

Parents' and children's acceptance toward the use of stainless steel crowns for the treatment of primary teeth

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ABSTRACT

Objectives: To evaluate children's and parents' acceptance toward stainless steel crowns (SSCs) compared with amalgam fillings as a treatment option for primary teeth restoration with regards to their appearance, teasing, function and cost.

Method: A prospective clinical study involving one hundred eighty five children (102 boys and 83 girls, SD; 5.43 ± 2.26 years)- selected from patients visiting the paedodontic department of the Queen Rania Hospital between 2018 and 2020 for the purpose of treatment of their primary molars- was performed. Based on a split-mouth technique, each patient received SSCs and amalgam fillings with similarly affected teeth at either sides of their upper or lower jaws. The children were grouped into two age groups of 3–6 and 7–10 years. At six months after the treatment visit both the children's and their parents' acceptance toward the SSCs compared with amalgam fillings were evaluated with reference to appearance, function and cost. 'Yes' or 'No' satisfaction results were then collected and analysed using the chi-square test and Pearson correlation. Significance was set at $P \leq 0.05$.

Results: Children who received SSCs were significantly more satisfied with them over the amalgam fillings performed. This was the same for the parents. For both children and their parents – with regards to the age groups –the ratio of satisfaction with the SSCs was higher in the age group 7–10 years, although this was not statistically significant compared with the other age group. A statistically significant correlation between the children's and their parents' acceptance regarding the SSCs was shown.

Conclusion: Both children (in all age groups) and parents showed high acceptance with significant satisfaction toward using SSCs over amalgam fillings.

Keywords: acceptance, amalgam filling, stainless steel crown

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INTRODUCTION

Oral health status of children in their primary teeth stage is a crucial and unnegotiable requirement for the purpose of maintaining the concepts of aesthetics and function until the permanent dentition stage starts to emerge and constitute the optimum lifelong occlusion. However, the prognosis for primary teeth is sometimes jeopardised due to intrinsic or extrinsic offenders such as; caries, hypoplasia or even traumatic injuries. For this, it is the clinicians' responsibility to determine the most appropriate way to conservatively overcome these problems by either using simple filling materials such as amalgam or by crowning the teeth with metallic – such as stainless steel crown – or aesthetic materials 1,2.

While amalgam fillings might be a convenient, routine and accessible option to treat carious teeth, they may behave less optimally than needed in terms of long-term preservation of the integrity of tooth structure and their negative appearance 3.

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Adding to these; the controversy regarding health effects of mercury as a constituent might be the offenders beyond the declined use of this type of filling materials over the last years 4. On the other side, stainless steel crowns (SSCs) have been indicated as a treatment option especially when teeth crowns are heavily destructed and the prognosis is compromised.

Based on the recent American Academy of Pediatric Dentistry (AAPD) recommendations; the use of SSCs is supported on high-risk children with large or multi-surface cavitated or non-cavitated lesions on primary molars, especially when children require advanced behavioral guidance techniques 5.

However, multiple researchers have investigated this issue and found greater superiority of the SSCs as a treatment modality over using different restorative materials such as amalgam, finding that SSCs had better long-term success 6,7. The ability of these materials to protect teeth might be related to their embracing effect and physical isolation from the oral environment 8. However, despite the wide acceptance toward using the SSCs; some studies have shown these crowns from a negative perspective and reported that they had fewer promising advantages over using the amalgam fillings 9,10

The satisfaction of patients and their parents is a fundamental issue in deciding whether to choose the option of using SSCs or not 11. Inquiries regarding the appearance and functionality of these crowns may be of great concern 12–14. A study performed at Jordanian sample showed low parental acceptance of using SSCs as a treatment option for their children's primary carious teeth and that they favoured to choose extraction of the affected tooth 15. However, such dissatisfaction with the SSCs was justified by the very low knowledge of the parents in this treatment option so that the authors highlighted the impact of parental education to overcome such negative response.

The objective of this prospective clinical study was to evaluate children's and parents' acceptance toward SCCs compared with amalgam fillings as a treatment option for primary teeth restoration with regards to their appearance, teasing, function and cost.

METHODS

Ethical approval:

Ethical approval was gained from the Human Research Ethics Committee at the Royal Medical Services under number 53-2-2020. All patient's parents were informed about the aims and methods of the study and they provided written consents to participate.

Study Design, Setting, and Subjects:

This was a prospective clinical study targeted subjects from attendees at the paediatric dentistry department of the Queen Rania Hospital for Children between January 2018 and January 2020. The inclusion criteria for candidates were based on the following: healthy children with ages ranging from 3–10 years; good compliance with treatment as classified by Frankl's scale 16. Intraoral carious primary molars (either first or second molars) on both left and right sides but within the same arch (mandibular or maxillary arches) for which the amount of caries necessitate the use of either heavy amalgam fillings or SSCs. The exclusion criteria involved; uncooperative children or those who disclose difficulty in complying with the planned follow-up visit and also patients with missing contralateral tooth or teeth.

The sample size was determined using a pilot study. The effect size was estimated at 0.95. On the basis of a significance level of alpha 0.05, the sample size was calculated to achieve 80% power and

showed that 170 subjects for each group were minimally needed. Amongst the daily patients visiting the department over the two years, 285 subjects were evaluated based on the inclusion criteria adopted among which 205 patients were found suitable for the research protocol after clinical examination by one paediatric dentist (the first author). The other subjects were not suitable for recruitment in the study due to reasons related to their cooperation, the intraoral findings which are necessary for the study protocol and their acceptance to participate in the research. A detailed explanation concerning the study protocol was presented to the patients and their parents. After getting their approval to participate in the research, parents were asked to sign informed consents. The subjects were grouped into two groups according to their ages: group 1 (3–6 years) and group 2 (7–10 years).

Study protocol:

Randomisation was performed using a coin to choose the site of performing either procedures (amalgam fillings or SSCs) whether the left or right sides of either jaws by one of the head administration staff to eliminate bias that could result from involving any of the authors of the research in this procedure. Based on a split-mouth technique, each child received both procedures on either side for either their first or second primary molars. It should be noted that the procedures were performed for a similar number of teeth on each side to standardise the results at the end. However, cases having one or two affected teeth on each side were the only cases selected for this research, while other more severe cases were not included.

The procedures were performed by 2 pediatric dentists (authors; A. A. and A. O.) for both techniques and commenced with seating the patient in the dental chair in a supine position, performing calming procedures, applying topical anaesthesia and then infiltration and removing caries using either high speed and/or low speed hand-pieces. After that, amalgam (SDI, USA) fillings were added, contoured and configured with smooth outlines for the amalgam treatment. In the SSC treatment, temporary filling (Dentsuply, USA) was added underneath the SSC (3M, USA) which was cemented using glass ionomer cement (MASTER- DENT, USA).

Each patient along with his parents were reassured and given detailed instructions to follow at home to maintain both procedures as long and safely as possible. Such instructions included; oral hygiene measures, dietary advices, instructions related to the SSCs in cases if re-cementation needed and for amalgam filling in cases if lost or broken. They were also provided with the department contact number for situations concerning inquires or emergencies encountered by the patients and their parents regarding the procedures performed. They were asked to return after one month to check for procedure integrity and note any complaints from either children or their parents.

Data collection:

At six months after the treatment visit, they were asked to visit the department and give their evaluation of the procedures performed. Each child and parent was separately asked to give their overall satisfaction with the SSCs they had compared with the amalgam fillings by either 'yes' or 'no' with respect to multiple factors: appearance, teasing, function and cost. It should be informed that the treatments performed for all children were provided free of cost as they were covered by the military medical insurance. However, parents were given informations regarding the costs of performing of each procedure (based on the official pricing leaflet of the Jordanian Dental Association) and kindly requested to suppose that they will pay for the procedures their children will receive and to give their evaluation based on this.

The data were collected by face to face interview and subjects were kindly asked to fill in a simple questionnaire designed for this purpose (Table 1). If the answer was no, parents were asked to precisely choose the reason beyond this dissatisfaction from the four factors above. Regarding the children age group (3-6) the responses toward the SSCs were collected from their parents who were kindly requested to give these responses based on how their children have behaved toward the crown separately from their own responses.

The resulting data were transferred for the purpose of the analyses needed to investigate the satisfaction with the SSCs compared with the amalgam fillings by both the children and their

parents. The comparison was also researched in terms of age group and whether satisfaction differed between both or not. The correlation between the satisfaction of both children and parents besides the reasons beyond parents' dissatisfaction were also analysed.

Statistical analysis

The significant differences between the children's and parents' satisfaction regarding the use of SSCs over amalgam fillings were analysed by the chi-square test with Fisher's exact analysis. All statistical tests were performed at the $P \leq 0.05$ level of significance using the statistical software SPSS, version 21 (IBM Corp., Armonk, NY, USA).

RESULTS

The response rate was 72% ($n = 205/285$). 20 subjects were excluded from the study due to lack of completion of the needed data and poor compliance with the scheduled visits (lost to follow up). The remaining 185 subjects were 102 boys (55%) and 83 girls (45%) with age ranging from 3.4-9.7 years with a mean of 5.43 ± 2.26 years.

The distribution of frequencies and ratios of the children's and parents' satisfaction with SSCs compared with amalgam fillings, as perceived relative to age group, is shown in Table 2. 69.2% were significantly more satisfied with them over the amalgam fillings performed (30.8%). With regards to the age groups, although the satisfaction with the SSCs was higher in group 2, this was not statistically significant compared with the other age group ($P=0.359$).

A similar result was obtained for the parents' group ($P=0.175$). A statistically significant satisfaction with the SSCs was seen over the amalgam fillings with a greater percentage in both groups children and parents ($P=0.011$, $P=0.016$), respectively.

Figure 1 shows the distribution of the four reasons beyond dissatisfaction with the SSCs compared with amalgam fillings as perceived by parents using a column chart type. Parents were asked to justify their dissatisfaction with using SSCs for their children and why they preferred using amalgam fillings instead. They were more prevalently concerned about the appearance of these crowns (48.6%) than the functional aspects with 28.6%, followed by teasing and finally the cost factor which was given the least concern.

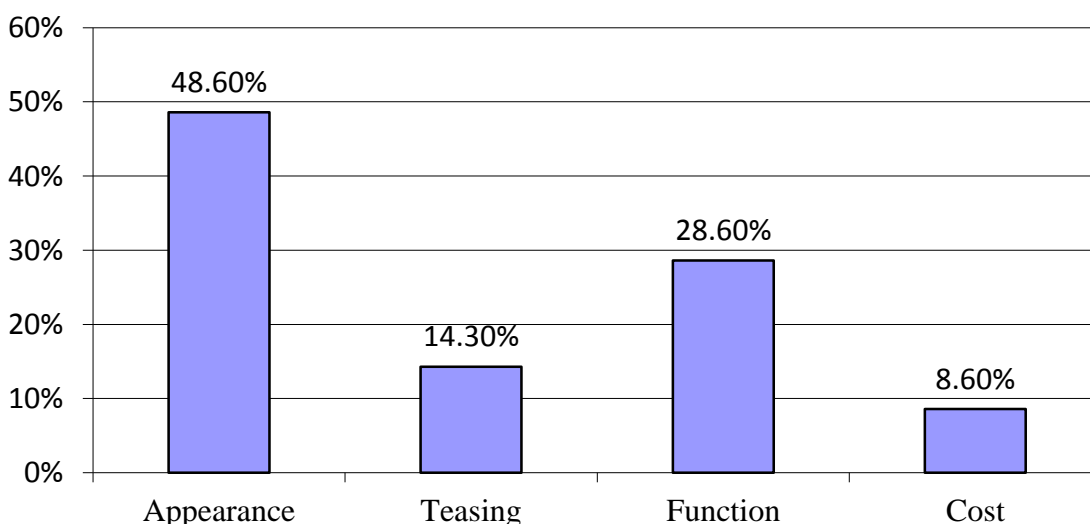


Figure 1: Distribution of the reasons beyond dissatisfaction with the SSCs compared with amalgam fillings as perceived by parents

Table I Questionnaire forms for children and parents acceptance used in the study.

Children Form (7-10 Yrs.)		
Child's Name:	National No:	Subject ID:
Gender: M F	DOB:	
Parent's Full Name:		
Living place:		
Overall acceptance of SSCs (Compared with amalgam filling):		
	(Yes)	(No)
Comments:		

Parent Form			
Child's Name:	National No:	Subject ID:	
Parent's Full Name:			
Living place:			
Overall acceptance of SSCs (Compared with amalgam filling):			
	(Yes)	(No)	
IF NO please mark reason: Appearance Teasing Function Cost			
Comments:			

Your child age group: (3-6yrs.) (7-10yrs.)			
If your child is in the 1 st group PLEASE answer the following (Based on your child response):			
-Overall acceptance of SSCs (Compared with amalgam filling):			
	(Yes)	(No)	
Comments:			

Table II Distribution of frequencies and ratios of children's and parents' satisfaction with SSCs compared with amalgam fillings as perceived relative to the children's age group.

Child age (Yrs)	Child satisfaction			Parent satisfaction		
	Yes (%)	No (%)		Yes (%)	No (%)	
3-6	90(64.3%)	50(35.7%)	P=0.359	108(77.1%)	32(22.9%)	P=0.175
7-10	38(84.4%)	7(15.6%)		42(93.3%)	3(6.7%)	
Total	128(69.2%)	57(30.8%)		150(81.1%)	35(18.9%)	
	P=0.011*			P=0.016*		
<i>Sig.</i>						
* Significant at P≤0.05 using chi-square test.						

DISCUSSION

The acceptance of any dental procedure performed for children is an essential prerequisite for the success of the procedure and for later satisfaction. While this issue solely affects the children who receive the treatment, their parents' acceptance are also important as they have direct contact on a daily basis with them. Certainly, the appearance aspect is usually given priority when choosing between treatment options not only for adults but also for children. However, children may be more sensitive to others' opinions, especially in general gatherings such as school time where teasing may occur. Moreover, the impact of the different available treatment options on functional demands such as eating and speech is also important. Furthermore, treatment cost is of great concern, particularly for families of low income.

The result of our study showed that SSCs, as a treatment option for primary molars, were more positively perceived compared with using amalgam fillings. Both children and their parents agreed with this result. Additionally, there was no significant difference between the two age groups with regards to acceptance for both children and parents. This might be due to the simple and relative fearless procedures that could be used for crowns placement such as; minimal use of local anaesthesia and absence of drilling or any other preparations procedures as it is the case in Hall crown 17,18. So that regardless of the child's age, compliance differences between the 2 age groups were not affected. This in line with Page et al. 19 who reported that almost 90% of children who received Hall SSCs were satisfied with the crowns and that most individuals were worried about the pain and surgery so that they were happy with being referred to clinics to have the Hall SSCs on their primary molars. Furthermore, they did not find any significant differences between children's age and their acceptance of the Hall SCCs. Also, Akhlaghi et al. showed that the majority of parents reported that their children accepted the SSCs while others were not 20.

In contrary to all of this, a highly appreciated national work by Al-Batayneh et al. reported low acceptance of the parents toward these crowns but such negative response was justified by the very low parental knowledge regarding the use of the SSCs 15.

The minority of parents who were not satisfied with the SSCs justified their dissatisfaction due to – in order – appearance, function, teasing and lastly, cost. This was concluded from the six months experience with their children having the two treatment options. This may be in line with the findings of Fishman et al. as they reported that SSCs were negatively perceived but this was due to the aesthetic fillings used in comparison and not amalgam fillings as we have adopted 20. However, the results of research by Sari et al. and Bell et al. confirmed that most children were not worried about the appearance of the SSCs when compared with posterior restorative materials 1, 21

It should be stated that the use of amalgam as a filling material has been given much concerns at the global level with regards to its safety. The United States Food and Drug Administration (FDA) has provided valuable recommendations concerning the use of this material and defined certain groups of people who might be at greater risk to the potential adverse health effects of mercury exposure which included children younger than 6 years old. Also, the European Commission Regulation on Mercury reported that Dental amalgam shall not be used for dental treatment of deciduous teeth, of children under 15 years except when deemed strictly necessary by the dental practitioner based on the specific medical needs of the patient. For this, they advised to use other treatment option among which the SSCs were included 22,23.

Although we did not find any significant differences between the children's and parents' acceptance with reference to the age groups, we believe that the age variable has to be standardised when comparing different studies performed with regards to our subject of research. Older children may look at the coloured materials applied into their oral cavity in a more negative way compared with younger ones. Their greater physical maturity and neural development may play a role in their decisions. This conforms with findings by Fishman et al. 20. The age of the children's group selected was 7.7years, which was older than ours (5.4years). Such older children might have different perception values compared with younger ones.

In a study performed at Sheffield Dental Hospital in the UK, most children found the clinical procedure of SSCs acceptable, with 54.8% reporting it was 'really easy', with no significant

differences according to placement technique or the experience level of the operator. However, only 4.8% of parents expressed strong objections to the appearance. Both parents and children revealed that the SSCs were a favoured option of treatment for the primary teeth 20, contrary to the studies by Fishman et al. 20 and Zimmerman et al. 24.

It should be noted that we have not considered the gender variable in our research. Although this is important, we have found that most of the literature agreed with the fact that gender in this age group (between 3–10 years) has no significant role in affecting the acceptance of one treatment option over the other. Evidence supporting this could be obtained from many studies, 2,19,24,25. Another limitation in this study is that we didn't consider differences in class 1 and class 2 cavities and if the tooth was first primary molar or second primary molar and whether in maxillary or mandibular arches all these factors may affect acceptability of amalgam as compared with SSCs.

CONCLUSION

Both children (in all age groups) and parents showed high acceptance with significant satisfaction toward using the SSCs over amalgam fillings.

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