

ADHESIVE BRIDGES IN THE TREATMENT OF HYPODONTIA OF THE UPPER LATERAL INCISORS IN ADULTS: 12 YEARS OF CLINICAL OBSERVATIONS

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ABSTRACT

INTRODUCTION: Hypodontia of the upper lateral incisors can be treated with an implant-supported denture, fixed and removable denture, and orthodontic procedures. Due to fast effect of the treatment and relatively low cost, one of the possible therapeutic options is an adhesive bridge.

OBJECTIVES: The aim of the study was to present the clinical effects of the use of adhesive bridges in the treatment of agenesis of the upper lateral incisors during 12 years of observation.

MATERIAL AND METHODS: The study included 13 adhesive bridges that were used in patients aged 18-30. The bridges were clinically and radiologically evaluated every 6 months in the first year of use, and then every year for a period of 12 years. In the 10th year of follow-up, patients participated in a survey measuring their satisfaction with the therapeutic method.

RESULTS: In the first 6 years, there was no aberration from the acceptable state in any case assessed. In the 7th and 10th year of observation, 2 fiber-reinforced composite bridges (FRC) were lost. Maryland bridges achieved a full clinical success after 12 years of use, despite slight color disharmony in relation to neighboring teeth and the necessity of re-cementing 1 bridge, while FRC bridges showed clinical efficiency of 55.55%.

CONCLUSIONS: The results obtained indicate that adhesive bridges can be used as long-term restoration in the treatment of hypodontia of the upper lateral incisors. The conditions determining their application are the absence of carious lesions of the abutment teeth, a large adhesive surface within the enamel, and particularly good oral hygiene.

KEY WORDS: clinical evaluation, hypodontia, survey research, adhesive bridges.

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INTRODUCTION

Modern dentistry has many methods of restoring congenitally missing teeth in the anterior region, including implant-supported denture, fixed and removable dentures, adhesive bridges, and orthodontic space closure followed by dental recontouring [1-3].

According to many authors, the most recommended method involves the use of implant-supporting single crown, consisting of the insertion of intraosseous dental implant and the fitting of ceramic or metal-ceramic crown. In the case of limited space, a mini implant may be used instead of the traditional one [4-6]. However, it should be noted that the single implantation in

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the aesthetic region in young patients can lead to serious complications. It has been proven that clinically significant vertical bone growth of the alveolar ridge occurs after the age of 20, especially in men. Too early implant placement in the region of upper lateral incisors may result in the formation of incisal line and an open bite at the implant site. The implant restoration does not follow the development of cranio-facial structures, which results in a higher implant position [7, 8].

A long-lasting positive effect of treatment is also obtained after the use of traditional three-unit bridges. However, the need for extensive preparation of abutment teeth was associated with significant loss of dental hard tissues and can irritate pulp tissue causing inflammation, which consequently increases the possibility of early or late post-operative complications [9, 10].

In situations, where local or general contraindications, patient reluctance to have the surgery performed or economic restrictions exist, other therapeutic methods should be considered. One of the solutions is the use of adhesive bridges, e.g. Rochette or Maryland [11-15]. These restorations based on a metal framework are characterized by high mechanical strength and good retention [12-14]. An alternative solution is the use of fiber-reinforced composite bridges (FRC). They can be made by direct or indirect methods [15, 16]. FRC bridges are considered minimally invasive restorations because they require only a little preparation of mineralized tissues. In some cases, the preparation may relate to previously made fillings, or even may not be needed if there is sufficient space for wing retainers [15]. In the treatment of hypodontia of the upper lateral incisors, zirconia ceramic cantilever resin-bonded fixed dental prostheses (RBFDPs) are also used [17]. It has been observed that they do not generate unfavorable stresses between the blocked spans of the abutment teeth, which occur during protrusive movements and laterotrusion in three-unit bridges [18]. The single-span bridge moves together with the abutment tooth.

OBJECTIVES

The aim of the study was to present the clinical effects of the use of adhesive bridges in the treatment of agenesis of the upper lateral incisors during 12 years of observation.

MATERIAL AND METHODS

The study included 4 Maryland and 9 FRC bridges that were used in 13 patients aged 18-30. They were one of 6 groups among 146 patients, who were under the treatment for hypodontia of the upper lateral incisors. Adhesive bridges were supposed to be used as temporary restorations before implantation. However, due to changes in patients' economic status, they were left

as long-term restorations. All patients were generally healthy, with proper oral hygiene maintained and low risk of caries and did not require additional preventive procedures. Ten patients were previously treated orthodontically. The teeth surrounding the gap did not require preparation, or a small preparation was performed in the presence of existing fillings.

Maryland bridges were made in the technical laboratory of HEARENium PW alloy (Heraeus Kulzer GmbH, Germany) and Vita Omega ceramic (Vita Zahnfabrik, Germany). FRCs were made using the direct method of Herculite XRV Laboratory composite (Kerr Corp, USA) on a FibreKor fiberglass substructure (Pentron Clinical, USA). Maryland bridges were cemented using Panavia adhesive cement (Kuraray Dental, Japan).

The bridges were clinically and radiologically evaluated every 6 months in the first year of use, and then every year for a period of 12 years as well as in emergency situations. The California Dental Association (CDA) quality assessment system was applied for functional and aesthetic assessment, which was modified for the purposes of this study. A 4-grade assessment scale was adopted: A – acceptable, B – restoration requiring repair, C – re-making, D – loss of restoration and change of treatment method. The result of the treatment was considered acceptable if evaluated additions maintained their retention, marginal tightness, anatomical shape, surface color, and smoothness. Moreover, the condition of periodontal tissues, gums, and mucosa was adequate, and there were no pain, fractures, periapical changes, and symptoms of caries. The type and number of restoration damage and repairs performed were recorded in a patient's file.

In the 10th year of follow-up, patients participated in a survey measuring their satisfaction with the therapeutic method used. The following questions were included in the survey: Are there any complications? Is the aesthetic effect satisfactory? Is the chewing efficiency correct? Is the phonetics correct? Have the repairs meet your expectations? Are you satisfied with follow-up visits? Would you change the therapeutic method used to treat the hypodontia of the upper lateral incisor? Each question had a 2-level, balanced Yes/No answer scale.

Excel Office 365 (Microsoft) was used to analyze the therapeutic effects obtained and survey data.

RESULTS

Figures 1-4 show selected adhesive bridges after adhesive fixing and after 12 years of usage. Figure 5 demonstrates the loss of the adhesive bridge, Figure 6 shows the delamination, and Figure 7 presents atrophy of bone tissue at the site of tooth agenesis 12. The results of the assessment of effectiveness of adhesive bridges are presented in Figure 8.

Table 1 presents the results of patients' satisfaction survey 10 years after completing the additions.



FIGURE 1. Patient B.S. Maryland bridge 12 after adhesive fixing



FIGURE 2. Patient B.S. State after 12 years



FIGURE 3. Patient M.P. FRC bridge 22



FIGURE 4. Patient M.P. State after 12 years



FIGURE 5. Patient M.P. Loss of FRC bridge 22

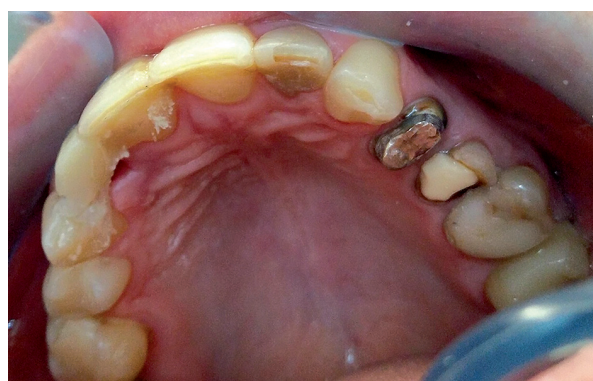


FIGURE 6. Visible FRC delamination

In the first 6 years, there were no aberration from the acceptable state (grade A) in any case assessed. In the 7th year of observation, 2 FRC bridges lost their retention due to delamination and required re-making. In the 10th year of follow-up, another 2 FRC bridges lost their retention, and patients decided to change the treatment method.

Maryland bridges achieved full clinical success after 12 years of usage, despite the slight color disharmony in relation to neighboring teeth and the necessity of re-cementing 1 bridge, while FRC bridges showed clinical efficiency of 55.55%. The adhesive reconstruction made were highly rated by patients in terms of aesthetic, functional, and economic values.



FIGURE 7. Visible atrophy of the alveolar bone in the neighborhood of tooth agenesis 12

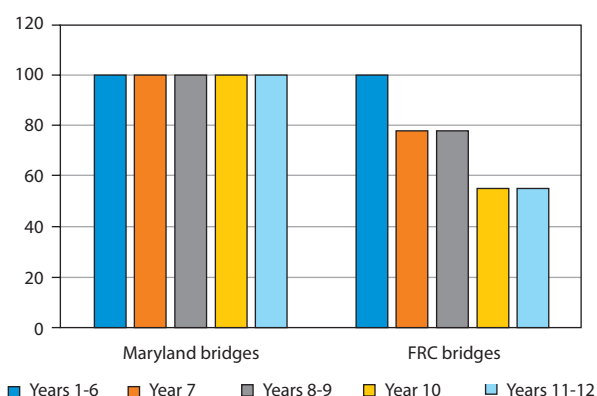


FIGURE 8. Evaluation of the effectiveness of Maryland and FRC bridges in the treatment of hypodontia of upper lateral incisors in adult patients in years 1-12

Based on digital radiological photography, it was found that under the bridge spans, at the place of the missing tooth, bone tissue atrophy occurs, which may cause aesthetic problems.

Patients treated with adhesive bridges declared 100% satisfaction with aesthetic and functional effects, although 15.38% reported complications and 23.07% reported problems with their use. Also, 100% of respondents declared compliance of the treatment effect with expectations, 84.61% of positively assessed repairs done. However, 15.38% of respondents would change the treatment method.

DISCUSSION

The treatment of hypodontia of the upper lateral incisors in adults is a difficult therapeutic challenge. When deciding on the treatment method, it is necessary to consider the restoration of oral function in accordance with the requirements of comfort and aesthetics, while maintaining the proper condition of the teeth surrounding the gap [2]. Many years of experience indicate that the best clinical effects are obtained after the application of the intraosseous implant and the protective crown [3]. When choosing the implant prosthetic procedure, the patient's age, coexisting dental occlusal defects, systemic diseases, preferences, and the economic status should be taken into account. In young patients and due to possible orthodontic recurrence, temporary restorations are used prior to implantation. At present, mainly adhesive restorations are made for this purpose, which have little or no invasiveness for the teeth surrounding the gap. In some cases, temporary bridges become long-term [16].

The study and literature data point to varying clinical effectiveness of adhesive bridges [16, 19-24].

Under the terms of the present study, an acceptable condition was noted in all cases during the first 6 years of observation. This is a better result than previously

TABLE 1. Results of the patient satisfaction survey 10 years after completing the additions

Type of reconstruction	Number of patients	Number of questions	Answer	
			Yes	No
Addition	13	1	2	11
		2	13	0
		3	11	2
		4	13	0
		5	3	10
		6	13	0
		7	11	1
		8	13	0
		9	2	11

described. In the case of FRC bridges, other authors reported 91.3% of positive clinical effects after 2 years, 78.3% after 3 years [19], and 82.7% after 42 months [20]. The authors of above-mentioned studies reported that a relatively small percentage of damage to the bridges under assessment resulted from a very careful selection of patients, in whom all support zones were preserved.

A meta-analysis carried out by Alraheem *et al.* showed that adhesive bridges allow, over a 5-year observation period, clinical success of 88.18% for a metal framework and 84.41% for non-metal framework (including 92.07% of zirconium oxide), 94.26% of Al_2O_3 , and 84.83% of FRC bridges), with a failure rate of $p > 0.05$. Technical errors were indicated as the main cause of failures [21].

One case of polymer delamination found in the 7th year of observation was a consequence of an error in the clinical procedure, while 2 cases resulted from probable occlusal overloads. One FRC bridge was made again and is still in use. However, in the second and subsequent 2 cases of loss of FRC bridge retention (in the 10th year of observation), the therapeutic method was changed and traditional 3-point ceramic-metal bridges were made.

Under the conditions of the present study, the full clinical success was obtained after the application of adhesive bridges on a metal framework, which confirms previous reports [21-23], e.g. Botelho *et al.* found an acceptable clinical effect in 97% after 5 years, 91% after 10 years, and 84 % after 15 years [22].

Other study showed 100% of clinical success after 6 years and 98.2% after 10 years using RBFDPs. Based on the research, it was found that this method achieves better results than traditional bridges or implants [24].

Good condition of the marginal periodontium was observed in nearly all evaluated adhesive bridges. In addition, patients maintained particularly good oral hygiene and they followed the instructions perfectly.

Despite the damage in some cases, adhesive restorations were highly rated by patients. When making ad-

hesive restorations, it is necessary to inform the patient about the advantages and disadvantages of these constructions. They should not be performed on demanding patients as well as patients with oral hygiene problems. Also, adhesive bridges are not recommended for persons with parafunction [20, 22, 25].

In the case of teeth with short clinical crowns with disturbed enamel structure, non-carious defects, or present fillings, the enamel surface for adhesive fixing is often too small to guarantee the adequate retention. Due to the above, the abutment teeth must have the right height to guarantee a large adhesive surface. The preparation of mineralized tissues should be deep enough to ensure that the thickness of the composite layer is at least 2 mm, which will prevent the possibility of polymer rupture [26].

CONCLUSIONS

The results obtained indicate that adhesive bridges can be used as long-term restoration in the treatment of hypodontia of the upper lateral incisors. The conditions determining their application are the absence of carious lesions of the abutment teeth, a large adhesive surface within the enamel, and particularly good oral hygiene.

CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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