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CLINICAL CHARACTERISTIC OF THE STATE OF ALVEOLAR TISSUE IN THE AREA OF DENTAL IMPLANTS AFTER RESTORATION WITH FIXED PORCELAIN-FUSED-TO-METAL STRUCTURES

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Abstract:

This paper deals with the clinical assessment of the state of alveolar tissue in the area of dental implants after restoration with fixed porcelain-fused-to-metal structures. To achieve the set tasks, total 105 patients of 35 to 65 years old with fixed porcelain-fused-to-metal implanted dentures were examined. The service life of orthopedic structures was from 1 to 5 years.

The examined patients had no allergic reactions or intolerances to metal alloys and ceramic body, of which their prostheses were manufactured. Clinical observations showed that 45.8% of patients had pathological changes in the area of available abutment implants. 25% of patients with 157 abutment implants had chronic catarrhal gingivitis of mild to moderate severity, 20.8% of patients suffered from mild chronic periodontitis in the area of 53 dental implants. 15% of patients with 146 abutment implants with fixed porcelain-fused-to-metal structures in their oral cavities had no pathological changes found in the periodontal tissues.

Keywords: periodontal disease, dental implants, porcelain-fused-to-metal construction, orthopedic service

1. Introduction

The problem of dental restoration with dental implants with the following prosthetics with the use of fixed structures, especially porcelain-fused-to-metal ones, is highly relevant [5,10,19,24]. Dental implantation has already become a routine practice, and aesthetic properties of the porcelain give patients a sense of comfort, inner satisfaction and confidence [12,15,18,23]. At the same time, these structures cause quite often the periodontal tissue diseases, such as of abutment teeth and abutment dental implants [3,14,17,22]. Pathological changes in periodontal tissues may occur as a result of the impact of prosthesis material on the adjacent gum tissue, as a result of interaction between the dental implant and oral environment [1,2,6,8,9]. The negative effect of fixed dentures on periodontal tissue of abutment

implants may be exacerbated by the structural features of the prosthesis, poor oral hygiene and other factors [4,7,11,16].

2. Objective of Research

To assess clinically the state of alveolar tissue in the area of dental implants after restoration with fixed porcelain-fused-to-metal structures.

3. Materials and Research Methods

To achieve the tasks set in this research, we examined total 105 patients of 35 to 65 years old with fixed porcelain-fused-to-metal implanted dentures. The service life of orthopedic structures was from 1 to 5 years. The examined patients had no allergic reactions or intolerances to metal alloys and ceramic body, of which their prostheses were manufactured. All patients of the main group had porcelain-fused-to-metal structures fixed on the screw dental implants installed no earlier than 1 year after the operation, i.e., all patients have undergone a delayed dental implantation. The patients we examined had the following types of dentures in their oral cavity: solid single ceramic-faced crowns – 185, porcelain-fused-to-metal bridgeworks - 95.

105 patients with fixed porcelain-fused-to-metal structures, had total 566 crowned implants installed, i.e., 5.4 implants accrue to one patient on average. The state of dentures was evaluated based on cosmetic and functional data. From an aesthetic point of view, the porcelain-fused-to-metal dentures should imitate natural teeth in their anatomical shape, color and position in the dental arch [25]. Basic requirements: functionally sound artificial crowns must fit tight to the neck of the tooth, not step over the periodontal sulcus more than 0.2-0.3 mm, not to raise the occlusion []. Bridgeworks must be qualitatively sound, neither adhere to the gum nor irritate it. Dentures and the state of periodontal tissues were clinically evaluated based on their cosmetic and functional data. 59 (56.19%) patients had an orthognathic occlusion, 16 (15.24%) - abnormal neutral occlusion, 12 people (11.43%) - edge-to-edge occlusion, 5 (4.76%) - posterior neutral occlusion, 3 (2.85%) - biprognathic neutral occlusion, 2 (1.9%) - posterior distal occlusion, 1 (0.95%) - pre-normal mesial occlusion, 3 persons (2.86%) had a deep occlusion, and 4 (3.81%) - unilateral asymmetrical occlusion.

To objectively assess the state of periodontal tissues, the periodontal indices were used: papillary-marginal-alveolar index (PMA), and periodontal index (PI). Papillary bleeding severity was determined with the use of the Muchlemann-Son papillary bleeding index (1971). To determine the severity of inflammation in periodontal tissues the Schiller-Pisarev test was used (D. Svraakov's iodine number, 1962). Hygienic condition of dental/implant arch

replaced with the fixed porcelain-fused-to-metal structures was evaluated using the hygienic indices (HI): simplified oral hygiene index (OHI-S), J.C. Green, J.R. Vermillion (1964), Silness-Loe hygiene index (1964, 1967), interproximal plaque index or interdental hygiene index - IHI (1999). Statistical processing of the numerical data of the experimental part of the study was performed with one-way analysis of variance and Newman-Keuls multiple comparison in Primer of Biostatistics 4.03 for Windows. Differences of $p < 0.05$ were considered significant.

4. Results

The study of periodontal tissue showed that 30 (35,29%) patients with 146 (41.01%) abutment implants with fixed porcelain-fused-to-metal (PFM) structures in their oral cavities and PFM crowned teeth had no pathological changes found. The patients had no complaints about their periodontal tissues and came only for the purpose of routine inspection. The gums objectively had a pale pink color, wet, smooth, and shiny. Interimplant papilla had no signs of inflammation, had a pointed shape, fit tightly to the implants. Gingival margin also had no signs of inflammation, alveolar gums were pale pink color with a grainy surface. No bleeding was detected. During Schiller-Pisarev test, the gums acquired a straw-yellow color, i.e., the test was negative. The appearance of the gums matched clinically intact periodontal disease. The patients with intact periodontal disease had Green-Vermillion dental plaque index (DPI) of the abutment teeth of fixed PFM structures lower than the control group. Despite the significant difference ($p < 0.05$), the index values in both groups corresponded to a satisfactory level of hygiene. No calculus was detected in this group of patients. The general value of Green-Vermillion HI in this group corresponded to a satisfactory level. The value of Silness-Loe HI of abutment teeth with intact periodontal disease did not differ from normal ($p > 0.05$), interdental HI did not differ significantly from the reference value - $p > 0.05$.

The results of periodontal tissue rheography showed that the patients with PFM structures having intact periodontal disease of abutment teeth had rheographic index, vascular tone index, peripheral resistance index and vessel elasticity index comparable with the values of the control group (Table 5).

The examination of periodontal tissues in 65 (64.7%) patients in the area of their 210 (58.99%) implants covered with single crowns and the abutment implants of fixed PFM structures revealed pathological changes. 40 (35,29%) patients with 157 (44.10%) abutment implants had chronic catarrhal gingivitis, 35 (29.41%) patients suffered from chronic periodontitis in the area of 53 (14.89%) abutment implants. Mild gingivitis was found in 108 (30.34%) abutment implants. However, the patients had no complaints. Only upon detailed survey they indicated the itching and bleeding in the area of inflamed gingival papillae, rarely occurring during teeth brushing.

24 (96.0%) patients with periodontitis the symptomatic gingivitis had catarrhal form: swollen gingival papillae, increased in volume, loose, hyperemic, with a bluish tint; edematous gingival margin, increased in volume, with roller-type thickening, hyperemic, with cyanotic tint. 6 (16.0%) patients had gingival retraction 1.5-2 mm detected. Alveolar gum was slightly swollen with the loss of granularity and slight discoloration. Upon probing the periodontal pockets of 3.0-4 mm deep were detected mainly near the interproximal surfaces of implants. The content of periodontal pockets was of serous nature. There was a significant amount of soft plaque and supragingival and subgingival solid deposits. Probing of periodontal pockets resulted in moderate bleeding. Impaired static of dental implants manifested itself in a lack of tight junctions on the implant-bone boundary. X-ray determined expansion of periodontal ligament in the cervical area of the abutment implants, the resorption of the cortical bone and the top of interimplant partitions of the affected areas of alveolar processes up to 1/3 of the implant length.

Patients with periodontitis had the value of Green-Vermillion dental plaque index (DPI) of the abutment implants exceeding the reference value ($p < 0.05$), but in both groups the indicators were consistent with a satisfactory level of hygiene. The value of Green-Vermillion calculus index (CI) differed significantly from the values of the control group ($p < 0.05$). The total value of Green-Vermillion HI of the abutment implants in patients with periodontitis was consistent with a poor level of hygiene. When surveyed, the patients explained this hygienic state by the presence of gum pain and bleeding during brushing. The Silness-Loe HI values in periodontitis exceeded significantly the values in all groups surveyed, and the values of interdental HI had no significant differences as compared with the other groups.

Comparative analysis of periodontal tissues of the abutment implants in patients with gingivitis and periodontitis, in terms of all periodontal indices, revealed significant differences: PMA index - $31.51 \pm 2.83\%$ and $52.54 \pm 3.11\%$ ($p < 0.05$), PI - 0.98 ± 0.08 points and 2.20 ± 0.12 points ($p < 0.05$), Schiller-Pisarev test - 1.53 ± 0.12 points and 2.74 ± 0.23 points ($p < 0.05$), PBI index - 1.1 ± 0.1 points and 1.7 ± 0.1 points ($p < 0.05$). The state of periodontal tissue in the area of the abutment implants of PFM bridgeworks and implants covered with single PFM crowns varied depending on the amount of metal-ceramic units in the fixed PFM prostheses. 23 (76.67%) of 30 patients with intact periodontitis of abutment implants had 1 to 5 PFM units, 7 (23.33%) - 6 and more PFM units; 12 (30.0%) of 40 patients with chronic catarrhal gingivitis of abutment implants had 1 to 5 PFM units, 18 (45.0%) - 6 and more PFM units; 9 (25.7%) of 25 patients with chronic periodontitis of abutment implants of fixed PFM structures had 1 to 5 PFM units, and 14 (40.0%) - had 6 and more PFM units in their oral cavity.

5. Summary

Thus, according to the Green-Vermillion dental plaque index DPI, which belongs to the group of hygienic indices defining crown area covered with soft plaque with the use of a plaque revelator, the level of hygiene of abutment implants was satisfactory in all groups. With the help of Silness-Loe HI, which belongs to the group of hygienic indices evaluating the thickness of plaque with the use of a probe, a soft plaque was revealed in the cervical area of abutment implants. In intact periodontal disease of the abutment implants, the index value did not differ from normal, while in gingivitis and periodontitis it significantly exceeded the target value. The interdental HI values in all groups surveyed had no significant differences.

6. Conclusion

Thus, the results of clinical observations led to the conclusion about the impact of fixed PFM structures of dentures on the periodontal tissue of the abutment implants. The examination of 105 patients with fixed PFM structures revealed pathological changes in 55 (45.8%) patients in the area of 210 (37.1%) abutment implants. 30 (25%) patients with 157 (27.7%) abutment implants had chronic catarrhal gingivitis of mild to moderate severity, 25 (20.8%) patients suffered from mild chronic periodontitis in the area of 53 (9.4%) dental implants. 30 (15%) patients with 146 (25.7%) abutment implants with fixed porcelain-fused-to-metal structures in their oral cavities had no pathological changes found.

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