Prediction for Periodontists by Oral Bacteria in Korean

2020 1st Semester Interdisciplinary Project

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1 Introduction

1.1 Periodontitis

Periodontitis is an inflammatory disease of the periodontium which is characterized by a progressive destruction of the tissues supporting the tooth [1]. In histopathologically, periodontitis may result periodontal pocketing, location of junctional epithelium apical to the cemento-enamel junction, loss of collagen fibers subjacent to the pocket epithelium, numerous poly-morphonuclear leukocytes in epithelium and a dense inflammatory cell infiltrate with plasma cells, lymphocytes, and macrophages [2]. Periodontits is currently assumed to progress as periodic, relatively short episodes of rapid tissue destruction followed by some prolonged intervening periods of disease remission [1].
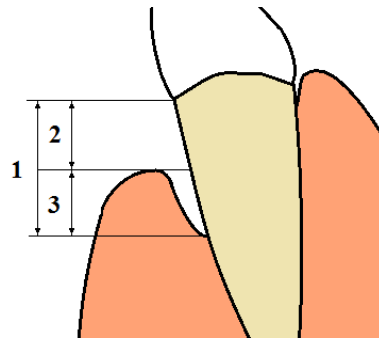

Figure 1: Diagram of Gingival Recession [3]

Periodontitis is diagnosed by measuring clinical attachment loss (CAL). Note that the CAL is the length of the figure 1-1, which is sum of gingival recession (figure 1-2) and probing depth (figure 1-3).

Periodontitis is generally believed to be a result of a host-parasite interaction in which bacteria are the determinants of periodontitis [4]. In etiology, the primary cause of periodontitis is presumed as a bacterial infection as the primary cause of periodontitis [2]. Thus, the treatment of periodontitis includes antibiotics and dental surgery.

In this manner, some medicines have been introduced for treatment. However, the success in the prevention and treatment of periodontitis has been limited. Many *in vitro* studies shows that Asian have the different bacteria from non-Asian, due to their groceries [5]. Thus, the developments of plaque and calculus in Asian differ, and may lead to distant reactions between Asian and non-Asian.

1.2 Machine Learning

Machine learning is the study of algorithms which advance spontaneously through experience. Machine learning is conjugated where is infeasible with conventional algorithms such as computer vision. Many papers show that machine learning brings out better result than human recognition.

If the feedback provides the correct answer for specific inputs, then learning problem is called supervised learning [6]. Classification is a kind of supervised learning for discrete values; regression is for continuous values.

1.3 Purpose of Research

There are many studies which have tried to find bacteria as bio-markers [7, 8].

Hence, the purposes of this research are as:

1. Classify the stage of periodontitis by oral bacteria.

2. Regress the CAL, gingival recession, or probing depth by oral bacteria.

2 Materials

3 Methods

3.1 Python Packages

Python programming language had been used to analyze data. Also, many Python modules had been adopted as hereinafter.

3.1.1 Pandas

Pandas is a Python library of rich data structures and tools for working with structured data sets common to statistics, finances, social sciences, and many other fields [11].

3.1.2 Scikit-learn: Machine Learning in Python

Scikit-learn is a Python module integrating a wide range of state-of-the-art machine learning algorithms for medium-scale supervised and unsupervised problems [9]. Also, the following algorithms amongst *Scikit-learn* package are used:

- AdaBoost
- Adam Neural Network
- DecisionTree
- K-Neighbors
- LBFGS Neural Network
- Linear SVC
- Poly SVC
- Random Forest
- RBF SVC
- Sigmoid SVC

3.1.3 Seaborn

Seaborn is a Python data visualization library based on *matplotlib*. It provides a high-level interface for drawing attractive and informative statistics graphics [10].

3.2 Stages of Periodontitis

There are five clinical stages of periodontitis:

1. Healthy
2. Slight
3. Moderate
4. Severe
5. Acute

4 Results

5 Discussion

6 Acknowledgment

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