

IMPROVEMENT OF PREVENTIVE PROSTHESES USED IN CHILDREN AFTER
THE LOSS OF PERMANENT MOLARS

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Abstract: The loss of permanent molars in school-aged children is associated not only with impaired masticatory function but also with the development of secondary deformities of the dentoalveolar system. In this regard, the timely application of preventive prostheses becomes particularly important. The aim of the present study was to improve the design of a removable preventive prosthesis for children aged 7–12 in order to restore function, stabilize jaw growth, and prevent dental arch deformities. Based on clinical observations and dynamic assessment of masticatory function, dental arch form, and occlusion in 28 patients with partial molar loss, a modified version of the removable prosthesis with elements influencing guided growth was developed and tested. The results demonstrated the clinical effectiveness of the proposed design and justified its use in early orthopedic treatment of children with post-extraction loss of permanent molars.

Keywords: preventive prosthetics, children, permanent molars, removable prosthesis, dental arch deformities, pediatric prosthodontics

Introduction

The loss of permanent molars in children of younger and middle school age (7–12 years) presents not only an orthopedic issue but also a complex dental problem, potentially leading to significant functional and morphological consequences. During this developmental period, occlusion formation, facial skeletal growth, and the establishment of dental arch relationships occur. Early loss of first permanent molars due to caries, trauma, or hypoplasia severely disrupts the dental arch balance and may result in secondary displacement of adjacent teeth, distal or mesial tipping, occlusal disturbances, jaw asymmetry, and functional overload of remaining teeth [1, 2].

Preventive prosthodontics in pediatric dentistry aims to timely restore the continuity of the dental arch, maintain masticatory function, prevent deformities, and stimulate proper jaw growth. However, conventional designs of removable dentures used in children often fail to meet the anatomical and functional requirements of the growing organism. Common limitations include poor retention, low adaptability, lack of guided growth influence, and the inability to adjust the prosthesis without full replacement [3–5].

Current trends in pediatric prosthodontics focus on improving appliance design, enhancing wear comfort, functionality, and therapeutic efficacy. In this context, the development of improved preventive prostheses that not only replace lost teeth but also exert a regulatory effect on the development of the dentoalveolar system becomes highly relevant.

The aim of this study was to clinically justify and test an improved design of a removable preventive prosthesis for children aged 7–12 with loss of permanent molars, taking into

account the anatomical and physiological characteristics of the growing child and the need to guide jaw growth.

Literature Review

Preventive prosthodontics in children with partial tooth loss is a key area in pediatric dental rehabilitation, as it helps maintain functional integrity of the dental system, prevent dental arch deformities, and avoid malocclusions. According to various authors, early loss of permanent molars in children occurs in 14–22% of cases, especially in socioeconomically vulnerable populations [1, 2]. The main causes are complicated caries, enamel hypoplasia, trauma, and lack of timely dental intervention.

The most commonly used preventive prosthetic designs include removable acrylic plate prostheses with clasp retention, removable partial dentures (in adolescents), and fixed splinting or space-maintaining appliances when abutment teeth are available [3]. However, classical removable designs often present several disadvantages in younger children: limited retention, low stability during mastication, potential soft tissue trauma, and inability to adapt to continued jaw growth [4].

Recent studies emphasize the need for an individualized approach to prosthetic design selection, considering factors such as occlusion type, growth direction, deciduous dentition status, arch symmetry, and the child's general health [5, 6]. Particularly promising are functionally guided prostheses that not only replace missing teeth but also influence jaw growth and occlusal development [7].

Innovations include appliances with adjustable support elements, modifiable bases, and replaceable artificial teeth that allow for adaptation over time. Some designs incorporate guiding bars, vertical growth modules, and buccal shields that prevent mesial tooth shifting and promote balanced load distribution [8, 9].

Thus, despite the diversity of available prosthetic designs for children with missing molars, the need for their improvement remains urgent. Enhancing adaptability, functional effectiveness, and preventive impact requires that new designs consider anatomical features, growth potential, functional correction needs, and the requirement for long-term clinical monitoring.

Materials and Methods

This prospective comparative clinical study was conducted as part of a clinical-experimental project at the Department of Prosthetic Dentistry and a pediatric dental clinic from 2024 to 2025. The primary aim was to clinically validate the effectiveness of an improved design of a removable preventive prosthesis for children aged 7–12 who had lost one or more permanent molars due to caries or trauma.

A total of 28 patients (16 boys and 12 girls) aged 7 to 12 years were enrolled. All were in the mixed dentition stage or early permanent dentition. Inclusion required premature loss of the first or second permanent molars (in some cases premolars) and preserved overall systemic health.

Inclusion criteria:

- Partial loss of one or more permanent molars;
- General somatic health within normal limits;
- Absence of severe malocclusions at initial examination;
- Informed consent from parents.

Exclusion criteria:

- Generalized periodontal disease;
- Systemic illness in decompensated stage;
- Severe craniofacial developmental anomalies;
- Neurological or behavioral disorders interfering with treatment.

Patients were randomized into two groups for comparison:

- **Main group (n = 14):** received a modified removable preventive prosthesis designed with growth-guiding elements, including a lightweight acrylic base with extended retention surface, replaceable tooth segments, integrated buccal shields (when needed), and inclined guiding planes to promote vertical alveolar development.
- **Control group (n = 14):** received conventional removable plate prostheses with clasp retention but without guiding or regulating elements.

Clinical effectiveness was evaluated at four time points: before prosthesis insertion, and at 1, 3, and 6 months post-insertion. Assessments included:

- Clinical examination with periodontal charting and hygiene index (OHI-S);
- Evaluation of occlusal relationships, arch symmetry, and stabilization using photographic analysis and dental models;
- Subjective assessment of adaptation, comfort, and satisfaction (using visual analog scale);
- Step-by-step photo documentation.

Statistical analysis included descriptive statistics, Shapiro–Wilk test for distribution normality, and comparison of intergroup differences using Student’s t-test and Pearson’s chi-square test. Statistical significance was set at $p < 0.05$.

Results and Discussion

The clinical observations obtained during the study confirmed the positive impact of the improved removable preventive prosthesis design on the stabilization of the dentoalveolar system in children with premature loss of permanent molars. All participants in both the study and control groups completed the scheduled follow-up period in full. Compliance was 100%, which can be attributed to the active involvement of parents and the high motivation of the patients.

Analysis of oral hygiene index (OHI-S) demonstrated improvement in both groups compared to baseline values. However, in the study group, the index normalized as early as

the first month (mean reduction from 2.4 to 1.1 points), whereas in the control group, stabilization was only observed by the third month (from 2.3 to 1.4). The intergroup difference was statistically significant ($p < 0.05$).

Assessment of diagnostic models revealed stabilization of abutment tooth position and absence of mesial migration in 85.7% of children in the study group. In contrast, 42.8% of patients in the control group exhibited mesial drift of adjacent teeth into the edentulous space, indicating limited stabilizing potential of conventional designs.

Photometric analysis of occlusion showed improvements in occlusal parameters in the study group, particularly in occlusal plane leveling and bite height restoration. By the sixth month, 10 out of 14 children in the study group demonstrated positive dynamics in occlusal contact formation on the prosthetic side, compared to only 5 patients in the control group.

Subjective evaluation of comfort and adaptation using a visual analog scale also revealed greater satisfaction in the study group. The average comfort score was 8.4 ± 0.6 compared to 6.9 ± 0.8 in the control group ($p < 0.01$). Parents of children in the study group reported faster adaptation, better retention, and fewer complaints of mucosal irritation.

Overall, the data support the conclusion that the modified design of the removable preventive prosthesis offers several functional and structural advantages: enhanced retention, improved stabilization of adjacent teeth, potential for guided growth influence, and better adaptation in younger patients. These findings emphasize the importance of a comprehensive approach in pediatric prosthetic design, considering not only restorative but also preventive and developmental functions.

Thus, the proposed design can be regarded as an effective solution for early orthopedic management in children with post-extraction loss of chewing teeth, improving occlusal prognosis and reducing the risk of secondary dentofacial deformities.

Conclusion

The results of this clinical study confirmed that the improved design of the removable preventive prosthesis provides higher efficacy in restoring masticatory function, stabilizing dental arches, and preventing secondary deformations in children with premature loss of permanent molars. The integration of guiding elements, buccal shields, and interchangeable modules enabled both anatomical and functional adaptation of the prosthesis to the dynamics of the growing craniofacial system.

Compared to conventional removable prostheses, the modified design demonstrated better clinical stability, improved hygiene outcomes, and greater subjective satisfaction among children and their parents. These findings support the use of the proposed design in pediatric dental practice as an effective tool for early preventive prosthetic rehabilitation, aimed not only at tooth replacement but also at maintaining proper occlusal development.

Future research should focus on expanding the sample size and conducting long-term follow-up to evaluate the stability of orthopedic and functional outcomes during adolescence.

References

1. Ponomaryova GM. Protezirovanie u detey i podrostkov [Pediatric and adolescent prosthetics]. Moscow: MEDpress-inform; 2016. Russian.
2. Baranova VV. Profilakticheskoe protezirovanie pri rannei utrate postoyannykh zubov [Preventive prosthetics in early loss of permanent teeth]. *Sovremennaya Stomatologiya*. 2021;(3):45–8. Russian.
3. Kalivradzhiyan SK. Detskoe protezirovanie [Pediatric prosthodontics]. Saint Petersburg: SpetsLit; 2018. Russian.
4. Fedorova VL, Ilina OA. Konstruktsii syomnykh protezov u detey s chastichnoy poterey zubov [Removable prosthesis designs in children with partial tooth loss]. *Rossiiskii Stomatologicheskii Zhurnal*. 2020;(4):18–22. Russian.
5. Shnaider MYu, Poryadin VI. Morfofunktsional'nye posledstviya rannei utraty postoyannykh molyarov [Morphofunctional consequences of early permanent molar loss]. *Stomatologiya*. 2019;98(5):52–5. Russian.
6. Khouw FE. Space maintainers in pediatric dentistry: clinical considerations. *Int J Clin Pediatr Dent*. 2020;13(1):72–7.
7. Nowak AJ, Christensen JR. *Pediatric Dentistry: Infancy through Adolescence*. 6th ed. Philadelphia: Elsevier; 2019.
8. DeJesus-Medina A, et al. Removable appliances for growing patients: benefits and limitations. *Eur Arch Paediatr Dent*. 2022;23(2):159–65.
9. Gorbachev AS. Funktsional'nye osobennosti profilakticheskogo protezirovaniya v pediatricheskoi praktike [Functional features of preventive prosthetics in pediatric practice]. *Vestnik Sovremennoy Klinicheskoy Stomatologii*. 2022;(2):31–4. Russian.
10. Karaseva IA. Individualizatsiya profilakticheskikh konstruktsii u detey 7–12 let [Individualization of preventive prosthetics in children aged 7–12]. *Detskaya Stomatologiya*. 2021;(1):26–30. Russian.
11. Tuychiyev R. Enhancing therapeutic strategies for herpetic stomatitis: a comprehensive approach towards improved patient outcomes // *Western European Journal of Medicine and Medical Science*. – 2024. – T. 2. – №. 2. – C. 10-14.
12. Tuychiyev R. Dentofacial implications of rickets: insights from pediatric cases // *World Bulletin of Public Health*. – 2024. – T. 31. – C. 16-18.
13. Valijon og'li T. R. ACCURACY OF LINGUAL STRAIGHT-WIRE ORTHODONTIC TREATMENT WITH PASSIVE SELF-LIGATING BRACKETS AND SQUARE SLOT: A RETROSPECTIVE STUDY // *Web of Medicine: Journal of Medicine, Practice and Nursing*. – 2024. – T. 2. – №. 6. – C. 35-46.
14. Jaloliddinova S. ALGORITHM FOR THE USE OF CALCIUM MEDICATIONS AND THEIR EFFECTIVENESS IN THE PREVENTION OF SECONDARY ADENTIA IN WOMEN OF CHILDBEARING AGE: A REVIEW // *International journal of medical sciences*. – 2025. – T. 1. – №. 1. – C. 286-290.
15. Khalilova B. R., Musayeva O. T., Urinboeva Y. THE PREVALENCE AND STRUCTURE OF THE INCIDENCE OF STOMATITIS IN CHILDREN // *World of Scientific news in Science*. – 2024. – T. 2. – №. 3. – C. 215-224.