Clinic and laboratory findings of Aggressive Periodontitis in China

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Aggressive periodontitis (AgP) is characterized by the young age of onset and severe periodontal destruction. The estimated prevalence of aggressive periodontitis was reported from 0.1% to 15% among Caucasians, Hispanic, and African-Americans. A greater prevalence was reported in African-Americans compared to Caucasians. The data from China showed the prevalence of aggressive periodontitis to be 0.12%~0.47% in different areas. Although variation in the reported prevalence of aggressive periodontitis may due to methodological factors and the selection of non-random sample populations, other factors such as genetics, race, age, and environment factors may also play a role. Following the naming of aggressive periodontitis in the classification system of periodontal diseases in 1999, many researchers and clinicians have contributed new evidence to the etiology and pathogenesis of the disease. This presentation concentrates on subgingival plaque biofilm, host susceptibility factors of patients with aggressive periodontitis in China, including the detection of pathogenic microorganisms and serum antibody responses to Actinobacillus actinomycetemcomitans and Porphyromonas gingivalis (Pg), family aggregation, Single Nucleotide Polymorphisms (SNPs), polymorphonuclear leukocyte, smoking, and local contributing factor-root abnormity.

Subgingival plaque is the initial factor of periodontitis and Actinobacillus actinomycetemcomitans (Aggregatibacter actinomycetemcomitans, Aa) was considered as a major etiologic agent of aggressive periodontitis, the classification in 1999 also stated that Porphyromonas gingivalis (Pg) was also suspected of participating in AgP. The prevalence of Aa in AgP patients (n= 89) in China was low (10.1%), while Pg, Tf, Td, Cr, Pi, Fn were more frequently detected in AgP patients than in healthy controls (n=31) (94.4% vs.32.3%, 91% vs.32.3%, 89.9% vs.12.9%, 96.6% vs.51.6%, 40.4% vs.3.2%, 82% vs.19.4%, P<0.01), Aa occurred with higher prevalence (19%) in patients younger than 25 years old than patients older than 25 years old (2.1%), P<0.05, and was more frequently detected in whole saliva sample than in pooled subgingival sample in AgP patients (32% vs.16%, P<0.05). AgP patients exhibited significantly higher IgG tiers to Aa serotype c (11.1±1.9 and 10.9±1.9) than healthy controls(9.1±1.8),P<0.01. The prevalence of high-responding patients to Aa serotype c in AgP patients (23.4%) was significantly higher than in healthy subjects (0%), P<0.01. In AgP group, the IgG tiers to Aa serotype c in Aa-positive patients were higher than those of Aa-negative patients(11.9±1.3 vs.10.6±2.0, P<0.05). The study indicated that Aa serotype c may be the predominant serotype in Chinese AgP patients, although the detected frequence of Aa in subgingival plaque was low. Since the mid 1990s, herpesviruses have emerged as putative pathogens in various types of periodontal disease. The further study of virus detection of the AgP patients showed that the prevalence of human cytomegalovirus (HCMV) in above AgP patients was significantly higher than that in healthy controls (43.8% vs. 12.9%, P<0.01), and the prevalence of Epstein-Barr virus (EBV) in AgP patients was also higher than that in healthy controls. It is suggested that the coexistence of periodontal HCMV, EBV and periodontopathic bacteria, and host immune
responses should be viewed as a precarious balance that has the potential to lead to periodontal destruction.

Familial aggregation is one of the general characteristics of AgP, several gene polymorphisms have been investigated as candidates for use as markers of increased susceptibility for AgP. Genetic polymorphisms in vitamin D receptor gene are associated with parameters of bone homeostasis and with diseases in which bone loss is a cardinal sign, in particular osteoporosis. A Taq I polymorphism in exon 9 of vitamin D receptor gene was commonly investigated. The t allele at this site was reported to be associated with decreases in bone-mineral density and the incidence of osteoporosis. The detected frequencies of Tt genotype and t allele were significantly higher in AgP patients than healthy controls in a Chinese population. A larger sample size from the same population did not change the results and a strong association between female aggressive periodontitis patients and Tt genotype was suggested. Our serial studies demonstrated that S100A8, the light subunit of calprotectin, was associated with periodontal inflammation, and a single nucleotide polymorphism existed in the upstream region of S100A8 gene in Chinese. The adjusted OR was 0.63 (95%CI=0.40-0.99, \( P = 0.046 \)) for allele A and male group compared to allele A and female group on aggressive periodontitis susceptibility. The results indicate, for the first time, that there was an important association between the polymorphism at 94bp upstream from ATG start codon in S100A8 and periodontitis in Chinese male. Recently, we detected two non-synonymous single nucleotide polymorphisms, 289C/A and 301G/C, in the 370bp N-formylpeptide receptor gene fragment in Chinese subjects by Denaturing High Performance Liquid Chromatography combined with DNA sequencing, but no statistically significant differences in distributions of the genotypes and alleles between aggressive periodontitis patients and healthy controls were found. The single nucleotide polymorphisms in N-formylpeptide receptor gene may not be associated with the susceptibility of aggressive periodontitis in Chinese population. Our studies have revealed genetic polymorphisms may influence AgP in a complex way, acting with genetic variants and environmental factors.

Polymorphonuclear neutrophil (PMN) is a major cellular component of human innate defense system, particularly against bacterial infection. A number of studies have reported that there are neutrophil abnormalities in aggressive periodontitis, which including abnormalities in adherence, chemotaxis, superoxide generation, phagocytosis, and bactericidal activity. The neutrophil abnormality relating to reduced chemotaxis has been well characterized in certain African-American families. However, in China, defective chemotactic responses of polymorphonuclear neutrophils and monocytes were not detected in AgP patients, which indicate that heterogeneity exists within the aggressive periodontitis classification with regard to neutrophil abnormalities.

It was quite often to see the root abnormality of involved teeth in Chinese AgP patients in the clinic. Based on a criteria of “root width” of X ray phenomena, teeth with root abnormality could be categorized into six types, cone-root (incisor, premolar), slender-root, curved-root, maladjusted proportion of crown and root, and syncretic root. The percentages of teeth with root abnormalities among AgP, AgP family member, chronic periodontitis and healthy control groups were compared on full sets of periapical radiographs recently, and the results showed that there was the highest percentages of teeth with root abnormality in AgP group (13.09%), while the healthy group had the lowest one (3.81%). Significant differences of percentage of teeth with root abnormality were found among the four groups. For the AgP patients, the root abnormality of teeth was significantly
correlated with severe alveolar bone loss \( (r=0.781, \ P=0.027) \). The results of logistic regression analysis showed that the root abnormality could be a local contributing factor for AgP patients, OR=1.554, which indicated that inherent anatomic and morphologic features of teeth can not only have a significant impact on the management and prognosis of the involved tooth or teeth, but also affected on the severity of periodontal destruction.