

REQUIREMENTS OF BACK TO BACK CROWNS IN 2 TO 6 YEAR OLD CHILDREN IN MAXILLARY ARCH - AN OBSERVATIONAL STUDY

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ABSTRACT

Stainless steel crowns have been proved to be successful and efficient full coverage restoration in pediatric dentistry especially after pulp therapy and for restoring multi-surface carious lesions. These crowns are usually pre-formed and are selected according to the size of the tooth that requires the crown. The purpose of this study is to determine the common reasons for requirements of back to back stainless steel crowns in the maxillary arch of children aged 2 to 6 years. This cross sectional observational study was carried out retrospectively by analysis of the case sheets for the treatment done with back to back stainless steel crowns in the right and left quadrants of maxillary arch and thereby determining the requirements for the same. Out of 69 pairs of back to back crowns, 90.4% of the teeth required pulpal treatments; 8% of the teeth required Class II restorations; 11% of the teeth were given back to back crowns as an abutment for space maintainers in the upper arch. Back to back crowns in the maxillary arch were placed mostly for teeth treated by pulpectomy, followed by abutments for space maintainers.

Key words: dental caries; pulpectomy; space maintainer; stainless steel crown

INTRODUCTION:

Many challenges are faced by pediatric dentists in framing a suitable and efficient treatment plan in managing dental caries successfully and also it demands an esteemed knowledge to provide treatment with a good prognosis (Ludwig et al., 2014). Both developing countries and industrialized countries across the world are dealing with a serious community dental problem which is Early Childhood Caries (Uribe, 2009). The quality of life of both the children who have ECC and also that of their parents are affected (Sharna et al., 2019). Just as it always said from the ancient days, "Prevention is better than cure", Early childhood caries should be prevented at all cost and that should be the first priority of every pediatric dentist and the parent thereby preventing many detrimental condition in the primary dentition and also sparing many traumatic and invasive treatment procedures in children (Gurunathan and Shanmugaavel 2016). It is essential to regain the function of the tooth after rendering the treatment required to solve the symptom which the child feels disturbing such as pain, sensitivity and swelling. Rendering a full coverage restoration to the teeth which has undergone an invasive treatment like pulp therapy or multi-surface restorations, serves best in longevity of the treatment and also regains the masticatory function (Miller et al., 1962)

Stainless steel crowns which were introduced in dentistry as Preformed metal crowns by Humphry in the year 1950, proved to be a successful full coverage restoration especially in pediatric dentistry(Nash, 1981). Even, large surface amalgam restoration shows lesser success when compared with full coverage restorations using stainless steel crowns(Dawson et al., 1981). During placement and cementation, stainless steel crowns have shown a strong advantage or relative lack of sensitivity to oral conditions. It is often possible to deliver a well fitting stainless steel crown in a tooth of an uncooperative child with no compromise in longevity or quality of the restoration. Hence when there seems a difficulty in maintaining a dry field without contamination of saliva, stainless steel crowns are the restorations of choice. Early childhood caries in moderate or severe cases are characterized by affecting both the first and second primary molars of the child and which is most usually intervened by providing full coverage restorations using stainless steel crowns(Kindelan et al., 2008).

Common indications for full coverage restoration with stainless steel crowns were following pulp therapy, Class II carious lesions and also as an abutment for space maintainers. Whenever two adjacent teeth require stainless steel crowns, in order to deliver them with a perfect fit, certain adaptations are done using corresponding pliers. Despite the various innovations and modifications in stainless steel crowns and their techniques, the clinical requirements for the need of back to back stainless steel crowns were left un-analyzed. The present study is designed to analyse and enumerate the clinical reasons for the requirements of back to back stainless steel crowns in the maxillary arch of children aged 2 to 6 years.

MATERIALS AND METHODS:

This study was carried out among the pediatric dental patients in the department of Pediatric and preventive dentistry, Saveetha Dental college and Hospitals. Ethical approval was obtained from the institutional ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320). This retrospective study was conducted from June 2019 to March 2020 in a university setting. A total of 1571 cases were verified for stainless steel crowns and cross verification was done by photographs. The eligibility criteria was kept specific, i.e primary maxillary teeth of children aged 2 to 6 years requiring back to back stainless steel crowns, thereby minimizing the sampling bias. Data collection and analysis was performed by two examiners.

The case reports were analysed from the patient records of the university. 1571 cases which included stainless steel crowns were manually verified with photographs for segregating them as back to back crowns and also to restrict the population age from two to six years. A total of 69 pairs of crowns which is individually 138 teeth with stainless steel crowns were included in the study after review. The variables which were to be studied in this study are the reasons for requirement of back to back crowns like pulp therapy, class II carious lesions and space maintaining abutments. Descriptive statistics for age, gender and the reasons for the requirements of back to back crowns were done using SPSS software version 23. Chi-square test was carried out to determine the significance between the requirements for back to back crowns.

Inclusion criteria:

1. Children aged 2 to 6 years
2. Children who require back to back stainless steel crowns in maxillary arch

Exclusion Criteria:

1. Children above the age group of 2 to 6 years
2. Children who didn't require back to back stainless steel crowns in the maxillary arch.
3. Children with special health care needs

RESULTS AND DISCUSSION:

A total of 69 pairs of back to back stainless steel crowns i.e, 138 teeth with stainless steel crowns were studied. The most common age group of children found to be in this study were of 3 to 5 years (Graph 1). The age of the children requiring more of pulp therapy in this present analysis were children of 4 years

old(Graph 2). Regarding gender, females were less commonly treated with back to back stainless steel crowns when compared to males; Statistically significant differences were observed for pulp therapy between the genders (p value = 0.000) (Graph 3). Provision of back to back stainless steel crowns in the maxillary arch was found to be equally distributed between the quadrants with a slight deviation toward the right quadrant. Statistically significant differences were observed between pulp therapy and other two requirements(p -value = .000) (Graph 4). 90.4% of the teeth with back to back stainless steel crowns were found to be rendered pulp therapy; 8% of the teeth required Class II restoration as their treatment; 8% of the teeth required both class II restoration and pulp therapy; 11 % of the teeth were given back to back stainless steel crowns as an abutment for space maintainers (Table 1).

The above results clearly depicts that the common requirement in the maxillary arch for children aged 2 to 6 years for back to back stainless steel crowns was pulp therapy followed by space maintainer abutment. Parents who have minimal awareness about dental health problems will not be able to prevent or detect early signs and symptoms in the child's dentition and thereby leading to subjecting the child to invasive treatments like pulp therapy and even extraction of teeth. Hence, dental awareness in maintaining oral health of the children has to be spread among parents (Gurunathan and Shanmugaavel, 2016). Fluoride is the most commonly used preventive modality against dental caries, especially in children. Efficiency of fluoridated toothpastes have been studied over the years and it has been proven to be an effective and easily accessible preventive strategy(Ramakrishnan and Bhurki, 2018). As the distribution of bottled drinking water is increasing across the world, the fluoride content of such bottled drinking waters has been studied to enhance the preventive plan against dental caries(Somasundaram et al., 2015). Children usually find it difficult and boring to follow oral hygiene practices like brushing twice daily and flossing regularly, and hence a new innovative study using chewable toothbrush was carried out to determine its efficacy in maintaining their oral hygiene (Govindaraju and Gurunathan, 2017). Determining biochemical markers in the saliva at an early age, paves way to study the genetic makeup of the child and also in framing a preventive plan against early childhood caries(Subramanyam et al., 2018).

Endodontic therapy in pediatric dentistry used to be carried out using conventional hand files for the preparation of primary root canals. But, recently an effective and efficient rotary endodontic file exclusive for primary teeth was introduced(Jeevanandan, 2017). The cases included in this study were delivered pulp therapy using this pediatric rotary endodontic file system. These rotary files for primary teeth were proven to be efficient in operating time compared to hand files (Panchal et al., 2019). Adding on to the advantage of lesser canal preparation time, these rotary files provide better obturation quality in the pulpectomy procedures(Govindaraju, Jeevanandan and EMG Subramanian, 2017a; Govindaraju, Jeevanandan and E Subramanian, 2017; Jeevanandan and Govindaraju, 2018). To add to these efficient studies, these pediatric rotary files have proven to be more effective than reciprocating files(Nair et al., 2018). Many pediatric dentists and even general dental practitioners are well equipped with the knowledge of these endodontic files for primary teeth(Govindaraju, Jeevanandan and EMG Subramanian, 2017b). In this present study, out of 138 teeth with back to back stainless steel crowns, 123 teeth were rendered pulp therapy, 11 teeth had class II carious lesion and 15 teeth were given crown as an abutment for space maintainers. In a similar study, 33.85% of cavitated lesions were found to be prevalent in a population and also it has been noted as the males are more affected when compared with females. The predominantly affected teeth were found to be the mandibular molars and maxillary anterior teeth(Sachdeva et al., 2015). Second primary molars were found to be the most commonly affected teeth by dental caries according to a study(Warren et al., 2002). In posterior teeth, full coverage restoration is essential after pulp therapy and if cuspal coverage doesn't seem to be mandatory, stainless steel crowns are preferred for at least short term strengthening (Tikku et al., 2010). Another major reason for the requirement of full coverage restorations are proximal carious lesions (Azizi, 2014). Class II restorations carried out using high viscosity glass ionomer cements have proven to be a failed treatment modality thus making full coverage restoration with stainless steel crown mandatory in such situations (Scholtanus and Huysmans, 2007). And also, it has been proven that class II amalgam restorations in permanent teeth were more efficient than that of composite resin restorations (Overton and Sullivan, 2012).

In this current study, type 1 glass ionomer cement was used for luting the crowns. Resin modified glass ionomer cements have proved to be an effective luting cement with lesser microleakage when compared to

conventional glass ionomer cements. Microleakage comparison between conventional tooth preparation and halls technique for stainless steel crowns showed no statistically significant differences(Gruythuisen et al., 2010).

In permanent dentition, cuspal fractures and abfractions are common and stainless steel crowns can be given in such cases to regain masticatory functions. These cuspal trauma are uncommon in primary dentition and hence such reasons cannot be found in requirements for full coverage restorations in primary teeth. In this information era, general dentists are also equipped with the awareness and knowledge of handling traumatic dental injuries (Ravikumar et al., 2017). In this study 11% of the crowns were given as an abutment of space maintainer in maxillary arch. Space maintainers like nance palatal arch, transpalatal arch and even anterior groopers appliance are commonly given to maintain the arch length due to premature loss of primary teeth in the maxillary arch. Usually in normal conditions these space maintainers are fabricated along a band adapted to the second primary molars, but in case where that abutment tooth requires a full coverage restoration, the band is replaced with a stainless steel crown and the space maintainer is soldered to the crown. However, there are various developmental malformations in the permanent dentition resulting in spacing, like midline diastema in between permanent central incisors due to high frenal attachment (Christabel and Gurunathan, 2015). More severe conditions than just dental caries like, dental abscess, cysts,tumors were commonly encountered in the field of pediatric dentistry. Management of extravagant lesions like ranula in a pediatric patient requires efficient skill and knowledge in literature (Packiri et al., 2017). This present study enumerated the clinical reasons for the requirement of stainless steel crowns in the maxillary arch of children aged 2 to 6 years, providing a better understanding of the caries prevalence and treatment needed in such conditions. The limitations of this study were that the treatment plan formulated in these cases were done only by a pedodontist .Inclusion of general dentists in the study could have given a holistic approach in delivering back to back crowns as the treatment modality. Longitudinal studies can be conducted to evaluate the success of these back to back crowns.

CONCLUSION:

The most common requirement for back to back stainless steel crowns in the maxillary arch for children aged 2 to 6 years were those teeth treated with pulp therapy. The next common reason was the need for full coverage restoration on the abutment tooth for space maintainers.

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CONFLICT OF INTEREST

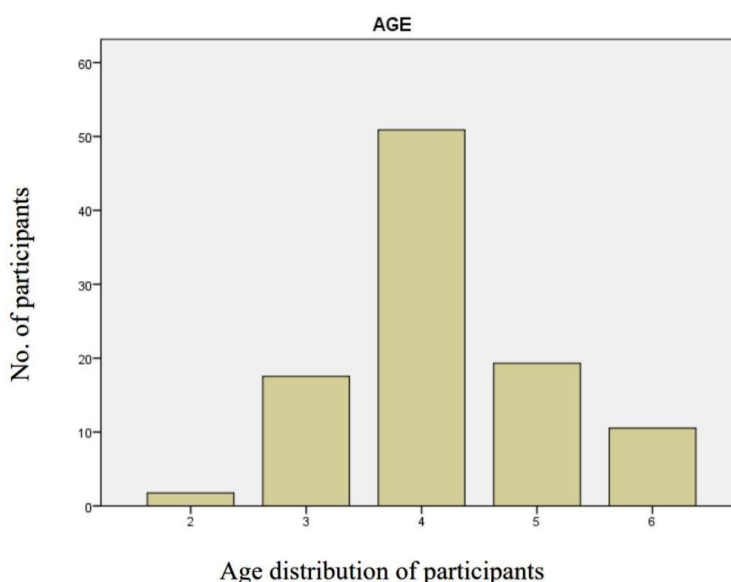
No conflict of interests were declared by the authors.

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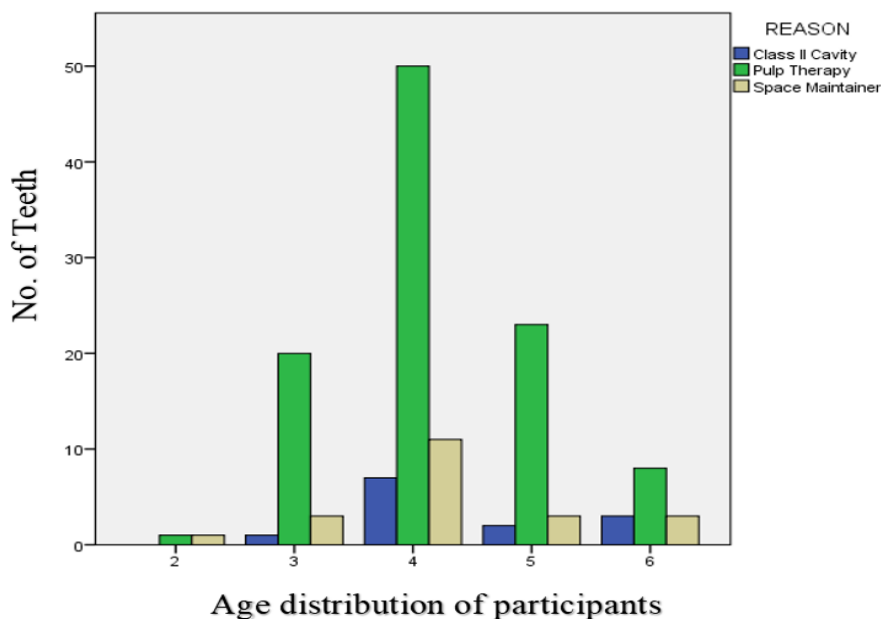
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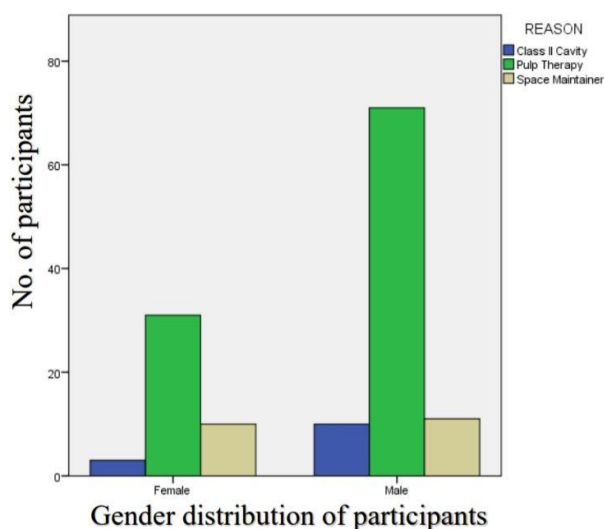
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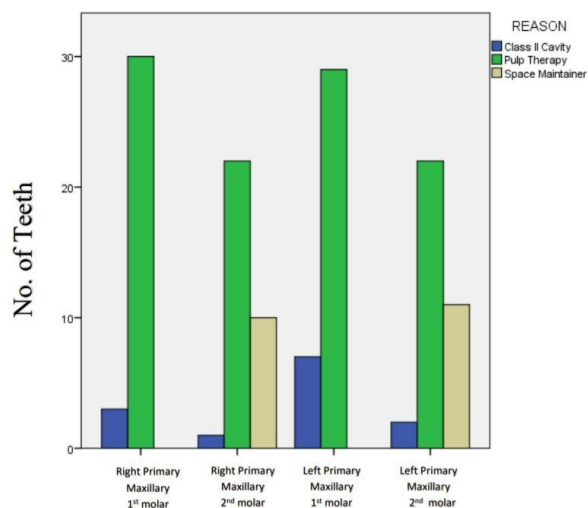
Graph 1: Bar chart showing the distribution of age of participants included in the study ; X-axis represents the age of the patients participated in this study, Y-axis represents the number of participants; The majority of the patients requiring back to back stainless steel crowns in mandibular arch were from 3 years to 5 years of age.



Graph 2: Bar chart showing the relationship of age of the patient with the reason for back to back crowns; X-axis represents the age of the patients participating in this study, Y-axis represents the number of teeth. Pulp therapy was the commonly occurring reason for the requirement of back to back stainless steel crowns in the maxillary arch and the age of the children requiring more pulp therapy in this present analysis were the children of 4 years old than any other. This difference was found to be statistically significant (Chi-square test done, p-value = 0.000)



Graph 3: Bar chart showing relationship of the gender of the patient with the requirement of back to back crowns. X-axis represents the gender of the patients participated in this study, Y-axis represents the number of participants; Blue represents Class II restorations, green represents pulp therapy and beige represents space maintainer abutments; Females were less commonly treated with back to back stainless steel crowns when compared to males; Statistically significant differences were observed for pulp therapy between the genders (Chi-square test done, p-value= 0.000).



Tooth in which the crowns were placed

Graph 4 : Bar Chart showing the distribution of back to back crowns in the right and left quadrants; X-axis represents the tooth type involved, Y-axis represents the frequency of occurrence. The incidence of back to back crowns in maxillary arch is equally distributed among the quadrants with slight predominance towards the right quadrant. Statistically significant differences were observed between pulp therapy and other two requirements (Chi-square test done, p- value= 0.000)

REASON FOR CROWN	COUNT	PERCENTAGE
Total Pulp Therapy	123	90.4%
Total Class II Cavity	11	8%
Class II Cavity requiring Pulp therapy	11	8%
Space maintenance	15	11%

Table 1 : Table enumerating the various requirements of back to back stainless steel crowns in maxillary arch in children of age 2 to 6 years; 90.4% of the teeth with back to back stainless steel crowns were found to be rendered pulp therapy; 8% of the teeth required Class II restoration as their treatment; 8% of the teeth required both class II restoration and pulp therapy; 11 % of the teeth were given back to back stainless steel crowns as an abutment for space maintainers