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Sensory Changes in Adults: Impact on Swallowing & Diet Selection; Part 1

Presenter: Denise Dougherty, MA, CCC-SLP

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Sensory Changes in Adults: Impact on Swallowing and Diet Selection Part 1

Denise Dougherty, MA, CCC-SLP
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Disclosures

Financial
- Honorarium - SpeechPathology.com
- Private Practice Owner

Non-Financial
- Quality Insights of Pennsylvania

Aging and disease processes change our swallow and impact nutrition/hydration. This two part seminar will review the normal aging swallow, physiologic changes in the aging patient and the impact on the swallow, diet and nutrition

Learning Objectives

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

- 1) explain the changes found in the normal aging swallow
- 2) list three physiologic changes that occur with aging
- 3) discuss the impact of aging on the esophagus

Body Composition (14)

DECREASED

- Muscular/skeletal mass
- Total body water
- Creatinine levels
  - Byproduct of muscle metabolism
  - Excreted by kidneys
  - Indicates renal health
  - Unhealthy kidneys = increased creatinine blood levels

Why Is This a Concern?

- Drug levels change in the body
- Dehydration
- Decreased strength

Vasculature Joints

(14)

- Decreased vasodilation or widening of blood vessels
- Increased peripheral resistance to blood flow

Why Is This a Concern?

- Hypertension

- Degeneration of cartilaginous tissues
- Fibrosis

Why Is This a Concern?

- Tight joints
- Osteoarthritis
- Elasticity lost in tissues

Sarcopenia (19)

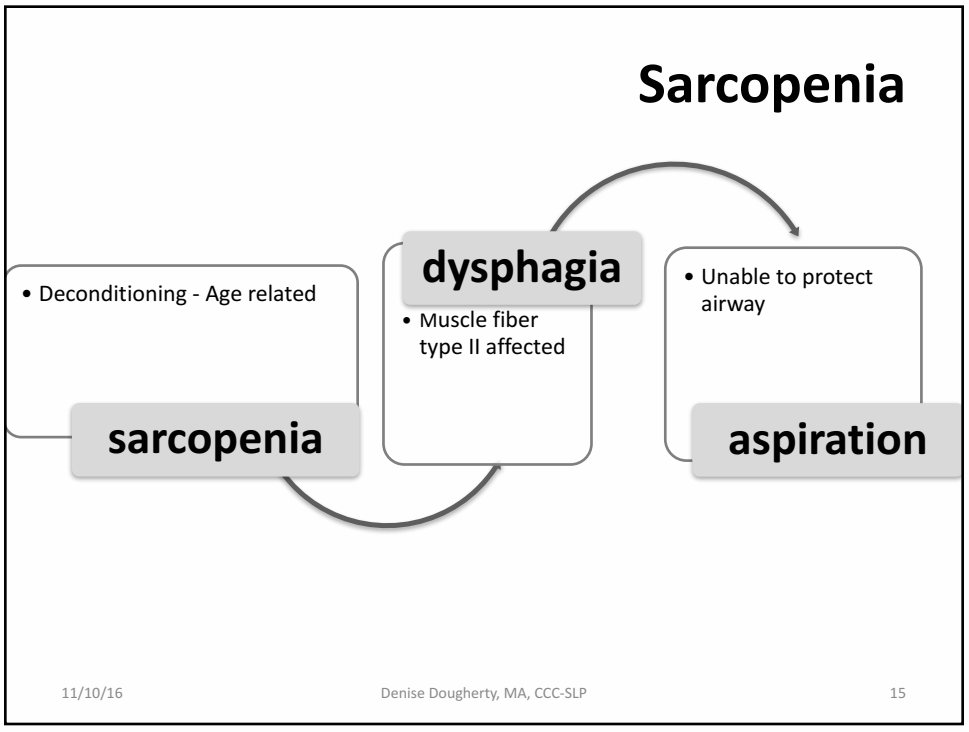
Reduces tongue strength, lateralization & protrusion

- Over age 60?
  - Affects 1 in 5!
- *%* of Skeletal muscle loss!
  - Over 60?
    - *10-50%*
  - Age 75-85?
    - *45-50%*
  - Age 85?
    - 55%+

Sarcopenia

- Unintended wt. loss (10 pounds+ in past yr.)
- Generally exhausted 3+ days per wk.
- **Muscle weakness**
- **Slow walking speed**
- **Low levels of physical activity**

(19)



Mobility (38)

Pain and Obesity
Predictors of mobility loss

Severe musculoskeletal pain associated with decreased
- physical activity
- muscle strength
- balance
- mobility limitations

Obesity Increases
- energy expenditure
- demands on aerobic capacity and muscle strength

Mobility (38)

Pain and Obesity:
predictors of mobility loss

Severe musculoskeletal pain?
associated w decreased

- physical activity
- muscle strength
- balance
- mobility limitations

Obesity associated w Increased

- energy expenditure
- demands on muscle strength

Falling/Fall Related Injuries (38)

Lead to catastrophic disability

- 20-40% of individuals age 65 yrs.+ fall every yr.
- 50% of those who fall repeatedly do so

Risk factors

- Muscle weakness, dizziness, disease related conditions
- **Medications**
- Decreased cognition

Mobility limitation –

- may be slowly progressive or sudden onset

CNS Cells

(14)

- Dopamine receptors decrease in number!
  - Needed to control movement, emotion and cognition

Why Is This a Concern?

Parkinsonian symptoms

Increased

- DNA damage
- Fibrosis

Decreased

- DNA repair capacity
- Oxidative capacity
  - Maximum oxygen consumed per gram of muscle per hour

Why Is This a Concern?

Increased cancer risk

Cognition and aging (40)

- Decreased
  - selective attention to information
- Linked w frontal lobe atrophy in aging
- Link between high blood pressure in midlife and increased risk of cognitive decline

Cognition and aging (40)

Risk factors

- Diabetes
- Physical inactivity
- High LDL cholesterol
- Obesity

- Cog abilities involving speed and problem solving decline with normal aging

Endocrine System

(14)

Decreased levels of

- Progesterone
- Estrogen
- Testosterone
- Vitamin D absorption and activation

Increased

- Thyroid abnormalities
- Insulin resistance and glucose intolerance
- Bone mineral loss

Endocrine System

(14)

Why is this a Concern?

Increased risk

- Diabetes*
- Fractures

Decreased muscle/bone mass

- Skin changes
- Water intoxication
  - electrolytes above safe limits when overly hydrated
  - High volume hyponatremia from
    - liver/kidney/heart failure
    - fluid restriction and diet low in salt (16)

GI Tract

(14)

- Decreased blood flow
- Bolus transit time increased

Why is this a Concern

- Constipation
- Laxative dependent
- Diarrhea

Immune System

(14)

- Decreased T cell function
  - White blood cells that scan for cell abnormality and infection (17)
- Decreased B cell function
  - White blood cells that secrete antibodies (18)

Why is this a Concern?

infections and cancer

- Reduced antibody response to immunization or infection
- Increased autoantibody levels

- Heart rate does not increase in response to decreased BP
- Decreased diastolic relaxation
  - Heart relaxes
- Cardiac rhythm disturbance

Heart (14)

Why is this a Concern?

Syncope

Decreased ejection fraction

- blood pumped out w each beat compared to blood there before beat (31)

Increased atrial fibrillation rates

- irregular heartbeat
- diastolic dysfunction
- diastolic heart failure

Liver (14)

Decreased

- Mass – 40%
- Blood flow – 40%
- Metabolism of meds

Why is this a Concern?

Changes in drug levels

Kidneys

(14)

Decreased

- Renal blood flow
- Renal mass (19)

Why is this a Concern?

- Increased risk of adverse drug effects
- Dehydration

Peripheral Nervous System

(14)

- Difficulty maintaining blood pressure
- Decreased sensing and processing of stimuli*
- Decreased fight or flight response
- Decreased responses of Heart, GI tract*, lungs

Why is this a Concern?

- Syncope
- Exaggerated response to anticholinergic drugs*
  - prescribed for depression, sleep disorders
- Decreased response to B blockers
  - Meds to manage cardiac arrhythmias

Pulmonary System (14)

Decreased

- Maximum air expelled (vital capacity)
- Air forcibly exhaled in first second (forced expiratory volume or FEV1) (33)

Increased

- Air in lungs after maximal expiratory effort (residual volume)
- Amt. of air vs. blood reaching alveoli per minute (32)
- Concentration of blood oxygen and carbon dioxide

Pulmonary System (14)

Why is this a Concern?

- Increased SOB during vigorous exercise
- Increased risk of death
  - pneumonia
- Increase risk of serious complications for pts. w pulmonary disorder

Malnutrition

(39)

Fat free mass loss (muscle, organ tissue, skin and bone)

- begins around 40-50 yrs.

- 10% loss of lean tissue in previously healthy adults
  - impairs immunity
  - increases infection risk
  - assoc. w increased mortality

- Wasting*
  - inadequate dietary intake w disease/psychosocial factors
- Cachexia*
  - loss may not be initially present; many diseases – HIV, cancer
- Sarcopenia*
  - aging process not disease
  - muscle disuse

Medical Factors - Malnutrition

(39)

- Poor appetite
- Poor dentition, oral problems, dysphagia
- Loss of taste and smell
- Respiratory disorders (emphysema)
- GI disorders – (malabsorption)
- Endocrine disorders (diabetes)
- Neurological disorders (Parkinson's)
- Infections (UTI, chest infection)
- Physical disability (arthritis)
- Drug interactions
- Other disease states

Malnutrition

(39)

Psychological factors

- Confusion
- Dementia
- Depression
- Anxiety
- Bereavement

DEHYDRATION (42)

- Common problem in elderly
  - Institutionalized pt
  - **One of top 2 diagnosis upon hospital admission**

Water output exceeds input

- % of Water
  - 83% of blood
  - 74% of brain
  - 22% of bones
- Water taken from organs, joints & discs in back to lubricate brain

DEHYDRATION (42)

- Older kidneys unable to concentrate urine
- Reduced feeling of thirst
- Unable to drink independently
- Disease process affects fluid & chemical balances

Water:

- Moves oxygen/nutrients to cells
- Assists w
  - elimination of body waste
  - Regulates temperature
  - Maintains adequate blood pressure
- Cushions joints
- Protects organs & tissues

DEHYDRATION
Causes and Consequences

- Fluid loss from vomiting/diarrhea
- Elevated temp/fever, infection
- Fluid restriction
- Excess use of diuretics & laxatives
- **Pt.'s room temperature**
- Large amts of alcohol, caffeinated beverages
- Dysphagia
- **9 or more medications** (42)

Thick ropey saliva
Confusion
Constipation*
Skin breakdown
Renal insufficiency*
Heartburn*
Angina*
Arthritis*
Back pain*
Cancer*
Colitis*
Cracked lips
Dark urine

Dehydration (42)

- Avoids liquids especially if thickened
  - Pudding thick!!!
- Food provides 20% or more of our fluid intake
- Quick onset

Death quicker from dehydration than malnutrition

- Survive 5 days without water vs. 5 wks. without protein, carbs & fats

Eyes (14)

- Decreased
  - Lens flexibility
- Increased
  - time for pupillary constriction/dilation
  - Incidence of cataracts

Why is this a Concern?

- Presbyopia
  - Difficulty focusing on close objects (15)
- Decreased visual acuity
- Increased glare
- Difficulty adjusting to lighting changes

Vision Deficits Impact Oral Intake (29)

3x more contrast needed vs. younger person

- Problem distinguishing contrast
- Reduced discrimination of blues and greens
- Decreased pupil size
  - Slow reaction
- Thickening/yellowing of lens & loss of elasticity
- Low vision

- Dementia and Vision problems
  - **Depth perception**
  - **Spatial disorientation**
  - Difficulty w colors/contrast

Vision and Aging

- Eyes evaluate texture!
- Changes in retina, lens, cornea affect quality of vision
  - Light reflects differently
  - Blurry images
- Age 80
  - Visual acuity approx. 80% less than a person in their 40's
- Difficulties visualizing foods (27)

Ears (14)

Loss of high frequency hearing

Why is this a Concern?

- Decreased ability to recognize speech
- Age 65+
  - 25-40% have some loss
- 80% loss by age 80
- Bone conduction of sounds 2° vibrations through skull while chewing
  - contribute significantly to perception of texture (5)

Auditory

- Plays a part in texture and flavor perception
- Foods w higher pitched sound on biting more often described as crisp than crunchy.
- Loud background noise dampens taste of salty and sweet foods (Spence, C., 2012. Auditory contributions to flavor perception and feeding behavior. Physiol. Behav. 107, 505-515)

Normal Aging Swallow (13)

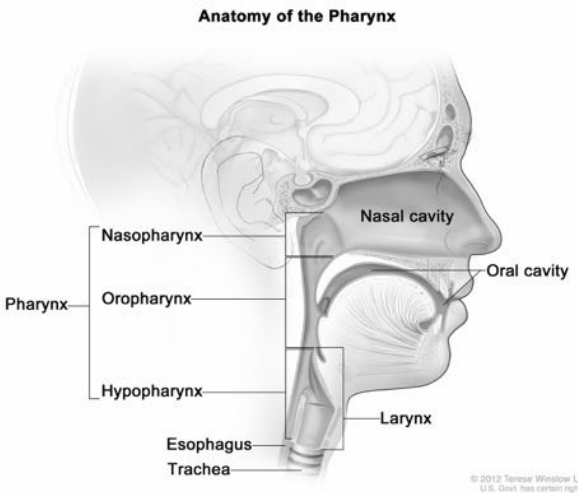
- Age **45** – slower pharyngeal phase
- Age **50** – penetration normal, **15%** penetrate w swallow
- Age **60** - more dippers
  - increased transit time does not mean **abnormal swallow**
- Age **60** – pharyngeal swallow triggered later
  - Past faucial arches to approx. middle of tongue base!
- Age **70** - pharyngeal phase significantly slower
- Age **80** – significant change in esophageal peristalsis

Normal Aging Swallow

- Age/meds decrease taste/smell
- Dentures decrease taste
- Xerostomia*
- Decreased anterior hyoid movement 2° weak suprahyoid muscles
- Reduced UES opening, increasing pharyngeal residue
- **Lingual pressure reserve declines**
  - Affects pressure for a-p of bolus
  - Need extra chewing time – enables buildup of lingual pressure
- Laryngeal penetration **normal** phenomenon in **53.1%** elderly without dysphagia (13)

Aging and the Pharynx www.cancer.gov

- Pharyngeal wall thickness decreases
- Muscles atrophy
- Pharyngeal lumen greater during swallow (46)
- Vallecular residue longer than 6 seconds increases penetration-aspiration risk (16)



Medications: Mixing with Food? (54)

- YOGURT best If clinically necessary to mix meds w food
- Allows better oral processing in dysphagic pts. without severely limiting drug dissolution
- Variable composition and texture between brands

Mixing with Food? (54)

- Honey and jam
  - appropriately high viscosity for oral processing
  - without major delay in dissolution
- Adhesive quality = sticky in the mouth
- Large variations between brands and product type
- High sugar content and poor dental care make these unsuitable for regular use .
- Avoid dose alteration (e.g. crushing medicines)
- Use alternate dose forms or routes of administration

Meds and Applesauce?

Med to treat ulcers (Nizatidine)

- Mixed w foods such as applesauce or vegetable juice

- Bioavailability (amt. of med available) reduced approximately **30 to 40%** compared to same med in capsule form w water

Meds and Applesauce?

- Administration of drugs w other compounds in applesauce
  - Adverse interactions before administration
- Drugs + warm applesauce
  - deleterious effects on med
- Unintentional, adverse effects on drug 2° poor quality control (55)

Nose (14)

- Decreased smell mistaken for loss of taste
- Can't taste if you can't smell

Why is this a Concern?

- Decreased appetite
- Increased nosebleeds

SMELL!!

- Smell more impaired by aging than taste
- Noticeable decline - 7th decade
- Olfactory neurons decrease w age
  - Sensory cell loss in olfactory mucosa
  - Decline in regenerative process (29)
  - Generated every 30-60 days (3)

SMELL!!

- **Loss of smell -** early indicator of neurodegenerative diseases
-
  - **1st symptom of Alzheimer's?**
  - **Parkinson's**
  - **76% cirrhosis of liver**
  - **56% chronic renal failure(significant loss)**

Olfactory Sense and Aging

- Structural changes
  - Alteration of messages sent to brain
  - Brain size/structure changes 2° aging and neurodegenerative conditions
- Olfactory tissue thinned and vascularization reduced
  - Decreased # of receptors
  - Size of olfactory bulb reduced
    - Aging
    - Lifespan exposure to environmental toxins and noxious substances (14)

Olfactory Sense and Aging

- Substantial olfactory impairment
  - Age 65-80 yrs.
    - More than 50%
  - Age 80+
  - more than 75%
- Increased incidence of rhinosinusitis and nasal polyposis
  - decreases olfactory performance
- Cardiovascular health is risk factor
  - carotid artery wall thickness is indicator for atherosclerosis
  - creates arterial damage in olfactory region (14)

Saliva and Aging

- Three sets of glands in mouth –
  - Parotid
  - Submandibular
  - Sublingual
- Tasting/chewing/smelling food stimulates production (23)
- Saliva production decreased/increased w meds
- Parotid
  - Largest
  - Greatest *stimulated* salivary flow
- Submandibular and sublingual contribute significantly to *resting* salivary flow rate

Salivation

Triggered by appearance of foods

- Not all foods contribute to salivation
- Perceived palatability of foods does not effect salivation

Flow rate influenced by mastication

- repeated closure of mandibular muscles

Greater salivary flow rate w food that requires higher masticatory bite force

Pts w dentures swallow less lubricated bolus (69)

Soft food

- does not require great deal of mastication
- leads to reduced salivary flow (14)

Salivation

Saliva Studies – varying results

- Resting salivary flow rate not affected by age

» **VS.**

- Significant effect of aging on salivary flow

- Non=medicated older adults
  - **Lower saliva flow rate** compared to young adults
  - May explain xerostomia (14)

DM Patients

Reduced saliva secretion and altered saliva composition common!

- 27% of insulin dependent DM pts have esophageal retention of food/decreased gastric emptying
- 1 ½ times greater risk of swallowing problems compared to those without diabetes. (Okamoto, N., Tomioka, K., Saeki, K., Iwamoto, J. Morikawa, M. Harano, A., Kirimatani, N. 2012. Relationship between swallowing problems and tooth loss in community dwelling independent elderly adults: the Fujiwara-Kyo study. J. Am. Geriatr. Soc. 60, 849-853)

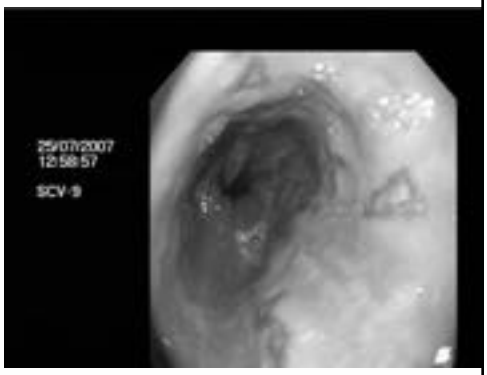
Altered Appetite (2)

- Drastic changes w Thyroid disease
  - Appetite
  - Significant body wt. changes
- Prednisone
  - dramatic appetite increase
  - fat distribution changes
  - significant increase in fluid accumulation and wt. gain
- Neurotransmitters and receptors
  - Increased/decreased food intake

Stomatitis and Esophagitis

Mucosal Toxicity

- Chemo kills rapidly replicating cells
- Gastrointestinal mucosa rapidly replicates
- Chemo can't differentiate good/bad cells
- Common site of toxicity for chemo drugs



(13)

Drug induced esophagitis

(10)

Medication induced esophageal injury

- Sudden onset dysphagia
- Retrosternal chest pain
- Odynophagia within 4/12 hours post medication

Pill induced esophagitis (2)

Injury associated with

- Acid containing products w pH less than 3
- Meds w prolonged dissolution time
- Large pill diameter

Risk factors for med induced esophageal injury (2)

- Pre-existing esophageal compression from cardiomegaly or tumor
- GERD
- Meds w little or no fluid
  - especially prior to bedtime in pts w extended GI transit time
- Delayed dissolution rate meds
- Decreased motility and saliva production in elderly
  - increased esophageal contact time
  - Impaired transport of med

Meds causing esophageal injury (2)

- Aspirin
- NSAIDS
- Prednisone
- Acidic irritants
- Chemo therapy agents
- Anticoagulants – Coumadin
- Anti-infective agents

Cause esophagitis

Protective barrier is inhibited

damage from exposure to stomach's acid contents

Meds causing esophageal injury (2)

- Anticoagulants – Coumadin

Gastrointestinal hemorrhage

Hematoma

Odynophagia from excessive anticoagulation

Meds causing esophageal injury (2)

- Acidic irritants
  - Tetracycline antibiotics
  - Vibramycin
  - Cleocin
  - Iron supplements
- Chemo therapy agents
  - Fluorouracil

Acidic irritants

- Irritates mucosa when meds dissolve

Chemotherapy may cause mucosal sloughing

- Direct irritation to GI tissue
- Cause necrotising esophagitis

Meds causing esophageal injury (2)

- Anti-infective agents
  - Vibramycin
  - Minocin
  - Nipent
  - Norvir
  - Invirase
  - Viracept
  - Foscavir
  - Cytovene

Oral or esophageal ulceration

Medications Resulting in GERD (2)

- Anticholinergic meds (Phenergan)
- Antidepressants w high anticholinergic activity (Elavil)
- Barbiturates (Phenobarbital
- Antihistamines (Benadryl)
- Antipsychotics (Mellaril)
- Benzodiazepines (Valium or Restoril)
- Beta-blockers (Inderal, Lopressor, Tenormin)
- Breathing med (Theophylline)
- Calcium channel blockers for hypertension (Procardia, Cardizem and Isoptin)
- Alcohol
- Estrogen replacement tx
- Morphine
- Nitroglycerine
- Muscle relaxants (Baclofen)
- Smoking

Prevent Injury! (2)

- Take all meds w at least 3 ounces of fluid
- Bedtime meds
  - upright position 10 min before reclining
- LIQUID MEDS
  - If bedridden
  - pts w delayed esophageal transit
- Take high risk meds early in day rather than at bedtime

Resources:

- **Drugs for the Geriatric Patient**. Shorr, R, Hoth, A, Rawls, N. Saunders/Elsevier, Philadelphia, PA. 2007.
- **Drugs and Dysphagia** – pro-ed product
- **Medscape.com**
  - Disorders
  - App
    - Herbs, prescriptions, over the counter (OTC)
    - Look up by disorder as well as med name
    - Drug interaction checker
- **Drugs.com**
  - Herbs, prescriptions, over the counter (OTC)
  - Drug interaction checker
  - Newsletter and email updates on meds
  - Access archives of email updates

Medications

iMedicalApps:

- Natural Medicines Comprehensive Database app
- provides information on efficacy, safety, drug-supplement interaction
- if product is verified by United States Pharmacopeial Convention (**USP**).
- **over 1,100 supplement ingredients** and thousands of combination OTC products.

Put the pieces together!

- Knowledge of physiologic changes
- Helps connect dots w what you observe w your patients

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