The Relevance of Oral Hygiene

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Reservoir of Organisms

- Complex flora of > 700 bacteria and 20 fungi
- Candida albicans: 50% carriage in adults
  - Mucocutaneous infections
- Helicobacter pylori in normal adults
  - saliva 54%, plaque in gingival crevice 48%
  - Ascends from this reservoir to the middle ear and to the para-nasal sinuses directly or by reflux, resulting in otitis, sinusitis, pharyngitis, and laryngitis.
  - HP in dental plaque may be a risk factor for relapse of gastro-intestinal infection and relapse of gastric ulceration after antibiotic therapy.

Candidosis

Infective endocarditis: More daily bacteraemia with gingivitis or periodontitis

Infective endocarditis

- Significant numbers of disadvantaged New Zealanders, especially young Maori and Pacific people, have rheumatic valvular heart disease, and gingivitis and periodontal disease.
- Aspects:
  1. Regular professional dental care
  2. Use of appropriate products
  3. Manual and powered toothbrushes
  4. Floss/interdental cleaning
  5. Other plaque-control devices such as antibacterial mouthwashes.

- Emphasis on improved oral health, rather than a sole focus on dental procedures and ABT prophylaxis.

Clinically significant reductions in interdental gingivitis vs control and baseline

- Regular fluoride toothpaste, plus Listerine mouthrinse (20 mL for 30 seconds twice daily for six months)
- Colgate Total toothpaste (brushed for 60 sec)
- Plus a placebo rinse
- N=316 subjects, 6 months

Reduction in visual scoring for Gingivitis: 22.9% vs 20.8% (NS)
Reduction in Bleeding Index: 70% vs 58% (P<0.01)
Reduction in Plaque Index: 56.1% vs. 22.1% (P<0.01)

"Listerine, when used in conjunction with a fluoride dentifrice and usual oral hygiene, provided a greater benefit in reducing plaque. When considering an antiplaque/antigingivitis product to recommend to patients, clinicians should consider Listerine, in conjunction with usual oral hygiene, if more rigorous plaque control is desired."

**Mechanisms**

- **Aspiration of dental plaque and saliva, especially in infirm and elderly.**
- **Biofilm development**
- Bacteria of oral/periodontal origin can be found in lungs of patients with COPD, pneumonia and VAP
- **Once in the lung, periodontal bacteria:**
  - Bind to lung epithelium
  - Allow colonization by pulmonary pathogens
  - Activate epithelial cells to produce inflammation, leading to fluid accumulation
  - Activate production of enzymes which break down lung connective tissues

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**Ventilator-associated pneumonia (VAP) in ICU patients**

- 3X daily toothbrushing reduces the risk of VAP in stroke, neurological and medical ICU patients within one week
- 2 X daily use of an effective anti-plaque rinse (Chlorhexidine or Listerine) reduces the risk of nosocomial pneumonia in intubated patients, by a factor of more than 6 times, compared with the same daily standard oral care protocol without a mouthrinse.

- **NB: CHX does not suppress gram-negative organisms causing VAP,**
  - e.g. *Pseudomonas, Acinetobacter, and Enterobacter* species

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**Patients with intellectual and developmental disabilities (IDD).**

- Oral organisms in dental plaque and saliva cause over 60% of respiratory infections (pneumonia and sinusitis) in IDD patients.
- **IDD patients require meticulous comprehensive oral hygiene of the oral cavity to reduce their oropharyngeal microbial load and the attendant risks of respiratory infections.**


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**Oral cavity sources of distant infection**

- **Periapical infection**
  - After dental caries, tooth fracture, and pulp exposure
- **Gingival and periodontal infection**
- **Mucosal breaches**
  - Ulcerations and lesions
  - Mucositis from chemotherapy or radiotherapy
  - Penetrating injuries and foreign bodies

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**PUO in immune compromised patients:**

_e.g. Chronic periapical lesions reactivate when host resistance fails_
Haematogenous spread of infection from the mouth to distant sites

- Immune compromised patients
- Pyrexias of unknown origin in oncology patients 30% dental origin
- Systemic sepsis and intravascular coagulation

Oral cavity is a portal for sepsis during chemotherapy / radiotherapy

Orbit
Brain
Liver
Lung
Spleen

Loss of epithelial integrity within periodontal pockets can represent an ulcerated surface area of up to 50-72 cm² in contact with the dental plaque biofilm.

Systemic Exposure to Periodontal Pathogens

- Oral bacteria penetrate into periodontal and vascular tissues and invade intracellularly.
- Organisms are found alive intra-cellularly within atheroma lesions: *P. gingivalis* 38-40% in carotid and coronary atheromas

Oral bugs in the pipes!

Periodontal Pathogens in Carotid Endarterectomy Specimens

(by PCR)

- *P. gingivalis* 13/50 26%
- *B. forsythus* 15/50 30%
- *P. intermedia* 7/50 14%
- *A. a.* 9/50 18%

44% positive for at least one periodontal pathogen


Haematogenous dissemination
PG and AA, both LPS and whole viable gram (-) bacteria.
Mediators: IL-1, TNF, IL-6, PGE2

S. Offenbacher
Spread of infections: Maxillary teeth
- Danger triangle: anterior teeth
  - Cavernous sinus thrombosis
- Canine teeth
  - Canine fossa and orbital involvement
- Molars
  - MX sinus involvement

Ludwig’s angina
- Life-threatening cellulitis of the floor of mouth
- Spreads to the sublingual space via the fascial planes
- Tongue is forced upward and backward, causing airway obstruction (strangulation).
  - Tracheostomy needed for airway support
  - High dose iv ABTs and surgical decompression
- Mortality: No ABT: 50%; ABT and surgical therapies: less than 5%

Periodontal treatment reduces the body’s burden of infection

Mandibular molars: Dental abscess extending into the submandibular space

Associations between periodontitis and systemic disease

- Diabetes – strongly (2 way)
- Pulmonary disease – yes: subgroups VAP, IDD
- Cardiovascular disease – possibly
- Adverse pregnancy outcomes – probably in certain ethnic groups
Periodontal – systemic health interactions

Diabetes Mellitus

- Poor glycaemic control is associated with more severe periodontal diseases.
- Untreated periodontitis impairs glycaemic control.
- Untreated diabetes accelerates periodontitis.

Diabetes Mellitus

Periodontitis is often considered the sixth complication of diabetes

- Patients with diabetes require more rigorous follow-up and greater attention to prevention.
- Patients with a history of poor glycaemic control and oral infections, require more frequent recall visits, AND urgent attention to acute oral infections.

Current Model of Periodontitis Associated Pregnancy Complications

Maternal Periodontal Disease
Placental & Fetal Exposure to Microbes
Poor Placental Perfusion & Inflammation
Preterm Membrane Rupture & Labor
Preterm Delivery
Fetal Growth Restriction (FGR) & Neonatal morbidity

Dental plaque and distant infection: Oral bacteria make bad tourists

Commemorating 75 years of Excellence in Oral Health: 1935-2010