

## Personalised Dentistry: Future Medicine for Successful Periodontal Therapy

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### Abstract

The field of personalized Medicine or Dentistry takes both genetic and clinical patient characteristics to deliver individualized treatment by using more advanced testing methods that enhance personalized patient care. Although the idea of practical personalized medicine is applied in the field of oncology the direct application to everyday dentistry and its use in periodontology in particular is increasing day by day. Dentists should consider this approach of using personalized dentistry in periodontics while treating the patients. Our increasing understating of risk factors along with new science of genetics helps in developing preventive treatment and thereby improves patient's health.

**Keywords:** Periodontitis; Periodontal Medicine; Genetics; Proteomics; Interleukin-1

### Introduction

In today's world of science, technology is rapidly developing by using various tests related to genetic background for diagnosis that also determines the patient's reaction to particular therapy.

Personalized medicine is a developing area where diagnostics tests are used to identify biological markers in particular thereby aiding individualized treatment for each patient. This personalized medicine helps to provide specific treatment therapy based on population groups. It uses collective information related to human genome, biotechnology and information technology [1,2].

Most of the oral diseases occur due complex interaction of various factors like genetic, biological and environmental [3]. The severity of the disease and its susceptibility differ from individual to individual based on the interaction of these factors. These variations among the patients were recognized by the doctors long time back and started providing personal care [4]. And due to growing technology and educational information sites patients also started demanding customized care to prevent disease. This method differentiates the patients with distinct risk factors, where the factors play an important role than any other disease characteristics.

Basic criteria of the personalized medicine are to stratify patients and separate the actual diseased individual from those with same clinical presentation. Hence risk factors can be characterized by patient's genetic information at birth along with their lifestyle and environmental factors. Thought use of personalized care in medical field is common its application in dentistry is still in budding stage. As per literature few areas like genomic analysis, disease management and various marker identification are concentrated [5,6]. This era will completely change the perspective of how the health care against the disease is provided. At present personalized medicine is mainly applied in Prediction, Diagnostics, Therapeutics and Drug development.

### Discussion

#### How important it is?

Along with the clinical presentation personalized medicine uses advanced technology and other related data to fabricate individualized care and precise treatment plan that was not practiced in the past.

Many advances have been noticed in molecular medicine in past few decades. Personalized medicine along with clinical profile uses these advance technology and other relevant data to customize the health care services provided to the patient. Personalized medicine is also named as stratified medicine [7] as it uses the data available to stratify the patients and customize the therapy accordingly.

Genes have an important role to play in human development and its mutation may lead to different type of diseases. Various genetic tests are used in risk assessment and customization of therapy. Then genetic information always plays an important role in various aspects of periodontal medicine.

It also plays a major role in pharmacogenomics where it examines the response of individual patient to therapy due to genetic variation [8]. It helps in suggesting dosage of drug, which is most appropriate for an individual with maximum benefits and minimal side effects [9].

Proteomics is comprehensive analysis and characterization of all of the proteins and protein isoforms encoded by the human genome. Though DNA is the principal component, major functions of cell like proteins carry out cell movement and cell death.

#### Dentistry applications

Most common among dental problems is dental caries, which is again associated with various factors and its degree of occurrence, vary from person to person [10]. Dental caries of both primary and permanent dentition can be affected by particular risk factor as said by Wang, *et al.* in a study [11]. Hence assessing these risk factors associated with dental caries can be used to differentiate the patients and customize the therapy [12].

Higher risk individuals with carcinoma can be discovered by disease causing mutation in a family. Collecting data from genomic studies and personalized care help for better prognosis in the patients and also render successful treatment according to tumor stage, its subtype and histology [13]. It also plays a major role in prevention recurrence of the disease by minimal residual disease tests by detection of tumor markers [14].

#### Periodontal applications

Periodontal disease is associated with various risk factors like smoking, diabetes and genetic variations [15]. Because similar type of preventive care is provided to all the individuals at equal risk, the patients who are at higher risk are inadequately treated and unnecessary services are provided to low risk individuals [16].

A recent study suggests that dentists for higher risk patients to prevent further breakdown of the disease or to prevent worsening of disease can incorporate personalized care. The study conducted by William Giannobile, DDS, DMSc at the University of Michigan [17] personalized medicine approach was used in the preventive care of patients at high and low risk for periodontitis. The researchers found that the identification of risk factors at every step of periodontitis helps in benefiting the patients by providing preventive oral care. It can also helps in knowing the causes of progressive periodontitis.

The researchers found that the rate of tooth loss was the same in low risk patients regardless the number of cleanings undergone annually, however, there were notable changes based on the frequency of preventive cleanings. The study results suggest that every clinician should personalize their treatment individually according to patients by assessing the risk initially. All patients must try to treat differently based on their disease risk.

The information collected from the above research provides a valuable opportunity for general dentists said by Periodontist Donald S. Clem III, DDS, from Fullerton, California. "As a periodontist, I would say to my dental colleagues, "You have the opportunity now to stratify your patient population and begin to deliver more personalized healthcare to them" [18].

Almost 30 percent of the population has some form of periodontitis and general dentist can begin to think about risk assessment rather than disease detection. Identifying the risk factors provide key to personalizing periodontal care which also preserve time and prevents patients with lower risk being over treated. Dr. Clem says that general dentists ability to evaluate the patients risk over a lifetime is essential.

Interleukin-1 is one of the pro-inflammatory cytokines. For example, increased inflammatory response is associated with the presence of IL-1 positive gene. It has demonstrated the potential to predict severity of periodontal disease. Assessment of IL-1 gene test by collection of cheek swab should be considered as a part of evaluation of periodontal disease. This genetic test helps to find the actual cause where other risk factors are associated. The test is marketed by IL genetics under the trade name of PerioPredict and at present it is the only genetic susceptibility test used for periodontal destruction.

Periodontal disease is an oral systemic problem where recording the health condition of the patient in detail will be beneficial before starting the treatment. Also identifying more genetic markers in future might be helpful for dentists in preventing severe form of disease. Genetic markers help in fabricating individual treatment approach. "Among all specialties periodontics introduced the concept of genetics for the first for patient care and management" as said by Dr. Rose.

### Need for personalized dentistry in curriculum

We are entering a new era in health care that of personalized medicine and dentistry, it is the time to change the way disease being approached and treated. Moreover, dentistry has been undergone many changes when it comes for the treatment part. Major changes have been taken place slowly, it helps the technicians to understand and react accordingly. In future the curricular changes must be implemented in a way health care professional can be educated and beneficial.

"In 2012, Kornman and Duffy wrote that personalized medicine is likely to enter dentistry because patients will start to demand it" [21]. More than public demand, dentistry has needed to fulfill public satisfaction towards health.

"Graduates must be competent to ... evaluate and integrate emerging trends in health care" [22]. Luke Williams of New York University's Stern School of Business stated that the necessity to implement change occurs when a business realizes that there is a gap between what it does in the present and what it needs to do in the future [23]. Therefore, dental schools must overcome major barriers to include this new discipline in their curricula.

### Conclusion

Personalized dentistry not only improves treatment options but also understands genetic composition of the individuals and their response to specific treatment therapy. It has great utilization in diseases like periodontitis, rampant caries and malignancies. Although number of genes is associated with periodontal disease, IL-1 genetic test is only available at present. Investigating these genetic markers and their clinical utilization to personalize the care are essential.

### Conflict of Interest

No conflict of interest.

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