

Teeth, No Teeth and Mastication

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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

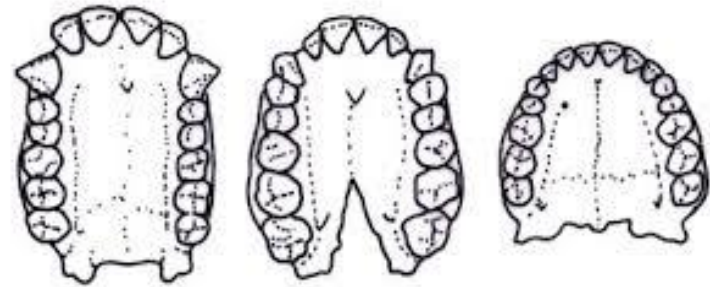
- Incomplete digestion
 - Nutrients not extracted
 - Undigested food sits in the colon
 - Bacterial growth
 - Gas, bloating
 - Flatulence



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

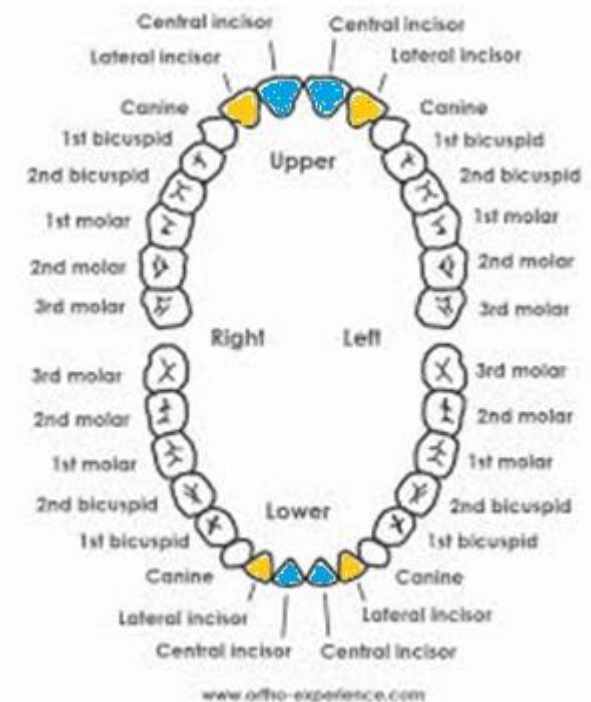
- Shear or cut food.

Position

- Visibility

Features:

- Upper incisors
- Shovel shape



Dental Primer - Canines



Function

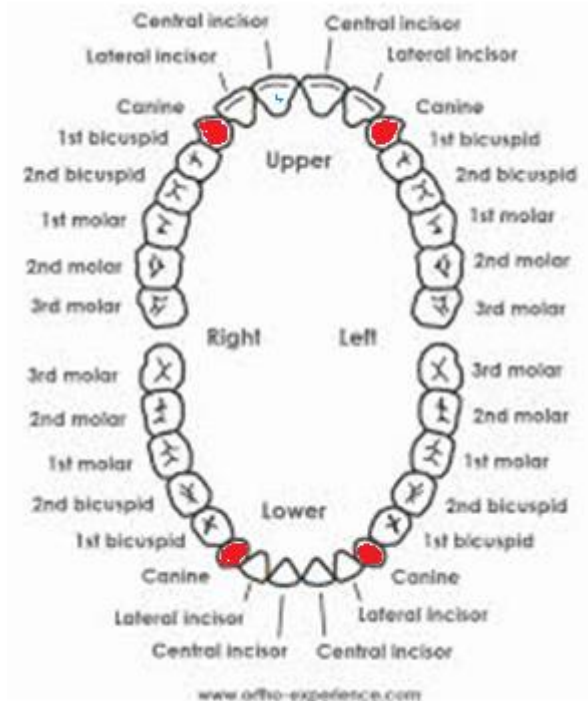
- Rip and tear

Position

- Curve of the arch

Features

- Strongest
- Guide biting
- V shaped



Dental Primer – PreMolars/Bicuspid



Function

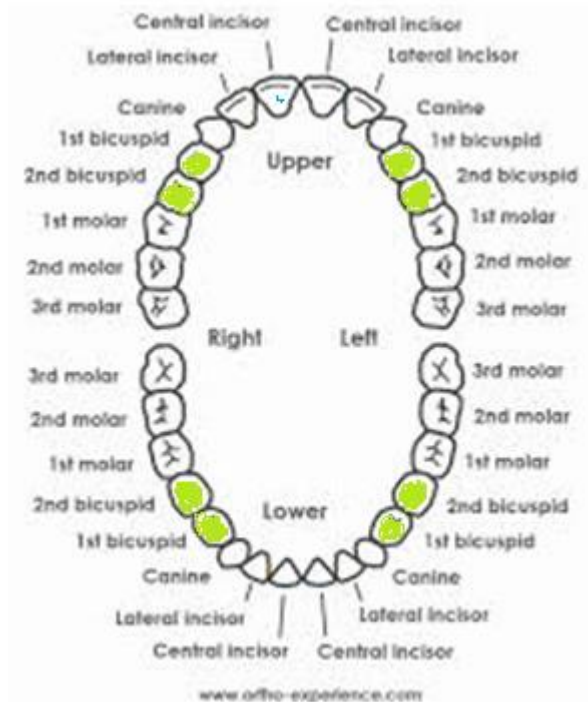
- Tear and grind
- Pass food

Position

- Posterior to canines

Features

- 2 cusps



Dental Primer - Molars



Function

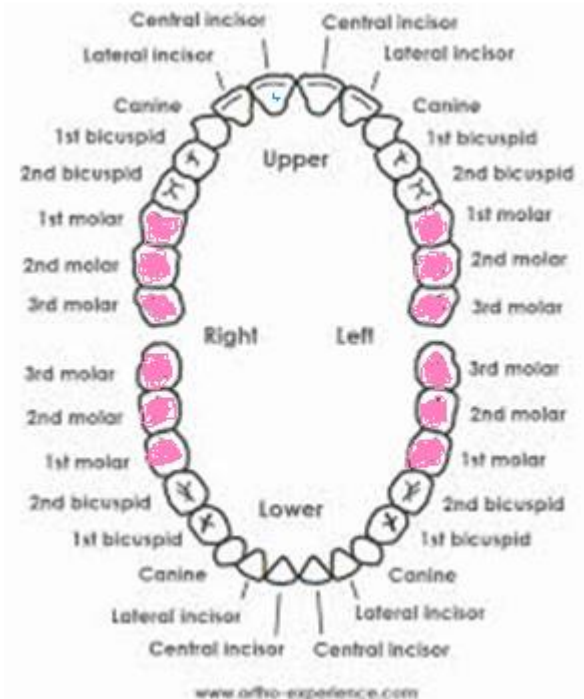
- Crush and grind

Position

- Most posterior

Features

- 4-5 cusps
- powerful

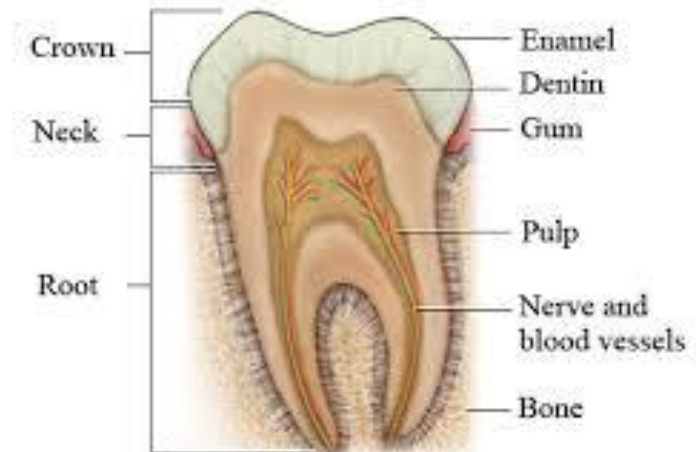


Dental Primer - Anatomy

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

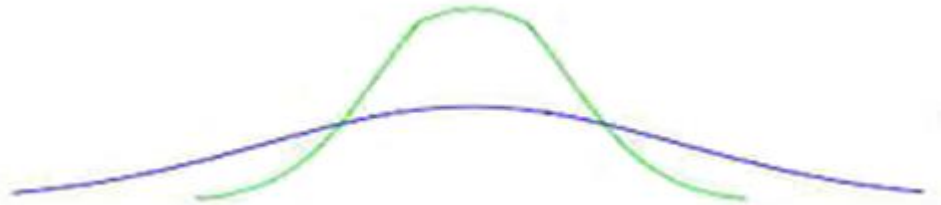
- Gum health
- Direct Pressure
- Skeletal bone density



Mastication Process

Alveolar Ridge Reabsorption

- By 3rd month
- By 6th month
- By 3rd year



Reabsorption Factors

- Dentures
- Nutrition deficits



Dental Primer – Occlusional Surfaces

Help Wanted

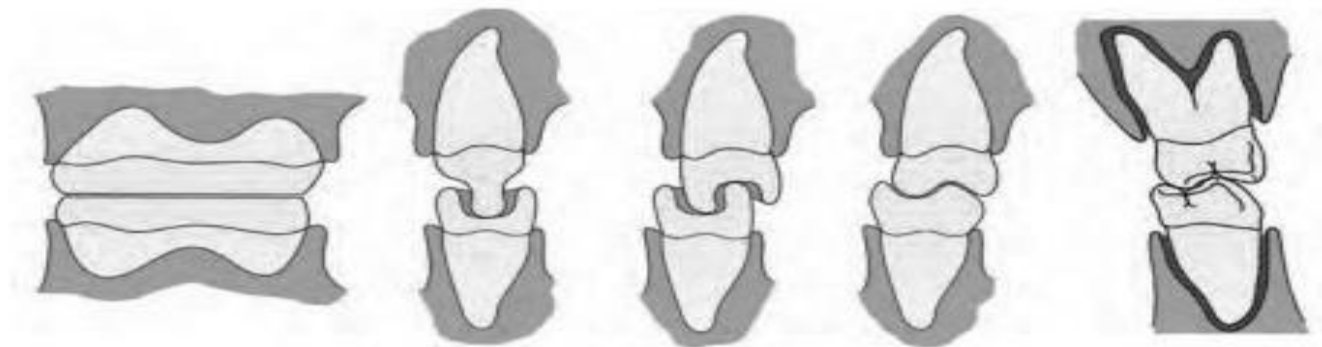
Men having at least two
upper and two lower
opposing front teeth.
Uniform and gun provided.



Dental Primer – Occlusional Surfaces

Occlusional Advantage

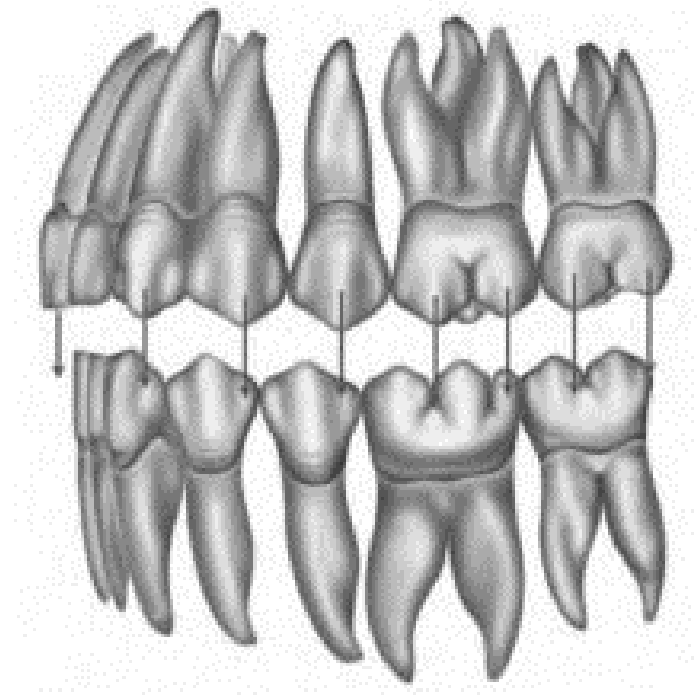
- Uniform Surface
- Single Cusp/Trough
- Interlocking



Dental Primer – Occlusional Surfaces

Occlusional Advantage

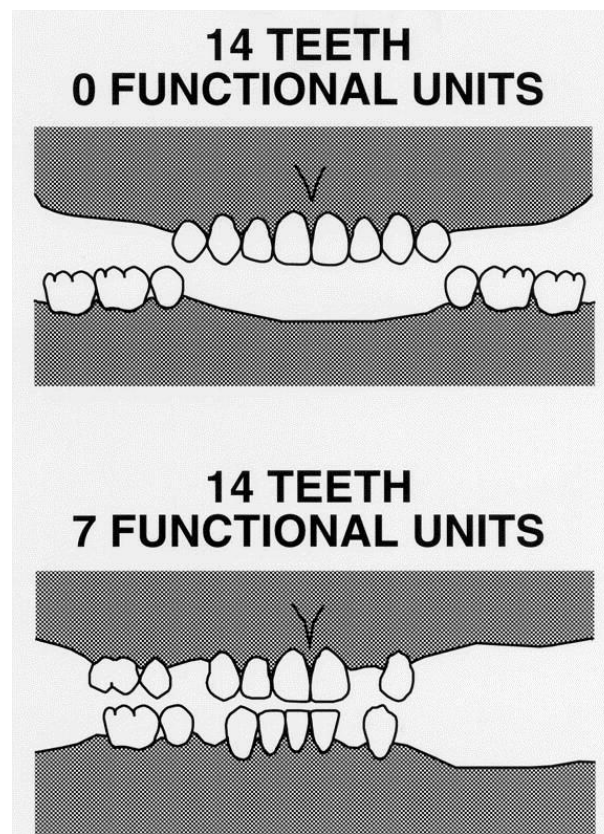
- Interlocking Series



Dental Primer – Occlusal 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

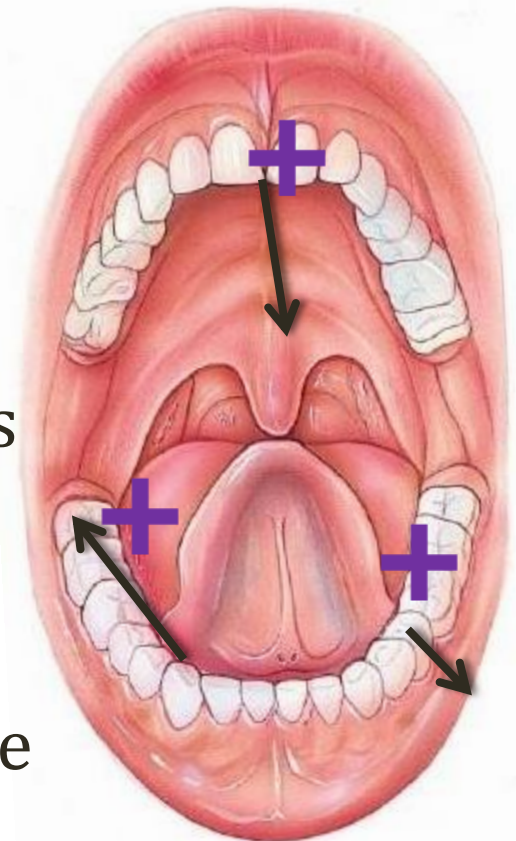
Increases

anterior to posterior alveolus

Decreases

anterior to posterior palate

ridge crest to buccal vestibule



Tooth Loss *Scary* Statistics



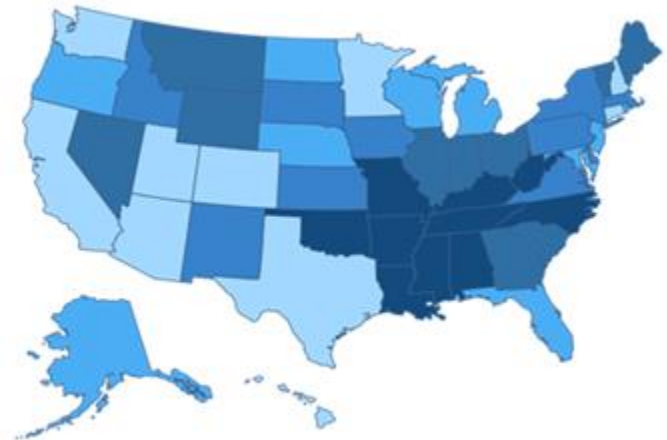
36 Million Americans have no teeth
120 Million are missing at least 1 tooth
Geriatric – 2:1 ratio (23 Million)



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.

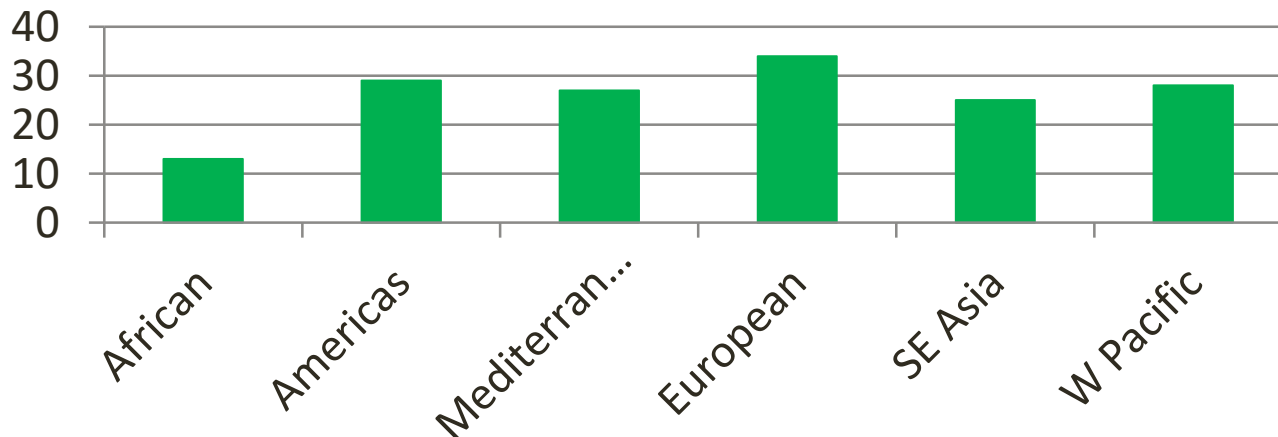


Tooth Loss Statistics

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 measure gnawing power.

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

Natural Teeth	Males	Females
At the Molar	150lbs	108lbs
At the Incisor	83lbs	57lbs

U/L Dentures	20-30lbs
U Denture, N Lower	30-40lbs



Bite Force

Bite Force

- Chewing side dominance
- Tooth type
 - Posterior advantage

	Bite Force
Incisors	22-33lbs
Canines	72-109lbs
Premolars	95-131lbs
1 st Molar	67-89lbs
2 nd Molar	107-168lbs

Edentulous bite force at canine/premolar area = 25.8lbs



Bite Force

Phagodynamometer – 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



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