MEDICAL SCIENCES

METHODS OF RESTORATION OF PRIMARY MOLARS

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In recent years, many authors have addressed the issue of restoration of primary teeth [1, 2, 4, 5]. However, in most cases, the focus has been on replacing the defect in the hard tissues of the crown of primary teeth without considering the role of these teeth in occlusion and articulation. There is relatively little scientific research on the issues of articulation and occlusion in primary and mixed dentitions [6, 7]. However, a number of authors point out the importance of occlusion and articulation in both primary and mixed dentitions in the formation of a harmonious permanent bite.

During the development of the dento-maxillo-facial system, primary (milk) teeth undergo a series of topographical and morphological changes. The formation of proper dental arches in the upper and lower jaws in the primary dentition is largely influenced by genetic factors, but the type of feeding also plays an important role.

The formed primary dentition is classically characterized as follows: 1) the shape of the dental arches in both the upper and lower jaws is semicircular; 2) there are diastemata and spaces (tremas) between the primary teeth in both the upper and lower jaws; 3) the distal cusp of the second upper primary molar overlaps with the corresponding cusp of the second lower primary molar, creating a "mesial step"; 4) physiological wear of the cusps and incisal edges of the primary teeth in both the upper and lower jaws occurs; 5) the incisal overlap is minimal, or the primary incisors of the upper and lower jaws come into contact with their incisal edges.

Based on the standard physiological primary dentition, the goal of modern restoration of primary teeth is to restore the aesthetic and functional architecture of the hard tissues of the crowns of primary teeth, taking into account the role of the crown elements in occlusion and articulation, as well as their indirect influence on the growth and development processes of the dento-maxillofacial area.

To address this task, we proposed a method for restoring primary molars using indirect restorations. In the current domestic and international dental literature, we have not encountered mentions of the possibility of using composite inlays on primary teeth. This is largely due to time constraints during dental appointments, the often inadequate behavior of children during appointments, and the limitation of using light-cured composite filling materials on primary teeth.

The question also arises regarding the feasibility of using inlays to restore primary teeth. Drawing an analogy with the use of composite inlays on permanent teeth, we applied the Occlusal Surface Destruction Index (OSDI) developed by V.Yu. Milykevich. This index is used to determine the degree of destruction of the occlusal surface of molars in Class I—II defects and to select the prosthetic design. The index is calculated as the ratio of the "cavity—filling" area to the chewing surface of the tooth. The entire area of the occlusal surface of the tooth is taken as 1, and the OSDI is calculated as a percentage of the cavity or filling area relative to the entire occlusal surface.

The author determined that when the OSDI is between 0.55 and 0.6 (i.e., when the surface is destroyed by more than 50%), the use of an inlay is recommended to prevent further destruction. For an index of 0.6 to 0.8, filling and artificial crowns are indicated, while for an index greater than 0.8, the fabrication of pin-retained restorations is recommended. However, the goal of using inlays in the restoration of permanent teeth is to preserve occlusal contact points and the "occlusal compass" as factors for effective load vector distribution and physiological articulation within the articulation paths of group function of the jaw.

The primary and mixed dentitions have a more complex architecture of arches and occlusal surfaces due to the growth of the jaws and the formation of spaces and diastemata, as well as physiological wear of the cusps, which in turn is necessary for changing load vectors that stimulate jaw growth. Therefore, using inlays made of high-strength materials on primary teeth may require placing such patients under regular dental observation, with adjustments to the occlusal surface of the inlay to match the age-related topography of the distribution of wear points/facets on the crowns of primary teeth.

We set the task of studying the processes of physiological wear of the occlusal surfaces of primary teeth crowns, the topographical variability of wear facet distribution, and the occlusal contact points in primary and mixed dentitions. To do this, we selected 150 children aged 3 to 8 years. To study the topographical variability of the distribution of occlusal contact points, the children were divided into four groups: 1) those with a formed primary dentition (3 years ± 6 months); 2) those with a formed primary dentition but with spaces and diastemata between the incisors and canines of the upper and lower jaws (from 4 to 5.5 years); 3) children in the early stage of eruption of the first permanent molar (from 6 to 7 years); 4) children with a mixed dentition during the eruption of the central permanent incisors of the upper and lower jaws (from 7 to 8 years). For all children, an occlusal diagram was taken, and the results were digitized to create a computer statistical model of the distribution of occlusal contact points relative to the occlusal surface area in the primary dentition.

For the study of the topographical variability of the distribution of wear facets on the occlusal surfaces of primary teeth crowns, the children were divided into four age groups: 1) 4 years; 2) 5 years; 3) 6 years; 4) older than 6.5 years, but with unchanged primary central incisors.

The contours of the wear facets were colored, and these contours were transferred to the occlusogram for subsequent digitization, enabling the creation of a computer statistical model of the distribution of wear facet topography relative to the occlusal surface area of the primary dentition. The obtained data were presented in the form of a compiled computer model depicting the distribution of occlusal contact points and wear facets during different periods of physiological changes in the occlusal relationships between the dental arches in the primary dentition as part of the growth and development process (Figures 1-4).

Based on the obtained data, a protocol for the dispensary management of children with restored primary teeth using indirect restorations was developed, considering the necessity of selective adjustment of the restorations to simulate the physiological wear of the occlusal surface of the crowns of primary teeth.

Preparing a primary tooth for restoration using inlays is not different from preparing permanent teeth. When preparing teeth for inlays, the following basic principles are followed: 1) the cavity is given the most rational shape to ensure the smooth insertion and removal of the inlay, i.e., all external walls should slightly diverge, and therefore, the entrance part should be slightly wider; 2) a box-like cavity shape must be created from which the inlay model can only be removed in one direction (the internal walls of the cavity should be parallel to each other and perpendicular to the bottom); 3) to prevent secondary caries, the cavity is prophylactically expanded and a bevel (falz) is created along the enamel margin, grinding it at a 45° angle, approximately 1/3 of the enamel thickness; 4) to prevent displacement or tipping of the inlay due to vertical and transverse forces, additional retention elements are created within healthy hard tissues; 5) when forming cavities in difficult-to-reach interproximal areas, an initial cut is made; after removing the contacting part of the tooth, free access to the carious cavity is opened, facilitating its formation; 6) the cavity should be asymmetrical or have additional indentations, serving as a guide when inserting the inlay; 7) the cavity should be sufficiently deep, extending into the dentin and not shifting under the influence of chewing pressure; 8) cavity preparation for the inlay should conclude with smoothing the edges and walls with carborundum burs and finishers.

To fabricate the inlay, an impression is made using silicone material. A model is cast from supergyp or fast-setting modeling materials. The model is coated with an isolating varnish. The inlay is modeled from light-cured composite filling materials, considering the appropriate age-related architecture of the occlusal and interproximal surfaces of the tooth, and the restoration of the "occlusal compass" of primary teeth. Polymerization of the inlay material is performed, followed by grinding and polishing. The inlay is cemented using glass ionomer cement.

An analysis of 50 indirect restorations of primary teeth and 80 fillings on primary teeth made of glass ionomer cement, conducted to assess the hygiene of inlays and the restoration of chewing efficiency, showed that plaque formation in the area of the inlays was 83% lower than in the area of similarly located glass ionomer cement fillings. According to the analysis of occlusograms, the use of composite material inlays for restoring primary teeth, with gradual correction of the occlusal surface of the restoration to simulate the physiological wear of the cusps, resulted in the preservation of the volume and topography of the occlusal contact points reaching 94% compared to the nominal volume of occlusal contact points on the opposite, intact side of the jaw.

Thus, the use of indirect restorations in primary teeth is feasible when there is a need to restore a large volume of lost hard tissue in the tooth crown, provided that the average topography of occlusal contact points is maintained and the patient is monitored through dispensary observation, with selective adjustment of the restoration to simulate the physiological wear of the cusps of primary teeth.

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