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THE UTILITY OF OPEN-FACED ANTERIOR STAINLESS STEEL CROWN RESTORATION AMONG PEDIATRIC DENTISTS AS A LUCRATIVE ESTHETIC OPTION IN PRIMARY INCISORS.

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ABSTRACT

Objective: The aim of this study was to evaluate the observations and predictions of success of open-faced anterior stainless steel crowns among Paediatric dentists in their practice. **Methods**: A cross-sectional survey was undertaken among the Paediatric dentists across the dental institutions in Bengaluru, India. Fifty five registered Paediatric dentists with a minimum experience of three years answered the structured questionnaire consisting of 13 questions regarding the various parameters such as the feasibility, indications, procedure, child behaviour and parental acceptance towards the open-faced anterior stainless steel crowns as a final full coverage restoration for the primary incisors. All data were computerized in to SPSS software, version 19 for Windows software (SPSS Inc, Chicago, IL, USA) and descriptive statistics was applied. **Results:** 70% respondents positively

correlated to the feasibility of open faced anterior stainless steel crowns and indicated their use in conditions such as pulp therapy, trauma, multi-surface caries, and developmental defects. The general idea regarding the ease of procedure was positive. Parental acceptance and child behaviour was also positive in this study. 81.8% of all the respondents rated the chair-side behaviour of children towards open faced anterior stainless steel crown restorations as definitely positive. **Conclusion:** In view of the protection of badly damaged primary incisors, open-faced anterior stainless steel crowns form a decent treatment modality owing to their exceptional durability and longevity and being cost effective with middle ground aesthetics, a strong consideration should be given to their use in children in day to day practice. **Key Words**: Awareness, Anterior teeth, Stainless steel crowns, Pediatric dentists.

INTRODUCTION

Conditions such as early childhood caries, trauma and hypoplastic defects of the maxillary incisors carry the potential in compromising the integrity of the dentition and often leave children with an undesirable esthetic appearance.[1] It results in functional, esthetic and psychological disturbances of the child, accompanied by great concern from the parents and the dentist.[2] The negligence on the part of the caretaker or the inability to seek early treatment may result in the continued destruction of tooth structure. The late consequences may continue long after its initial treatment as malnutrition, low self esteem, decay and malocclusion in permanent dentition.[3] A successful treatment option in these primary teeth involves a well planned restoration which meets the esthetic demands, adequate retention and resistance to fracture. However, owing to the smaller sized primary teeth, close proximity of the pulp to the tooth surface, relatively thin enamel, and surface area for bonding, issues related to child behavior, the cost of treatment along with compromised tooth structure, providing such a retentive restoration is quite challenging.[4]

Numerous treatment approaches have been proposed to address the esthetics and retention of restorations in primary maxillary incisors.[5] There have been various types of full coverage restorations available to restore primary incisors such as strip crowns, polycarbonate crowns, stainless steel crowns, open faced stainless steel crowns and they have their own advantages also have certain limitations.

Stainless steel crowns are prefabricated crown forms that are adapted and cemented to individual teeth with a biocompatible luting agent.[6] The SSC is extremely durable, relatively inexpensive, subject to minimal technique sensitivity during placement, and offers the

advantage of full coronal coverage but the metallic appearance may be esthetically displeasing to both parent and child.[7] Open-faced stainless steel crowns with a resin window give improved esthetics over traditional stainless steel crowns through a chair side veneering and their procedure involves a provision of a facial window that is cut in the crown and composite resin can be bonded to the toothsurface.[8] Thus, the aim of this study was to evaluate the observations and predictions of success of open-faced anterior stainless steel crowns among Pediatric dentists in their practice.

MATERIALS AND METHODS

A descriptive cross-sectional survey was undertaken among the Pediatric dentists across the dental institutions in Bengaluru, Karnataka India. It was designed and initiated in the Department of Pediatric Dentistry, Rajarajeswari Dental College and Hospital, Bengaluru, India. The list of institutions was obtained from the Rajiv Gandhi University of Health Sciences, Bengaluru, India.

Fifty five registered Pediatric dentists from these institutions, who were also engaged in private practice with a minimum experience of three years, participated in the survey. They answered the structured questionnaire regarding the various parameters such as the feasibility, indications, procedure, child behavior and parental acceptance towards the open-faced anterior stainless steel crowns as a final restoration for the primary incisors. The questionnaire was designed to assess the extent of involvement and interest of pediatric dentists in practices related to open-faced anterior stainless steel crowns.

The questionnaires were distributed at their place of work and collected back the same day. The questionnaire was accompanied by a covering letter explaining the aims of the study and indicating that their personal views and identity would remain anonymous.

Statistical methods: All data were computerized in to SPSS software, version 19 for Windows software (SPSS Inc, Chicago, IL, USA). Descriptive statistics were used for the survey and the data was expressed in percentage between groups and chi square tests were applied to check the difference in proportions between the groups. A P-value of 0.05 or better was considered significant.

RESULTS

A cross-sectional survey was undertaken among the Pediatric dentists across the dental institutions in Bengaluru, India. Fifty five registered Pediatric dentists from these institutions participated in the survey with a minimum experience of three years.

They answered the structured questionnaire regarding the various parameters such as the feasibility, indications, procedure, child behavior and parental acceptance of the open-faced anterior stainless steel crowns as a full coverage restoration.

Table 1: Demographic data.

Personal details	**Percentage**
Gender	
Male	40%(22)
Female	60%(33)
Qualification	
Master of Dental Surgery (MDS)	100% (55)

Feasibility: In this study, the respondents positively correlated to the feasibility of open faced anterior stainless steel crowns. Most of the respondents, 39 (70%), employed open faced anterior stainless steel crowns both in their institutional practice and private practice. However, only a few respondents, 11 (20%), employed open faced anterior stainless steel crowns only in their private practice. All the respondents, 33(60%), stated that the anterior stainless steel crowns were easily procurable. Majority of them, 34 (62%), found the sizes of crowns being appropriate in most cases. However, only 21 (38%) respondents felt that the parents find anterior stainless steel crowns economically feasible. The limiting factors for the Success of the crowns were crown retention, 22(40%); retention of crown facing described in terms of total resin loss, 21(38.1%) and partial resin loss, 22(40%); and colour change, 34(61.8%).

Table 2: Feasibility

Do you employ open faced anterior stainless steel crowns in your practice?	**Percentage**
Yes	70%(39)
No	30%(16)
Are anterior stainless steel crowns easily procurable?	
Yes	60%(33)
No	40%(22)
Do you find the sizes of crowns being appropriate in most cases?	
Yes	62%(34)
No	38%(21)
Do parents find anterior stainless steel crowns economically feasible?	
Yes	38%(21)
No	62%(34)

Indications: In this study, the respondents indicated anterior open- faced stainless steel crowns for the following indications. pulp therapy, 44(80%); trauma, 22(40%); multi-surface caries, 55(100%); and developmental defects, 33 (60%).

With regards to the special healthcare needs children, the respondents 63.6%(35) recommended anterior open- faced stainless steel crowns for the following indications. Pulp therapy, 17 (30.9%); trauma, 11 (30.9%); multi-surface caries, 15(100%); and developmental defects, 44 (80%).

Table 3: Indications

Do you feel the need for open faced anterior stainless steel crowns in primary teeth?	**Percentage**
Yes No	72.7%(40)
	27.3%(15)
Do you recommend open faced anterior stainless steel crowns for children with special healthcare needs?	
Yes	63.6%(35)
No	36.3%(20)

Procedure: The general idea of the respondents regarding the ease of procedure for the following steps was positive in this study. Simulating crown adaptation on a stone model in advance of actual tooth restoration, 21 (38.1%); where as 61.9% (34) extensive tooth preparation, 11 (20%); extended chair side time, 28 (50.9%); and expansive dental materials, 23 (41.8%). Most of the respondents 50.9%(28) feel that extensive preparation and materials is not required for placement of Open faces SCC. 38.1%(21) respondents feel it's difficult and time consuming.

Table 4: Procedure

Would you prefer simulating crown adaptation on a stone model in advance of actual tooth restoration?	**Percentage**
Yes	38.1%(21)
No	61.9%(34)
Do you feel that open faced anterior stainless steel crowns require extensive preparation and materials?	
Yes	50.9%(28)
No	49%(27)
Placement of open faced to open faced anterior stainless steel crowns is difficult?	
Yes	38.1%(21)
No	61.9%(34)
Was placement of open faced stainless steel crown time consuming?	
Yes	61.9%(34)
No	38.1%(21)

Children's Behavior and Parental acceptance: Parental acceptance and child behaviour was also positive in this study. All the respondents, 45 (81.8%) rated the chair-side behaviour of children towards open faced anterior stainless steel crown restorations as definitely positive. A majority of about, 39 (70.9%), respondents noted that the task on motivating and educating the parents regarding open faced anterior stainless steel crown restorations was fruitful.

Parental acceptance of open faced anterior stainless steel crowns found success as 70.9% (39)respondents* was described under the following terms: Appearance, 39 (70.9%); colour 55 (100%); shape, 44 (80%); size, 44 (80%); durability, 45 (81.8%).

Table 5: Children's behavior and parental acceptance

Were you effectively able to manage child behaviour during Placement of open faced anterior stainless steel crown restorations?	**Percentage**
Yes	81.8 %(45)
No	18.1%(10)
Do you feel the task of educating and motivating the parents for open faced anterior stainless steel crowns has been successful?	
Yes	70.9%(39)
No	29.1%(16)
Is parental acceptance with regard to open faced anterior stainless steel crowns was a success?	
Yes	70.9%(39)
No	29.1%(16)

DISCUSSION

For decades, stainless steel crowns (SSCs) have been the easiest placed and most durable restoration for severely decayed primary teeth, outperforming amalgam and composite.[9,10] Unfortunately, they offer poor esthetics for anterior teeth and displease some parents to the extent of having incisors extracted if SSCs are the only restorative option.[11] Because crowns play a crucial role in restoring a child's carious anterior teeth, esthetic alternatives to SSCs such as open faced crowns, bonded strip crowns and pre-veneered crowns along with other esthetic crowns have been developed.[12]

The bonded strip crown is the most esthetic, natural-looking, complete-coverage restoration available for primary incisors, but is time consuming and extremely technique sensitive.[9,13] A study of children whose dental treatment was accomplished under general anesthesia found that strip crowns had a failure rate of 51%, compared to a low (8%) failure rate for SSCs. (10%).

In a study they found that the crowns made esthetic with the open-face method showed a success of 95%, while the veneered crowns showed a success of 80% based on greater than two thirds facing retention.[14] Lopez-Loverich et al reported good crown retention rates for NuSmile Signature crowns and stainless steel crowns with no statistically significant difference between them.[15]

In this study, the respondents positively correlated to the **feasibility** of open faced anterior stainless steel crowns. Most of the respondents, 39 (70%), employed open faced anterior stainless steel crowns both in their institutional and private practice. However, only a few respondents, 11 (20%), employed open faced anterior stainless steel crowns only in their private practice. All the respondents, 33 (60%), stated that the anterior stainless steel crowns were easily procurable. Majority of them, 34 (62%), found the sizes of crowns being appropriate in most cases. However, only 21 (38%) respondents felt that the parents find anterior stainless steel crowns economically feasible. This may be the reason for reduced employment of open-faced anterior stainless steel crowns in private practices as recorded in this study.

The limiting factors for the Success of the crowns were crown retention, 22(40%); retention of crown facing described in terms of total resin loss, 21(38.1%) and partial resin loss, 22(40%); and colour change, 34(61.8%).

These findings are in accordance with a study done by Roberts et al[3] where retention of prefabricated resin-faced stainless steel crowns was found to be 100%, providing further evidence that stainless steel crowns are a highly retentive restoration. However, there was a high prevalence of facing failure with about 1/3 of the facings showing complete or substantial facing loss. The facing failures were attributed mostly at the resin-resin and resin-metal interface. The authors suggested future research and development of approaches to optimize the resin bond at these interfaces leading to improved retention. Advancement in technique was described by Wiedenfeld et al, using new light-cured materials that simplify the veneering process and produce thinner veneers. The resulting veneers maintain the adaptability, strength, and gingival contour benefits of the stainless steel crown in conjunction with the cosmetics of composite facings.[16]

In the present study, the respondents 72.7%(40) **indicated** anterior open- faced stainless steel crowns for the following indications. Pulp therapy, 44(80%); trauma, 22(40%); multi-surface caries, 55(100%); and developmental defects, 33 (60%).

With regards to the special healthcare needs children, the respondents 63.6%(35) recommended anterior open- faced stainless steel crowns for the following indications: pulp therapy, 17(30.9%); trauma, 17(30.9%); multi-surface caries, 55(100%); and developmental defects, 44(80%).

The general idea of the respondents regarding the ease of **procedure** for the following steps was positive in this study: Simulating crown adaptation on a stone model in advance of actual tooth restoration, 21(38.1%); extensive tooth preparation, 28(50.9%); extended chair side time, 34(61.91%); and expansive dental materials, 23(41.8%).

Parental acceptance and child behaviour was also positive in this study. All the respondents, 45 (81.8%) rated the chair-side behaviour of children towards open faced anterior stainless steel crown restorations as definitely positive. A majority of about, 39 (70.9%), respondents noted that the task on motivating and educating the parents regarding open faced anterior stainless steel crown restorations was fruitful.

Parental acceptance of open faced anterior stainless steel crowns was found success as 70.9%(39) described under the following terms: Appearance, 39 (70.9%);colour55 (100%); shape, 44 (80%); size, 44 (80%); durability, 45 (81.8%).

The positive perception of the children and their parents towards resin-faced stainless steel crowns has been well documented in the literature. The results of the present study are in accordance with a study where overall parental satisfaction with the treatment was excellent. However, satisfaction with crown esthetics received the lowest rating. Total facing loss was the most prevalent (9 or 24%) form of facing failure with only 3 facings (8%) showing evidence of partial veneer loss.

Even though open faced stainless steel crowns are proving to be a promising successful restorative option there is a lack of clinical trials and follow-up studies quoted in the literature.

Eventually, as the quest for better crowns continues, open faced anterior stainless steel crowns hold tremendous potential to prove as a restorative material with further clinical studies.

In view of the protection from future decay provided by their feature of full coverage and their increased durability and longevity, strong consideration should be given to the use of SSCs in children. Finally, a strong argument for the use of the open faced SSC restoration is its middle-ground esthetics and cost effectiveness based on its durability and longevity.

What this paper adds

- This paper describes the clinical performance of open-faced anterior stainless steel crowns in the experience of Pedodontists through their observations and predictions of success.
- Open-faced anterior stainless steel crowns can be a promising avenue for full coverage restorations as indicated by the results of this study.
- With proper motivation and guidance, child behavior and parental acceptance achieved can be remarkably satisfactory.

Why this paper is important for pediatric dentists

- In the present scenario, anterior stainless steel crowns which are more durable and economical can also be made esthetic with certain modifications.
- Pediatric dentists should develop keen interest in improving knowledge and skills regarding open-faced anterior stainless steel crowns in order to achieve superior results with anterior full coverage restorations.

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