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CLINICAL PERFORMANCE OF STRIP CROWNS IN RESTORING PRIMARY INCISORS: PRELIMINARY STUDY

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Tooth decay is the most frequent chronic disease of childhood, which may involve the upper front teeth early in the child's life, leading to dental crown loss. Therefore, aesthetic and functional rehabilitation of primary teeth represents a challenge for the pedodontists. The restoration of dental morphology using preformed crowns might be a possible biologic, fast, easy to accept, long-lasting and affordable alternative. The study sample included 35 children aged between 14-60 months old who reported to the Pediatric Practice in 2014 and 2015. They displayed dental caries on upper incisors and were treated with composite resin and glass ionomer restorations. From the 104 upper incisors treated, 87 were restored with strip crowns and 42 required endodontic therapy (pulpectomy). During periodic dental check-ups, 6 restorations (6.89%) out of 87 were completely lost and 9 restorations (10.34%) required adjustments and additional care. The overall success rate was 82.77%. Restoring primary incisors by means of strip crowns is easy to perform even with little tissue remaining after preparations and provides good aesthetic results. However, long-term clinical studies are needed to investigate the advantages and disadvantages of this technique, and evaluate the clinical success and failure of these restorations.

Keywords: strip crowns, maxillary incisors, morphology, glass ionomer, composite.

INTRODUCTION

Oral health represents an important component of the general health of a child. Oral health problems can lead to alterations of the child's general health status and development, and affect the quality of life. The most frequent oral health issue is dental caries. Sometimes, it can affect even very small children, short after the eruption of the first teeth, being called early childhood caries (ECC). This particular type of dental caries has been defined by the American Academy of Pediatric Dentistry as "the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger"[1].
ECC represents an aggressive form of dental caries, which first develops on teeth surfaces that are not usually affected by decay, such as the labial surfaces of maxillary incisors.
It subsequently affects the occlusal surfaces of the upper and lower molars, followed by the upper and lower canines and finally, by the upper and lower second molars. Practically, the teeth are affected in their order of eruption. The mandibular incisors are affected only in very advanced stages, due to their position in the mouth, being protected by the salivary flow and the tongue [2].

Depending on the degree of tooth alteration, ECC may be mild to moderate – characterized by the presence of white spots and caries on molars and/or incisors; moderate to severe – characterized by labiolingual carious lesions affecting the maxillary incisors with or without molar caries (depending on the age of the child and the stage of the disease), mandibular incisors are not affected; severe – the carious lesions affect almost all teeth, including the mandibular incisors[3,4].
The initial clinical aspect of ECC is under the form of white spot lesion, noticeable on the smooth surfaces of teeth. In this stage, the enamel is intact but demineralized. Left untreated, the lesion progresses into dentin, followed by the appearance of cavitation. The tooth crown is subsequently destroyed, triggering dental pulp inflammation, necrosis and sepsis, with painful symptomatology [2].
The etiology of ECC is multifactorial, involving the interaction of primary risk factors (such as the susceptible tooth/host, the food substrate – consisting in fermentable carbohydrates and the type of bacterial plaque) and the presence of associated risk factors. Certain features are specific to children with ECC: the presence of high levels of Streptococcus mutants in the bacterial plaque (acquired early, from their mothers or other family members/other people) and the increased and prolonged consumption of

sugary drinks. The associated risk factors include nocturnal bottle feeding (with cariogenic liquids), prolonged breastfeeding (though a clear association with ECC could not be established), poor oral hygiene, lack of fluoride in toothpastes, low level of parental education and poor socio-economic status [4-7].

Treatment options depend on the stage of the disease. Thus, in the initial stage, when only white spots are present (enamel demineralisation), treatment consists in topical fluoride applications, instructions toward proper oral hygiene and changing eating habits.

When dental lesions progress into dentin, tooth restorations are needed. In extreme cases, where the entire tooth crown is destroyed, tooth extraction is the choice [8,6,9].

Tooth restoration options include dental fillings and full tooth coverage by the placement of tooth crowns.

The first crown types used were steel crowns, which are not esthetic.

The high demand for esthetic restorations of front teeth has led to the development of various types of dental crowns, such as: open faced steel crowns, resin (composite) strip crowns, pre-veneered steel crowns and Zirconia crowns [10,11]. Strip crowns are thin, transparent, celluloid preformed crowns; they serve as support for the restorative material while being applied on the prepared tooth, during the restoration protocol. They are removed from the tooth after the restorative material has set (at the end of the procedure).

The aim of the study was to assess the strength and stability of the glass ionomer and composite material crown restoration using the preformed strip crown technique in primary maxillary incisors with restricted and extended decay.

MATERIAL AND METHODS

The study was designed to evaluate the success and clinical performance of the strip crown technique that was applied in a pediatric dentistry office, beginning with 2014 until present (20 months). The study sample consisted in 35 children, 17 girls and 18 boys, aged between 14 and 60 months, with primary maxillary incisors affected by proximal decay (affecting one dental surface), extensive cavities (2 or more surfaces) or severe tooth decay requiring endodontic therapy, fractured teeth, discolored teeth or teeth with enamel hypoplasia and requiring treatment.

The exclusion criteria from the study were: teeth with insufficient dental structure needed for the retention of restoration, teeth in deep overbite, teeth with gingival or periodontal disease, patients with bruxism, uncooperative children who would have required general anesthesia in order to perform the restorative procedure.

The study participants came to regular check-ups every 3 months for the clinical and photographical assessment of strip crown restorations. The status of the gingival tissue adjacent to the restoration was considered as an indicator of the integrity of the cervical restoration margin. It is supposed that healthy gingiva corresponds to correctly adapted restoration margin. Photographic examination (Canon 660D, EFS 60 mm f / 2.8 Macro USM) included assessment of color, shape and integrity of strip crowns restorations. While applying this technique of restoring tooth crown morphology, the standard procedures for each type of lesion were followed and the parents gave their consent to participate in this study. Data were statistically analyzed with Epi Info 2000 program.

The restoration protocol included the following steps:

- Selection of Crown forms, these being available in 6 sizes (No. 1 to 6) (Unitek Strip Crown, 3M ESPE, St Paul, MN Nowak Crowns, Dental Supplies Inc.)[12] with a mesiodistal incisal width equal to the tooth to be restored by placing the incisal edge of the crown against the incisal edge of the tooth (Figure 1).
- Shade Selection. The composite shade can be selected for better esthetics.
- Tooth Preparation: administration of appropiate anesthesia; isolation of the anterior teeth using a rubber dam; minimally reduction of the mesial and distal surfaces and 1 mm reduction of the incisal edge; removal of all caries; in cases of very deep cavities, an application of a resin-modified glass ionomer liner/base (Vitrebond, 3M ESPE Dental Products) for pulp protection was needed. A gel etching agent was placed for 15 seconds and rinsed off (Ultra-Etch, Ultradent Products, SJ, Utah). A bonding agent (G-aenial Bond, GC corp. Tokyo, Japan) and resin composite restorative (GC composite restorative A1, A2) were used following manufacturer's instructions.
- Crown Placement: the selected crown form was trimmed with crown and bridge scissors, to remove excess crown material at cervical level; a small hole was created by punching the strip crown with a sharp explorer at the incisal edge or palatal surface, to allow flowing of excess composite/GC material during crown placement; the crown form was filled with the selected material and seated on the tooth and checked for correct position; the excess material from the gingival area was removed; the composite material was light cured through the celluloid strip crown; the celluloid crown form was first removed, following with the removal of the rubber dam; the occlusion was checked.

Figure 1. Strip crowns[12]

RESULTS AND DISCUSSIONS

A total of 104 affected upper primary incisors were treated, out of which 87 (83.65%) met the criteria for inclusion in the study and were restored with composite and glass ionomer cement using the strip crown technique (Figure 2).

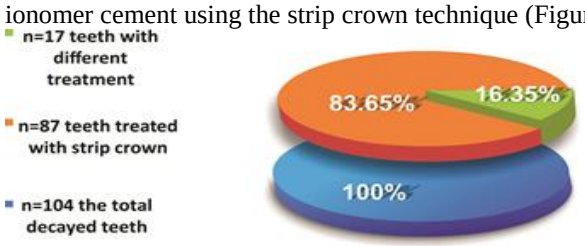

Figure 2. Percentage of teeth treated by strip crowns and other means in the study sample.

From all teeth restored, 42 teeth (40.38%) required endodontic therapy (pulpectomy) consecutive to severe decay. All procedures were performed by the same dentist.
Over a period of 20 months of follow-up, 9 strip crown restorations (10.34%) required adjustments and additional care and 6 restorations (6.89%) were completely lost. The overall success rate of strip crown technique (82.77%) is illustrated in figure 3.

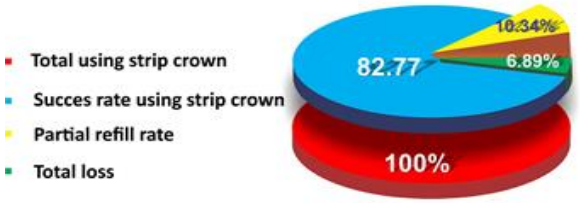

Figure 3. Rate of success and failure of the strip crown procedure in the study sample

The restoration of destroyed primary incisors by strip crown technique in children aged 3 to 4 years old is shown in Fig. 4. The initial and final clinical situation, during the same treatment day, is displayed.

Patient R.A., 3 years old – „before" and „after" treatment

Patient V.A., 4 years old – „before" and „after" treatment

Patient A.S., 3 years old – „before" and „after" treatment

Patient N.A., 3 yrs. 8 mos. old – „before" and „after" treatment

Figure 4. Restoration by strip crown technique of decayed incisors ("before" and "after" treatment)

The purpose of restoring carious primary incisors is to allow the patient retain these teeth until natural exfoliation. The choice of restoration materials used includes glass ionomer cements (GICs), compomers and composite resins. The bonded resin composite strip crown technique has been used to restore primary incisors with extensive and multisurface decay for over 30 years[13]. Despite this, there are few studies evaluating its clinical performance. Some of them revealed high esthetic results and acceptable durability over time [14,15].
The technique proves simple to use by dentists, provides great parent and patient satisfaction due to very good esthetics and it is easy to repair in case of breakdowns. The time for restoration placement is reasonable and the cost of materials (strip crown kit) is affordable. However, it may be easily fractured by trauma/traumatic occlusion, it is technique-sensitive, requires good tooth isolation from moisture, needs adequate tooth structure for retention and also patient cooperation[10,11].
The results of the present study are similar to those of Kupietzky et al.[15], who assessed 112 strip crown composite restoration placed in 40 children, after a period of 18 months. The authors reported an 88% overall retention rate, with only 12% of restorations losing some resin material, and none of the restorations being totally lost.
Ram D.[16], evaluating the longevity of strip crown restorations in primary incisors after a 24-months period of follow-up reported a success rate of over 80%.
Dhillon et al.[17], while assessing the clinical performance of 26 restorations of primary incisors by means of the strip

crown technique, obtained a success rate of 80.8% after one year of follow-up.

Eshghi A. et al.[18] treated 161 compromised primary maxillary incisors with 53 composite post restorations, 54 fiber post restorations and 54 reversed post restorations. After root canal preparation and post cementation, the tooth crown was reconstructed with composite resin and celluloid crowns (the strip crown technique). After one year of follow-up, 136 teeth were available for assessment. The retention rates of the restorations after one year were: 100% for the reverse post technique, 97.83% for fiber post and 97.73% for composite post. Walia T et al.[19] compared the clinical outcomes of composite strip crowns, pre-veneered stainless steel crowns (SSCs) and pre-fabricated primary zirconia crowns in restoring 129 carious and traumatised primary maxillary incisors. The evaluation was made after 6 months and showed a retention rate of 100% for zirconia crowns, 95% for SSCs and 78% for strip crowns. Duhan H. et al.[20] assessed the clinical performance of four different types of restorations: composite, strip crown, biological and composite with stainless steel band. A total of 52 primary frontal teeth were treated by these means. The check-up periods were 3, 6 and 9 months after treatment. Loss of retention was seen in composite restorations and composite restorations with stainless steel band after 3 months. After 6 months, retention loss was seen in all restoration types, except for strip crowns, in which loss was seen after 9 months.

CONCLUSIONS

Restoring temporary incisors by means of strip crowns is easy to perform even with little tissue remaining after preparations and provides good aesthetic results. However, long-term clinical studies are needed to investigate the advantages and disadvantages of this technique, and evaluate the clinical success and failure of restorations.

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