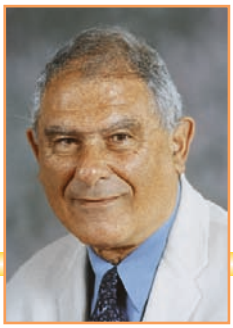
Periodontal Links to Systemic Disease



Dr. R. Schoor [1] - Dr. G. Kano [2]

I- INTRODUCTION

Recent studies suggest that there is a possible relationship between oral infection and systemic disease. Emerging evidence is amplifying the thought that oral infection affects not only local tissues, but predisposes the body to disease distant from the oral cavity. Several inter-relationships under investigation are periodontal disease and coronary artery disease, cerebral stroke, Diabetes Mellitus, preterm low birth weight, and osteoporosis. This paper provides an overview of the current understanding of these associations and the impact research will have on the early diagnosis and treatment of periodontal diseases.

Coronary Artery Disease and Cerebral Stroke

Recent evidence has demonstrated the relationship between periodontal disease and systemic illnesses. Oral infection has been implicated as a risk factor in coronary artery disease and cerebral stroke[1]. One thesis relates transient bacteremia to vascular lining alteration and the formation of athromata. A second hypothesis associates transient bacteremia and rheology, the transport viscosity that affects blood flow and thromboembolic episodes. A third element is the vascular effects of local infection, demonstrating the relationship between periodontal infection and Diabetes Mellitus, whereby increased chronic levels of glycosylating hemoglobin result in the formation of receptors for aggregating glycation end products (RAGE). Chronic RAGE results in vascular damage, atheroma formation and thromboembolic incidents[2].

Aggressive and chronic forms of periodontitis are bacterial infections with specific bacteria rather than host interactions. Generalized periodontal infections involving multiple teeth provide large surface areas from which the significant spewing of microorganisms into the blood stream can occur. Chronic bacterial interactions between blood platelets, blood vessel surfaces, and existing fatty streaks reduce blood flow, enlarge existing vascular plaques and alter the intimal lining of medium and large blood vessels at weakened sites.

Mark Herzberg, of the University of Minnesota, suggests a mechanism whereby certain bacteria induce platelets to aggregate by elaborating a protein called platelet aggregating protein (PAAP). An in vitro model shows the ability of specific microorganisms to cause platelet clumping in a model system mimicking myocardial infarctions. ECG abnormalities develop after blood infusions with S. sanguis, which are followed by increased heart rate and reduced cardiac contractibility[3].

1- Robert Schoor, D.D.S.
Director Advanced Education in Periodontics
New York University College of Dentistry
2- Gina Kano, D.D.S.
New York University College of Dentistry

Correspondence address:
New York University - College of Dentistry
David B. Kriser Dental Center
New York, NY 10010-4086.
Tel: 212 998 9898 - Fax: 212 995 4080

Infections are thought to be a risk factor for heart disease and stroke, and periodontal infection is a common, persistent source of chronic infection[4]. Multicenter interventional trials are currently underway at the Universities of Buffalo, North Carolina, and Texas at San Antonio, to test if instituting treatment of periodontal disease reduces the incidence of vascular disease.

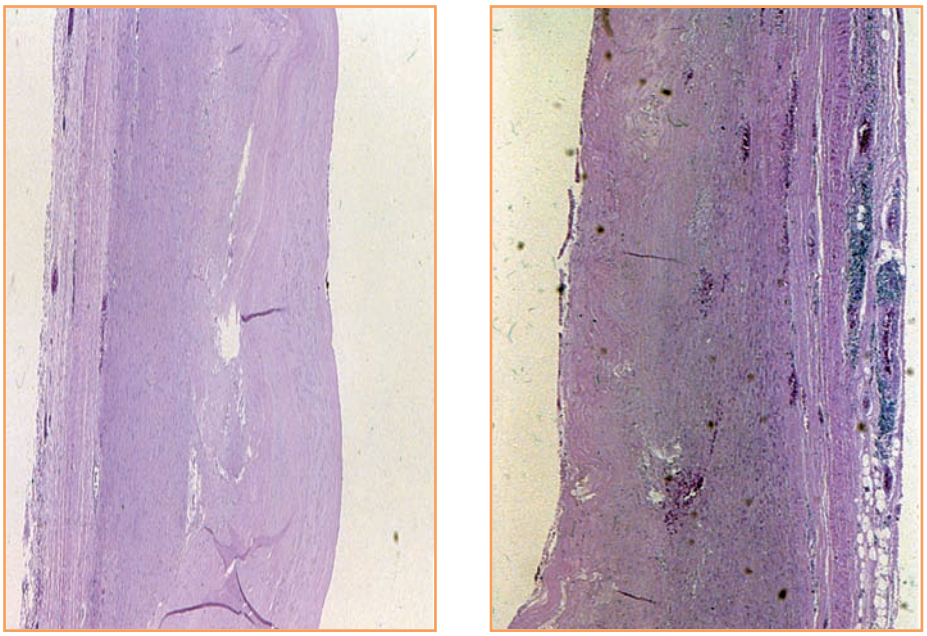


Fig.1: Atherosclerotic plaque rupture (Courtesy of Dr. Eric Li and Dr. Barry Stokes, Department of Pathology, NYU Medical Center at Tisch Hospital)

Diabetes Mellitus

There is extensive literature associating Diabetes Mellitus with changes to the periodontium. Acute periodontal abscess, loss of alveolar supporting bone, premature tooth loss and poor wound healing, are complications of uncontrolled or poorly controlled Diabetes Mellitus. Diabetes is shown to aggravate an already existing periodontitis, and uncontrolled diabetes is a risk factor to successful implant dentistry. Far less evidence exists to implicate periodontal disease as a risk factor in destabilizing controlled Diabetes Mellitus. However, exciting new evidence has shown that local periodontal intervention, reduces systemic glycosylating hemoglobin. Treatment of periodontal diseases resulted in a more stable Diabetes Mellitus. Thus, the relationship between local oral infection and systemic disease was further explored and supported. Again, the interventional research noted above will continue to test the hypothesis that periodontal infection impacts systemic disease.

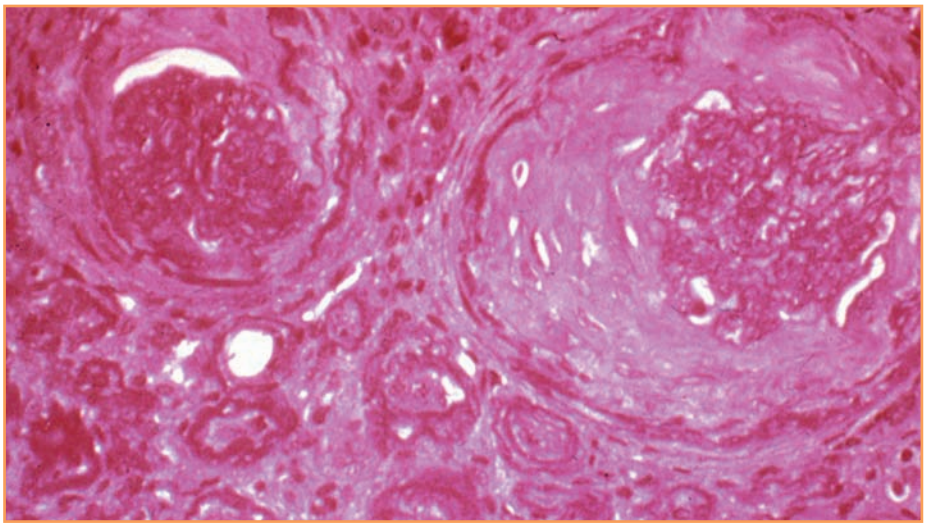


Fig.2: Nephrosclerosis in a patient with long-standing diabetes (Courtesy of Dr. Eric Li and Dr. Barry Stokes, Department of Pathology, NYU Medical Center at Tisch Hospital)

Preterm Low Birth Weight

Preterm low birth weight is a significant health problem with physical, emotional, and financial implications. It has been estimated that 25% of preterm low birth weight babies present with unknown etiologies. Early findings by Beck and Offenbacher[1], at the University of North Carolina, implicate periodontal disease as a contributing factor in preterm low birth weight where other etiologies are unknown. Infections of the birth canal have been investigated by Offenbacher and co-workers[5] with evidence that suggests an oral source of pathogenic microorganisms. This group of researchers, culturing amniotic fluids of pregnant women with periodontal disease, demonstrated the presence of putative oral bacterial flora in the fluid. An increase of prostoglandin mediated through such infection has the potential to increase contractions, pain and premature delivery, resulting in a preterm, low birth weight infant.

Osteoporosis

M. K. Jeffcoat and M. S. Reddy are investigating the potential of diagnosing systemic osteoporosis by dental x-ray diagnosis[6]. Evidence suggests that women who have been diagnosed with osteoporosis and use tobacco suffer early tooth loss, more edentulous jaw resorption and more difficulty in functioning with full dentures. Through the use of subtraction radiography, Jeffcoat and co-workers are comparing maxillary and mandibular mineralization with skeletal mineralization.

It is apparent that one cannot separate the oral environment from the rest of the body. The oral cavity can be a contributing factor in systemic disease, and it is itself affected by systemic disease. In April 2001, the American Academy of Periodontology collaborated with the National Institute for Cranio-facial Research in an AAP-NIDCR symposium. The symposium and partnership reviewed the evidence linking periodontal disease and systemic disease, and sought to establish sources of funding for future research.

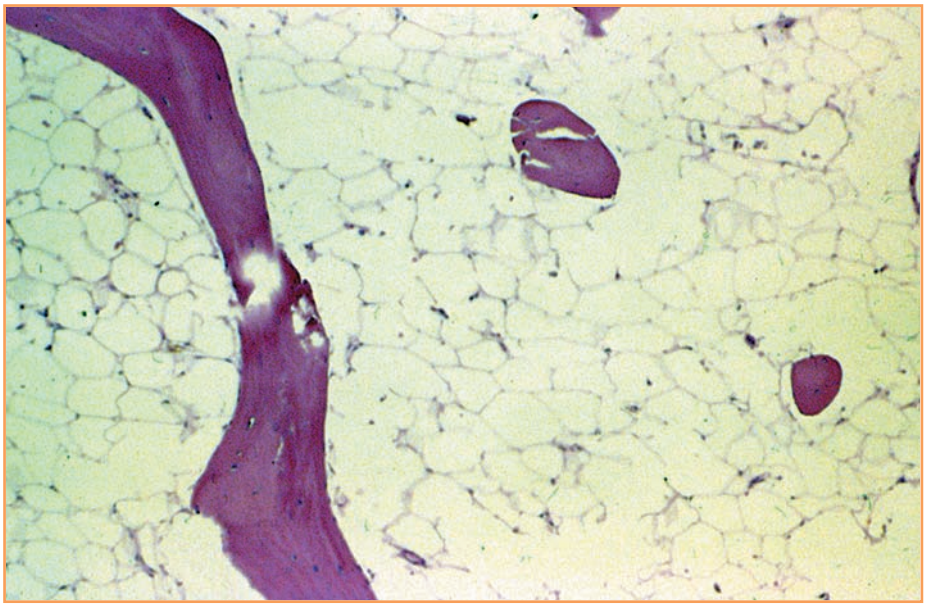


Figure 3: Osteoporosis (Courtesy of Dr. Eric Li and Dr. Barry Stokes, Department of Pathology, NYU Medical Center at Tisch Hospital)

Conclusion

The evidence that periodontal disease impacts systemic illness is continually emerging and provides compelling support. Current and future research will focus on tracing oral infection to areas outside the oral cavity through biotyping and through interventional therapy, as ways to test the thesis that eliminating local oral disease improves systemic disease outcomes. More interventional evidence, such as that found in the link between periodontitis resolution and a reduction of glycosylating hemoglobin, is needed to confirm its link with other systemic disease.

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