Treatment of Various Stages of Periodontitis and Prevention of Periodontitis

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Abstract. Periodontitis is an infectious disease caused by bacteria destroying periodontal supporting tissues. As the number of patients with periodontitis is increasing, more attention is being paid to the prevention and treatment of periodontitis. The incidence of periodontitis in China is about 70%. Currently, periodontitis has been considered one of the three major diseases that endanger human oral health. Both diabetic patients and hypertensive patients have a higher risk of periodontitis disease than healthy individuals. Advanced stages of periodontitis are often accompanied by tooth loss, and tooth loss can lead to decreased chewing function, which can lead to diseases such as indigestion and gastric ulcers. Besides, A growing body of research links periodontitis to Alzheimer's disease. Periodontitis is closely related to other systemic diseases. Therefore, the prevention and treatment of periodontitis is important. The paper summarizes the treatment measures for periodontitis in different periods in the new international classification of periodontal diseases in 2018 by analyzing the relevant literature and also introduce the measures related to the prevention of periodontitis.

Keywords: Periodontitis; treatment; prevention.

1. Introduction

Many scholars have found that high blood sugar not only increases the prevalence of periodontal disease, but also aggravates the damage of periodontal tissue. High blood pressure will affect the microcirculation of periodontal tissue, thus aggravating periodontitis [1]. In addition, some scholars have found that the pathogens, virulence factors and inflammatory factors of periodontitis are involved in the development of Alzheimer's disease and promote the progression of Alzheimer's disease [2]. Therefore, Prevention and treatment of periodontitis is very important. This article will introduce how to prevent and treat periodontitis. Currently, the widely used criteria for classifying periodontal diseases are those developed by the American Academy of Periodontology (AAP) at the International Symposium on the Classification of Periodontal Diseases organized in 1999. The European Federation of Periodontology (EFP) and the American Academy of Periodontology held an international symposium on the new classification of periodontal and peri-implant diseases in 2018 and reformulated the classification of periodontal diseases at the symposium. Periodontal diseases are divided into three categories.one is necrotizing periodontal diseases (NPD). Two is periodontitis, including aggressive periodontitis and chronic periodontitis. The third is periodontitis reflecting systemic systemic disease. In addition, a new concept of periodontal health was presented at the 2018 discussion that can be used to guide clinicians in evaluating the effectiveness of periodontal treatment [3]. Normally, healthy gums are pink, thin and close to the tooth surface. When inflammation is present, the gums are often bright red or dark red, they may be enlarged or even hyperplastic, and the texture of the gums becomes floppy and fragile and inelastic. However, sometimes the inflammation of the gums is confined to the periodontal pockets and the redness and swelling of the gums is not obvious. Therefore, bleeding on probing is an important indicator of gum inflammation and periodontal health [3]. In the early stages of gingival inflammation, the amount of gingival crevicular fluid increases, which is also a reference indicator for determining gingival inflammation. Therefore, the amount of gingival crevicular fluid can be used for the early prevention and treatment of periodontitis. Many scholars have found that the level of nitric oxide in gingival crevicular fluid correlates with the degree of periodontal inflammation; the higher the level of nitric oxide in gingival

crevicular fluid, the more severe the periodontal inflammation. Patients with chronic periodontitis had significantly higher levels of nitric oxide in gingival crevicular fluid than patients with chronic gingivitis [4]. Therefore, the content of nitric oxide can be detected in time during the treatment of periodontitis to determine the treatment effect. In addition, the formation of periodontal pocket and the absorption of alveolar bone are also important characteristics of periodontitis.

2. Staged treatment and prevention of periodontitis

2.1. Staging and grading of periodontitis

Periodontitis is an infectious disease caused by bacteria that destroy periodontal supporting tissues. Periodontitis is also currently a major factor in adult tooth loss. Periodontitis usually has symptoms such as resorption of alveolar bone, periodontal pocket formation, loose teeth, and bleeding gums. Advanced stages of periodontitis often present with tooth loss. Periodontitis can greatly affect the quality of life of patients. Li believes that the etiology of periodontitis includes endocrine factors, direct infection by bacteria, smoking, wearing dentures, psychological factors, genetic factors, and dental calculus [5]. In the new international classification of periodontal and peri-implant diseases established in 2018, four periods of periodontitis were defined according to severity and complexity (See Table 1). The first period is the early stage of periodontitis, which should be detected, diagnosed and intervened early to prevent periodontitis from continuing to progress. The second period is moderate periodontitis, where periodontitis produces definite damage to the teeth. The third period is severe periodontitis, with the possibility of tooth loss. The fourth period is the more serious severe periodontitis, which may result in tooth displacement, bite relationship disorder, and even dentition loss [3,6].

In the new 2018 International Classification of Periodontal and Peri-Implant Diseases, periodontitis is classified into grades A, B, and C based on the degree of 5-year attachment loss, the ratio of bone loss to age, clinical presentation, and risk factors. The grading represents the rate of disease progression (See Table 2). Grading includes the effect of diabetes and smoking on periodontal conditions. Grading of periodontitis can guide the clinician to better assess the prognosis of periodontitis and facilitate patient-physician communication.

Table 1. Staging of periodontitis in the new international classification of periodontal and peri-implant diseases [4]

	Projects	Phase I	Phase II	Phase III	Phase IV
Severity	Loss of attachment	1-2mm	3-4mm	Greater than or equal to 5mm	Greater than or equal to 5mm
	Bone resorption	Crown orientation1/3(<15 %)	Crown orientation1/3(15 %-30%)	Root length1/2-2/3	Root length1/2-2/3
	Number of missing teeth	No missing teeth due to periodontitis	No missing teeth due to periodontitis	The number of missing teeth due to periodontitis is less than or equal to 4	The number of missing teeth due to periodontitis is greater than or equal to 5
Complexity	Partial situation	The largestprobing depth (PD) is less than or equal to 4 mm, and most of it is horizontal bone resorption	The largest PD is less than or equal to 5 mm, and most of it is horizontal bone resorption	The largest PD is greater than or equal to 6 mm.Vertical bone resorption greater than or equal to 3mm.Root bifurcation lesion II-III degree.	On the basis of phase III, more complex treatment is needed: secondary occlusal trauma,masticatory dysfunction, secondary occlusal trauma, occlusal disorder, tooth inclination, tooth fan-shaped displacement, and the number of remaining teeth is less than 20
Range and Distribution	Applicable to each stage. Limited type (affected tooth position<30%). Extensive type. incisor/molar distribution type				

Table 2. Grading of periodontitis in the new international classification of periodontal and peri-implant diseases [3]

		Direct Evidence	Circumstantial Evidence		Risk Factors	
classification	Speed of progress	Loss of bone on imaging or loss of clinical attachment	Bone loss/age	Clinical manifestations	Smoking status	Diabetes
Class A	Slow	No clinical loss of attachment for more than five years	Less than0.25%	Large amount of plaque adherence,but low level of periodontal destruction	No smoking	Normal blood sugar，no diagnosis of diabetes
Class B	Medium	Five-year clinical attachment loss less than 2mm	0.25%-1.0%	The degree of periodontal destruction is matched to the degree of plaque adherence	Less than 10 sticks per day	Diabetic patients with glycosylated hemoglobin less than 7.0%
Class C	Fast	Five-year clinical attachment loss greater than or equal to 2 mm	greater than1.0%	Periodontal destruction exceeding the amount of plaque adherence,with clinical examination clearly showing rapid disease progression/and early onset features	Greater than or equal to 10 sticks per day	Diabetic patients with glycated hemoglobin greater than or equal to 7.0%

The precondition of periodontitis treatment by stages by dentists is to establish periodontitis first. After excluding gingival retraction caused by occlusal trauma, caries of the tooth neck, loss of attachment of bistal surface of the second molar caused by the impacted tooth, periodontal drainage pathways in periapical periodontitis, fold vertically to the root, periodontitis can be established by the presence of attachment loss on the proximal surface of at least two non-adjacent teeth in the patient's mouth, periodontal pockets with PD greater than 3mm on the Buccolingual side of at least two teeth, and attachment loss greater than or equal to 3mm on the Buccolingual side of at least two teeth.

2.2. Treatment

He showed that the use of personalized oral hygiene education in the treatment of periodontitis can improve clinical outcomes. Therefore, individualized oral hygiene education is necessary for every stage of periodontitis. Dental clinicians should choose to teach patients to floss and use interdental brushes according to their actual intraoral conditions. The oral clinician can use a plaque disclosing agent to clearly indicate the sites of plaque retention for more thorough oral cleaning. Dental clinicians need to inform patients of the etiology of periodontal disease so that patients can strengthen their awareness of plaque control [7]. Currently supragingival scaling, subgingival

scraping, and root planning are important components of periodontitis treatment, and their purpose is to remove dental plaque, soft scale, calculus, and infected cementum to form a periodontal reatlachment. The use of supragingival scaling, subgingival scraping, and Root Planning along with periodontal endoscopy as an adjunct allows for the direct visualization of the Removal of fine tartar to improve treatment results, reduce cementum damage, and facilitate periodontal tissue healing [8]. Supragingival scaling, subgingival scraping, and Root Planning are required for every stage of periodontitis, but they have certain shortcomings in the removal of periodontal pathogenic bacteria, and it is difficult for the treatment instruments to reach the root bifurcation and the bottom of the periodontal pocket, so clinicians combine them with medications. The most commonly used clinical drugs for periodontitis are antibacterial drugs, nonsteroidal drugs, and other rinse-containing drugs. Antibacterial drugs are the most used in the treatment of chronic periodontitis, of which metronidazole is the preferred antianaerobic drug and is more effective against Gram-negative anaerobic bacteria. metabolites of metronidazole can also inhibit bacterial DNA synthesis. For aggressive periodontitis, clinicians routinely use metronidazole + amoxicillin. Some scholars have had patients with aggressive periodontitis take metronidazole + amoxicillin for 6 months after subgingival scraping and Root Planning, and the patients showed a significant reduction in inflammation. In addition, tetracycline plays a major role in periodontal treatment as a broad-spectrum antibacterial drug that affects bacterial protein synthesis [9]. Many scholars have found through research that Chinese medicine is also useful in the treatment of periodontitis. Chinese herbs have local anti-inflammatory effects, so they can inhibit periodontal pathogenic bacteria, as well as induce periodontal tissue regeneration and regulate systemic immunity. Chinese herbs commonly used in the treatment of periodontitis include Yunnan Baiyao and Liu Wei Di Huang Wan [10].

In summary, for stage I periodontitis, clinicians need to develop individualized oral hygiene instruction education, perform supragingival scaling, subgingival scraping and Root Planning also use medication as needed for the condition. In stage II periodontitis, compared to stage I, there is an increase in probing depth, bone resorption level, and attachment loss, but there is still no missing tooth due to periodontitis, so the treatment is approximately the same as in stage I.

In stage III periodontitis bone resorption reaches 1/2-2/3 of the root length and furcation involvement occurs as well as missing teeth due to periodontitis. At thisstage, patients may face the problem of loose teeth, so periodontal splints should be used in stage III periodontitis. Periodontal splints not only improve the patient's chewing efficiency and disperse the occlusal force of the loosened tooth, but also facilitate periodontal tissue repair. Some studies have reported that high-strength fiber splints can also be used for aesthetic restoration of missing teeth in periodontitis, and good results have been achieved [11]. After non-surgical treatment, some patients still have deep periodontal pockets, which require periodontal flap surgery to fully expose the lesion area, remove infected soft and hard tissues under direct vision, trim the alveolar bone, and remove part of the pocket wall to achieve therapeutic results. Chen et al. statistically analyzed the probing depth and clinical attachment level of 80 patients with chronic severe periodontitis before, 3 months after and 6 months after periodontal flap surgery and found that periodontal indexes improved at 3 and 6 months after periodontal flap surgery [12].

As the displacement of teeth can lead to malocclusion, malocclusion can also aggravate the symptoms of periodontitis. At present, periodontal regeneration combined with orthodontic treatment has become the mainstream of treatment for periodontitis. Wu and Wang divided 86 patients with periodontitis into a combined group and an orthodontic group. The combined group was treated with combined periodontal tissue regeneration + orthodontic treatment. The orthodontic group was treated with orthodontic treatment. According to the statistical analysis, it can be concluded that the gingival index, attachment loss, plaque index, and sulcus bleeding index of the combined group were significantly lighter than those of the orthodontic group [13]. In addition, photodynamic therapy is an emerging treatment for periodontitis. Photodynamic therapy uses a chemical reaction between light and a photosensitizer to destroy the bacterial envelope and the macromolecular components of the cells. Therefore, photodynamic therapy can remove residual periodontal pathogenic bacteria at the

root bifurcation and at the bottom of deep periodontal pockets. Zhu et al. found that photodynamic therapy combined with orthodontic treatment could significantly improve the periodontal symptoms in patients with periodontitis through experimental analysis. Photodynamic therapy combined with orthodontic treatment can reduce the level of periodontal inflammation and suppress the number of A.a, P.g and F.n. Therefore, in periodontitis III, clinicians can also use photodynamic therapy [14].

In stage IV periodontitis, there are more missing teeth, and the restorative treatment is complicated by loose remaining teeth, disturbed occlusal relationships, and significant alveolar bone resorption. stage IV is treated in much the same way as stage III. In stage IV periodontitis, attention should be paid to the extraction of non-functional third degree loose teeth. Periodontitis and pulpitis can also interact with each other in the late stages, and in cases where periodontitis leads to pulpitis not only periodontitis treatment but also pulp treatment is required. Zheng found that the treatment of periodontal pulp lesions with minocycline hydrochloride antibacterial + hot pressed adhesive filled root canal can significantly improve the periodontal situation [15].

One of the most important steps in the treatment of periodontitis is periodontal health maintenance. Periodontal health maintenance should continue throughout life. Periodontal health maintenance means that the practitioner educates the patient about oral hygiene. Patients need to learn about oral health, proper brushing, flossing and interdental brushing and abstain from smoking and alcohol. Good periodontal health maintenance is a key step to ensure the long-term effectiveness of periodontal disease treatment. Failure to maintain periodontal health is likely to lead to recurrence of periodontal disease. A study on the effect of periodontal maintenance treatment on chronic periodontitis found that the combination of basic treatment and periodontal maintenance treatment significantly increased the treatment effect of periodontitis. Basic treatment and periodontal maintenance therapy were more efficient and had a lower Plaque index and Periodontal bleeding index than basic treatment alone, resulting in better clinical outcomes [16].

The above treatment plan for periodontitis adopts advanced treatment technologies such as photodynamic therapy and periodontal tissue regeneration, which can better guide clinicians to make reasonable treatment plans. However, the plan is not comprehensive and specific enough, gingival recession often leads to caries and tooth sensitivity. So clinicians should add some conventional treatment means such as caries filling and tooth desensitization with the specific problems of patients.

2.3. Prevention

Nowadays, there are more and more studies on the correlation between periodontitis and cardiovascular diseases. Li et al. considered periodontitis as a risk factor for coronary heart disease. Bacteria in periodontal pockets can enter the bloodstream to form antigen-antibody complexes deposited in the endocardium and coronary arteries [17].Periodontitis is also a risk factor for myocardial infarction[18]. This is why prevention of periodontitis is especially important. The first step in preventing periodontitis is to keep mouth clean and brush teeth morning and night for at least three minutes each time. This is because periodontal pathogenic bacterial infections are the direct cause of periodontitis. The next step is to clean teeth regularly, as calculus can lead to gingival recession and microbial infection of the periodontal tissues. It is also very important to stop smoking, as smoking destroys the body's immunity and thus prevents the patient from fighting off the virulence of periodontal pathogens. Maintaining good physical and mental health is also a means of preventing periodontitis. Numerous experiments have shown that periodontal disease is closely related to mental stress. In addition, glucocorticoid imbalance has been shown to aggravate periodontitis, so controlling underlying diseases such as diabetes and coronary heart disease will also reduce the risk of periodontitis [5]. Regular oral check-ups at the hospital, early detection, early diagnosis and early treatment of periodontal diseases. Raising awareness of oral health care is a fundamental measure to prevent periodontitis. Good oral health behaviors can largely reduce the risk of periodontal pathogenic bacterial infections. Periodontitis is also associated with diet. Spicy and stimulating foods and excessively hard foods can aggravate the development of periodontitis. Patients with periodontitis should minimize the intake of these two types of foods [19].

3. Conclusion

With the development of periodontology and medical technology, the classification of periodontal disease has become more refined, the staging and grading more reasonable, and the methods of treatment more diverse. In this article, treatment measures are developed based on the 2018 periodontitis staging. All stages of periodontitis require personalized oral hygiene education, supragingival scaling, subgingival scraping, root planning, and medication as needed. stage III and IV periodontitis can be treated with periodontal splints, periodontal tissue regeneration, photodynamic therapy, periodontal flap surgery, and also combined with orthodontists The treatment is coordinated with the orthodontist. The treatment protocols in this paper involve many new technologies and provide clinicians with a variety of options, but the dentist needs to select specific measures that take into account the patient's oral condition. This paper summarizes the measures to prevent periodontal disease. Periodontitis can only be prevented by raising awareness of oral health care, regular checkups, regular cleanings, controlling systemic diseases, quitting smoking and drinking, maintaining physical and mental health, and eating a reasonable diet. The prevention and treatment of periodontitis is something that can only be achieved through the joint efforts of doctors and patients.

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