Celiac Disease, Irritable Bowel Syndrome, Crohn's Disease and the Role of the Dental Team

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What food contains gluten? Foods made from these GRAINS: – Rye – Wheat – Barley – European spelt

non-celiac gluten sensitivity -may not develop intestinal problems-blood tests are negative, not a wheat allergy-symptoms include headache, "foggy mind," joint pain, and numbness in the legs, arms or fingers. -symptoms appear hours or days after gluten has been ingested **-**not antigen specific but symptoms are relieved on gluten-free diet

Celiac disease (spelled 'Coeliac' in Europe)- *is* antigen specific **-**positive antibodies to tissue-transglutaminase, endomysium and deamidated gliadin antibodies **-**DOES result in an attack on its own tissue **-**intestinal damage, or enteropathy, absorption problems, related diseases

Prevalence of Celiac Disease: Ranges from 3 to 13 cases/1000-Overall prevalence = 1% but only 10-15% have been diagnosed and treated-Huge increase in diagnosis AND prevalence (doubling) during the last 20 years - unknown WHY there has been an increase in gluten-related disorders -No published data on prevalence of non-celiac gluten sensitivities -There has been a huge increase of gluten free products (promoted by celebrities?)

True Allergy to Gluten: Respiratory: - 'hay fever' symptoms (rhinitis, bronchiole spasm) -Food allergy: -itching in the mouth, difficulty swallowing and breathing - after digestion: nausea, vomiting, diarrhea, abdominal pain –hives -**WDEIA**: - wheat-dependent exercise induced anaphylaxis - Contact urticaria: -hives from external contact on the skin

Prevalence of Celiac • 18 million in the US are gluten sensitive – 6% of the population • 3 million have celiac disease – 1% of the population

How gluten causes damage in patients who are susceptible

Pathogenesis of Celiac disease

Can Stress cause Celiac Disease? "In conclusion, our study indicates that life-events are associated to some degree with recent diagnosis of celiac disease in adults. The number of the events and not their severity appear as the determinant factor."

Oral manifestations of celiac (coeliac) disease: Enamel defects • Apthous ulcers • Dermatitis herpetiformis • Glossodynia • Dental erosion

Where things can go wrong during tooth development • Lack of calcium (hypocalcemia, Vitamin D deficiency) • Enamel protein matrix malfunction (e.g. defective amelogenin) • Defective enzymes that remove enamel proteins (MMP20, Kallekrein) –injury to the developing tooth bud

Proteases essential for complete enamel crystal growth • Kallekrein-4 (KLK4, EMSP-1, prostase) - serine proteinase family (like trypsin) - expressed during maturation phase -mutations linked with amelogenesis imperfect -Enamelysin (matrix metalloproteinase-20, or MMP-20) – a zinc dependent enzyme – expressed during late secretory and early maturation of enamel development – knockout mice show amelogenin imperfecta – specific for amelogenins

Are Celiac Disease patients deficient in zinc?

One study says yes, another no.

Cross reaction of antigliadin to enamel proteins

Grading of enamel defects in Celiac Disease

Prevalence of enamel defects in Celiac Disease

Differential Diagnosis Amelogenesis Imperfecta: Enamelin Translation Termination at codon 53 autosomal dominant local hypoplastic amelegenesis imperfecta

Amelogenesis Imperfecta : Prevalence is estimated to be 1 in10,000 (Chosack 1979; Witkop 1989; Chan 2011) - Half are caused by defects in the genes coding for secreted enamel proteins (AMELX, ENAM, AMBN, MMP20, KLK4) - Could also be defects in membrane protein amino acid sequences

Differential Diagnosis Premature Birth, Antibiotics, Syphilis

Is breastfeeding protective in the celiac baby? yes

Linear Enamel Hypoplasia (LEH): All the crowns of the primary teeth are completed by 11 mo. LEH shows up as an enamel defect in the middle 1/3 of the primary incisors- Breast feeding and NOT introducing wheat foods until age 3 would protect the primary teeth

The PRIMARY incisors only are affected-There is a line of hypocalcification on the facial surface • Indicates severe hypocalcemia at birth (usually accompanied by neonatal tetany)

Differential Diagnosis of enamel defects: Environmental Toxins • Dioxins, PCBs – found defects in the permanent first molars • Tributylin – Interferes with tooth development • Polycyclic aromatic hydrocarbons – from cigarette smoke (as well as industrial and traffic pollution) – thinning of permanent incisors

Differential Diagnosis of enamel defects: Dental Fluorosis

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Differential Diagnosis of mucosal lesions: Aphthous Ulcers: simple vs recurrent aphthous stomatitis

Differential Diagnosis of skin lesions: Dermatitis Herpetiformis **'Gluten Rash'** • Sometimes confused with – Eczema – Herpes Zoster – Contact dermatitis – Psoriasis – acne

Dermatitis Herpetiformis

History: Discovered in 1884 by Dr. Louis Duhring • The association of DH and enteropathy was described in 1966 by Dr. Janet Marks • In 1969 Van der Meer in Holland described the presence of granular immunoglobulin (Ig) A in the dermal papillary tips of skin from patients with DH (currently recognized as the hallmark of the disease. Dr. Kumar, in 2001, at the University of Buffalo is credited with the discovery of the endomysial antibody in patients with DH(20).

Gold standard diagnosis of DH • Positive skin biopsy- Dermatitis herpetiformis can go undiagnosed for years-Complications of Dermatitis Herpetiformis -High association autoimmune diseases include thyroid (5-11%), pernicious anemia (1-3%), type 1 diabetes(1-2%), collagen tissue disease

Treatment of DH

1. Drug therapy 20 – 100 mg Dapsone/day (4,4' diaminodiphenylsulfone) -inhibits neutrophil recruitment • anti-inflammatory, antibacterial • reduces local neutrophil and eosinophil mediated tissue injury

2. Gluten free diet

Differential Diagnosis of enlarged tongue: Atrophic Glossitis or Tongue Hypertrophy a) contact sensitivity to dental materials b) food allergies c) connective tissue and metabolic disorders d) oral infectious diseases such as Herpes simplex/Zoster e) oral candidiasis f) vitamin deficiencies g) systemic diseases with similar symptoms (e.g. Sjögren´s)

Other oral signs of CD • Angular cheilosis (chelitis) • Oral Lichen Planus

Periodontal health in Celiac Patients • *Rothia Mucilaginosa* usually associated with periodontal health • Has been found in periodontal disease but not a main causative bacteria •*Rothia* are natural colonizers of the upper GI tract • Periodontitis is not increased in Celiac Disease

Caries risk in Celiac Disease • Celiac patients have fewer caries...WHY? – Delayed tooth eruption? – Symptoms of bloated stomach, cramps, loss of appetite = less frequent snacking – 'junk food' containing gluten also contains sugar – Vitamin D and Calcium supplementation reduces risk of caries – Excellent dental IQ, better oral hygiene – Lower zinc levels reduces MMP-20 activation in dentin caries - Excellent dental IQ, better oral hygiene – Lower zinc levels reduces MMP-20 activation in dentin caries

Celiac Disease and Dental Erosion • Nausea and vomiting can occur until diagnosis is made and gluten-free diet started

Associated Disorders in Celiac Disease • Osteoporotic bone fracture

Celiac and brain effects • Gliadin peptides produce a morphine-like response in the brain – this could explain 'addiction' to wheat

• Schizophrenics may be affected by celiac disease – "Five biomarkers of gluten sensitivity were found to be significantly elevated in patients with non-affective psychoses compared to controls."

Celiac and Autism Spectrum Disorders: may be a connection

Gluten-free diet • *Starches allowed* – Amaranth – Arrowroot – Buckwheat – Corn and cornmeal – Flax – Hominy (corn) – Millet – Quinoa – Rice – Sorghum – Soy – Tapioca – Teff

Starches to avoid • Barley (malt, malt flavouring and vinegar, beer) • Rye (rye bread) • Triticale (cross between rye and wheat) • Wheat (anything made with wheat flour) – huge assortment of breads and pastries – pasta, pizza, Matzo – cereals, pancakes, chocolate bars, granola treats – Pies, desserts, cakes – gravies, processed foods, medicines.

Other info:

Wheat germ agglutinin (WGA) is a natural pesticide -it is a lectin that binds to sialic acid and N-acetyl-D-glucosamine which inhibits bacteria, fungi and insects.

A gluten-free diet in Celiac Disease releases mercury from tissue stores

Leaky Gut -effects on other organs, triggers, foods to nourish, supplements, prebiotics

Other Bowel Disease Irritable Bowel Disease (IBS), Crohn's Disease, Ulcerative Colitis, Diverticulitis

How to distinguish Crohn's Disease (CD) and Ulcerative Colitis (UC) from Irritable Bowel Syndrome (IBS)

Rising incidence of Crohn's Disease and Ulcerative Colitis- Age groups most affected by Crohn's Disease and Ulcerative Colitis are the older youngsters

Toothpaste does not contribute to Crohn's or ulcerative colitis

Sugar pills (placebo) reduced IBS symptoms even when the patients knew they were getting a placebo.

Adalimumab (Humira) is a monoclonal antibody against Tumour Necrosis Factor-beta (TNF-β) - may not work any better than altering the diet and is very expensive

Diverticulitis and the hygienist 1. No oral concerns 2. Immune system may be impaired 3. Diet may aggravate symptoms 4. A high-fibre diet is the only requirement on which a medical consensus appears to exist. 5. Decisions about diet should be made in consultation with the physician or dietician

Take home points about Bowel Diseases and Dentistry

• Gluten intolerance and celiac disease are more common than previously recognized

• The dental team has an important role to play in helping celiac patients deal with the oral complications of their disease

• Most symptoms of celiac disease can be managed by avoiding all gluten-containing foods and products

• Fluoride MAY be a factor in causing IBS symptoms

• NO long dental appointments

• Look for soft tissue oral lesions if medical history reveals bowel diseases

• Zinc mouthwashes may be beneficial to soft tissue oral lesions

• Patients with Crohn's may be at higher risk for caries

• Patients with Crohn's don't need to avoid toothpaste