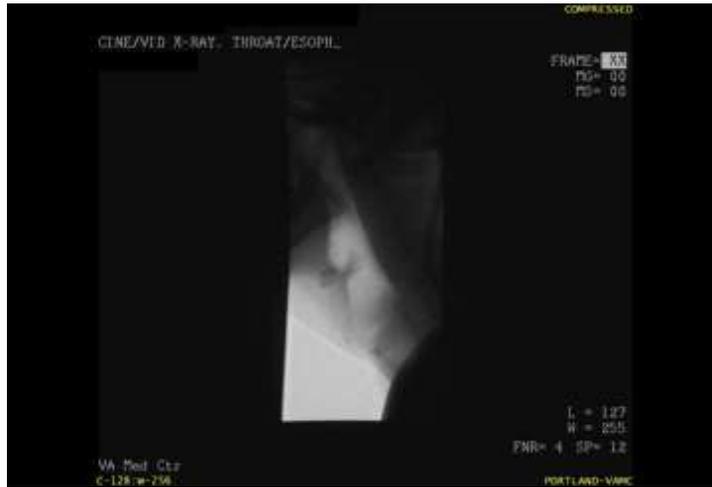
INCLUDES:

- Soft Palate elevates
- Tongue base makes contact with pharyngeal wall
- Hyolaryngeal excursion initiates
- Breathing momentarily stops
- Airway closes:
 - Vocal cords close
 - Epiglottis inverts
- Muscles of the pharynx contract
- Upper esophageal sphincter (UES) opens

DEFICITS NOTED WITH PD:

- Bradykinesia / hypokinesia
- Pharyngeal delay
 - difficulty triggering the swallow.
- Laryngeal penetration
 - material enters the top of the airway but does not drop below the vocal cords
- Aspiration
 - material drops below the vocal cords into the lungs
- Silent Aspiration
 - No cough is initiated
- Pharyngeal residue
 - Material remains in the throat post swallow
- Decreased UES opening

Pharyngeal Dysphagia: (LIQUIDS)



Pharyngeal Dysphagia:



ESOPHAGEAL PHASE:

INCLUDES:

- Primary wave
- Esophageal clearance
- Lower esophageal sphincter relaxes

*Persons with problems in the esophageal phase often have pharyngeal phase complaints.

DEFICITS NOTED WITH PD:

- Esophageal residue:
 - Material does not clear through the esophagus into the stomach completely
- Retrograde flow:
 - Material bounces back and forth within the esophagus
- Reflux:
 - Material and stomach acids escape back up into the esophagus from the stomach.
- Diminished opening of the upper or lower esophageal sphincters

NORMAL SWALLOW (Esophagus):



Esophageal Dysphagia:



SIGNS AND SYMPTOMS: What to watch for

- **ORAL PHASE DYSPHAGIA:**
 - Extra effort needed to chew/swallow
 - Inability to eat specific foods/items
 - Loss of food or liquid from the mouth
 - Food sitting in the mouth after a meal
- **PHARYNGEAL PHASE DYSPHAGIA:**
 - Coughing, choking or gagging during or right after a meal
 - Wet or gurgly voice or breath sounds after eating or drinking
 - Sensation of food "sticking" in the throat
- **ESOPHAGEAL PHASE DYSPHAGIA:**
 - Frequent episodes of regurgitation, reflux or spitting up after a meal
 - Difficulty managing or clearing solid foods
 - Sensation of food sticking in the throat or chest area
 - Complaints of dysphagia without overt coughing or choking

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OTHER POTENTIAL RISK FACTORS OR SIGNS:

- Recurrent pneumonias
- Diminished voluntary cough effort ¹
- Sialorrhea (excessive secretions/drooling)²

1. Pitts, T; Bolser, D; et al., Voluntary Cough Production and Swallow Dysfunction in Parkinson's Disease., *Dysphagia*. (2008) 23;297-301.
2. Nobrega, AC., Rodrigues B., et al. Is Drooling secondary to a Swallowing Disorder in Patients with Parkinson's Disease?, *Parkinsonism Relat Disord* 2008; 14(3):243-245.

SPEECH PATHOLOGY EVALUATION:

- **Clinical evaluation:**
 - Interview/history/background/medical status
 - Oral Motor Exam
 - Food/liquid trials
- **Objective evaluation:**
 - Modified Barium Swallow (MBS)
 - Flexible Endoscopic Evaluation of Swallowing (FEES)

FLEXIBLE ENDOSCOPIC EVALUATION OF SWALLOWING (FEES)



TREATMENT OPTIONS:

- **Compensatory strategies**
 - Food/liquid texture modifications
 - Behavioral/environmental manipulation
 - Positioning
- **Strengthening exercises**
 - Shaker Exercise - LSVT??
 - Masako - EMST??
- **Medical Management**
 - Botox/myotomy
 - Medications
 - Feeding Tube

QUALITY OF LIFE:

- **Swallowing deficits have been linked to:**
 - Depression
 - Sense of burden to family
 - Reduced participation in social events
 - Anxiety/panic
- **What to do?**
 - Acknowledge changes in lifestyle
 - Educate patients/families on all options
 - Allow patients to make informed decisions
 - Consider/offer assistance from mental health providers

WHERE DO WE GO FROM HERE?

TREATMENT TRENDS.....

DEEP BRAIN STIMULATION (DBS) AND SWALLOWING:

Ciucci, MR; Barkmeier-Kraemer, JM; Subthalamic Nucleus DBS Improves Deglutition in Parkinson's Disease. *Movement Disorders.*, 23;5, 2008., 676-683.

- 14 subjects (12 men, 2 women)
 - Quadripolar electrodes placed in the subthalamic nucleus (STN) region
 - MBS performed with DBS ON and DBS OFF
 - Parameters observed: pharyngeal transit time, maximal hyoid bone excursion, Pharyngeal Total Composite Score and an Oral Total Composite Score.
- RESULTS:**
- Improved pharyngeal transit time and pharyngeal total composite score with DBS ON.
 - Hyoid bone excursion did not improve and in fact had less excursion with DBS ON.
 - No statistical improvement noted on the oral stage of deglutition.
- LIMITS TO THIS STUDY:**
- Small subject size
 - Qualitative vs Quantitative limits
 - Bolus/order effects on results

Deep Brain Stimulation and Swallowing – An update:

- Very few new studies performed looking at DBS and swallowing since Ciucci's study in 2008.
- Two studies performed in Sweden.
 - Very limited subject size
 - Methods were not consistent between all patients
 - Neither study found significant findings – however, results were not felt significantly reliable.

EXPIRATORY MUSCLE STRENGTH TRAINING:

Pitts, T., Bolser, D., Rosenbeck, J., et al. Impact of Expiratory Muscle Strength Training on Voluntary Cough and Swallow Function in Parkinson Disease., *Chest*, 2009; 135:1301-1308.

- 10 subjects:
 - All male
 - Hoehn and Yahr score between 2-3
 - All participants had MBS evidence of penetration or aspiration
- One baseline training session with the EMST 150 device then pt's trained with the EMST for 4 weeks (5 sets of 5 breaths per day)
- MBS performed before and after treatment
- Measurements:
 - PEmax – indirect measure of expiratory muscle strength
 - Voluntary cough measures:
 - Inspiration phase duration (IPD)
 - Compression phase duration (CPD)
 - Expiratory rise time (EPRT)
 - Expiratory phase peak flow (EPPF)
 - Cough volume acceleration (CVA)
- RESULTS:
 - Cough Volume Acceleration improved
 - CPD and EPRT decreased after training
 - Penetration/Aspiration score on the swallow task decreased significantly
- LIMITS TO THIS STUDY:
 - Small subject size
 - Only males participated
 - Limited to H&Y score of 2-3
 - Limited PO tasks performed

EMST follow up:

Troche, MS; Okun, MS; Rosebek, JC; Musson, N.; et al. Aspiration and swallowing in Parkinson disease and rehabilitation with EMST., *Neurology*., 2010. Vol 75; no. 21: 1912-1919.

- Randomized, blinded, sham controlled EMST trial.
- 60 participants w/ PD
 - H&Y stages II-IV
 - No significant differences in the baseline dysphagia characteristics of the EMST group and the sham group
- 4 wks, 5 days/wk; 20 min/day using a calibrated or sham device.
- EMST set weekly to 75% the subjects max expiratory pressure
- Measured (via MBS):
 - PA score
 - Swallow timing
 - Hyoid movement
- RESULTS:
 - EMST group exhibited improved PA scores and improved hyolaryngeal displacement and function.
 - These results were not found in the sham group.
- LIMITS TO THIS STUDY:
 - Subjects had only mild to moderately impaired swallowing
 - Disease severity of subjects was broad

LEE SILVERMAN VOICE TREATMENT PROGRAM AND SWALLOWING

Sharkawi, A. et al., Swallowing and voice effects of Lee Silverman voice Treatment (LSVT(R)): a pilot study. *Journal of Neurology, Neurosurgery and Psychiatry*. 72:1 (2002).

- 8 Subjects (6 men; 2 women)
 - Hoehn & Yahr Scale
 - 3 subjects =stage II
 - 2 subjects =stage III
 - 2 subjects =stage IV
 - 1 subject =not staged yet
 - MBS eval performed before and after treatment
 - LSVT program was performed per protocol
- **RESULTS:**
 - Lingual pumping diminished or disappeared
 - Oral transit time diminished
 - Oral residue diminished
 - Pharyngeal residue was diminished
 - **LIMITS TO THIS STUDY:**
 - Small subject size
 - Study was limited to only mild-moderate dysphagia
 - Qualitative measurement of residue is questionable

Lee Silverman voice treatment program and swallowing: Follow up...

- Literature review identified no further investigation into LSVT effects on swallowing.

Neuromuscular Electrical Stimulation:

Heijnen, B.J., Speyer, R., Baijens, L.W.J., Bogaardt, H.C.A., Neuromuscular Electrical Stimulation Versus Traditional Therapy in Patients with Parkinson's Disease and Oropharyngeal Dysphagia: Effects on Quality of Life. *Dysphagia*. 2012. 27:336-345.

- 3-arm, randomized trial
 - Group 1 = received traditional logopedic tx.
 - Group 2 = received traditional + NMES of the suprahyoid musculature at the motor level.
 - Group 3 = received traditional + NMES of the suprahyoid musculature at the sensory level.
 - All groups received 13-15 tx sessions; 30 min; 5x/week within 3-5 week span.
- => 30 subjects/tx group (109 subjects total)
- Clinical eval performed to identify dysphagia.
- Pre/post and 30 day post measurements:
 - Functional Oral Intake Scale
 - SWAL-QOL
 - MD Anderson Dysphagia Inventory
 - Dysphagia Severity Scale
- **RESULTS:**
 - All groups found significant therapy effects on the dysphagia severity scale
 - All groups found some restricted improvements on the SWAL-QOL and MDADI.
 - Only slight, nonsignificant differences were found between the 3 groups.
- **LIMITS TO THIS STUDY:**
 - No objective measures – measures were all subjective
 - Median H&Y severity = 2
 - The NMES groups also received traditional therapy.

RESOURCES:

- **NW Parkinson's Research, Education and Clinical Center (PADRECC)**
 - Portland VA Medical Center
 - www.parkinsons.va.gov/northwest
 - (503)721-1091
- **Parkinson's Resources of Oregon**
 - www.parkinsonsresources.org
 - (503)594-0901
- **National Parkinson's Foundation**
 - www.parkinson.org
 - 1-800-473-4636