Oral Signs of Nutritional Disease: What the Mouth Can Tell Us

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Nutritional Deficiencies: The How and the Who

- Reduced intake
  - Economically disadvantaged
  - Debilitated states
  - Alcoholism, other drug use
  - Eating disorders
  - Fad diets
  - Edentulous adults
    * Correlation of # of posterior occluding pairs of natural teeth
  

- Impaired absorption
  - Genetic deficiency (Hartnup syndrome for tryptophan/B3)
  - Intestinal inflammation (celiac disease, IBD)
  - Small bowel bypass surgery
  - Diarrhea
  - Achlorhydria

- Increased use relative to consumption
  - Pregnancy (B6)
  - Lactation (B6)
  - Systemic malignancy
  - Carcinoid syndrome
    * Tryptophan (+B2, B6, Cu, Fe) → B3; shunted to serotonin
  - Concomitant medications
    * Chlorpromazine → riboflavin/B2 excretion
    * Isoniazid → pyridoxine/B6 deficiency

The Mouth: A Window to Nutritional Status

- Epithelial cell turnover rate
  - Oral mucosa = 3-7 days
  - Skin = ≤ 28 days

- “Normal” repetitive trauma, exposures
  - Eating, chewing
  - Talking
  - Breathing

**Water- and Fat-Soluble Vitamins**

**Water-soluble**
- Not stored in large amounts in the body
- Must be obtained regularly through diet, supplements
- Greater risk of deficiency
- Lower risk of toxicity
- Vitamins B2, B3, B6, B7, B9, B12
- Vitamin C

**Fat-soluble**
- Stored in significant amounts in body
- No need for daily consumption
- Lower risk of deficiency
- Greater risk of toxicity
- Vitamins A, D, K

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**Angular Cheilitis**

- Angular cheilosis, angular stomatitis
- Perlèche – “to lick”
- Fissures extend from mucosal surface to cutaneous skin
- Maceration
- Erythema
- Crusting

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**Angular Cheilitis**

- Vit B2, B3, B6, B7, B9
- Excessive vitamin A
- Inadequate support of lips
- Malocclusion of teeth
- Poorly fitting dentures
- Habits: lip licking, biting, improper flossing/hygiene

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**Angular Cheilitis**

- 2nd infection
  - Fungal (C. albicans)
  - Bacterial (S. aureus, Streptococcus species)
- Contact cheilitis
  - Irritant
  - Allergic

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**Recurrent Aphthous Stomatitis**

- Vitamin B9
- Vitamin B12

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Recurrent Aphthous Stomatitis

- 34 RAS
- 17M, 17F
- Mean age 36.7yr
- 32 controls
- 13M, 19F
- Mean age 34.3yr


Recurrent Aphthous Stomatitis

<table>
<thead>
<tr>
<th>Serum Test</th>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>Vitamin B12</td>
<td>RAS</td>
<td>245.5</td>
<td>97.9</td>
<td>0.028</td>
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<td></td>
<td>Control</td>
<td>294.0</td>
<td>80.0</td>
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<tr>
<td>Folic acid</td>
<td>RAS</td>
<td>8.756</td>
<td>4.422</td>
<td>0.916</td>
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<tr>
<td></td>
<td>Control</td>
<td>8.658</td>
<td>3.172</td>
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<td>Ferritin</td>
<td>RAS</td>
<td>68.5</td>
<td>61</td>
<td>0.267</td>
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<tr>
<td></td>
<td>Control</td>
<td>53.51</td>
<td>49.48</td>
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</table>


Recurrent Aphthous Stomatitis and Hematinic Deficiencies: Meta-Analysis

- Hematinic deficiencies occur in 20% RAS patients
- 9 case control studies: 710 RAS and 602 controls

<table>
<thead>
<tr>
<th>Hematologic parameters</th>
<th>No. of study</th>
<th>Off (95% CI)</th>
<th>P=publication bias</th>
<th>Heterogeneity test</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>6</td>
<td>3.74 (2.35, 5.94)</td>
<td>0.03</td>
<td>0.13</td>
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<tr>
<td>Folic acid</td>
<td>8</td>
<td>7.55 (3.81, 11.80)</td>
<td>0.40</td>
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<tr>
<td>Ferritin</td>
<td>6</td>
<td>2.02 (1.60, 4.46)</td>
<td>0.12</td>
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<tr>
<td>Ferritin</td>
<td>5</td>
<td>1.77 (1.12, 2.85)</td>
<td>0.72</td>
<td>1.00</td>
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</tbody>
</table>


Atrophic Glossitis

- Vitamin B12*
- Vitamin B9
- Vitamin B2 (riboflavin)
- Vitamin B3 (niacin)
- Vitamin B6 (pyridoxine)


Glossitis Secondary to B12 Deficiency


Glossitis Secondary to B12 Deficiency

Glossitis Secondary to B12 Deficiency


Atrophic Glossitis: Differential Diagnosis

- Xerostomia, sicca symptoms
- Sjogren syndrome
- Oral candidiasis
- Celiac disease
- Lichen planus
- Migratory glossitis (psoriasis)

Oculo-Oro-Genital Syndrome

- Mixed B vitamin deficiency (B2, B6)
- Blepharoconjunctivitis, photophobia
- Oral
  - Atrophic glossitis with magenta hue
  - Angular cheilitis, cheilosis
  - Glossodynia
- Genital and perianal erythema, scaling, with pruritus and/or burning → may progress to ulcers

Pellagra (B3 Deficiency) = 3 D’s


Pellagra

- Cheilosis, angular cheilitis
- Burning mouth
- Erythematous glossitis, gingivitis
- Apathy, depression, irritability
- Poor concentration, dementia
- Diarrhea with malabsorption
  - Watery +/- blood, mucus
Biotin (B7) Deficiency

Vitamin C Deficiency: Scurvy
- Mucosal petechiae
- Hemorrhagic gingivitis
- Gingival hypertrophy
- Interdental infarcts

Vitamin C Deficiency: Scurvy

Water-Soluble Vitamins: Measurement
- B2 (riboflavin) = RBC glutathione reductase activity
  - Activity coefficient >1.4 = insufficiency
- B3 (niacin) = serum N-methyl nicotinamide
- B6 (pyridoxine) = plasma pyridoxal-5-phosphate
  - <20 nmol/L deficient; 20-30 nmol/L = marginal
- B9 (folic acid) = serum folate
  - <2 ng/ml deficient
- B12 (cyanocobalamin) = serum B12
  - <200 pg/ml deficient

Eating Disorders
- Anorexia nervosa
  - Refusal to maintain body weight ≥ minimally normal weight for age/height (<85% IBW)
  - Intense fear of gaining weight
  - Altered body perception
  - Amenorrhea ≥ 3 menstrual cycles
- Bulimia nervosa
  - Recurrent binge eating with lack of control
  - Inappropriate compensatory behavior
  - ≥ 2x/week for 3 months
  - Weight often normal or above-normal

Eating Disorders
- “Culture-bound” syndromes
  - More widespread in Western culture
- Lifetime prevalence in women:
  - Anorexia nervosa: 0.5%
  - Bulimia nervosa: 1 to 3%
- Prevalence in men = 10% of that for women
- Risk factors: female, early childhood eating problems, childhood GI problems, low self-esteem, sexual abuse
Anorexia and Bulimia: Oral Manifestations

Vitamin Deficiencies
- Angular cheilitis
- Mucosal atrophy
- Glossitis
- Gingivitis
- Taste abnormalities

Traumatic “Guiding Signs”
- Palatal erosions
- Dental enamel erosions
  - Dehydration, xerostomia
  - Citrus, CO₂ beverages
  - Gastric acid with emesis
  - Frequent toothbrushing
- Hyperkeratosis +/- scarring on the dorsal fingers

Dental Erosions

- 63F, 3M Norwegians with ED
- Mean age 27.7yr
- Self-induced vomiting
  - Mean duration 10.6yr (3-32yr)
- Dental erosions + 69.7%
  - 41.6% on palatal/lingual
  - 36.6% on occlusal
  - 21.8% on buccal

Parotid Hypertrophy in Bulimia


Russell Sign in Bulimia

Summary

• Angular cheilitis, glossitis and recurrent aphthae may be attributable to nutritional deficiency.
• Consider nutritional disorders when evaluating patients with recurrent oral complaints.
• Unique oral signs may aid in the recognition of patients with eating disorders.
• Oral examination should be performed as part of routine skin examination.

The Dermatology Foundation has supported & advanced my research – and patient care.

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