

Periodontal Disease and Oral Ageing: Influence of Genetic (HLA) and Environmental Factors

I. Pettenati-Soubayroux*^{**}, J.J. Bonfil*^{**}, G. Susini*, G. Boëtsch*^{**}

* Faculté d'Odontologie Marseille. Hôpital Nord

^{**} Laboratoire d'Anthropologie - UMR 6578, Marseille. Université de la Méditerranée

^{**} With the collaboration of the EFS (Etablissement Français du Sang) (Dr. D. Reviron)

Introduction

The general process of ageing involves both physiological ageing (endogenous and/or innate) and ecological ageing (exogenous and/or acquired). Physiological ageing is the functional ageing that affects all individuals, leading to the decline of organic functions and systems of control. However, physiological ageing is also programmed genetic ageing, creating disparity among individuals with regard to old age and longevity. Ecological ageing corresponds to extrinsic ageing related to environmental factors, which condition what has been called «usual and successful ageing». In the same way, oral health depends on both genetic factors (sex, HLA antigen profile) and epigenetic factors (level of oral hygiene and dental care, socioeconomic and cultural status, smoking habits). In order to analyze the influence of both physiological and ecological factors we examined 260 subjects from 49 to 72 years old of Marseille population.

Material and Methods

The results of two epidemiological studies are presented here. The first was an anthropological study of the effects of environmental factors on bucco-dental ageing (Pettenati-Soubayroux, 2001, Pettenati-Soubayroux *et al.*, 2002). The second investigated the role of HLA DR4 in periodontal disease (Bonfil *et al.*, 1999).

First study

A descriptive cross-sectional epidemiological study of etiological factors of bucco-dental ageing was conducted in a dental service (CHU - Marseille) on 260 subjects from 49 to 72 years old. The variables under study were mainly: sociocultural and socioeconomic factors (sex, age, educational level, social and occupational groups); factors related to oral hygiene and periodontal status (CPITN, plaque index, gingival index, tartar index, periodontal recession index). The data were analyzed mainly by logistic regression.

Second study

This «case-control» study was conducted on patients of a

dental service (CHU - Marseille) and/or blood donors of the regional blood transfusion center (CRTS - Marseille). The 48 patients, or «cases», were 20 to 48 years old. They presented at least 5 sites spread over several teeth with an attachment loss equal to or greater than 6 mm and 10 sites spread over several teeth with periodontal pockets equal to or greater than 5 mm. Verification with a WHO probe showed an individual CPITN score of 4. Subjects whose average CPITN score for the 6 sextants was less than 3 were excluded from the study. Among the «severe periodontitis» patients, we distinguished a subgroup of subjects 20 to 35 years old who had 5 or more teeth with pockets at least 6 mm deep (Katz *et al.*, 1987). The dental charts of these subjects showed an attachment loss of more than 3 mm on certain teeth over a period of 1-3 years. They all showed an obvious loss of bony support in the affected sites. We called these subjects the «rapidly progressive periodontitis» subgroup. The 55 «controls» were all over 20 years old and were free of periodontal disease at the clinical examination. HLA typing of the cases and controls was performed using 4 sequence oligoprobe hybridization after polymerase chain reaction, in accordance with the 11th International Workshop. This method allowed the detection of DR4 alleles and DR4 subtypes.

Results

First study

With regard to periodontal disease, 16.7% of the subjects presented a healthy periodontium, 56.3% gingival bleeding and some tartar, 20.1% periodontal pockets and 5.9% deep periodontal pockets (Hescot, 1995, 1996).

Anthropological Analysis

The cost of professional dental care was important for 46.2% of the subjects. Thus there was a significant difference in the answers given by subjects earning less than or more than 1450 euro per month ($p=0.000$, $c2$). There was a significant negative correlation between the variable «Income» and the various periodontal indexes: gingival index, $r=-0.146$; recession index, $r=-0.172$; tartar index, $r=-0.165$; plaque index, $r=-0.148$. The higher the income, the better the oral hygiene. An analysis of covariance (where income was the determining factor, the criterion was the periodontal pathology and hygiene was

the variable of adjustment) showed that income influenced the model ($p=0.058$); however, all things being equal, hygiene remained highly determinant ($p=0.000$). Whatever the socioeconomic environment, women had better periodontal health than men, with a significant difference between the sexes for all the periodontal indexes (Student's t test). In particular, there was a large difference for the plaque and tartar indexes ($p=0.000$), both linked to oral hygiene. Indeed, with a mean of 2.21 dental brushings vs. 1.58 for men ($p=0.000$, Student's t test), the women practiced more careful hygiene. This held for both the total sample and for the subgroups of subjects earning less than 1450 euro per month.

The women are obviously more worried about their health: 40% of them stated that they regularly consult their dental surgeon vs. 20% of the men. Again, the significant difference between men and women for «mode of consultation» ($p=0.000$, c2 test) also held for the subgroups earning less than 1450 euro per month.

Finally, it was the same for scaling: 62.3% of subjects having regular scaling were women.

This study also revealed the better general health habits of the women, who had a significantly lower consumption of alcohol and tobacco than the men.

Second study

The subtypes 0401, 0404, 0405 and 0408 tended to be more frequent ($p=0.08$) in the cases (severe periodontitis) than in the controls. In the «rapidly progressive periodontitis» subjects aged 20-35, there was a very significant Mantel-Haenszel c2 ($p=0.0058$), which led to a Mantel-Haenszel standardized odds ratio (OR) equal to 17. The 95% confidence interval was $1.03 < O.R. < 180.10$.

Conclusion

In the first study, we cannot attribute all the responsibility for declining bucco-dental status to income, e.g. ageing due to renunciation of dental care for financial reasons. Oral hygiene is a highly determinant variable in periodontal disease.

The second study suggests that subtypes 0401, 0404, 0405 and 0408 can be considered risk factors for rapidly progressive periodontitis. The HLA profile can be a risk factor of periodontal disease for subjects in the prime of their life.

These studies demonstrate the importance of cultural and exogenous factors on the appearance of the periodontal disease «stigma» during ageing. However, they also show the importance of the HLA profile, which can «precipitate» the development of periodontal disease.

This indicates the need for research on both innate and acquired factors related to periodontal disease during ageing.

We envisage a synthetic study including all the previously mentioned factors as well as other variables such as menopause and attitudes toward dental care.

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