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The Aging Swallow
Angela Mansolillo, MA/CCC-SLP, BCS-S

“Death is caused by swallowing small amounts of saliva over a long period of time.”
George Carlin

Learning Objectives
As a result of this Continuing Education Activity, participants will be able to:

1) Describe how to distinguish a normal aging swallow from dysphagia
2) Define three strategies to improve nutrition and hydration in the elderly
3) Describe how to identify clients who could potentially benefit from exercise to improve endurance for feeding/swallowing activities

continued
Challenges in Dysphagia Management

- Large amounts of information, sometimes conflicting
  - Wide variety of sources - websites, journals, fellow clinicians
  - Myths vs. anecdotal info vs. evidence

Practice patterns of SLPs

- Case review by 254 SLPs (internet survey)
  - 47 different interventions recommended
  - Only 3.9% of respondents reported choosing their recommendations based on physiologic abnormality
  - No single combination of therapies was repeated exactly across respondents
  - 58% of recommendations did not match specific dysphagia symptoms

Carnaby, and Harenberg, 2013.

Swallow Physiology

- First of all...
  - A swallow is not a swallow is not a swallow is not a swallow...
  - There is a great deal of variability in normal swallowing that clinicians must be aware of!
Presbyphagia

Changes in swallow function in otherwise healthy aging adults

*Not dysphagia!*

So, what does it look like?

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Normal Aging

Effects on Swallow Physiology

- Increased *swallow apnea duration* (Hiss et al, 2001)
- *Later onset of swallow response* (Stephen et al, 2005; Martin-Harris et al, 2007)
- *Longer dwell times* in valleculae and pyriform sinuses (Butler et al, 2009; Butler et al, 2011)
- Increased *laryngeal penetration* (Daggett et al, 2006; Butler et al, 2009; Allen et al, 2010)

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Presbyphagia

- Decreased lingual pressures
- Slower swallow response
- Longer swallow apnea duration
- Reduced tension in UES
- Cricopharyngeal noncompliance – stiffening – results in narrowing of UES
- Decreased sensation
- Sarcopenia (decreased muscle mass)
- Decreased efficiency of nutrient absorption
- Reduced functional reserve
- Reduced lung elasticity
Presbyphagia

Which results in...
• Slower transit times
• Increased laryngeal penetration
• Slowed esophageal motility; gastric emptying
• Increased nutritional need (due to decreased absorption)

Sensory Changes in Aging

• Reduced taste bud density
• Reduced smell
• Reduced retronasal olfaction
• Diminished thirst
• Reduced sensory specific satiety

Which results in...
• Increased risk of dehydration
• Alterations in satiety
• Taste loss (largely related to changes in olfaction)
• Reduced variety in diet
• Weight loss

Respiratory System in Aging

• Increased chest wall stiffness; reduced elastic recoil
• Decreased respiratory muscle strength
• Decreased vital capacity
• Increased residual volume
• Decreased alveolar surface area
• Reduced ventilatory drive

Which results in...
• Reduced tolerance for swallow apnea
• Reduced ability to coordinate breathing, swallowing
• Reduced potential for muco-ciliary clearance
Renal System in Aging

• Overall renal function declines
• Decreased renal blood flow
• Decreased ability to conserve sodium, excrete hydrogen
• Decreased creatinine clearance

Which Results in...
• Decreased efficiency of homeostasis
• Increased risk of dehydration (decreased ability to concentrate urine for conservation)

Cardiovascular System in Aging

• Decreased resting HR
• Increased serum cholesterol
• Increased systolic BP

Which results in...
• Arteriosclerosis/Atherosclerosis (pathological)
• Potential dietary modifications
• Reduced endurance

Gastro-intestinal System in Aging

• Reduced mucosa
• Shrinking stomach lining
• Decreased liver function (decreased weight, volume of liver)

Which results in...
• Slower elimination of drugs from system
• Increased risk of drug toxicity
• Increased susceptibility to ulceration
Immune System in Aging

- Increased susceptibility to infection
- Loss of physical barriers to pathogens (skin, oral mucosa)

Which results in...
- Reduced cellular clearance (pulmonary clearance)
- Slower healing

Presbyphagia

So...
- The aging swallow is not disordered

But...
- Aging does increase one’s susceptibility to dysphagia

The Dilemma

How do we distinguish normal swallow variability from disordered swallowing?

- Most normal subjects who exhibited penetration (or even aspiration) did not do so consistently on all trials
- Deep laryngeal penetration (i.e., to the level of the vocal folds) was predictive of aspiration while shallow penetration was not
- Pooled secretions in laryngeal vestibule was predictive of aspiration
How Can We Help?

• Hydration
• Nutrition
• Oral hygiene/health
• Endurance
• Strengthening exercise

Managing Hydration

Water and Hydration

Water is absorbed into the bloodstream via the lower GI tract
Distributed to cells throughout the body where it...
• Absorbs metabolic heat
• Maintains vascular volume
• Transports nutrients
• Removes waste products
• Regulates cell metabolism
Water and Hydration

Daily Water Turnover
- Skin (sensible and insensible)
- Respiration
- Urinary system
- GI system

Water and Hydration

Dehydration
- Cells shrink (water is held in intra and extra cellular spaces)
- Elements of body fluids increase in concentration
- Antidiuretic hormones released – kidneys re-absorb water and return to blood supply

Dehydration – elderly

Risk factors – Physical
- Immobility
- Frailty
- Somnolence
- Reduced thirst
- Laxatives, diuretics etc
- Infection, fever
- Renal disease (fluid restriction)
- Dysphagia

Risk Factors – Environmental
- Overheated environment
- Dependence for fluid intake
- Fear of incontinence
- Difficulty communicating
Dehydration

Consequences of Dehydration
- Urinary tract infection
- Renal failure, stones
- Confusion, lethargy, weakness
- Slowed wound healing
- Constipation
- Reduced cilia movement
- Increased viscosity of mucus
- Infection

Preventing Dehydration

- Regular reminders to drink
- Offer fluids more frequently; particularly those the patient particularly likes
- Keep water within reach
- Record fluid intake


Preventing Dehydration

- Offer fluids regularly – particularly those that are preferred
- Minimize fasting time for procedures
- Supervision
- Keep water/fluids within reach
- Beverage carts/Happy Hour
- Appropriate positioning
- Record fluid intake
- Use family to encourage drinking

Preventing Dehydration

Other Preventable Factors:

- Glasses too large or heavy to handle
- No one is offering fluids
- Don’t like liquids offered
- Hot weather


Who’s at Particular Risk?

Risk Assessment

- Older age
- Low BMI
- Dementia
- Depression
- Urinary incontinence
- Renal disease
- History of dehydration
- Diuretics
- Laxatives
- Anti-psychotics

- Poly pharmacy
- Requires assistance to drink
- Poor eater (eats <50% of meal)
- Forgets to drink
- Dysphagia

Mentes. 2006

Thickened Liquids

Hydration

- Patients using thickened liquids failed to meet daily fluid requirements in a number of studies
- Fluid intake improves with pre-thickened liquids

Thickened Liquids

Is thicker better?
• Yes….for oral management disorders, delayed pharyngeal response, reduced laryngeal elevation/closure
• No….for decreased pharyngeal clearance, cricopharyngeal dysfunction, tongue base weakness

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Thickeners and Satiety

- Added fiber adds to feeling of fullness
- Slower oral transit increases exposure to taste, texture receptors
- Liquids thickened with guar gum do not separate; digested more slowly
- Also slowed nutrient absorption, continuous satiety signals are generated

Cichero, J., 2013

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Thickened Liquids

Patient Compliance – Palatability

Thickeners...
- Suppress main flavor and impart new flavor (bitter, astringent, sour)
- Result in change in texture (grainy, slick, lumpy)

Matta, et al, 2006
Thickened Liquids

**Patient Compliance – Palatability**

Individual Preferences

- Presented three thickener types – Simply Thick, Thick-It, and naturally thick liquids in hot (hot chocolate) and cold (juice) beverages
- Subjects rated each based on their individual preference
- Little agreement; much individual variability

*Horwarth, et al, 2005*

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Hydration in Dysphagia Patients

When thickening...

- Provide options for thickeners
- Consider pre-thickened liquids
- Patient, family, staff training re: thickening
- Offer liquids more frequently
- Choose foods with higher fluid content
- Consider carbonation
- Consider “thicker thins”
- Consider water

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Frazier Water Protocol

Rehab patients who are NPO or on a dysphagic diet

- Water is unrestricted prior to meals and 30 minutes after a meal
- Medications given in puree, or with thickened liquid, not with water
- Manner of presentation of free water may be restricted
- “Aggressive oral care”
- Outcomes = increased pt. satisfaction, increased hydration, no increase in pneumonia rate
Free Water

Possible Exclusion Criteria

• Impulsivity
• Significantly impaired cognition
• Severe coughing
• Active pneumonia
• Poor oral hygiene despite interventions
• Active oral infection


Managing Hydration

• “Can Drink” (inadequate intake; forget to drink)
  Education, cues, reminders

• “Can’t Drink” (need physical assist; dysphagia)
  Swallow interventions; adapted cups; physical assist

• “Won’t Drink” (incontinence fear; “sippers”)  
  More frequent offers; education; Kegels

Mentes, 2006

Managing Nutrition
Nutrition and the Elderly

- Reduction in density of taste buds
- Decreased energy intake
- Poor appetite
- Limited mobility/decreased access to food/meal prep
- Constipation (related to dehydration)
- Polypharmacy

Malnutrition

Sarcopenia

Age associated loss of muscle mass and function

- Prevalence = 6-15% of elderly
- Predictor of falls, fractures
- Not necessarily associated with weight loss
Sarcopenia

Role of Resistance Exercise?
- Stimulates hormone release
- May enhance the benefit of nutritional interventions
- May result in reverse of muscle loss but only studied in skeletal muscle

“Progressive resistance strength training for improving physical function in older adults,” Cochrane review, 2009

Functional Reserve

- Most ADL's require +/- 30% of normal capacity; the remaining 70% = functional reserve
- Normal aging results in decrease in functional reserve
- Generally, swallowing is a “submaximal” task but what about dysphagia?

Anorexia of Aging

- Age related reduction in appetite and energy intake
- At times, greater than the decrease in energy expenditure
- May result in Failure to Thrive (FTT) - inability to maintain functional status and in a state of decline
FTT - Elderly

- Poor appetite
- Limited mobility/decreased access to food/meal prep
- Weight loss and dehydration lead to dehydration and constipation which further limits appetite
- Polypharmacy often a factor

Frailty

What is Frailty?
No agreed upon definition.....
- Accumulation of abnormalities
- Reduced potential for compensation
Eventually a critical point is met which negatively impacts the entire system
May manifest as shrinking/weight loss, weakness, fatigue/exhaustion, reduced mobility, reduced physical activity...

Frailty

Results in....
- Increased fall risk
- Immune compromise
- Low reserve
- Higher degree of disability
- Increased morbidity and mortality
Frailty and Dysphagia

Growing evidence to suggest that frailty associated with
- Dysphagia
- Aspiration
- Malnutrition


Hip Fracture Population

Hip fracture population (n = 181; mean age = 83) assessed post surgery for dysphagia
- Dysphagia found in 34%
- Risk factors = pre-existing neuro and resp morbidities, delirium, age, living in a residential facility prior to admission


Refeeding Syndrome

- Occurs in individuals who have been severely malnourished when nutrition in re-instituted
- Results in metabolic disorder which can lead medical complications (cardiac, neurologic, pulmonary, cognitive, GI...)

Prevented via...
- Slow re-institution of nutrition
- Glucose control
- Fluid restriction
- Addition of specific nutrients (e.g. magnesium, thiamine)
Feeding strategies

Correlation between dependence for feeding and weight loss... (Cole, 2012)

Increasing compliance, volume of intake
• Increased feeding assistance for feeding but also for set-up and ongoing verbal cues/encouragement (Wright et al, 2008; Manning, et al, 2012; Young et al, 2012)
• Pre-recorded videos of family members encouraging participation (O’Connor, et al, 2011)

Feeding Strategies

Other Strategies
• Serial weights
• High calorie supplements, snacks
• Appetite stimulants (less effective with very low BMI or in end stage disease)
• Exercise, activity
• Finger foods for increased independence
• Optimal feeding assistance – variations from meal to meal; avoid “all or nothing” feeding assistance

Environmental Modifications

• Increased lighting
• Use of contrasting colors
• Appropriate assistive devices
• Music at mealtimes
• Appropriate seating, positioning
• Family style dining – increases intake
• Honoring prior mealtime practices and foods
• Socialization
Environmental Modifications

Persons of varying levels of dementia eating together
• Without nursing staff present, those with the least amount of dementia provided assistance to others
• With nursing staff present, all subjects demonstrated more dependency
  Sandman and Norberg, 1988

Environmental Modifications

Staffing
• Feeding assistance group increased food and fluid intake
• Average amount of time spent per resident = 35-40 minutes/meal
• Time spent did not vary between verbal cues and physical assistance
  Simmons, et al, 2001; Simmons and Schnelle, 2008

Environment Matters

Comparison of SNL’s with high vs. low TF use
Low usage facility:
• Dementia unit
• Activities that involved food (eg barbecues, ice cream parlors, beverages in public areas)
• Higher staff to patient ratio
• Staff trained in re: feeding strategies
• Patients transferred out of w/c in dining room
• Fewer Medicaid residents
  Lopez, et al, 2010
Education for Feeders

- Slow down!
- Sit at the same height
- Avoid derogatory comments about the food
- Talk about what you’re doing
- Avoid “elder speak”
- Engage in conversation
- Individual-specific strategies, criteria for discontinuation

Care Resistant Behaviors

Actions “invoked by a care-giving encounter...identified as the repertoire of behaviors with which persons with dementia withstand or oppose the efforts of a caregiver”

Increase in frequency as dementia severity increases

Care Resistant Behaviors

Limbic system (specifically the amygdala) detects threats and initiates protective responses; cortex receives these signals and assesses them, adds context
Dementia interferes with individual’s ability to assess, contextualize threats
Resident is no longer able to accurately assess threats; employ CRB’s to protect themselves
Care Resistant Behaviors

Triggers
• Physical assistance (without verbal cues)
• Forceful insertion of swab or brush into mouth
• Lack of praise, encouragement
• Multi-step directions
• Unsmiling facial expression
• “Elderspeak”

In General....

• Quiet, familiar environment to trigger procedural memory, calm patient
• Establish routine in re: place, time
• As few people present as possible
• Smile on approach
• Establish rapport before beginning meal
• Calm approach
• Avoid standing over the patient, resident

Management – Diet Issues

So...when changing texture

• Consider personal preferences
• Increase choices
• Assistance for family re: caloric density
• Increase taste intensity
• Visual presentation
Managing Endurance Issues

Dining requires >400 swallows of various textures, sizes, consistencies...
Potential for fatigue

**Muscle Fatigue:** reduced ability to exert force

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Managing Endurance Issues

Dining and Fatigue

Healthy (young and old) subjects demonstrated tongue muscle fatigue after dining but...

Older subjects demonstrated longer meal durations and some signs of dysphagia at end of meal

Kays, et al, 2010

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Managing Endurance Issues

So...

- Energy conservation for mealtimes
- Choose foods, liquids with high caloric, protein density
- Consider easy-to-chew foods
- Between meal snacks (high protein)
- Sensory enhancement (flavor, temperature, texture)
- Different recommendations for different times of day
**Nutrition and Mastication**

Chewing Problems in the Elderly – associated with increased mortality:
- Weight loss/malnutrition
- Reduced consumption of “hard to chew foods” including fruits, veggies; increased fats, cholesterol
- Decreased participation in social activities; decreased life satisfaction measures

Graziano, et al, 2007; J Am Geriatric Society

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**Oral/Pharyngeal Exercise**

**Intensity**: Load – must exceed the typical demand

**Exercise Frequency**: # of training sessions per unit of time

**Progression**: Systematic increase in resistance, contraction velocity, duration

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**Oral/Pharyngeal Exercise**

**Targets?**
- **Skill** – acquisition and/or refinement of movement sequences – (via combinations of motor sequences)
- **Strength** – increased force capacity – (via resistance)
- **Endurance** – capacity for continuous motor output – (via repetition)
Oral/Pharyngeal Exercise

Specificity – Exercise does not generalize
- Target the muscles exhibiting the weakness
- Target movements related to feeding, swallowing
- Motor control for speech vs. non-speech mechanisms have different neural controls – some overlap early in development; fully differentiated by two years

Oral/Pharyngeal Exercise

Specificity – Lingual Musculature
Healthy Adult Subjects – 3 sessions/week x 4 weeks
Strength training, endurance training, power training, speed training groups
Performance increased for each particular training variable and not in the other areas
Speed training was the only exception – no significant improvement on any variable
Clark, 2012

Oral/Pharyngeal Exercise

Detraining
- Occurs more rapidly than training
- Atrophy
- Neuroplasticity implications
- Less force generating capacity
- Weaker, slower, less efficient movements
So...Who is a candidate for exercise?

• Weakness, low endurance – consider underlying etiology
• Potential to complete activities with *high frequency and intensity*
• Potential for *progression*
• Consider *specificity*

Oral Health

Oral Cavity Assessment

Salivary Glands
Three paired major glands
• Parotid
• Submandibular
• Sublingual
Together, these account for 90% of fluid production
5 – 10% from small mucous glands in oral cavity (surface of oral mucosa) which primarily lubricate mucosa
Saliva Production

Factors Affecting Production:
- State of hydration
- Nutritional state
- Nature and duration of stimulus
- Emotional state

Follows a circadian rhythm – peaks during the day, decreases during sleep

Oral Health Assessment

Normal Oral Flora
- Prevent colonization by pathogens by competing for attachment and nutrients
- Antagonize other bacteria
- Assist in immune responses

Oral Health – Risk Factors in Elderly

Physical Factors
- Cognitive impairment; resistance to care
- Functional impairment (i.e., dependence for care)
- Radiation Therapy
- Reduced salivary flow
- Natural teeth may contribute to oral bacterial load

Environmental Factors
- Residence (risk increases in SNF - limited staff knowledge, limited staffing, limited supplies, inadequate supervision)
- Medication use
- Attitude and utilization of dental care
- Access to dental care (medical condition, cognition, socio-eco status, lack of dental insurance)

Agency for Healthcare Research and Quality (AHRQ) Guidelines, 2011
Xerostomia

Caused by...
• Diabetes
• Sjogren’s syndrome
• RA
• Lupus
• CF
• Hormonal imbalances
• RT
• Medications

Can result in...
• Dental caries
• Oral abrasion
• Reduced taste
• Difficulty swallowing, chewing, speaking
• Increased risk of infection

Xerostomia

Frequent side effect of medications (>400 medications can cause dry mouth)
Medications trigger alteration in neural pathways that stimulate salivary secretion.
Direct correlation between the number of medications taken and dry mouth
Submandibular gland is most susceptible

Oral Health Assessment

Poor Oral Health has been linked to...
• Diabetes
• Heart disease
• Stroke
• Low birth weight premature birth
• Lung disease
• Pneumonia
Oral Health Assessment

Oral Cavity Assessment
- Condition of mucosa (Dry/cracked vs. pink/moist)
- Comfort
- Lips, tongue condition (Moist, dry, coated?)
- Teeth (Clean? Dentures well fitting? Caries?)
- Saliva production (Adequate? Ropey/thick?)

Oral Health Assessment

Dental Plaque: Colonizing bacteria forms a film on teeth
Tooth Decay: Bacteria de-mineralizes the tooth; results in cavities (caries)
Gingivitis: Inflammation of the gum; early stage of Periodontal disease

Oral Health Assessment

Periodontal Disease: Destruction of gum tissue
Denture stomatitis - Inflammation under the dentures
Xerostomia – Dry mouth
Oral Health Assessment

Mucositis
Painful inflammation and ulceration of mucosal lining
With RT, severity is dose, schedule dependent

Oral Health Assessment

Oral Mucosal Diseases
Candidiasis – fungal infection
- Burning, itching of mucosa
- Predisposing factors include impaired salivation, DM, smoking, immune compromise, antibiotic use

Oral Health Assessment

Oral Mucosal Diseases
Burning Mouth Syndrome (BMS)
- Mucosa appears normal
- Salivary hypofunction often a precipitating factor
Oral Health Assessment

**Denture stomatitis**
- Inflammation under the dentures
- Often Candida
- Redness, swelling
- Typically under *upper* denture

Oral Health Assessment Tools CHECK THESE

- Brief Oral Health Status Examination
- Oral Health Assessment Tool
- Assessment of Current Oral Hygiene Care

Oral Health Assessment

To what extent can patient be independent?
- Manual dexterity
- Vision/Perception
- Positioning
- Level of alertness
- Attention to task
- Cognition
How Can We Help?

- Ongoing oral cavity/oral health assessment
- Adapted toothbrushes (weight, color)
- Appropriate degree of assistance
- Positioning
- Type, frequency of cueing
- Aspiration precautions
  Individualized!

Old age ain't no place for sissies.

~ Bette Davis