Nutrition and Periodontal Disease

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What is periodontal disease?

- Inflammatory disease
- Response to bacteria which accumulate as a biofilm on the surface of the teeth (dental plaque)
- Damage to supporting tissues resulting in some cases in the loss of teeth

Periodontal diseases

- Common
- Advanced disease affects 10-15% of population worldwide
- Treatable
- Preventable

Nutrition and Oral disease

- Diet factor in the progression of dental decay (caries)
- Role in development and progression of periodontal disease less well defined
- Limited data

Nutrition and Periodontal Disease

- Dairy products
- Obesity
- Antioxidants

Calcium

- Intake 1-1.2 g day
- Body 1200g calcium
- Critical for nerve, muscle and enzyme function
- Structure bones and teeth

Calcium

- Regulation by hormones and Vitamin D
- Low Vitamin D associated with an increased risk of periodontal disease in those aged 50 or older *Dietrich et al. 2004*

Intake of dairy products

- Low dietary intake of calcium resulted in more severe periodontal disease in young men and women and older men

  Nishida et al. 2000

- Hisayama study in middle aged and elderly lactic acid containing foods including yoghurt and lactic acid drinks had a beneficial effect

  Shimazaki et al. 2008

Obesity and Periodontal Disease

- PRIME study
- 1400 men aged 60 -70 years
- Periodontal examination
- Tooth loss
- General health
- Height weight
- 21% were obese

Obesity and Periodontitis

- Obese men were significantly more likely to have periodontitis
- Lost more teeth

Obesity and periodontitis

- Odds ratio 1.77 (1.20-2.63)
- 77% more likely to have periodontitis if obese
  - Adjusted for age, smoking, diabetes, education, socio economic status, dental attendance and toothbrushing frequency

Adipose tissue

- Not passive storage depot for fat
- Produces cytokines
- Higher C-reactive protein levels
- Low-grade systemic inflammation in obesity

Obesity

- Inexpensive calorie dense foods
- Reduction physical activity
- Intake exceeds expenditure less 1%

Obesity and gut bacteria

- Gut bacteria may be a factor
- Extract more energy from food e.g. from otherwise indigestible dietary polysaccharides
- Gut bacteria in obese differs from those in lean individuals
- Cause or effect?

Vitamin C

- Water soluble
- All plants most animals
- Humans cannot synthesise

- Maturation of collagen

- Antioxidant properties

Vitamin C and periodontal disease

- Reduced dietary intake of vitamin C associated with an increased risk of periodontitis NHANES III *Nishida et al. 2000*

- Prevalence negatively associated with serum vitamin C and other antioxidants

Chapple et al. 2007

Oxidative stress

Central to periodontal tissue damage that results from host-microbial interactions

Chapple & Matthews 2007

Carotenoids

- Antioxidants
- Provitamins act as source Vitamin A
- Increased consumption associated reduced risk of some cancers and heart disease

Carotenoids

- Fat soluble pigments
- Animals cannot synthesise carotenoids
- Important in visual pigments
- Colour animal tissues is important in the acceptibility of food e.g. shellfish trout salmon

Carotenoids and periodontitis

- Investigated the association in a homogenous group Western European men
- 1258 men aged 60-70 years with at least 6 teeth had a periodontal examination
- Measurement of serum carotenoids

Carotenoids measured

- Alpha-carotene
- Beta-carotene
- Beta-cryptoxanthin
- Zeaxanthin
- Lutein
- Lycopene

Carotenoids and periodontitis

- Low serum levels of carotenoids were associated with periodontitis

- Strong association between low levels of beta carotene and beta cryptoxanthin in particular and severe periodontitis

Beta cryptoxanthin

- Antioxidant effect
- Stimulates bone formation and inhibits bone resorption in a tissue culture model of bone
- Increased intake of Satsuma mandarins, a rich source of beta cryptoxanthin, leads to changes in circulating markers of bone metabolism *Yamaguchi 2008*

Alpha and beta carotene

- Antioxidant effect
- Role in immune modulation
- Anti-inflammatory properties

Implications

- Periodontitis may be associated with low levels of antioxidants
- Increased intake of fruit and vegetables can increase antioxidant levels
- Focus on improvement in the diet may benefit periodontal health

Supplementation

- Interactions between different compounds with variable antioxidant activity provide enhanced effects
- Mixtures more effective than single compounds
- Individual supplementation may not work because need complex mixtures from foods

Tooth loss and diet

- Men lost teeth more likely to stop eating apples, pears and raw carrots *Ritchie 2003*
- Tooth loss affects dietary quality and nutrient intake with increased disease risk *Krall et al. 2001*
- Those no teeth significantly more likely to not eat citrus fruits *Lowe et al. 2004*

Conclusions

- Nutritionally adequate diet to maintain host resistance keep integrity periodontal tissues
- Increase fruit, vegetables and dietary calcium
- Reduce intake refined carbohydrates