

Genetic Risk Assessment of Periodontal Disease in Healthy Patients

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Abstract

Introduction: About 30% of the general population manifests periodontal disease (PD). Patients with parents with a compromised periodontal condition may need prosthetic or implantology treatment (PIT), therefore those patients are at increased risk of developing PD during or after dental treatment. Hence the use of a genetic test for identify those most at risk of PD and submit them to very closely oral hygiene protocols, is mandatory. PIT of these patients must be done safely having previously assessed the risk of developing PD. Polymorphisms of IL6 and IL10 constitute risk factors for chronic periodontitis, so the use of a genetic test is fundamental to ensure a correct preventive protocol and plaque control in healthy patients.

Keywords: Prosthodontic; Periodontitis; Genetic susceptibility; Genetic test

Introduction

About 30% of the general population manifests periodontal disease (PD) [1]. Young patients with parents with a compromised periodontal condition may need prosthetic or implantology treatment (PIT), therefore these patients are at increased risk of developing PD during their life. Infact they must be considered “healthy” people, because they don’t manifest clinical signs of PD, but they could be at major risk to develop PD. Hence the use of a genetic test for identify those most at risk of PD and submit them to very closely oral hygiene protocols, is mandatory to prevent forensic controversies during or after PIT. PIT of these patients must be done safely having previously assessed the risk of developing PD during dental treatment.

Oral hygiene may be more difficult to maintain after PIT, which may lead to plaque accumulation and inflammation. Therefore, both favorable and unfavorable periodontal outcomes seem possible after PIT.

It is clear the major risk of developing periodontal disease after PIT. So our group has performed a genetic test aimed at identifying a possible genetic predisposition to the onset of periodontal disease in each patient, and in particular in patients whose parents had PD.

Genetic and Periodontal Disease

Periodontitis is a multifactorial disease in which both environmental and genetic factors play a role. A major risk in periodontitis progression is related to periodontal pockets microbiota where both the amount and the presence of specific bacteria species represent risk factors. Additional risk factors are smoking and diabetes. However, a range of host genetic factors can influence individual susceptibility to periodontitis and are able to influence the clinical aspects and rate of progression of the disease [1].

Genetic susceptibility to multifactorial diseases is usually due to several gene polymorphisms instead of a single, or few, gene mutations. Common variation in the genetic code may results in altered expression or in functional changes of the encoded molecules, therefore resulting in an increase of disease severity or making individuals with genotypes more susceptible to a given disease [2].

Recently, investigations on susceptibility factors of periodontitis have mainly focused on genes that modulate immunoregulation, such as cytokines, chemokines, cell-surface receptors, enzymes and proteins related to antigen recognition. Cytokines, such as IL-1A, IL-1B, IL-10, and IL-6, are key factors which mediate the inflammatory process during periodontitis progression. They have a role in B-cell activation, proliferation and differentiation that are the majority of infiltrating cells in advanced periodontitis lesions [3]. Thus, these variations can alter the progression of disease because may be responsible for the repeated cycles of tissue inflammation [4,5].

In periodontal disease the microbiota accumulated in the subgingival region are the environmental factors that influence the inflammatory response in periodontal tissues [6]. However, cytokines indirectly contribute to connective tissue destruction and bone resorption [7]. Alveolar bone resorption is a key factor in periodontal disease, so the vitamin D receptor (VDR) has been considered as a periodontitis susceptibility factor. Recent articles reported a revision of scientific literature regarding genetic association analysis between common polymorphisms of candidate genes and periodontitis [8,9]

It is noteworthy that the majority of the genetic studies on periodontitis have employed small size cohorts, resulting in a large potential for false-positive and false-negative results, thus having low statistical power to properly detect association. Additionally, the number and types of disease-modifying genes in periodontal disease may be different in different ethnic populations or disease subgroups.

In our recent paper we analyzed six specific polymorphism of the IL-1A, IL-1B, IL-6, IL10 and VDR genes in order to test whether they act as a susceptibility factors of chronic periodontitis in the Italian

population, and demonstrated a statistical significant association between common variant alleles, IL6 rs1800795-G and IL 10 rs1800872-A, and periodontal disease [10]. These data suggest a possible use of this polymorphism in a DNA-based diagnostic test of periodontitis.

Conclusion

Periodontitis is a multifactorial disease in which both environmental and genetic factors play a role. Prosthetic or implant oral rehabilitation could be considered risk factors of periodontal disease also. Presence of fixed prosthesis, poor oral hygiene, can lead to maintaining periodontal bacteria in plaque below the gumline, leading to changes in the microflora and progression from gingivitis to periodontal disease. However a range of host genetic factors can influence individual susceptibility to periodontitis.

Here we reported a statistical significant association between common variant alleles, IL6 rs1800795-G and IL 10 rs1800872-A, and periodontal disease. These data suggest a possible use of these polymorphism in a DNA-based diagnostic test of periodontitis. Implantology and prosthetic rehabilitation is a part of forensic litigation in dentistry, though prevent PD is mandatory for dentist. Oral rehabilitation presents many points of medico-legal concern connected with the difficulties inherent to dental procedures and objectives (both functional and esthetic), as well as full patient collaboration as an essential part of successful treatment. An accurate assessment of each case by the clinician is fundamental. The patient should therefore receive complete information and be made fully aware of the risk of increase PD if a poor oral hygiene follows oral rehabilitation, as well as possible complications, limits to the procedures, and the fact that successful outcome will also depend on scrupulous observance of the practitioner's instructions and oral care. It is also recommended to perform a preventive genetic test aimed at identifying a possible genetic predisposition to the onset of periodontal disease in each patient, and in particular in son of periodontal patients. For those positive to the genetic test, a stricter oral hygiene program must be applied, including professional tooth cleaning and plaque control. Thus, genetic analysis represents an effective, low cost method to rapidly detect the onset of PD. This test

(LAB-test, LAB-SRL - Codigoro - ITALY) was performed in a large patients sample and results demonstrated that the test is a valuable tool to improve diagnosis of periodontal disease and a defense in the in the event of medico-legal controversies.

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