

# Influence of dental care on children's oral health and wellbeing

B. K. Drummond,\*<sup>1</sup> A. M. Meldrum<sup>1</sup> and D. Boyd<sup>1</sup>

## IN BRIEF

- Reviews evidence for the improvement of children's oral health-related quality of life with dental care.
- Considers the risks for poor oral health and general health in adolescents who had early childhood caries.
- Discusses approaches to controlling dental caries by sealing at different stages of lesion progression.

**Background** Dental problems in early childhood can have a very significant effect not only on the oral health of young children but on their quality of life and that of their families. Added to this are the long term risks they carry into the permanent dentition. **Aim** To review current literature on the management of early childhood caries and its influence on wider oral and general health. **Results** Recent studies suggest that the risks for dental caries, periodontal disease, malocclusion and other general health problems including overweight and obesity may be increased in children who have had early childhood caries. Traditional restoration of damaged primary teeth has been shown to have only moderate outcomes depending on the techniques and materials used and the ability of children to cooperate because of age or other factors. **Conclusions** More recent interesting approaches that seal enamel caries, only partially remove carious dentine or attempt to entirely seal carious dentine lesions merit not only discussion but also longer term investigation. With increasing demands on health funding, dentistry must look at how the most appropriate care can be provided to allow children to reach adulthood with healthy permanent dentitions – something that less than half the population currently achieve.

## INTRODUCTION

Children present with a range of dental conditions, the most prevalent being dental caries. Dental practitioners may face dilemmas when treating children, often related to their age and stage of development. For example, there are challenges associated with very young children who present with little language and understanding of their oral problems or with young adolescents who may be unmotivated to carry out a preventive regime or may be unwilling to allow appropriate restorative treatment. Adult patients make their own choices about home oral care or whether or not to have treatment after a dental practitioner has attempted to motivate, inform and explain their dental needs. The decision to refuse care is made for several well-recorded reasons including anxiety or fear about receiving care, or cost.<sup>1,2</sup> However, practitioners working

with children face a different situation where the delivery of care is in partnership with the child and parent and this may be affected by circumstances over which the child has little control including having been brought to the dentist for care. The aim of this paper is to identify issues surrounding the provision of dental care for children including the impact of dental pain and infection on children and their families; relationships with diet, dental caries and general health; the outcomes of, and need for, restorative care; and the possibilities for sealing caries. It considers the long-term impact of caries in early childhood on the risks of problems in the permanent dentition and draws attention to the argument that working towards good oral health in childhood is a key factor in improving lifetime oral health.

Diagnosis of the presence of pain can be difficult, as young children do not always complain of discomfort. Practitioners are well aware of parents being very surprised when they are shown draining sinuses from periapical infections. A useful approach is to ask parents if their child's sleeping or eating habits have changed or if their child is often irritable. This is more likely to identify a child with chronic

pain than asking directly if their child has complained of discomfort.<sup>3-5</sup> Indeed, these studies would challenge the comments of some authors that because children have not presented with pain to a dental practice their teeth have not been causing discomfort.<sup>6</sup> In addition a child who refuses to eat some foods and who does not eat full meals but snacks constantly may be suffering from chronic tooth pain and hunger. The consequence of not providing care for a young child with toothache may be far more significant than for an adult. It may include poor sleeping, unhealthy eating and altered normal daily activity. It can also affect the child's immediate environment with arguments over refusing foods, parents being wakened in the night and behaviour changes that affect learning at school. These issues have significant consequences on family life and given that the prevalence of dental caries is highest in families who are most stressed it is inconceivable that efforts would not be made to improve oral health for children with these problems.<sup>3,7-9</sup> Early childhood caries (ECC) in primary teeth has been shown to be one of the most significant predictors of the caries risk and health of the permanent dentition in adolescence and

<sup>1</sup>Sir John Walsh Research Institute, University of Otago, PO Box 647, Dunedin 9054, New Zealand  
\*Correspondence to: Bernadette K. Drummond  
Email: bernadette.drummond@otago.ac.nz

adulthood.<sup>10–12</sup> It has also been shown that oral health, including periodontal health, malocclusion and dental anxiety is worse in adolescents who have had ECC.<sup>12–14</sup> It could be argued that dental care for children and adolescents is more critical than at any other time in life because of the impact on the developing adult dentition. Therefore the provision of care should include the appropriate dental professional skill mix, effective prevention and treatments with reliable outcomes.

### DENTAL CARIES IN CHILDREN

ECC can have a very severe effect on the oral health and wellbeing of young children.<sup>15,16</sup> For over 30 years the dental literature has recorded the effectiveness of various preventive programmes particularly those showing the effect of fluoride on the prevalence of dental caries in communities with optimal levels of fluoride in community water supplies.<sup>17,18</sup> Dental caries that remains even with fluoride use in water supplies or with toothpaste is often stated to be only in a small percentage of children. Despite this, the reality is that throughout the world around half the children starting school at five to six years of age have some experience of this disease, and there is good evidence from the most recent national oral health surveys that dental caries is still a significant health burden for children and adolescents. In 2009 49% of children in New Zealand aged 5–11 years had visible caries in their primary teeth and 22.5% already had caries in their permanent teeth.<sup>19</sup> In 2007 46% of six-year-old children attending the school dental service in Australia had dental caries with 10% of children having severe ECC with almost ten decayed, missing or filled primary teeth (dmft).<sup>20</sup> Most studies report that although the prevalence of dental caries in 12-year-olds has decreased greatly over the past 30 years the disease level is still significant. What is of far greater concern, and rarely mentioned in the literature, is the increase in caries that occurs through adolescence. In the 2007 Australian survey 39% of 12-year-olds and 60% of 15-year-olds had experience of dental caries.<sup>20</sup> In a UK survey of 12-year-old children attending state schools in England in 2008/2009 33.4% were reported to have visible dental caries in their permanent teeth.<sup>21</sup> In 2009 in New Zealand 45.3% of 11–17-year-olds

had caries in their permanent teeth.<sup>19</sup> If the goal is for children to reach adulthood with dentitions that will be healthy for life it is no longer acceptable to plan oral healthcare and/or funding based on oral health data for 12-year-olds alone. Indications are that considerably more than half the adolescent population reach adulthood with a restorative burden and all reports indicate that the most severe caries is associated with socioeconomic deprivation and ethnicity. With increasing competition health funding, dentistry will need to think of (as yet untested) innovative approaches to reducing the caries risk in children and in adolescents.

### DIET AND DENTAL CARIES

There is much evidence to show the importance of diet as it affects the prevalence of dental caries.<sup>22,23</sup> However, how well do we or indeed patients understand the relationships of diet on the health of teeth? The general public can explain very well that eating sugar causes dental caries but only a very small proportion can relate this to the frequency of eating, despite the many studies that have clearly demonstrated this.<sup>24</sup> There is general confusion about which foods contain sugars and still a belief by many that starchy foods are safe or safer for teeth. The habit of constantly eating and drinking throughout the day (grazing) raises questions about the changing patterns of eating and how this might be investigated and addressed. With current information, a simpler message that encourages patients to give their teeth a rest in between eating and drinking, to recover from the acids produced, could be considered.

There is also increasing concern about the possible links between dental caries and overweight and obesity. The findings to date have been mixed with some studies showing an association between overweight and obesity and dental caries while others show no significant relationships.<sup>25–27</sup> Studies in young children have tended to show decreased growth and weight when there is severe ECC, which is not surprising when they cannot eat properly and therefore tend to snack frequently because they are probably hungry.<sup>8</sup> There are mixed reports of catch-up growth after treatment is provided.<sup>28</sup> A recent study in early adolescents by Gerdin *et al.*<sup>27</sup>

suggested relationships between caries and overweight and obesity but prospective longitudinal studies are now needed to look at this, particularly as dental caries takes many years to be detected. A consideration might be given to encouraging dental practitioners to record the weights and heights of child patients as part of their health information. This would allow retrospective reviews of oral and general health indicators to be carried out in the future. Another consideration is that children's oral health status should be recorded in their general medical records and that all children with ECC and other oral health problems should have that information sent to their medical practitioners to encourage awareness of the impact of the child's oral health on their general wellbeing. Furthermore, oral health should be given greater emphasis in the medical curriculum, and in general medical practitioner training, particularly in relation to the impact of severe dental caries on oral health-related quality-of-life. Dental, medical and other health professionals should all be giving appropriate health messages that cover all dietary related diseases.

### TO RESTORE OR NOT TO RESTORE DENTAL CARIES IN THE PRIMARY DENTITION?

Probably the most difficult factors influencing the range and quality of restorative care provided for children worldwide are: funding, facilities and equipment, practitioner expertise and time available. As well as these issues dental professionals have responsibility to seek alternatives when a child or adolescent is unable to manage needed care. Many still have a perception that:

- It takes too long to treat children
- Primary teeth do not need to be treated
- Children do not have any problems with chronic dental infection
- There is not enough funding to treat children
- It is too risky to have a general anaesthetic (GA) to provide dental care
- Restorations do not last in primary teeth
- Young children do not mind missing anterior teeth.

None of these arguments should be used as justification for not providing care. The

improvement of the oral health-related quality of life of children and their families with appropriate dental treatment provides considerable evidence that children with dental caries should receive care to halt the disease, remove infection and restore the teeth and occlusion as appropriate. If this requires funding for sedation or general anaesthesia to avoid children living with chronic pain, then the arguments should be as compelling as those for managing other medical problems such as ear or skin infections. Dental care is healthcare and this care should be seen to be as important as all other common preventive and surgical procedures that children receive to support normal child development.

### WHAT ARE THE OUTCOMES OF RESTORATIVE CARE IN THE PRIMARY DENTITION?

Many years of research have shown that the survival of restorations/materials in primary teeth varies widely. It has been suggested that this may be due to many factors including the difficulty of gaining appropriate isolation and cooperation in very young children, the small size of the teeth and/or the structure of the enamel for bonding resin materials. With regard to child cooperation it is clear that if appropriate management is used, be it behavioural techniques, sedation, or general anaesthesia, then more acceptable longer-term results are possible.<sup>29</sup> Restoring teeth under general anaesthesia where ideal conditions can be achieved has been shown to result in a significant improvement in the oral health-related quality of life.<sup>30,31</sup>

Numerous studies have looked at the survival rates for restorations and restorative materials. Composite resin and polyacid modified composite resins have been shown to have around 80% retention over two to four years and amalgam restorations have more than 70% retention. However, resin modified glass ionomer and glass ionomer cement restorations have not demonstrated the same success over a similar period of time. The restoration that has shown the best outcomes, at least for the primary molar teeth, is the stainless steel crown (SSC).<sup>29,32-40</sup> To date, there have been few longer-term studies that have investigated the longevity of materials over the expected life span of primary teeth – around nine years for the

second primary molars. Future research of restorative materials and techniques should consider the particular needs of primary teeth and how they might be preserved to exfoliation if they are damaged by caries, trauma or other causes. Considering the importance of reducing the cariogenic biofilm to decrease future caries risk, restorative care has a role alongside microbiological approaches.<sup>41</sup> Several studies including that of Tanner *et al.*<sup>42</sup> have shown the changes in the microbiota that can be achieved with successful care involving comprehensive restorative and extraction treatment and preventive care.

### PRESERVING CARIOUS PRIMARY TEETH UNTIL THE TIME OF NATURAL EXFOLIATION

There is good evidence that SSCs are an extremely successful and cost effective restoration for primary molars with more than one surface affected by dental caries. In the past practitioners have sometimes been daunted by the preparation and placement of these crowns although those who have made the effort to master the procedure have found this technique to be effective with very low failure rates.<sup>35,43</sup> More recently an approach has been to place SSCs without caries removal and no tooth preparation other than after a few days of tooth separation (Hall technique – named after a practitioner in Scotland who initiated this procedure). The outcomes are good where the crowns can be placed.<sup>44</sup> However, it is important to consider both the benefits and the limitations of this procedure. Where only a few molars are involved and there is no space loss, SSCs placed with this technique may provide an effective sealed restoration. This is not a new concept as previous studies of carious lesions sealed with resins or after stepwise excavation or indirect pulp capping have clearly shown a decrease or halt in the progression of lesions when the carious tissue is well sealed.<sup>45-48</sup> A problem with the resin fissure sealing approach has been that these materials do not maintain a permanent seal and must be regularly maintained – a problem when patients are not regular attendees. At the present time, the duration of an effective seal in teeth restored with SSCs placed with or without tooth preparation is not known but

it may be expected to be quite successful. However, the Hall technique for SSC placement offers a useful approach for some young children. An example would be children where sedation or general anaesthetic options are not available, they are unable to cooperate and present with only one or two molars with caries or hypoplasia. Many children will successfully bite the crowns into place when there is still adequate interproximal space. In older children who are not very cooperative, the Hall technique has, unsurprisingly, been shown to have a far greater success rate than intra-coronal glass ionomer cement restorations.<sup>49</sup> However, there are limitations to this approach. Teeth should be carefully selected and should be without signs or symptoms of pulp involvement – not always an easy diagnosis in children who have not complained of pain. When teeth have been cavitated for a period of time there is often space loss precluding fitting of stainless steel preformed crowns without significant adjustment to avoid having marked overhangs. This procedure therefore does not replace the traditional approach to placing crowns but is another approach with appropriate case selection.

Regardless of any technique or material used in restoring cavitated teeth, the needs of the whole mouth must be considered. Successfully restoring posterior teeth while leaving carious anterior teeth or other teeth with enamel caries results in the retention of a highly cariogenic biofilm that may put newly erupting permanent teeth at risk.<sup>42</sup> With good understanding of the risk to the permanent dentition in these patients, it is important that alongside any restorative management with SSCs, attempts should be made as the child develops better coping skills, to restore, reverse or seal caries in other teeth to reduce the bacteria in the biofilm as well as encouraging the use of preventive measures at home.

### ARE THERE OTHER OPTIONS FOR SEALING CARIOUS LESIONS?

The Hall technique for placing SSCs has rekindled interest in the possibility of halting caries by sealing carious lesions by various means. This is not a new concept. Davila *et al.*<sup>50</sup> in the 1970s demonstrated that sealing interproximal lesions with resin sealants could significantly reduce the progression of the lesions. Later

Handelman *et al.*<sup>46</sup> demonstrated over a two year period, that occlusal dentine lesions could be halted and the numbers of bacteria in the lesions reduced if the lesions were effectively sealed with resin. In the past few years, studies investigating only partial removal of carious dentine by mechanical or chemo-mechanical means from primary teeth lesions have been showing good long-term outcomes.<sup>51</sup> This indicates the need for ongoing investigation of materials to ensure teeth treated in this way can be effectively sealed to support this technique. The concept of resin infiltration of enamel lesions was investigated by Robinson *et al.*<sup>52</sup> and more recently by Paris *et al.*<sup>53</sup> and Meyer Lueckel and Paris.<sup>54</sup> This approach aims to infiltrate enamel lesions and potentially dentine lesions to prevent progress of the caries. There may be problems associated with this approach. While the lesions remain sealed or infiltrated, progression does not occur but resins wear and fracture so need to be regularly maintained. This can be an issue with irregular attendees, or when the funding system does not pay for repairs. Another issue may occur when patients move to other practitioners who take radiographs and see what appears to be a carious lesion that has not been restored. Another approach to managing caries that has been suggested in the past and is again under investigation is to use materials to arrest the caries without actually restoring the defects. Materials that have been reported include silver diamine fluoride with and without potassium iodide.<sup>55,56</sup> This approach does not always take into account the needed space for the developing permanent dentition and occlusion but perhaps these materials could be useful to gain some time until children on waiting lists can be seen by a dentist or specialist who can provide restorative care. All of these approaches avoid removing healthy tooth tissue to control the caries process and offer a way forward in future management.

## CONCLUSION

There is an increasing body of evidence that problems in the primary dentition are indicators of and contribute to risks of poor oral health in adolescence and adulthood. Achieving good oral health for life thus requires concerted efforts to

not only find more innovative preventive approaches but also improved approaches by all dental practitioners to restoring and preserving primary and young permanent teeth. Children are not able to be advocates for themselves and the dental profession must continue to work towards care that will give children comfortable and functional primary dentitions, healthy young permanent dentitions and optimum oral health throughout their adult lives. It is important that child-related oral health research and appropriate education for general practitioners and paediatric dental specialists receive adequate funding. The future undoubtedly holds different models of care and different approaches to managing caries not only for children but throughout life. The available information would support the conclusion that many children are not receiving adequate or appropriate dental care and that the dental profession needs to be open to investigating novel approaches that may involve a mix of restoring, sealing and arresting dental caries. Avoiding this in children will only add to the risk of longer-term problems in adulthood affecting both oral and general health.

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