ARIC MANUSCRIPT PROPOSAL #658

PC Reviewed: 03/18/99  Status: Approved  Priority: 2
SC Reviewed: 03/19/99  Status: Approved  Priority: 2

1.a. Full Title

Relationship of periodontal disease to heart rate variability. The ARIC study.

1.b Abbreviated Title

Periodontal disease and HRV

2. Writing Group

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3. Time Line

Obtain data set: March 1999
Begin statistical analysis: March 1999
Complete statistical analysis: Summer 1999
Complete manuscript: Fall 1999

4. Rationale:

A prospective study of ARIC cohort members found that reduced heart rate variability was associated with incident coronary heart disease (Liao et al., 1997). Reduced heart rate
variability has also been shown to be a predictor of all-cause mortality in survivors of acute myocardial infarction (Kleiger et al., 1987; Quintana et al., 1997) and in elderly populations (Tsuji et al., 1994; Dekker et al., 1997; Huikuri et al., 1998). Coincidental to these reports of associations with reduced heart rate variability have been reports of associations between periodontal disease and incident coronary heart disease (Beck et al., 1996) and between periodontal disease and all-cause mortality (Garcia et al., 1998). These similar outcomes for periodontal disease and heart rate variability have led us to hypothesize that periodontal disease may be associated with heart rate variability. We believe that if such a relationship exists, periodontal disease, which is an infectious disease, may influence heart rate variability through an inflammatory process. The determinants of heart rate variability are not well understood, and very little has been reported about the effects of inflammation or infection on heart rate variability; however, there has been a report that among healthy 35 year-old men, higher leucocyte count is associated with reduced heart rate variability (Jensen-Urstad et al., 1998). There is also evidence that the vagus nerve, which has a direct influence on heart rate, provides an important communication channel between cytokines and the brain (Maier et al., 1998).

We propose a cross-sectional study of data obtained from ARIC cohort members at Visit 4. Heart rate variability, as measured by time domain and frequency domain variables, will be compared between persons with and without periodontal disease.

5. **Main Hypothesis:**

People with periodontal disease are more likely to have reduced heart rate variability than people without periodontal disease.

6. **Data:**

**Outcome variable.** The outcome is heart rate variability as determined by time and frequency domain analyses of subjects' beat-to-beat heart rate data. Specific variables will include the mean heart rate, minimum and maximum heart rate, standard deviation of R-R intervals, high-frequency power, low-frequency power, and the ratio of high to low frequency power. These heart rate variability indices were derived from 5 minutes of beat-to-beat heart rate data collected on the 13,000 members of the ARIC cohort who took part in Visit 4.

**Main independent variable.** The main independent variable is prevalent periodontal disease as measured by gingival bleeding, probing pocket depth, and periodontal attachment loss.

**Covariables.** The covariables will be age, sex, race, education, body mass index, hypertension, smoking, diabetes, history of coronary heart disease, fasting time, serum cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, and beta blocker usage.

**Time window.** This study will be a cross-sectional study of the data obtained from ARIC cohort members at Visit 4.
Inclusions/exclusions. This study will include all ARIC cohort members for whom periodontal and heart rate variability assessments were completed at Visit 4. Approximately 6800 persons had periodontal examinations at Visit 4.

References:


