Teeth, No Teeth and Mastication

Kerry Winget, CCC-SLP/A, BRS-S
MSHA 2018
Disclosures

No relevant financial or non-financial relationships to disclose regarding this presentation’s subject matter.
Outline

1. Introduction
2. Dental Primer
3. Mastication Process
4. Tooth Loss
5. Dentures
6. Bite Force
7. Dentition Effects on Nutrition
8. Conclusions
Learning Objectives

1. Learn 3 mastication characteristics of natural adult teeth
2. Learn 3 characteristics of edentulous mastication
3. Learn 3 effects of dentition on nutrition in older adults
Introduction

Misconceptions

“A patient with no teeth is not capable of managing solid consistencies.”

“Edentulous patients should be on a puréed diet.”

“If a pt is on purée, they need their meds crushed.”

“Any denture is better than none.”
Introduction

Chewing Process initiates digestion responses throughout the whole body.

- Saliva
  - Pylorus Relaxes
- Taste receptors
  - Stomach acid production
  - Pancreatic enzyme production
Introduction

Well chewed food
- Efficient digestion
  - Nutrients maximized
  - Equalized digestion responses
- Dental stimulation/workout
- Healthy consumption quantity
Introduction

*Poorly* chewed food
- Incomplete digestion
- Nutrients not extracted
- Undigested food sits in the colon
  - Bacterial growth
  - Gas, bloating
  - Flatulence
Dental Primer

Evolutionary Changes
- Size of teeth and jaw
- Wear patterns

Causal Theories
- Diet Characteristics
- Genetic Deselection
Dental Primer - Types

32 Adult/permanent teeth: 16 upper/16 lower

Main function = Nutritive Chewing

Dental classifications of teeth
- Incisors
- Canines
- Premolars
- Molars

Each type is well-defined in position and function.
Dental Primer - Incisors

Function
- Shear or cut food.

Position
- Visibility

Features:
- Upper incisors
- Shovel shape
Dental Primer - Canines

Function
- Rip and tear

Position
- Curve of the arch

Features
- Strongest
- Guide biting
- V shaped
Dental Primer –
PreMolars/Bicuspid

Function
- Tear and grind
- Pass food

Position
- Posterior to canines

Features
- 2 cusps
Dental Primer - Molars

Function
- Crush and grind

Position
- Most posterior

Features
- 4-5 cusps
- powerful
Dental Primer - Anatomy

Crown - *the enamel*

- Degrades over time
- Abrasion
- Elongation
- Erosion
- Decay
Dental Primer - Anatomy

Alveolar bone
- Alveolar bone proper
- Supporting alveolar bone

Dynamic through the lifetime
- Gum health
- Direct Pressure
- Skeletal bone density
Mastication Process

Alveolar Ridge Reabsorption
- By 3\textsuperscript{rd} month
- By 6\textsuperscript{th} month
- By 3\textsuperscript{rd} year

Reabsorption Factors
- Dentures
- Nutrition deficits
Dental Primer – Occlusional Surfaces

Help Wanted
Men having at least two upper and two lower opposing front teeth. Uniform and gun provided.
Dental Primer – Occlusional Surfaces

Occlusional Advantage
- Uniform Surface
- Single Cusp/Trough
- Interlocking
Dental Primer – Occlusional Surfaces

Occlusional Advantage
- Interlocking Series
Dental Primer – Occlusional Surfaces

Functional Tooth Units
Posterior Occluding Pairs

World Health Goal
- 20 natural or
  4 FTUs
Mastication Process

Chewing is part of the normal eating process.
- Bolus formation
  - Malleable
  - Lubricated
  - Cohesive.

Primarily semi-autonomic act, but can be mediated by high conscious input.

Chewing energy
- Force through the bolus
Mastication Process

Food

- Cheek/tongue move it between teeth
- Jaw muscles bring teeth into cyclic contact, repeatedly occluding.
- Becomes softer and warmer as enzymes begin breakdown

Feedback from the proprioceptive nerves in the teeth and TMJ develop neural pathways with govern duration and force of chewing muscle activation.
Mastication Process

Process Model of Feeding
- Stage I Transport: solid moves from anterior to post canines for mastication
- Processing: reduce food to a swallowable consistency
- Stage II Transport: move chewed food posteriorly from oral cavity to pharynx
Mastication Process

Characteristics
- Male more efficient than female
- Male more forceful than female

Breakdown Patterns
- Broader bite size when fast chewed
- Narrower bite size when slow chewed
Mastication Process

Swallow Threshold Triggers
- Food Particle Size
- Lubrication/Cohesiveness

Oral physiology VS. food characteristics
Mastication Process

Loss of teeth:

- Loss of occlusal surface
- Loss of periodontal receptors
- Loss of vertical dimension
- Loss of jaw stabilization
- Prefrontal deactivation
Mastication Process

Loss of teeth:

- Increases number of chews
- Decreased bolus viscosity

- Increased size of ‘swallowable’ bolus
Mastication Process

Edentulous Mucosal Pain:
- Pain mapping

*Increases*
- anterior to posterior alveolus
*Decreases*
- anterior to posterior palate
- ridge crest to buccal vestibule
Tooth Loss Scary Statistics

36 Million Americans have no teeth
120 Million are missing at least 1 tooth
Geriatric – 2:1 ratio (23 Million)
Tooth Loss Statistics

Top states for most toothless seniors from extractions due to decay or disease

1. West Virginia  33.7%
2. Kentucky  23.9%
3. Missouri  22.5%
11. Michigan  12.9%
Tooth Loss Statistics

Seniors over 65 have average of 18.9 teeth remaining

Fewer teeth in black seniors
- chronic smokers
- lower income levels
- less education

Nationwide, 27% have total loss of teeth.
Tooth Loss Statistics

Worldwide problem

- Diet
- Dental care access
- Awareness/Acceptance

WHO Percentages 65-74 Edentulous
Dentures

“Glass eyes don’t see, wooden legs don’t walk, and dentures don’t chew.”
Dentures

90% of edentulous adults have dentures.

Successful suction seal:
- Surface gum area
- Saliva

In most cases:
Adhesive means a bad fitting denture.
Dentures - Myths

- They last forever.
  - Reality: 7-10 years
  - Dulling of grinding surfaces
  - Pitting/Scratches = bacteria
  - Supporting alveolar ridge has shrunken
Dentures - Myths

Wearing is self-explanatory, just pop it in and eat.

- Avoid biting with front teeth (use canines)
- Don’t hold liquids in mouth for long time
- Do distribute food to both sides of mouth when chewing
- Chew with up-down crush motion
Dentures

#1 Complaint/fear

*Food stuck in/under the denture (54%)*

**Top 5 avoided items:**

- 50% Corn on the Cob
- 34% Apples
- 33% Nuts
- 23% Steak
- 8% Staining Beverages (i.e. coffee/wine)
Dentures

Energy Distribution
- Through the denture base
  - Mucosal Tissue
    - Tolerate limited pressures
    - Will become thicker
  - Indiscriminate muscle activity
    - Masseter muscle
- Posterior strength
Bite Force – Power of the Jaw

Human jaw works with a Class 3 mechanical advantage of less than 1.

Output force is less than input force.
- A 10lb bite force requires 40lbs jaw muscle contraction.
Bite Force

Human Mandible
- Double Hinge
  - Open/close
  - Forward/Back
  - Side to side
Bite Force

“Increased tolerance of pressure by the periodontal membrane could often be acquired by changing a soft diet to one needing more vigorous mastication”

Mastication practice

- 30lbs initial tolerance
- 100lbs tolerated at 1 month
- 150lbs tolerated at 3 months

Dr. G.V. Black
Lincoln Park, IL
Bite Force

Gnathodynamometer – device created to measure gnawing power.

Finding: Limit of the bite force was not due to jaw musculature, but the teeth themselves.

<table>
<thead>
<tr>
<th>Natural Teeth</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the Molar</td>
<td>150lbs</td>
<td>108lbs</td>
</tr>
<tr>
<td>At the Incisor</td>
<td>83lbs</td>
<td>57lbs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dentures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U/L Dentures</td>
<td>20-30lbs</td>
</tr>
<tr>
<td>U Denture, N Lower</td>
<td>30-40lbs</td>
</tr>
</tbody>
</table>
Bite Force

Bite Force
- Chewing side dominance
- Tooth type
  - Posterior advantage

<table>
<thead>
<tr>
<th>Tooth Type</th>
<th>Bite Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incisors</td>
<td>22-33lbs</td>
</tr>
<tr>
<td>Canines</td>
<td>72-109lbs</td>
</tr>
<tr>
<td>Premolars</td>
<td>95-131lbs</td>
</tr>
<tr>
<td>1st Molar</td>
<td>67-89lbs</td>
</tr>
<tr>
<td>2nd Molar</td>
<td>107-168lbs</td>
</tr>
</tbody>
</table>

Edentulous bite force at canine/premolar area = 25.8lbs
Bite Force

Phagodynameter – device created to test the force required to crush a food item.

(1895)

45lbs Roast Beef  40lbs Tender Ham
40lbs Cole Slaw   30lbs Corn Beef
25lbs Lettuce    20lbs Pork Chop
20lbs Young Radish
Dentition Effects on Nutrition

Effects of Age:
- Less Variety
- Less Quantity
- Less Quality

Compromised dentition=further restriction.

Older adults wearing well-fitting dentures showed similar nutrient intake and dietary quality to those with their natural teeth.
Dentition Effects on Nutrition

Food Avoidance:
Fruits: Apples, Oranges, Pears
Vegetables: Carrots, Tomatoes, Leafy
Nuts
Cooked Meats
Toast

Dietary Insufficiency:
Folic Acid
Vitamin C
Beta-carotene
Vitamin E
Serum Albumin
Fiber
Dentition Effects on Nutrition

Missing dentition leads to increased consumption
- Carbohydrates
- Rice
- Candy/Sweets

Special Populations:
- Increased benefit from denture use
  - Increased nutritional parameters
  - Increased BMI
Conclusions

**Refine** your oral exam
- Locate FTUs/POPs
- Judge flattening/hardening of ridge
- Saliva

**Assess** any dentures
- Cusp wear
- Seal/fit

**Consider** variables
- Gender
- Chewing speed
- Bite musculature
- Stimulability
References/Resources


References/Resources


References/Resources

