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Implant Surgical Treatment of Mandibular Alveolar Ridge with Severe Resorption due to Periodontal Disease

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Abstract: Periodontal disease, as one of the common oral diseases in China, is the key factor that causes tooth loss in adults. Alveolar bone resorption is an important pathological process of periodontitis. As the alveolar bone is absorbed, the supporting tissue of the tooth is gradually lost, causing the tooth to become loose and eventually fall out or be extracted. With the development of medical technology, the surgical treatment of periodontal disease leading to severe resorption of mandibular alveolar ridge has been gradually improved. Therefore, this paper discusses the surgical treatment of periodontal disease one by one, as the basis for the clinical treatment of patients with periodontal disease.

Keywords: Periodontal disease; Severe resorption of mandibular alveolar ridge; Implant surgery

Periodontal disease in the early stages of the main presentation of gingivitis, its symptoms are easy to bleeding and red and swollen teeth. As the disease progresses, patients may experience tooth loosening and displacement, which may even lead to tooth loss^[1]. According to a survey, from 1990 to 2019, the prevalence and incidence of periodontal disease in China increased from 8,866.09/100,000 and 854.46/100,000 to 14,738.7/100,000 and 1,269.93/100,000, respectively, showing an overall upward trend. It is predicted that in 2030, the standardized incidence of periodontal disease in women will rise to 1127.30/100,000, an increase of 4.53%, and that in men will rise to 1127.19/100,000 in 2030, an increase of 3.67%^[2]. In the pathological process of periodontitis, the serious absorption of mandibular alveolar ridge is a key phenomenon, which is closely related to the subsequent deterioration of the patient's disease, and brings great difficulties to the traditional repair. Studies have shown that implant dentures are becoming a key clinical treatment for the restoration of missing teeth in periodontal diseases^[3]. However, there are many problems to be solved in the process of periodontal disease patients undergoing implant denture restoration. The main problems include periodontal inflammation, insufficient bone mass and insufficient soft tissue mass. Many studies have shown that the mouth of patients with periodontitis is difficult to treat due to the presence of bacteria, and the occurrence of peri-implant inflammation is likely due to the patient's history of periodontal disease^[4]. At the same time, periodontal disease resulting in the mandibular alveolar ridge leads to a decrease in the height of the bone available for the affected tooth. It also leads to insufficient secretion of alveolar ridge width and serious bone loss. In addition, for patients with periodontal disease, severe atrophy of the alveolar ridge is often accompanied by an insufficient amount of soft tissue, which may increase the risk of bone tissue exposure in the operative area and may even lead to serious consequences such as infection and necrosis.

1. Surgical treatment of mandibular alveolar ridge with severe resorption due to periodontal disease

1.1 Surgical management of bone mass deficiency

In the case of severe resorption of the alveolar bone, the proper implantation of the implant and its initial stability may be seriously affected, which in turn negatively affects the long-term success rate of the implant. To solve this problem, bone tissue reconstruction surgery is usually required, which aims to restore the volume of the alveolar ridge and ensure that the implant can be placed in the correct position. To solve the problem of horizontal and vertical alveolar ridge bone deficiency, there are many clinical solutions, such as Onlay bone grafting, guided bone regeneration technology, mandibular nerve ionization and alveolar bone traction osteogenesis technology. The selection of these protocols should be comprehensively considered according to the specific situation and surgical needs of the patient. Onlay bone grafting is a widely used procedure for bone increment techniques designed to address the lack of bone height and width. It is predictable and widely applied, and is an effective means among many bone increment techniques. In Onlay bone grafting, autogenous bone grafting is usually the best option, but a separate bone removal operation is required at a donor site other than the implant site. Studies conducted by Chiapasco M

showed that Onlay bone grafting could achieve ideal results for types 3 and 4 alveolar bone defects^[5]. Guided bone regeneration technology is the most widely used and reported bone increment technology in clinical practice. Its technical principle is to maintain the osteogenic space by using absorbable or non-absorbable barrier membrane, so as to provide necessary conditions for bone tissue regeneration. Tian Yan et al. performed guided bone regeneration surgery in the bilateral mandibular first molar area of the patient, and closed the missing tooth space by moving the bilateral mandibular second and third molar mesially^[6]. After correction, the alveolar bone height in the GBR area of the patient returned to normal, while the periodontal and pulp remained healthy. Mandibular nerve ionization is mainly suitable for cases where the alveolar ridge is severely absorbed and the bone height is not high enough to support implant implantation. Through the implementation of this surgery, the mandibular nerve injury can be effectively avoided in the process of implant implantation, to ensure the smooth completion of implant surgery, and to help patients to recover normal chewing function. Studies have found that when the vertical height of alveolar bone is insufficient, the use of alveolar bone traction osteogenesis technology can effectively reduce the absorption of new bone and promote the regeneration of soft and hard tissues at the same time, which not only avoids the operation of bone extraction and bone donor area, but also solves the problem of soft tissue closure during a large number of bone implants^[7]. However, traction osteogenesis technology also has certain limitations in clinical application and can not be widely used.

1.2 Surgical management of soft tissue deficiency

There is a close dependency between soft tissue and bone tissue, in which soft tissue is dependent on the existence of bone tissue. Therefore, the atrophy of the alveolar ridge inevitably leads to a corresponding reduction in soft tissue. After bone increment surgery, if the amount of soft tissue is insufficient, closing the wound area may lead to serious complications, and soft tissue treatment is a crucial step. Gunter Wiesner conducted a study on the use of connective tissue grafts to thicken tissues around implants when implants were placed. Free tissue flap was obtained from the hard palate to deal with insufficient soft tissue volume, and it was found that the thickness of soft tissue at the enhanced site of the patient increased by 1.3mm one year later, and the patient was very satisfied^[8]. After the transplantation of gingival flap combined with stent-guided gingival expansion and vestibuloplasty, it has been clinically verified to show significant therapeutic effect on the problem of insufficient soft tissue. Gingival expansion guided by the stent after gingival flap transplantation is mainly performed in the second stage of surgery. The incision is designed on the lingual side of the alveolar bone, the alveolar bone is exposed to the lip and buccal flap, the vestibular groove is released, and the soft tissue flap edge is sutured to the periosteal of the bottom of the vestibular groove. Two free gum grafts were obtained, then sutured at this recipient site, and a previously customized acrylic scaffold was screwed onto the farthest implant, stabilizing the soft tissue surrounding the implant^[9]. Labiform vestibuloplasty provides a safe and convenient surgical approach for the installation of implant fixtures, and its significant advantage is that it can effectively reconstruct the vestibular part of the damaged atrophic ridge in the anterior mandible^[10].

2. Conclusion

To sum up, various surgical methods have their unique advantages and limitations in the treatment of periodontal disease patients, especially in the restoration of implant dentures with severe alveolar ridge absorption. Therefore, it is essential to develop a detailed and thorough treatment plan for patients. In the treatment design, the physiological and biomechanical principles of implant denture must be strictly followed to ensure the stability and durability of the treatment effect. This will help to maximize patient outcomes and quality of life.

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