Child and parental acceptance of preformed metal crowns

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Abstract

AIM: To assess child and parent acceptance of preformed metal crowns (PMCs). **STUDY DESIGN:** This was a service evaluation using a child- and parent-centred self-report questionnaire in a convenience sample of hospital patients. **METHODS:** Questionnaires were developed with service-users and issued to 98 children who had received a PMC on a primary molar within the paediatric dentistry clinic, Sheffield Dental Hospital, UK. Children used a pictorial Likert scale to rate their treatment experience and views on PMCs. Parents were also asked to complete a 5-item questionnaire, to explore their attitudes towards the PMC and how they felt their child had coped with treatment. Both children and parents were invited to comment in a free-text box on any other issues relating to PMCs. Clinical data were extrapolated from the child's dental records as follows: child's age and gender; status of clinician who had placed the PMC (staff or student), and technique for PMC placement (Hall technique or conventional). **RESULTS:** 62 questionnaires were completed (63% response rate). The mean age of the child participants was 6.6 years (SD±1.51; range=3.8-10.3), and 65% (n=40) were male. Most children found the clinical procedure acceptable with 54.8% (n=34) reporting it was 'really easy', with no significant differences according to placement technique, or the experience level of the operator ($P<0.05$, chi-squared test). Only 4.8% (n=3) of parents expressed strong objections to the appearance. Both children and parents felt the clinical rationale had been fully explained to them (88.7%, n=55 and 100%, n=62 respectively). Themes commonly identified from the children's accounts related to specialness, function and recollections of the treatment, with the perception that PMCs were valued for being different. **CONCLUSIONS:** This study revealed that PMCs were mainly viewed favourably by children and their parents. Clinicians who have been reluctant to use this restorative approach may be encouraged by these findings. However, communication and clinical expertise are paramount in ensuring children and parents have positive treatment experiences and attitudes towards PMCs.

Introduction

Preformed metal crowns (PMCs) are widely accepted by paediatric dentists as the restoration of choice for primary molars with extensive caries, enamel or dentine defects, and following pulp therapy treatments [American Association of Pediatric Dentistry, 2008; Kindelan et al., 2008]. Advocates of PMCs suggest that they achieve consistently better outcomes than intra-coronal restorations in high caries risk children [Randall, 2002]. However, a systematic review, published in 2007, highlighted the absence of prospective randomised clinical trials to support this clinical opinion [Innes et al., 2007].

Recently, there has been increasing interest in using PMCs in the UK following the report of a novel clinical approach: the 'Hall technique' [Innes et al., 2006]. This was first developed by a general dental practitioner in Scotland and involves placement of crowns without the need for local analgesia or any tooth preparation [Evans et al., 2000; Innes et al., 2006]. Following on from this, Innes and colleagues conducted a randomised controlled clinical trial to compare the clinical effectiveness of the Hall technique versus more conventional methods of managing carious primary molars in the dental practice setting [Innes et al., 2007]. The spread of restorative materials chosen by the dentists comprised: glass ionomer cement (69%); amalgam (8%); compomer (5%); composite (11%); PMC with tooth preparation (1%); and fissure sealant (2%). After a minimum follow up period of 23 months, the 128 PMCs, placed using the Hall technique, were found to have significantly outperformed control restorations.

Although clinical case series provide convincing evidence for the favourable clinical outcomes of PMCs in the primary dentition [Attari and Roberts, 2006], this is certainly not reflected in the views or clinical preferences of general dental practitioners, in the UK or the USA [Roshan et al., 2003; Threlfall et al., 2005; Chadwick et al., 2007; Kowolik et al., 2007]. General dental practitioners rarely place PMCs and quote patient and parent opinions as one of the barriers to their use. Threlfall and colleagues [2005] published the following quotes from interviews with 93 British dentists:

- *"...parents hate them [PMCs] because they are metal. They don't like their kids with big metal pieces in their mouths."*
- *"Parents aren't brilliantly happy about great big silver crowns on their children's teeth."*
- *"It's a lot for a child, it's a big procedure."*

It should be borne in mind, however, that the above comments reflect UK dentists' impressions of parents or children's opinions and thus may not portray what patients' really think.

Key words: Children, preformed metal crown, satisfaction, parents

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In fact, very little is known about the views of children and parents on this restorative option. A randomised clinical trial, undertaken in Saudi Arabia, to compare the clinical performance of PMCs and resin-modified glass ionomer cements, did provide anecdotal evidence that parents requested the more aesthetic restoration in preference to metal crowns [Atieh, 2008]. Interestingly, there are no published studies to suggest any professional or parental concerns about the appearance or use of PMCs across Europe, where this restorative technique is widely used. However, it is not known whether this absence of data reflects true clinical, economic, educational or cultural differences between the UK and Europe, or whether the subject area has simply not been investigated.

Evans and co-workers [2000] conducted a pilot study on the Hall technique with the additional objective of determining its acceptability amongst dentists, patients and parents. It is worth reiterating, that placement of PMCs using this technique does not require local analgesia or any tooth preparation. Interestingly, all 45 children found the placement of a PMC by this method 'acceptable'. Immediately after a crown had been fitted, 44 out of 45 parents also viewed the procedure as acceptable. Interestingly, the one parent who initially disliked the colour of the crown was reportedly satisfied at a one-week review. A fascinating paper actually explored children's preferences for posterior restorations on the basis of appearance [Fishman et al., 2006]. In this study 100 American children, aged 5-12 years, were shown photographs of a variety of restorative materials and asked to rate their favourite. Composite resins proved the most popular choice, although African-American children showed a preference for PMCs.

The value of seeking children's opinions about their treatment experiences and outcomes is gaining increasing momentum in health care [Marshman and Hall, 2008]. There is wider recognition that, as it is the child who receives treatment and lives with the consequences, their opinions are credible [Mouradian, 1999]. The UK National Service Framework for Children, Young People and Maternity Services [Children's NSF, 2004] calls for services (including dental services) to give children and their parents increased information, power, and choice over the treatment they receive and to involve them in the planning of their care. Furthermore, funding bodies worldwide now expect studies to include patient-centred outcomes as well as the more 'traditional' clinical or biomedical outcomes. The overall aim of this study, therefore, was to seek child and parent perspectives on the use of PMCs as a restorative option for primary molars. Specific objectives were to compare views according to the gender of the child, and to determine whether the seniority of the treating clinician or technique of PMC placement had any impact on feedback.

Materials and Methods

Background. The first step was to speak to children and their parents, in general terms, about their experiences and opinions of PMCs. Over a 4-week period, the investigators approached 10 children and their parents who regularly attended the paediatric dentistry clinic at the Charles Clifford Dental Hospital, Sheffield, and who had previously received a PMC. Using a pre-prepared script, open questions were asked about the placement, appearance, function and perceived value of the PMC. This helped identify key themes of importance to children and their parents, as well as the words they used in relation to PMCs. The information was then incorporated into the definitive questionnaire. The study constituted a service evaluation, thus approval was obtained from the Clinical Effectiveness Unit of the Sheffield Teaching Hospitals NHS Foundation Trust.

Questionnaire. The child questionnaire comprised seven items and employed a 3-point pictorial and verbal Likert scale for responses: positive, neutral or negative (Table 1). The children were also asked to record what words they used to describe their 'silver tooth' and anything else about their visit to have the PMC fitted. The parent questionnaire included five items and a 5-point Likert scale (see Table 2 for questions). Parents were also invited to write any additional comments on their child's experience of having a 'silver crown'. The questionnaire was piloted for ease of understanding on five patients but did not require further amendment.

Subjects. All patients who had a PMC placed on a primary molar during the period January 2006 to December 2008 were identified from the hospital patient attendance database. Dental records were reviewed to obtain the following information: age of child at PMC placement; gender of child; status of clinician who placed the PMC (dental student or staff); and technique used (Hall technique or conventional i.e. involving local analgesia and tooth preparation). Postal questionnaires were sent to 98 patients and parents with a covering letter explaining that an anonymous survey was being carried out to gain children's and parents' points of view on PMC's. Parents were invited to help their child complete the children's questionnaire, if necessary, and return both questionnaires in a pre-paid envelope. A second questionnaire was sent out if a response had not been received within a 5-week period. In order to maximise the response rate, questionnaires were also handed out to any potential participants if they happened to attend the paediatric dentistry clinic during the data collection period.

Statistical analysis. Data were entered into an electronic database (Statistical Package for Social Sciences, v14). Simple descriptive analysis was used to present the patient and clinical variables. A chi-squared test was used to determine whether there were any statistically significant differences in responses according to patient gender (male or female), operator status (staff or student), and technique used (Hall or conventional). The significance level was set at $P<0.05$.

Additional comments made by the children were explored using an accepted qualitative approach [Pope and Mays, 2000]. After thorough familiarisation with the data, comments were grouped into themes that provided further insights into experiences and attitudes relating to PMCs. The analysis was carried out independently by two investigators (AGM and HDR).

Table 1. Patient responses to questions about attitudes and experiences of preformed metal crowns in a sample of British children.

Question	Response % (n) Positive	Neutral	Negative
1. What do you think about your silver tooth?	56.4 (35)	38.7 (24)	4.8 (3)
2. Are you glad to have your silver tooth?	59.7 (37)	29.0 (18)	11.3 (7)
3. Do you mind people asking about your silver tooth?	30.6 (19)	53.2 (33)	16.1 (10)
4. How did we look after you when you had your treatment?	82.3 (51)	14.5 (9)	3.2 (2)
5. How friendly were we when you came to see us?	95.2 (59)	4.8 (3)	0.0 (0)
6. How well did the dentist explain everything about your silver tooth?	88.7 (55)	11.3 (7)	0.0 (0)
7. Was it ok having the silver cap put on your tooth?	54.8 (34)	37.1 (23)	8.1 (5)

Results

Subjects. A total of 62 child and parent questionnaires were completed, giving a response rate of 63%. The mean age at which a child had received a PMC was 6.6 years (SD±1.51; range=3.8-10.3) and 65% (n=40) were male. The Hall technique had been employed in 29% (n=18) of children and a conventional approach had been used for 71% (n=44). Further analysis revealed that the children who had been subject to the Hall technique were significantly younger than those who had undergone conventional PMC placement (mean ages=5.8 and 7.0 years respectively; P=0.012, independent t-test). The operator was a student in 18% (n=11) cases, and a qualified therapist or dentist in 82% (n=51) of instances. There was no significant difference in the relative proportion of Hall technique or conventional PMCs placed by student or staff clinicians (P=0.881, chi-squared test).

Child responses. Table 1 shows the children's responses to the seven questions. The key findings were as follows:

- Just over half of the participants (56.5%, n=35) indicated that they 'really liked' their 'silver tooth', but a small minority (4.8%, n=3) said they 'really hated' it,
- Over half (59.7%, n=37) were 'really glad' to have the crown, but 11.3% (n=10) wished they did not have to have it,
- Most children (53.2%, n=33) were ambivalent about other people asking about their 'silver tooth', but 3.2% (n=2) of children hated being questioned about it,
- Children gave positive feedback about how they had been looked after during treatment, with 82.3% (n=51) stating that they had been 'really well' looked after,
- An overwhelming 95.2% (n=59) thought everyone on the clinic had been very friendly to them,
- 88.7% (n=55) stated that the dentist had explained everything to them about their crown, and no one said that they had not received any information,
- The vast majority had thought the procedure was either 'really easy' (54.8%, n=34) or 'okay' (37.1%, n=23).

Table 2. Parents' responses to statements about their child's preformed metal crown in a sample of British children.

Statement	Strongly agree	Agree	Response % (n) No opinion	Disagree	Strongly disagree
1. The dentist explained very well why my child needed a silver crown*	79.0 (49)	21.0 (13)	0.0 (0)	0.0 (0)	0.0 (0)
2. I have no concerns about how the silver crown looks	50.0 (31)	33.9 (21)	6.5 (4)	4.8 (3)	4.8 (3)
3. I think the silver crown is doing a good job at protecting my child's tooth	66.1 (41)	30.6 (19)	3.2 (2)	0.0 (0)	0.0 (0)
4. My child coped well with having the silver crown put on their tooth	59.7 (37)	35.5 (22)	0.0 (0)	4.8 (3)	0.0 (0)
5. The dental team were kind and helpful during my child's treatment	90.3 (56)	9.7 (6)	0.0 (0)	0.0 (0)	0.0 (0)

* Significant difference in response according to whether the PMC was placed with Hall technique or conventionally (P<0.05, chi-squared test)

Chi-squared analysis revealed that a child's gender had no effect on any of the above responses (P>0.05). Furthermore, no significant response differences were found according to whether a student or a member of staff had treated a child. Finally, there was no significant difference in how well children reported coping with treatment between those who had undergone the Hall technique compared to those who had been subject to the conventional approach using local anaesthetic.

A total of 77% (n=48) of the children provided their own accounts and experiences relating to their 'silver tooth'. Analysis of these narratives revealed four recurring themes: the perception of specialness of the PMC; function of the PMC; appraisal of the treatment procedure itself, and inter-personal relationships with the dental team. Both investigators independently identified these four themes, demonstrating the reliability of the framework analysis. The results, illustrated by anonymous quotes, are described in further detail below.

Specialness. Many of the children described their PMCs in enthusiastic terms, with the consensus that they were considered special, desirable and out-of-the-ordinary.

"I've got a silver tooth and it's cool" (boy, aged 8)

"They're brilliant and very special" (girl, aged 5)

Interestingly, the PMC seemed to enable some participants to adopt another persona, by imparting an attribute of a popular character, such as a cinematic hero or heroine.

"I tell people I am a pirate" (boy, aged 7).

"Made me feel like a princess" (girl, aged 4).

"I say I am from Mars" (boy, aged 6).

Function. The children provided a range of responses describing the function of PMCs in both the promotion of oral health and as a consequence of dental disease, demonstrating a clear understanding of the reasoning for their use.

"That the enamel on my back teeth is thin so I have some metal caps on them to protect them" (girl, aged 8).

"...I say the dentist put it [silver tooth] in because I've been eating to much sugar that I've got holes..." (girl, aged 10).

Treatment procedure. Regrettably in some cases, the treatment procedure itself was described as a negative experience.

"Having the silver tooth on hurt" (boy, aged 6).

"I don't like it because I couldn't eat" (boy, aged 9).

Communication. The final theme to emerge was that of communication and interactions they had experienced with the dental team. Children valued being treated with friendliness and kindness.

"My dentist is really nice and helpful" (boy, aged 8).

"Everyone was kind to me and made me feel happy" (girl, aged 4).

However not all interactions were described as being positive:

"There was the most horrible woman who hurt my jaw and did not listen to me at all..." (girl, aged 9).

Parent response. Parent responses to the five questions are presented in Table 2, and the key findings are summarised below:

- 100% (n=62) strongly agreed or agreed that the dentist had clearly explained why their child needed a silver crown,
- The majority (83.9%, n=52) had no concerns about the appearance of the crown, but 4.8% (n=3) had very strong objections to the way it looked,
- 66.1% (n=41) strongly agreed that the crown was doing a good job at protecting their child's tooth, and no parent disagreed with this concept,
- Only 4.8% (n=3) did not think that their child coped well with the procedure,
- 100% (n=62) strongly agreed or agreed that the staff had been kind and helpful during their child's treatment.

Chi-squared analysis did not identify any significant differences in parental responses between those whose child had been treated a student and those treated by a staff member (P>0.05). Only one significant difference was found according to the technique used: 100% (n=18) of 'Hall technique parents' strongly agreed that they had received a good explanation for the use of a PMC compared with 70% (n=44) of 'conventional technique parents' (P=0.008, chi-squared test).

A total of 55% (n=34) of parents took the opportunity to provide additional comments. After analysis four key themes were identified: communication; appearance and social acceptability; treatment procedure; and gratitude for care. Again, there was complete agreement between the two investigators in theme identification.

Communication between the dental team and child. A range of responses described the high worth placed on good communication, with parents clearly valuing patient involvement.

"..they also explain to the child as well as the parent what is going to happen. A good example of the patient-centred approach" (parent of a 6-year-old boy).

"He was always directly addressed and everything was explained to him by the doctor in an age appropriate manner" (parent of a 5-year-old boy).

"Please listen to the children and take on board what they want" (parent of a 9-year-old girl).

Appearance and social acceptability. Views on the appearance of PMCs were described in more detail, and interestingly, both negative and positive opinions were voiced. One

appearance-related consideration raised was that of social acceptability. As a PMC is a noticeable reminder of dental caries, children could be exposed to other people's prejudices, and that the PMC was stigmatising.

"Feels like a daily reminder that my child has dental decay and people make assumptions" (parent of a 6-year-old boy).

Despite these reservations about appearance there was a general appreciation for the functional merit of PMCs.

"I don't really like the look of the silver crown but if they are helping my son's teeth then that's all that matters" (parent of a 5-year-old boy).

"I don't mind his silver teeth as they serve a purpose but would prefer him to have a natural coloured smile for his school photos, rather than a silver one, but this only encourages him to look after his second teeth better" (parent of 6-year-old boy).

Treatment procedure. A further theme, which had been also identified in the children's feedback, was that of the treatment procedure itself. In the main, these were positive accounts.

'It wasn't a scary experience, I was really happy about the whole experience" (parent of 5-year-old boy).

However, some parents had found the treatment visit difficult, although satisfaction with the final outcome was expressed.

"We as parents also found it very traumatic but understand the importance of saving young teeth" (parent of a 5-year -old boy).

"Not telling her she was about to have an injection was I think the wrong decision in my child's case" (parent of 7-year-old girl).

Gratitude for care. Lastly, many of the parents had spontaneously expressed their gratitude and appreciation for the care that had been provided for their child.

"The time and effort showed by the dentist was fantastic. The confidence my daughter has gained with dentists is brilliant compared with 12-months ago." (parent of a 6-year-old girl).

"Greatly appreciated having this as an option as didn't want general anaesthetic for tooth extraction when much younger. Feel very well supported by team." (parent of 5-year-old girl).

Discussion

The aim of this study was to explore the use of PMCs for the restoration of primary molar teeth from the perspectives of young patients and their parents. Seeking both quantitative and qualitative evaluations provided us with an invaluable insight into a range of issues relating to PMCs. In addition, a good response rate (63%) was achieved, suggesting that children and parents welcomed the opportunity to provide feedback.

The significant majority of the participants in this study found the clinical procedure to be acceptable, with most of the children reporting that they had coped well, irrespective of the technique used for PMC placement. Although this finding supports those of previous investigations that report the excellent acceptability of the Hall technique, it is surprising that there were no significant differences between children receiving the Hall technique and those exposed to local analgesia and tooth preparation [van Bochove and van Amerongen, 2006; Innes et al., 2007]. However, it should be noted that, in the present study, the mean age of the children subject to the conventional technique was older than those having the Hall technique, which may be a confounding factor. Nonetheless, this finding does challenge the opinion held by some UK general dental practitioners that the treatment modality is too demanding for children to tolerate [Threfall et al., 2005].

Although the quantitative data support an overall positive treatment experience for participants, individual feedback from some children and parents suggest that specific aspects of treatment had on occasion been painful. A whole variety of factors may have contributed to these negative accounts including patient/parent anxiety or specific technical challenges encountered by the clinician. Further research would be needed to identify these specific psychosocial or clinical factors. One area of potential interest is the prior placement of orthodontic separators to facilitate PMC fit. This appears to be a matter of personal preference for clinicians using the Hall Technique, but it is not known how beneficial they are to the overall patient experience. Nonetheless, it is imperative that good communication, behaviour and pain management are maintained throughout the procedure to minimise the risk of any discomfort or distress.

An acknowledged barrier to the use of PMCs in primary dental care appears to be limited clinical experience, as reported by general dental practitioners themselves [Chadwick et al., 2007]. Correspondingly, dental students have reported low levels of exposure to PMCs during their undergraduate training [Rodd et al., 2010]. Although specialists in paediatric dentistry view the provision of PMCs as an essential clinical skill, the General Dental Council in the UK only requires dental undergraduates to have a knowledge of the procedure [General Dental Council, 2008]. However, with the recent introduction of the Hall technique into the undergraduate curriculum by some schools, there is likely to be far greater opportunities for dental and hygiene/therapy students to achieve competency in PMC placement [Rodd et al., 2010]. In turn, this may have a profound impact on the clinical practices and preferences of future dental practitioners.

An unexpected, but encouraging, finding from the present study was that children's acceptance of PMCs was not influenced by the experience level of the operator. Admittedly,

within a supportive and open learning environment, senior clinicians are proactive in providing clinical input for students and junior staff when difficulties are encountered or anticipated. Furthermore, patients are usually pre-selected as being suitable for student care. Thus, these aspects need to be taken into consideration when interpreting the findings. However, it would appear, from the patients' and parents' perspectives, that student-led care for PMC provision is entirely acceptable.

Surprisingly, most of the parents and children in this study expressed little or no concern about the appearance of PMCs. This is in stark contrast to the responses found by two previous studies conducted in North America where restorative aesthetics were a primary concern [Fishman et al., 2006; Zimmerman et al., 2009]. Furthermore, it does not support the notion held by British general dental practitioners that PMCs are cosmetically unacceptable [Threfall et al., 2005]. There may be a number of possible explanations for this unexpected finding. Firstly, as the present study was carried out retrospectively it is possible that the participants had simply adapted to the presence and appearance of the PMC. Secondly, this was a hospital-based sample that has acknowledged differences in expectations and social, medical or dental characteristics to patients seen in primary care settings, or indeed private practice. It should also be noted that previous studies have not specifically sought children's opinions on crown aesthetics, but rather considered parents' or dentists' views as a proxy. This study actually found that children viewed PMCs as special although some parents expressed the wish that the crowns should be 'white'. An important factor to consider here is the young age of the children involved in this study, who had a mean age of only 6.6 years. It is proposed that, at this age, children have not developed a desire to be 'normal' which is experienced strongly in adolescence. A visible dental difference, such as a PMC, would not appear to concern younger children; indeed it was viewed as something 'cool' and something to show off about! However, it may be that as children get older, the appearance of the crown may be viewed less positively and further research is needed to explore this.

The overall high level of acceptance of PMCs found by this study does deserve further explanation. It is speculated that thorough pre-operative discussion and involvement of both the child and parent in decision-making was conducive to obtaining such positive feedback. One aim of the participating clinic is to provide all patients and parents with the clinical rationale for the use of a PMC, and to demonstrate the crown prior to its actual placement. Effectively conveying this information, and encouraging patient involvement may have generated greater acceptance for PMCs. It is well recognised that effective communication is fundamental to achieving high levels of patient satisfaction with dental treatment [Newsome and McGrath, 2007]. Moreover, the parents clearly valued the way in which their child was also included in the conversations, using words and terms that children could easily relate to. This use of 'child-friendly' language is paramount to good behaviour management and is in accordance with national policies to make health care services more child-centred [Fayle and Tahmassedi, 2003; National Service Framework, 2004].

The social acceptability of PMCs, which may act as a visible marker of a child's caries experience, warrants further consideration. There was the suggestion from one parent that the presence of a PMC was felt to be stigmatising. Although a decayed dental appearance in adults has been shown to incur negative social judgements, the impact of caries and related treatment has not been explored in a young population [Kershaw et al., 2008]. However, children with poor incisor aesthetics, following dental trauma, may be viewed more negatively by their peers than those with normal incisor aesthetics [Rodd et al., 2010]. The complex interrelationship between dental appearance, self-esteem and social acceptance therefore presents an interesting avenue for future enquiry. The increasing pressure for young people to conform to Western society's demands for an 'all white smile' may become more and more apparent in our patient encounters. But for now, at least, our younger patients are happy to be different.

Conclusion

This study showed that PMCs were, in the main, viewed favourably by children and their parents. Clinicians who have been reluctant to use this restorative approach may be encouraged by these findings. Good communication and clinical expertise are paramount to ensure children and parents have positive treatment experiences and attitudes towards PMCs.

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