OVERVIEW OF PERIODONTAL DISEASE ORAL SYSTEMIC CONNECTIONS

PROF EVELYN WAGAIYU

Microbiota of periodontal sites associated with initiation &/or progression of disease:

Porphyromonas gingivalis
Tannerella forsythensis
Treponema denticola
Aggregatibacter actinomycetemcomitans
Peptostreptococcus micros
Prevotella intermedia
Campylobacter rectus
Selenomonas

Viruses: EBV and HSV are immunosuppressive and support the overgrowth of the periopathogens.

After two decades of research, it has been firmly established that an association exists between periodontal disease (PD) and cardiovascular disease (CVD)

However the question is?

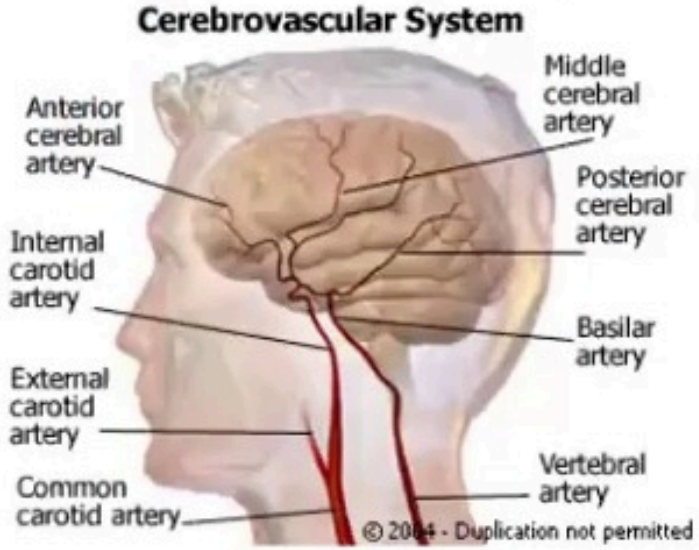
Does the infectious and inflammatory periodontal disease contribute to the causation of heart attack and strokes or are the two conditions coincidentally associated.

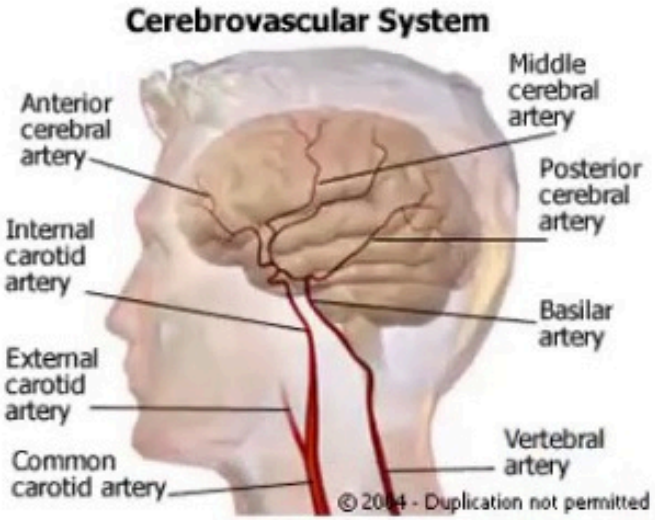
The Evidence

Traditional studies of PD and CVD found higher levels of dental caries, periodontitis, peri-apical lesions and pericoronitis more frequently in patients with recent myocardial infarction than in healthy control patients. - Mattila and colleagues 1989

- Mattila and colleagues (1989) were the first to examine dental health in patients with myocardial infarction and matched controls.
- Dental health was significantly worse in patients with acute myocardial infarction than in controls.
- The association remained valid after adjustment for age, social class, smoking, serum lipid concentrations and diabetes.

Syrjanen and colleagues 1989 observed relatively poor oral health among patients who had experienced a recent stroke compared with control patients who had not experienced stroke





Wu et al 2000

- Looked at relative risk for cerebrovascular disease according to periodontal disease status amongst a cohort of 9962 adults in the National Health and Nutrition Examination Survey in the USA
- They found PD to be an important risk factor for total cerebrovascular accidents and in particular nonhemorrhagic stroke

Many studies have since shown a consistent relationship between indices of oral health and various indicators of cardiovascular disease.

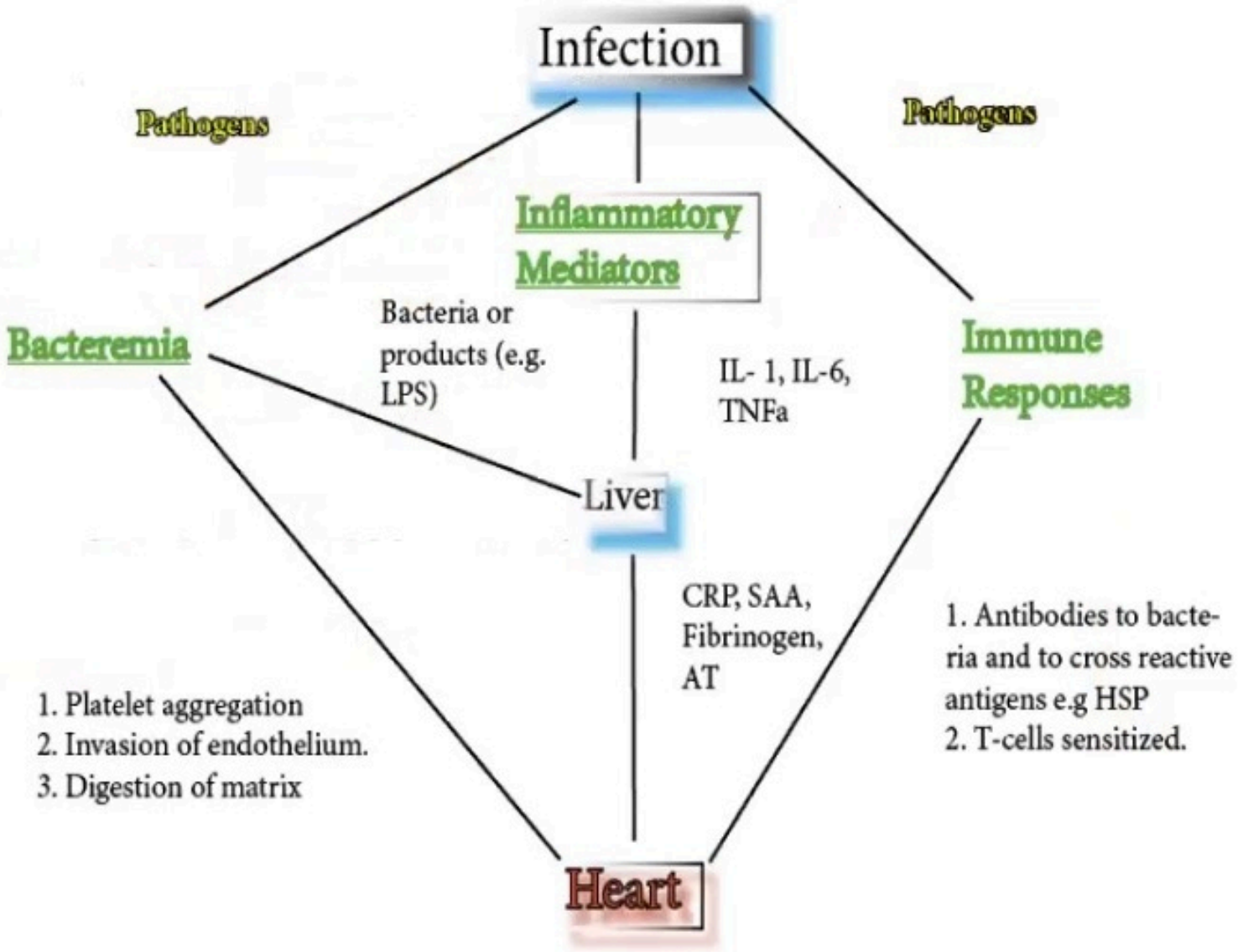
In a case control study of myocardial infarction by Trevisan and colleagues in 2007, focusing on both men and women aged 35-69 years, periodontal disease was significantly associated to the risk of myocardial infarction in both sexes

Theoretical Plausibility

There are a number of potential pathways linking periodontal infection to cardio vascular disease

- Including bacteremia,
- inflammatory mediators
- immune response

Proposed Role Of Infection In CHD



Inflammatory pathway

- Central to the atherosclerotic process is the production of proinflammatory cytokines and their effects on the arterial wall.
- Locally, cytokines mediate the attraction and migration of mononuclear cells and other inflammatory cells into the vascular tissue
- Cytokines released into the systemic circulation cause the liver to increase its production of a series of proteins termed ‘acute phase reactants’ such as CRP

- A study on monozygotic twins (Tabrizi et al 2007) where one twin had CVD and the other did not showed:-
- Worse periodontal conditions in twins with CVD compared with their siblings with no history of CVD
- Thus "periodontal inflammation, poor oral health and atherosclerosis are associated when genetic factors are controlled"

2 cm foot ulcer- smaller than the ulcerated epithelium within infected periodontal pockets

Oral Disease and Systemic Disorders

Pro-inflammatory cytokines (IL-1, IL-6, TNF-A) and prostaglandins (PgE2) accumulate in the gingival tissues in active periodontitis at extraordinary levels and can enter the circulation. Salvi et al, Annals of Perio 97

Periodontitis is an anaerobic infection flooding the blood stream 24 hours a day with endotoxins and inflammatory mediators. Offenbacher, 1998

Following dental scaling, the low grade bacteremia resulted in increased circulating TNF-A and IL-6.

Ide 2004

Periodontitis and Surgical Complications

"The bacteria from periodontitis can enter the blood stream and cause systemic complications … and compromise recovery from any surgery, particularly patients receiving implants, transplants, or replacements of body parts since it may cause these procedures to fail."

Dr. Gordon Douglas, President AAP, 9/2003

Epidemiologic Studies in the Pimas:

Shlossman, Emrich, Knowler, and others

- Diabetics had more severe periodontitis than non-diabetics.
- Destructive periodontitis occurred much earlier in life in the diabetics (27% of diabetics 15-19 years old).
- Diabetics were 15X more likely to lose all their teeth.

Diabetes and periodontitis

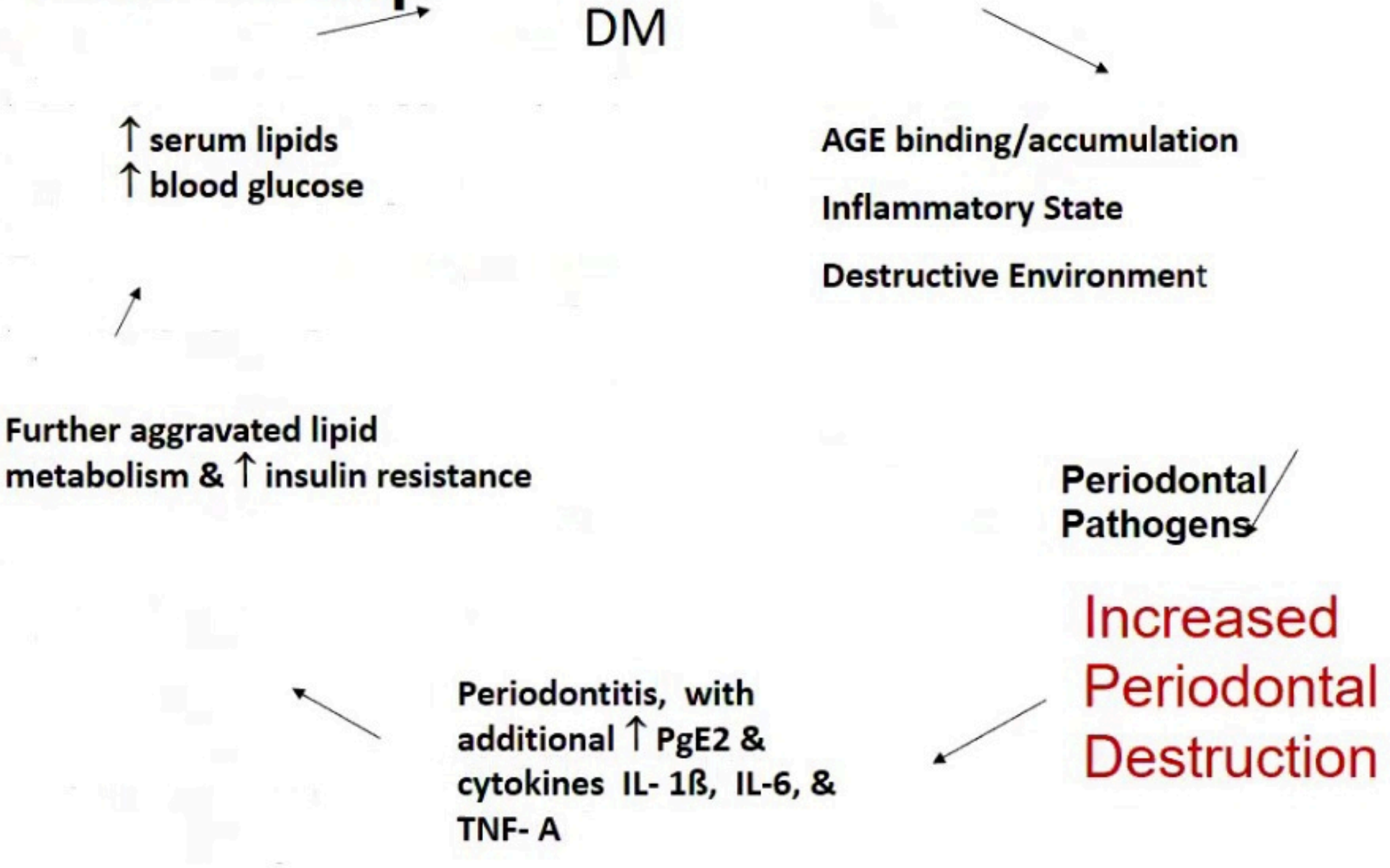
A recent review of 55 studies involving subjects with diabetes found consistent evidence of greater periodontitis:

- Prevalence
- Incidence
- Severity
- Extent
- Progression

Dose-response relationship- as glycemic control worsens, periodontitis worsens.

Taylor, CCED 2004

DM and Periodontitis- The 2 Way Relationship



Pre-Term, Low Birth Weight Infants:

- < 37 weeks, < 5lbs 8oz
- Related to 60% of infant deaths
- 25% can't be explained by accepted risk factors such as smoking, alcohol, nutrition, UTI, and level of education or prenatal care.

Oral Disease and Systemic Disorders
Periodontitis and pregnancy

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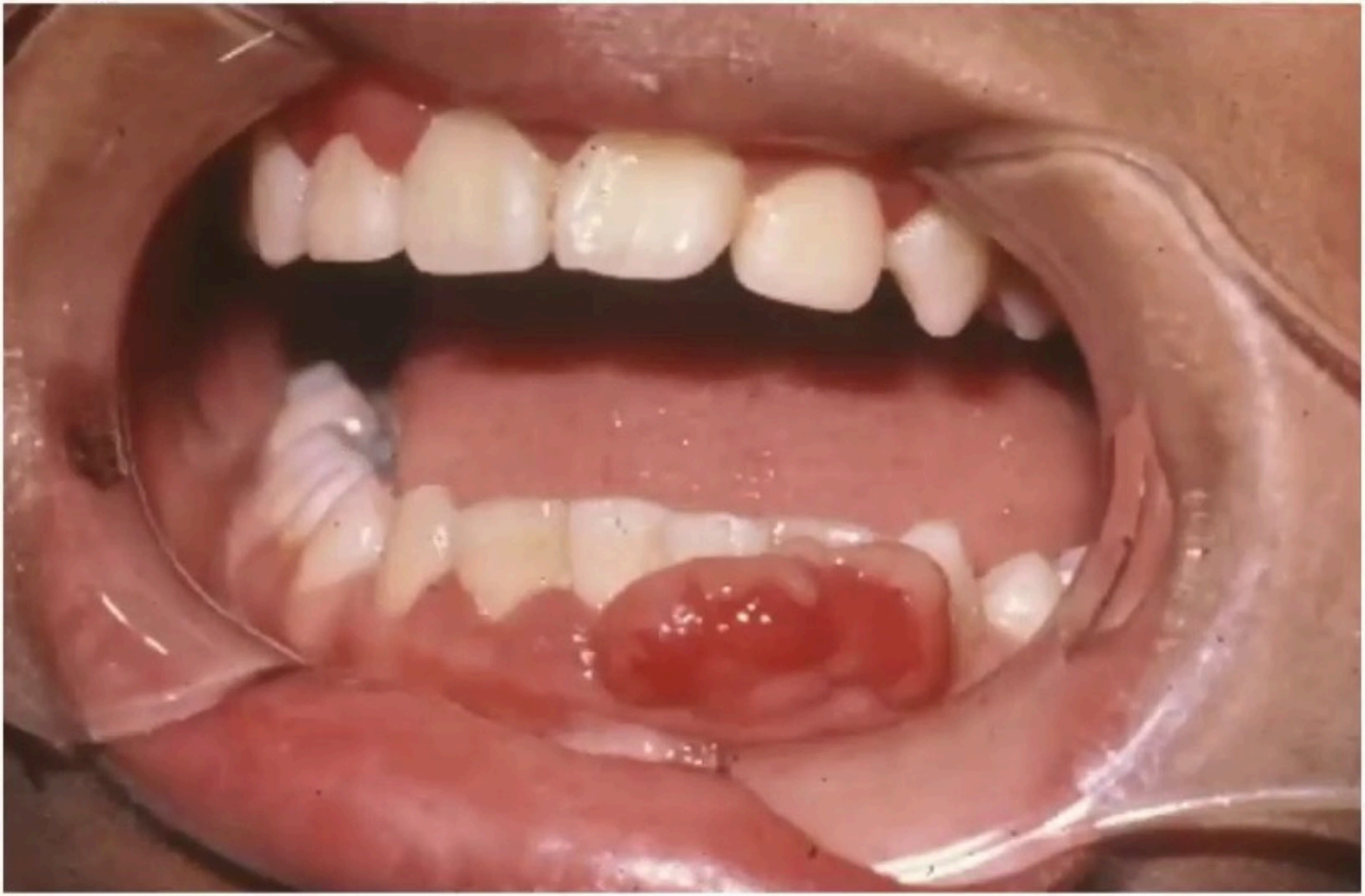


Pregnancy and Risk for Periodontitis

Increased:

- Vascular permeability
- GCF flow
- GI scores
- PMNs in the sulcus
- PgE2
- Bacteroides species

Kaulkwarf 78, Kornman 80

Pregnant women had sig greater:

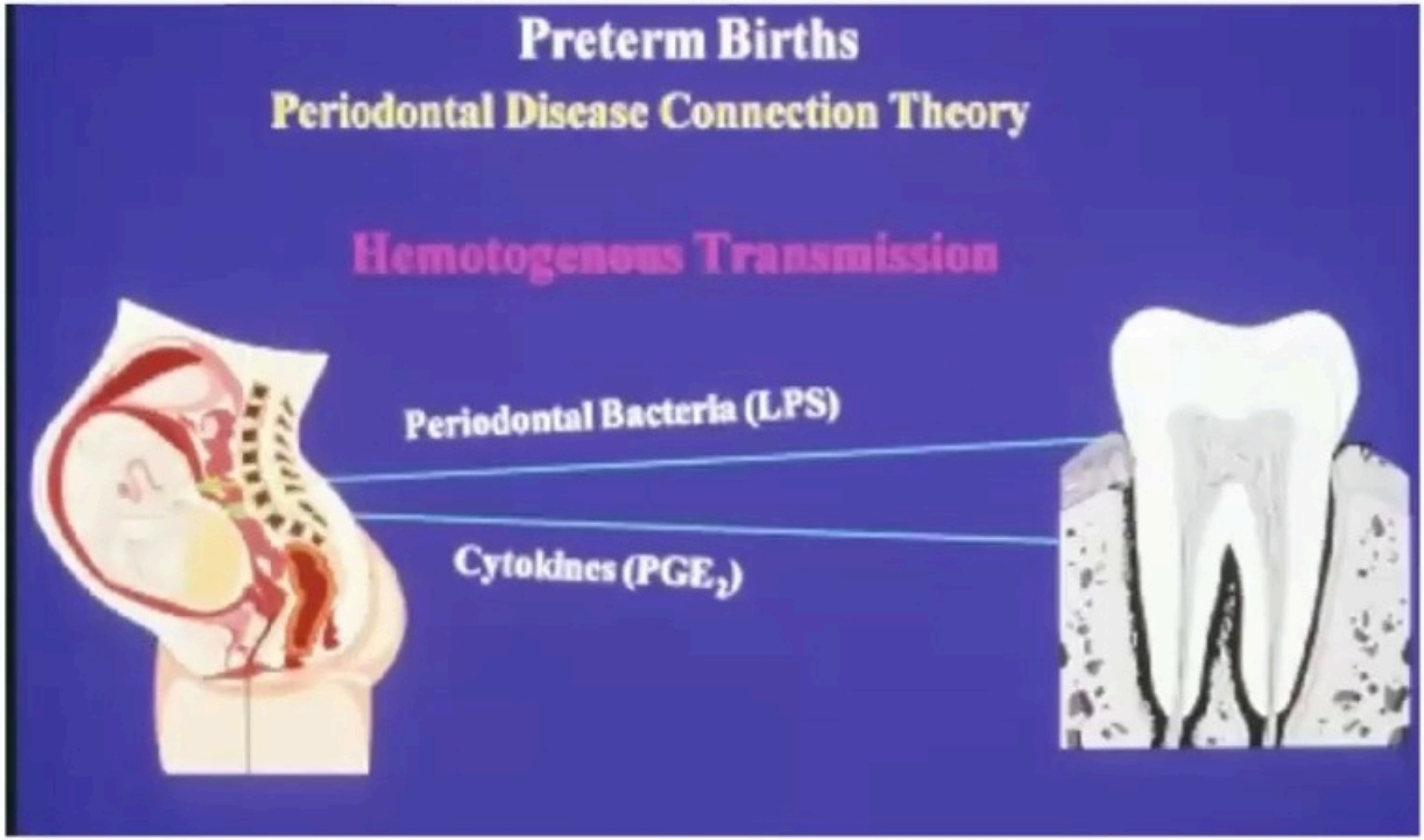
-gingivitis during pregnancy vs. after delivery.
-Existing gingival problems were aggravated.

Stilness and Loe 1966

- % of moderately deep pockets
- % increased with the month of pregnancy

Miyazaki 1991

Biologic Mechanisms for PTLBW Infants



Entry of inflammatory products (PgE2, Il-6, TNF- α), endotoxin, and/or periodontal bacteria into the bloodstream and their translocation to the fetus and decidual tissues

Associations between infections and adverse pregnancy outcomes:

1. Chorioamnionic membrane infiltration by neutrophils.
2. Incidence of clinically evident infections in preterm neonates (sepsis, meningitis).
3. Positive bacterial cultures of amniotic fluid and membranes.
4. Markers of infection (cytokines IL-6 and TNF- α, PgE2) in amniotic fluid and maternal serum.
5. Bacteria or their products induce PTB in animal models.

Gibbs 2001

Periodontitis, Pregnancy and Hypertension

Women with severe perio during pregnancy had increased risk of developing preeclampsia compared to those with gingival health:

- Perio healthy at delivery- 3% developed preeclampsia
- Mild periodontitis at delivery- 5%
- Severe periodontitis at delivery- 10% (OR 2.4)

- Women with periodontal disease progression during pregnancy had an increased risk for developing preeclampsia (OR2.1).

Boggess, 2003 Obstet Gynecol

n= 763 births

Biologic Mechanisms-Pulmonary Disease

- **Many oral bacteria can be aspirated into lower airways and are strongly associated with bacterial pneumonia.**
- **Saliva enzyme activity increases in periodontitis, promoting adhesion and colonization of pathologic bacteria in the oropharynx.**
- **Cytokine release in periodontitis can promote perio pathogen and H. influenza adhesion and colonization of mucosal surfaces, with additional cytokine release from epithelial cells, with neutrophil recruitment, epithelial damage and infection.**

Other Explanations for Systemic Disease Susceptibility are Common Risk Factors:

- Age
- Smoking
- Alcohol use
- Health behaviors/habits
- Genetic makeup
- Stress
- SES

In Summary

- Oral health is important to general health (Surgeon General's Report), and is not less important and separate from general health.

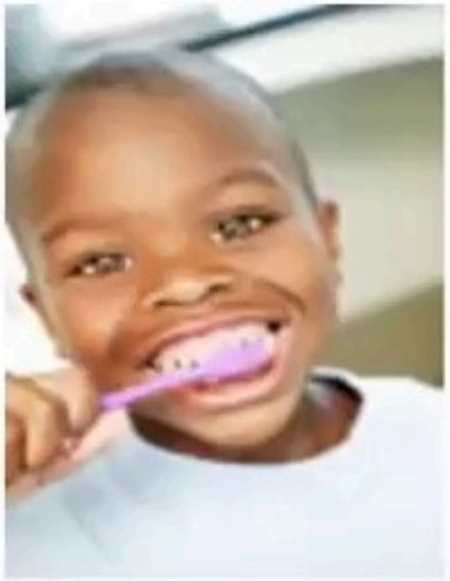
- Not only are patients with DM more susceptible to periodontitis, but the presence of periodontitis may negatively affect glycemic control. Without oral health, it may be difficult to control Type 2 DM.

- Periodontitis can't be considered a cause of CVD or stroke yet, but can be considered an additional risk factor, with consistent findings of increased odds ratios and significant probability values.

In Summary

- Periodontal intervention may prevent the onset or progression of atherosclerosis-induced diseases.
- Periodontitis is a strong, independent risk factor for pre-term birth, and periodontal treatment prior to the 3rd trimester can decrease the risk.
- Poor oral hygiene and periodontal bone loss can increase the risk of chronic and acute respiratory illnesses, particularly bacterial pneumonia.

Prevention of PD before a threshold of Irreversible disease is reached is probably the best way forward



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