

Research progress of implant restoration in the treatment of periodontal disease

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Abstract: Periodontal disease is one of the most important clinical factors of oral missing teeth. This kind of disease specifically refers to the disease of the tissue around the teeth, which can have a serious impact on the quality of life of patients. If we do not carry out scientific and effective treatment for patients in time, the disease can continue to develop and eventually all the teeth will fall off. In clinic, tooth loss caused by periodontal disease is often accompanied by inclination, loosening of residual teeth and loss of alveolar bone. Based on the above factors, it can not only significantly improve the difficulty of clinical repair, but also conventional repair is difficult to achieve the ideal effect. Patients often complain of unstable denture retention, tenderness and low chewing efficiency, which affect the doctor-patient relationship. When periodontal disease patients are not suitable for other missing tooth restoration schemes, the use of implant technology can better solve the above problems.

Keywords: planting; Repair; Periodontal disease; progress

Clinically, the disease of periodontal tissue (i.e. dental supporting tissue) is called periodontal disease, including periodontal ligament and gingiva. (1) Periodontitis: this kind of disease can be divided into three types: Periodontitis reflecting systemic diseases, invasive periodontitis and chronic periodontitis. The last one is the most common type of periodontitis, accounting for about 95%.^[1] Dental plaque is not only the initiating factor of the disease, but also the local promoting factor (dental calculus, food impaction, etc.), which can make patients show symptoms such as periodontal pocket formation and gingivitis. (2) Gum disease: including gingivitis caused by dental plaque such as adolescent gingivitis, pregnancy gingivitis and chronic gingival marginal inflammation, gingivitis caused by non-dental plaque such as viruses and fungi, and the performance of systemic diseases in gingiva. Dental plaque and dental calculus are the initiating factors of chronic gingivitis. After the continuous progress of the disease, it can cause gingivitis or aggravate the inflammatory symptoms of patients. Specifically, the lesion is prone to bleeding, the gingival sulcus can exceed 3mm, and the shape of false tooth bag becomes the main manifestation.^[2] Local adverse stimulation and improvement of sex hormones are the main factors leading to adolescent gingivitis. They are more common at the gingival margin and labial interdental papilla of anterior teeth, and are prone to bleeding^[3].

1. Overview of Implanting Materials

Dental implant materials need to have the following advantages^[4]: good corrosion resistance and biocompatibility, suitable mechanical properties, etc. Because bone bonding is affected by implant composition and surface treatment factors, titanium alloy and composite materials are often selected in clinical implantation. One of the commonly used implant materials in clinic is pure titanium. This material has good biocompatibility and strong corrosion resistance. In cases of tooth loss, the material has good tightness and wrapping, and can play a fair therapeutic effect. In addition, the application of pure titanium will not cause bone mineralization reaction, and can be well fused with bone, which can promote patients to better restore masticatory function.^[5] However, due to the poor wear resistance and mechanical properties of pure titanium and low strength, the overall restore effect and long-term effect are not ideal. The mechanical properties and mechanical properties of the new implant material titanium alloy are good, and compared with pure titanium, titanium alloy implant has better compatibility with tissue and higher safety. Therefore, patients with tooth defects are more suitable for titanium alloy materials.^[6]

Some scholars have found that metal surface spraying ceramic materials can effectively combine

the advantages of the above two materials, and the biological compatibility of the composites is better, which is more beneficial to periodontal health and can significantly improve the long-term effect.^[7] In relevant clinical studies, some scholars selected self-curing calcium phosphate as implant material for patients with tooth defects and achieved good clinical efficacy. At the same time, they pointed out that high-quality bone substitute biomaterials need to meet the following basic requirements at the same time:^[8, 9] (1) It can be implanted in irregular bone cavity; (2) It can be in close contact with the implant surface and bone surface; (3) Have certain load bearing capacity; (4) Can promote the formation of new bone. Therefore, a single material cannot meet the above requirements, so it is necessary to construct composite materials with regenerative medicine technology to realize dental implantation. Water mixed with self-curing calcium phosphate powder can form slurry, which is used to fill patients with irregular bone cavity. It not only has more plasticity and injectability, but also can be fully filled and self-cured. It has good compatibility and bone guiding ability, which is more conducive to improve the long-term effect.

2. Overview of Implant Restore Timing

One of the prerequisites for shaping implant conditions for patients with periodontal disease is to master their oral health status. It is also very key and important to grasp the implant timing in implant restore. Many researchers suggest that^[10, 11] although the success rate of immediate implantation is lower than that of delayed implantation, there is no significant difference in alveolar bone resorption, aesthetic effect and implant stability. Usually, patients with periodontitis need a long time of bone integration, and early or delayed implantation is often adopted in clinic.

The immediate implant is guided by the extraction socket. The implanted implant is closer to the natural tooth regardless of the angle or position, the aesthetic effect is more vivid and natural, and the alveolar bone absorption rate can be reduced. Single tooth can be implanted immediately. Choosing a longer implant can make the initial stability better and the aesthetic effect more ideal.^[12] Referring to the periodontal conditions of patients, the application of non-flap minimally invasive surgery is more conducive to the retention of complete blood supply of mucoperiosteal and the reduction of bone plate absorption. If the patient has obvious absorption of labial bone plate and the gap between the patient and the implant is more than 2mm, artificial bone powder or autologous bone can be combined during the operation to increase the retention of the implant. Many clinical scholars support that the slight load of early implant will not affect the bone implant interface, and believe that the appropriate load stimulation in the early stage is conducive to promote the bone reconstruction and retain the original height and width of alveolar bone to a certain extent.^[13] Early and appropriate restore can not only meet the aesthetic needs, but also enhance the reconstruction and metabolism of bone around the implant. In the untreated periodontitis observation group, delayed implantation is more conducive to the formation of good bone bonding of implants, and the marginal bone loss of implants is less than that in the untreated group. This suggests that the periodontal tissue in the stable stage can receive better therapeutic effect after delayed implant restore. In patients with periodontal disease, the risk of delayed implantation of anterior teeth is lower than that of immediate implantation, and the risk of lower jaw is lower than that of upper jaw; in the choice of delay and immediate time, strengthening infection control and designing a good implantation angle will not significantly affect the success rate of implantation.^[14]

3. Overview of Aesthetics and Restoration

Patients with periodontal disease often have problems such as poor occlusal relationship and gingival recession, which can improve the difficulty and risk of implant restore. (1) soft tissue Aesthetics: the factors that may affect the aesthetic effect of patients after soft tissue restore mainly include surgical trauma, bone mass, implantation timing, gingival biotype, implant implantation direction, etc. Through the digital guide plate and CBCT technology, it is more conducive to the accurate orientation and positioning of patients, so that the gingival tissue can be early induced and supported, so as to improve the aesthetic effect. Bone loss can cause soft tissue collapse. Minimally invasive surgery and bone increment can make up for this problem, but it is also easy to show the defect of insufficient soft tissue, which will affect the aesthetic effect and increase the probability of infection.^[15] In this regard, soft tissue stretch plasty, vestibuloplasty or free gingival flap transplantation can be delayed or performed at the same time to increase the width of keratinized gingiva. Whether the gingival tissue can remain stable for a long time after restore can also be affected

by gingival biotype. Compared with the thicker gingival biotype with gingival thickness $\geq 1\text{mm}$, the thin gingival biotype with gingival thickness $< 1\text{mm}$ is easy to cause gingival retraction. Therefore, the gingival biotype must be clarified before restore. In the face of patients with thin gingiva, we must fully communicate before operation and inform them of aesthetic risks. All operations must be fine. Minimally invasive surgery is preferred as far as possible, the blood supply of alveolar bone plate is preserved, and the biological type of gingiva is changed as far as possible through soft tissue increment.^[16] (2) Restoration: Patients with periodontal disease are limited by the interference of residual natural teeth, anatomical factors and the reduction of vertical bone height in the mouth, which can significantly improve the difficulty of restoration. In order to ensure good restore effect, the following factors need to be fully considered: ①Self-cleaning: Compared with those without a history of periodontitis, patients with periodontitis are more susceptible to implant inflammation after treatment. Therefore, it is very important and necessary to design restorations conducive to plaque control. When selecting the restore type, we need to fully consider the self-cleaning performance. If the patient has poor oral hygiene, fixed implant denture is not recommended, and telescopic crown implant denture is more recommended. In terms of the shape of the restoration, the crown axial convexity should be restored and a moderate gap should be left, which is more conducive to food overflow, self-cleaning and cleaning. ②Occlusion: The abnormal occlusion in the mouth of patients with severe periodontal disease is mostly caused by long-term non axial force or excessive load of implant. Therefore, it is necessary to pay more attention to the direction and force of implant when designing prosthesis. The bite force can be transferred to the posterior tooth area to reduce the non-axial load in the anterior tooth area, reduce the inclination of the tooth tip and the surface of the prosthesis, so that the load is not concentrated on the inclination of the tooth tip, but in the central fossa as far as possible, so as to ensure that the load is moderate in the lateral, median and forward extension. If necessary, the remaining natural teeth can be adjusted appropriately. When the condition of the whole mouth and jaw of patients with periodontal disease is poor, the design with scattered and small force such as overdenture should be adopted.^[17] (3) Immediate restore: under the condition of good initial stability, on the basis of controlling fretting, immediate implantation at the infection site and immediate weight-bearing will not reduce the success rate of implant, and early weight-bearing can promote the formation of new bone in the stress concentration area, which is conducive to the improvement of aesthetic restore effect.

4. Factors Affecting the Prognosis of Implant in Patients with Periodontal Disease

Oral hygiene habits (smoking, etc.), poor oral health care and systemic diseases (diabetes mellitus) are common clinical factors that can influence the prognosis of periodontal disease patients.^[18] (1) Oral hygiene: most scholars believe that maintaining the oral hygiene of patients with periodontal disease after implantation is helpful to reduce the risk of peri-implant inflammation. Some other studies have also found that regular maintenance of oral hygiene in the treatment stage and post repair stage of patients can ensure the survival rate of implants even if the probing depth of periodontal pocket increases or bone defects around implants occur. (2) Smoking: smoking is one of the important factors to promote the occurrence and development of periodontal disease. Many studies have shown that smoking can cause periodontal disease and aggravate the severity of periodontal disease. Some other studies have also shown that smoking is one of the important factors affecting bone loss around implants.^[19] In related studies, smoking patients with periodontal disease have significantly lower repair success rate than non-smoking patients, and the probability of peri-implant inflammation is about 80-85% and 20-30% respectively. (3) Diabetes: another important risk factor for periodontal disease is diabetes mellitus. At present, it is not clear about its impact on implant repair. For patients with unstable blood sugar, it may not have a significant effect on the success rate of planting. Some scholars have pointed out that diabetes can slow down the rate of bone formation and affect bone union and cause peri-implant inflammation. Some scholars believe that diabetes is not regarded as the absolute contraindication of implant restoration. The key lies in better control of infection, controlling blood sugar, avoiding premature load and ensuring the stability of osseointegration.^[20]

5. Conclusion

In conclusion, implant repair can achieve good application effect and clinical value in patients with periodontal disease, but the development of the disease is easy to affect the long-term effect and healing effect of implants. Therefore, we must give patients perfect periodontal maintenance and treatment, properly select the implantation time, grasp the indications of implant restoration, and ask them to insist on returning to the hospital after completing the implant restoration, and maintain the

implant and periodontal in their life.

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