MEDICAL SCIENCES

CLINICAL PERFORMANCE OF ADHESIVE BRIDGES

Panahov N.A.,
Doctor of Medical Sciences. Professor
Head of the Department of Orthopedic Dentistry
Azerbaijan Medical University,
Baku, Azerbaijan
Babayev E.E.,
Doctor of Philosophy in Medicine, assistant
Department of Orthopedic Dentistry,
Azerbaijan Medical University
Baku, Azerbaijan
Aliyev M.S.A.
Doctor of Philosophy in Medicine
Department of Therapeutic Dentistry Assistant
Azerbaijan Medical University
Baku, Azerbaijan

Abstract

A clinical study of the effectiveness of prosthetics with adhesive bridge prostheses made by a direct method was conducted at various follow-up periods. Indications for the choice of specific means and methods for the restoration of dentition are given. On specific clinical examples, the technique for manufacturing adhesive bridges of various designs is described.

The highest clinical efficacy after two and three years of use was demonstrated by adhesive structures made with additional preparation of the vertical walls of the retention cavities in the form of recesses and which were reinforced with fiberglass tape and a beam. The most common complications during the use of adhesive prostheses made by other methods were violations of the integrity and retention of the prostheses, as well as the marginal fit of the photocomposite.

Keywords: adhesive bridges, direct method, retention elements, design, reinforcement, clinical efficacy.

Relevance. Adhesive bridge prostheses (AMP) are non-removable orthopedic constructions that are used for prosthetics in patients with included short dentition defects. To improve the fixation of AMPs, various retention elements are made, in particular, grooves, cavities, holes for foams, etc. [12]. A fairly common design of repotential elements are cavities of class II according to Black, which are prepared on the contact and chewing surfaces of the abutment teeth [3, 4, 5]. One of the ways to improve the retention of AMPs should be considered to be an increase in the area of adhesive bond between the photocomposite material and the hard tissues of the abutment teeth, as well as an increase in macromechanical retention, which can be achieved by creating additional immersions in the corrugated parts of the vertical walls of the abutment cavities. In order to increase the strength and rigidity of adhesive structures, reinforcing elements are introduced into the thickness of the photocomposite materials, which should bond with the cover photocomposite due to adhesion, have elasticity close to such hard tissues of supporting teeth., be convenient to use in the manufacture of AMP[1.2]. These requirements are largely met by fiberglass reinforcing elements, which have strength up to 2000 MPa, high aesthetics, and do not require additional accessories for use [6, 7.8]. The type, quantity and method of laying reinforcing glass fiber elements has a significant impact on the strength of AMB [8]. Reinforcing systems are widely presented in the form of threads, tapes, cords and beams. Numerous methods for enclosing reinforcing elements have been proposed, at the same time it is known that the optimal AMB design will be the one in which the specific volume of reinforcement will be maximum, and the frame will be covered with photocomposite.

Material with a thickness of at least 1 mm [9]. According to the results of a laboratory study of samples of photocomposite material with various reinforcing elements using the three-point bending method, samples reinforced with fiberglass tape and a beam have the highest strength [10]. A comparative clinical study of the state of AMPs fabricated by the direct method using different approaches will make it possible to determine more advanced orthopedic structures with long service life and a reliable prognosis.

Purpose of the study. up to 35 years old, who had small included defects in the dentition in the lateral areas with the absence of one tooth. The individuals included in the study had an orthognathic or level bite, a good or satisfactory level of oral hygiene, and a healthy periodontium. There were no signs of deformities of the dentition, pathological wear and parafunctional habits. The teeth limiting the defect had a pronounced anatomical shape, were stable, intact, or had minor restorations on the chewing and contact surfaces, an X-ray study confirmed the absence of signs of inflammation in the periodontium of these teeth. Patients were offered options for orthopedic restoration of the integrity of the dentition, after discussion of which it was decided to directly manufacture the AMB. Each patient was made

one AMP, in total, there were 120 prostheses. -the randomized distribution of patients into six groups, 20 people each. Informed consent for dental interventions was obtained from each patient. To confirm the identity of the study conditions, patients of all groups were assessed the state of oral hygiene according to the simplified OHI-S index and determined the complex periodontal index according to P. A. Leus. anesthesia and isolation of the working field in patients of group I on the contact and chewing surfaces of the supporting teeth, box-shaped cavities of class II according to Black were prepared with rounded corners and the following parameters: length -3 mm, width -3 mm, depth -4 mm. After total etching of the solid tissues of the bottom and walls of the formed cavities with a 37% solution of phosphoric acid, a fifth-generation adhesive system was applied, and polymerization was carried out with the light flux of an LED photopolymerizer, according to the manufacturer's instructions. A thin layer of a fluid photocomposite material was applied to the gingival walls of the supporting cavities, into which Interlig, Angulus fiberglass tape was immersed parallel to the crest of the alveolar process and light polymerization was carried out. Then a second layer of a fluid photocomposite was applied and a second similar tape was inserted parallel to the first one, followed by light polymerization. The anatomical shape of artificial and abutment teeth was restored with a nanophotocomposite material, occlusal correction, grinding and polishing of the structure were performed. Patients of group II underwent similar stages of manufacturing AMPs with the same design of cavities, using two fiberglass beams, which were inserted parallel to each other and into the alveolar ridge. a fiberglass tape was installed parallel to the alveolar process, and a fiberglass beam was laid on top of the tape in the same direction. To create immersions of the same shape and size, diamond marking burs with a working part width and thickness of 1.0 mm were used. Other stages of AMP fabrication and reinforcement did not differ from those in group I patients. Finally, in patients of group VI, AMPs were fabricated according to the proposed method, which included the design of retention elements in the form of box-like cavities with additional immersions, as in patients of groups IV and V, and reinforcement of AMPs with fiberglass tape and a beam, similar to reinforcing the patients' prostheses. Group III [11] Patients of all groups were scheduled for follow-up examinations on the next day after the manufacture of AMP in 24 and 36 months. The absolute criteria were used to determine the integrity of the supporting elements and the intermediate part, the retention of the prostheses and the condition of the mucosa in the area of the intermediate part of the adhesive structures. In cases where the AMP did not meet one or more of the absolute criteria, the prosthesis received an “unsatisfactory” rating, it was removed and a new one was made with the consent of the patient, the patient was excluded from the study. The following indicators were involved in relative clinical criteria: restoration of the anatomical shape of artificial and abutment teeth, aesthetic characteristics, marginal fit of the photocomposite material to the hard tissues of the abutment teeth, restoration of occlusal relationships with antagonist teeth, absence of each other. market caries and complications from the pulp and periodontal abutment teeth. In case of non-compliance with the relative clinical criteria, the condition of the AMP was assessed as satisfactory, the violations were corrected with the consent of the patient, and the patient was monitored. If the AMP was in excellent shape and met all the criteria, he received an excellent grade and did not need any intervention. Clinical efficacy was determined by the number of prostheses that did not have any violations and corresponded to the assessment of "excellent". The results were given as absolute values and percentages. Significantly different results were considered with a significance level of $p<0.05$. Results and discussion. According to the results of the assessment of the simplified index of oral hygiene in 180 patients, insignificant differences were found between the indicators of individuals of different groups ($p>0.05$). Thus, patients of group II had the lowest OHI-S index, it was 1.05±0.12, higher than the values of the indices of patients in groups I, VI, V and III, which were 1.08±0.11; 1.13±0.09; 1.16±0.11 and 1.19±0.1, respectively, the worst index was in patients of group IV – 1.21±0.12. In general, oral hygiene was good. No significant differences were found among the patients of the six groups ($p>0.05$) in terms of the complex periodontal index. In patients of III, IV and VI groups, its value was 0.83±0.06; 0.86 ± 0.09 and 0.87 ± 0.08, respectively, the indicators of persons of groups II, I and V were insignificant, in particular, they were 0.98 ± 0.1; 1.04±0.08; 1.09±0.06. The condition of the periodontium of the examined individuals can be assessed as having a risk of developing the disease. The next day after the manufacture of AMPs, all 180 constructs (100%) met the requirements of absolute and relative clinical criteria. These prostheses were rated "excellent" and did not require intervention. After 24 months, patients with 112 AMPs (93.33% of the initial number of prostheses) remained in the clinical study. The other 8 AMPs (6.67%) were replaced, and patients, based on the results of previous examinations, were excluded from the study due to non-compliance of adhesive constructions with one of the absolute clinical criteria, and in patients of groups II, III and VI, all of them remained functional 20 AMPs (100%), in patients of group I - 15 prostheses (75%), in patients of groups IV and V - 18 (90%) and 19 (95%). During the follow-up examination, the clinical effectiveness of prosthetics in patients of group I 14 AMPs (70% of the initial number) had no comments and continued to function successfully. In patients of this group, a violation of the fixation of 2 AMPs (10.0%) was determined. These prostheses were marked "NO" for not meeting the absolute clinical criterion "retention", they were rated "unsatisfactory". In addition, fractures of 1 AMB structure were established (5%), for non-compliance with the absolute criterion "integrity of the supporting elements and the intermediate part of the AMB" they also received an "unsatisfactory" rating. These 5 prostheses (16.7%) were subject to replacement, this was offered to patients. In patients of group II, 2 prostheses (10.0%) were installed, which had chips of the cover photocomposite, that is,

they did not meet the relative clinical criterion "restoration of the anatomical shape of the teeth", for which they were rated as "satisfactory" and required correction.

In 1 AMT (3.3%), violations of the occlusal ratios of the artificial tooth with antagonist teeth were determined, as a result of which the prosthesis was rated "satisfactory". Prostheses with such violations were subject to correction. In addition, fixation disorders were found in 3 AMPs (10.0%), they were rated “unsatisfactory” and, with the consent of the patients, were replaced. The other 23 AMPs (76.7%) of patients in this group did not have any disorders, they were rated as "excellent". Among the patients of group III, a violation of the retention of 1 AMP (3.3%) was determined, who were presented with an “unsatisfactory” rating and replaced with a new one.

In the study for patients of all groups in the manufacture of AMPs, the same adhesive system of the fifth generation AdperSingleBond2, 3MESPE was used, but in patients of groups IV, V and VI, additional immersions were performed in the vertical walls of the supporting cavities, which increased the area of the adhesive connection, increased the macromechanical retention of prostheses in the vertical direction, thus minimizing the amount of violation of retention and marginal fit of the AMP. In addition, a significant factor influencing the fixation of AMPs with bilateral resistance is the differences in the micro-movement of the abutment teeth. These differences within a few months lead to the detachment of the AMP from one of the abutment teeth. Given this, in this work, patients were carefully examined in relation to the condition of the periodontium, and individuals with signs of inflammatory changes were excluded from the study. Thus, careful selection of patients, taking into account contraindications for the manufacture of AMPs, can significantly reduce the number of complications in the form of impaired fixation of AMPs. The structural strength of the AMB depends on the ratio of the specific volume of the reinforcing frame to the covering photocomposite material. In patients of groups I and IV, AMP reinforcement was 66.7%; in patients of groups V and IV, it was even lower, 63.3% and 56.7%. Again, the smallest number of successfully functioning prostheses was found in people of group I, in particular, only 14 designs received “excellent” ratings, that is, the efficiency was 46.6%. The greatest number of complications was associated with a violation of the anatomical shape of the constituent elements of the AMP (33.8% of the total number of complications in persons of all groups), complete destruction of the AMP structure due to a fracture of the photocomposite together with the reinforcing frame (28.2%), loss of retention of prostheses (19 .7%) and violation of the marginal fit (12.7%). In addition, isolated cases of the absence of occlusal contacts (2.8%), the occurrence of inflammation of the mucous membrane under the intermediate part of the AMP (1.4%) and the development of secondary caries (1.4%) were recorded. From the side of aesthetic properties, no changes in color, transparency and gloss of the surface of the structures were found. box cavities. The strength of fixation of adhesive prostheses is affected by the choice of the adhesive system, the area of the adhesive connection of the photocomposite with hard tissues of the teeth, and the configuration of the retention elements. In the study for patients of all groups in the manufacture of AMPs, the same adhesive system of the fifth generation AdperSingleBond2, 3MESPE was used, but in patients of groups IV, V and VI, additional immersions were performed in the vertical walls of the supporting cavities, which increased the area of the adhesive connection, increased the macromechanical retention of prostheses in the vertical direction, thus minimizing the amount of violation of retention and marginal fit of the AMP. In addition, a significant factor influencing the fixation of AMPs with bilateral resistance is the differences in the micro-movement of the abutment teeth. These differences within a few months lead to the detachment of the AMP from one of the abutment teeth. Given this, in this work, patients were carefully examined in relation to the condition of the periodontium, and individuals with signs of inflammatory changes were excluded from the study. Thus, careful selection of patients, taking into account contraindications to the manufacture of AMPs, can significantly reduce the number of complications in the form of a violation performed with two Interlig, Angulus fiberglass tapes parallel to each other, 0.2 mm thick and 2 mm wide, and it was in patients of these groups that more often occurred complications in the form of a violation of the integrity of the AMB structures due to a fracture of the photocomposite material together with the reinforcing frame. In patients of groups II and V, the specific volume of fiberglass reinforcement of AMP was maximum, because the frame was created using two glass fiber beams JenFiberBulkNo3, Jendental, with a diameter of 1.8 mm. In patients of these groups, more often there were chips of a fragment of the photocomposite material from the reinforcing frame or in the thickness of the photocomposite. A possible reason should be considered insufficient space for the cover photocomposite layer, which, as you know, should have a thickness of at least 1 mm. A significantly lower number of such complications was observed in patients of groups III and VI, in whom AMPs were reinforced with fiberglass tape and a beam, which were inserted in one direction. The use of a tape instead of the lower beam makes it possible to increase the photocomposite layer on all sides of the reinforcing frame, compensate for the tensile stresses that occur in the crown part of the artificial tooth under the action of vertical masticatory pressure, and counteract the rotational angular load at the moments of transversal movements of the lower one.

Findings.

During the three-year follow-up period, the highest clinical efficacy, which was 93.3%, was demonstrated by adhesive bridges made with the proposed design of retention elements and reinforced with fiberglass tape and a bar. The most common complications in the operation of adhesive structures made according to other approaches were violations of the integrity and retention of prostheses, as well as the marginal fit of the photocomposite. More often, such complications occurred in patients of group I, in which the reinforcement

of the prostheses was performed with two fiberglass tapes. Prospects for further research. In the future, it is necessary to continue laboratory and clinical studies aimed at finding and determining the optimal design of highly aesthetic and functional adhesive bridges using the latest reinforcing and facing materials for long-term and effective prosthetics in patients with included dentition defects.

References

1.Sorohan M, Bjelikov O. Comparative characteristics of dental bridges with a minimally invasive preparation of abutment teeth (the literature review). Bukovyns'kyj medychnyj visnyk.2017;21(1):224-9.

2. Boujoual I., El Yamani A., Andoh A. Single dental restoration by resin-bonded bridge. International Journal of Advanced Research. 2018;6 (10):203-7.

3. Tacir I, Dirihan R, Polat Z, Salman G, Valittu P, Lasilla L, et al. Comparison of load-bearing capacities of 3-unit fiber-reinforced composite adhesive bridges with different framework designs. Medical Science Monitor. 2018;24:4440-8.

4. Augusti D, Augusti G, Ionescu A, Brambilla E, Re D. Fiber-reinforced composite resin bridges: an alternative method to treat root-fractured teeth. Restorative dentistry & Endodontics. 2020 Feb;45(1):1-9.

5. Escobedo M, Rodríguez S, Valdés J, Olay S, Mauvezín M. A new technique for direct fabrication of fiber-reinforced composite bridge: a long-term clinical observation. Dental Journal (Basel). 2020;8(2):48. DOI:10.3390/dj8020048

6. Scribante A, Vallittu P, Ozcan M, Lassila L, Gandini P, Sfondrini M. Travel beyond clinical uses of fiber reinforced composites (FRCs) in dentistry: a review of past employments, present applications, and future perspectives. BioMed Research International. 2018;8:1-8.

7. Rajak D, Pagar D, Menezes P, Linul E. Fiber-reinforced polymer composites: manufacturing, properties and applications. Polymers. 2019 Oct;11(10). DOI: 10.3390/polym11101667.

8. Scribante A, Vallittu P, Özcan M. Fiber-reinforced composites for dental applications. BioMed Research International. 2018;2018:4734986. DOI:10.1155/2018/4734986.

9. Tuncdemir A, Guven M. Effects of fibers on color and translucency changes of bulk-fill and anterior composites after accelerated aging. BioMed Research International. 2018;Jan. 28:1-8. DOI: 10.1115/2018/2908696.

10. Udod A., Pompiy A, Shidlovsky N. Laboratory investigation of the reinforced photo composition material bending strength. ModernScience. 2019;4:143-9.

11. Udod O, Pompij O. Method of direct manufacturing of adhesive bridges Patent Ukrai'ny na korysnu model' No 130904. 2018. BjulNo 24.

12. Pompij O, Udod O. The system for evaluating the clinical state of adhesive bridges is symmetrical. Certificate of copyright registration for the work no. 85034. 2019 January. 30