

Oral Health Research Review

Making Education Easy

Issue 8 – 2011

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Oral Health Research Review is also made available to Dental Hygienists through the kind support of the New Zealand Dental Hygienists' Association

Welcome to the eighth issue of Oral Health Research Review.

Our first issue for 2011 leads with a study showing that a healthy diet and physical activity appear to be associated with good periodontal health. The amount of fluoride in bottled water available in Australia is put under the spotlight, with many findings also applicable in NZ. We finish this issue with a review providing reassuring data that oscillating-rotating power toothbrushes (ORPBs) are as safe as manual brushes, and that most toothbrushing-related problems are due to incorrect technique (irrespective of which type of toothbrush is used).

I would like to thank Deanna Beckett from the University of Otago for her contributions to this issue.

We hope you enjoy this issue of Oral Health Research Review, and we look forward to your comments and feedback.

Kind regards,

Jonathan Leichter D.M.D

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The association between periodontal disease, physical activity and healthy diet among adults in Jordan

Authors: Bawadi HA et al

Summary: This study involved 340 participants who were assessed to determine if an association existed between their diet, physical activity and periodontal health. Body mass index (BMI) was calculated, and questionnaires completed to obtain the level of physical activity and a healthy eating index score. Gingival index, plaque index, probing depths and clinical attachment loss were assessed by a dental hygienist. The authors found that a poor diet was significantly associated with an increased odds of periodontal disease, including missing teeth and average clinical attachment loss. The percentage of participants with periodontal disease also decreased with increased physical activity.

Comment (JL): Cardiovascular disease, hypertension and diabetes immediately spring to mind when thinking about those patients who are unfit and overweight, but what about the health of their periodontal tissues? Although more studies are needed, this provides us with yet another reason to promote a healthy lifestyle to our patients.

Comment (DB): For a long time, healthy eating and lifestyle have been linked to disease prevention for a wide range of chronic diseases. This study looked to find a relationship between diet, lifestyle and the development of periodontal disease. Participants were family members of patients attending outpatient clinics at the Jordan University of Science and Technology. Dietary and physical activity assessments were conducted, as well as dental examinations and questionnaires. The results showed that individuals with poor diets and low levels of physical exercise were at greater risk of developing periodontal disease. The reasons for these associations are still not fully understood, and further studies are needed to explore this relationship.

Reference: *J Periodont Res* 2011;46(1):74–81

<http://onlinelibrary.wiley.com/doi/10.1111/j.1600-0765.2010.01314.x/full>

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Fluoride in still bottled water in Australia

Authors: Mills K et al

Summary: This study included 100 different brands of still bottled water, with two analytical methods used to determine fluoride levels. 85% of the samples tested had fluoride levels <0.1 mg/L, with 91% of the samples <0.6 mg/L, and only 9% had levels within the recommended range for reticulated water in Australia. The highest fluoride level reported was 1.6 mg/L. Fluoride levels were recorded on the labels of 11% of samples.

Comment (JL): Water fluoridation is a key population health strategy for the prevention of dental caries. However, the consumption of bottled water is increasing, with Australians drinking 150 million litres of bottled water a year. I would imagine that New Zealanders are no different with a huge range of bottled waters now available in our country. Besides the impact on our landfills, are there oral health implications insofar as fluoride exposure is concerned? Although an Australian study, many of the brand names were familiar to me and obtainable in NZ with water originating from NZ, Fiji, Asia, Europe and the USA. For those patients living in unfluoridated areas or drinking mostly bottled water, choice of brand based on fluoride level should be promoted. With our help, patients need to make informed decisions with regard to their oral health.

Comment (DB): With a significant increase in sales of bottled water, there is concern that individuals drinking bottled water rather than their own fluoridated reticulated water supply may not be getting maximum dental protection. Currently natural levels of fluoride in bottled water are not required to be reported in Australia. Only 9% of the 100 varieties of bottled water tested contained fluoride at a level that can help optimise dental health and one brand actually had levels above the recommended amount for reticulated water in Australia. This study has highlighted the need for a change in reporting requirements for fluoride. Bottled water, fluoridated to optimum levels for dental health, would be beneficial to those living in both fluoridated and nonfluoridated areas wishing to make an educated decision. As a dental professional, it would be useful to be able to recommend particular brands to my patients.

Reference: *Aust Dent J* 2010;55(4):411-6

<http://onlinelibrary.wiley.com/doi/10.1111/j.1834-7819.2010.01262.x/abstract>

Diabetes, periodontitis, and the subgingival microbiota

Authors: Ohlrich EJ et al

Summary: This review firstly summarised the role of plaque in periodontal disease, then the effects of diabetes on subgingival microbiota and the host response, and concluded with the relationship between periodontitis and diabetes control. It was concluded that while the biological mechanisms behind the association between periodontitis and diabetes have not yet been fully elucidated, our understanding is increasing. Similarly, the effect of periodontitis on diabetes control is still not well understood, but the role of systemic inflammation exacerbated by periodontitis as a contributing factor is compelling.

Comment (JL): It has been estimated that by 2030 there will be 366 million people worldwide with diabetes. Periodontitis has been described as the sixth complication of diabetes, with an increase in the severity of periodontal disease shown across most age ranges in patients with type 1 diabetes. Type 2 diabetes has also been shown to be a risk factor for periodontal disease. Several reasons for this have been suggested. Hyperglycaemia may alter the subgingival microenvironment favouring more pathogenic bacteria and affecting collagen metabolism, tissue homeostasis and wound healing, or an altered source of nutrition from the elevated glucose content of the gingival crevicular fluid could modify the proportions of certain species in the biofilm. Regardless of the biological mechanisms, we need to encourage our diabetic patients to improve their glycaemic control, maintain excellent plaque control and see their hygienist/dentist regularly for maintenance and monitoring.

Comment (DB): This paper looked at the prevalence of severe periodontitis in diabetics and explored the relationship between the two chronic conditions. I found it an interesting concept that not only do diabetics have an increased prevalence of periodontitis, but patients with severe periodontitis have an increased chance of developing diabetes. This is almost a case of which came first, the chicken or the egg? Studies have looked at this relationship and found evidence to suggest that the two conditions have an effect on one another. A meta-analysis of 23 studies confirmed a significantly higher severity and prevalence of periodontitis in diabetics. So do metabolic changes, due predominantly to hyperglycaemia, predispose diabetics to periodontitis? Do people with poorly-controlled diabetes also have poorly controlled oral hygiene, which, in turn, leads to more severe periodontal disease? Does periodontal disease impact on glycaemic control making patients more susceptible to diabetes? I found this paper to be a thorough, informative and thought provoking discussion on the subject.

Reference: *J Oral Microbiol* 2010;2:5818-25

<http://www.journaloforalmicrobiology.net/index.php/jom/article/view/5818/6546>

A literature review of dental erosion on children

Authors: Taji S & Seow WK

Summary: This review of dental erosion in children noted that reported prevalences range from 10% to >80%, with primary dentition believed to be more susceptible. In addition, the aetiology, diagnosis and prevention of dental erosion in children were critically reviewed, and the relationships between this and other conditions, such as caries and enamel hypoplasia, were also discussed.

Comment (JL): It is important for those of us who treat children to be able to recognise erosion, as early diagnosis and prevention can help to prevent damage to >80%, with primary dentition believed to be more susceptible. In addition, the aetiology, diagnosis and prevention of dental erosion in children were critically reviewed, and the relationships between this and other conditions, such as caries and enamel hypoplasia, were also discussed. Erosion is often found alongside other forms of tooth wear, such as attrition and abrasion, with some studies also suggesting an association between erosion and caries. Although both are multifactorial with the dietary factors related to erosion also contributing to caries, further research is needed in this area. We need to be able to make a confident diagnosis, identify the intrinsic and/or extrinsic causative factors, assess the biological factors such as saliva, acquired pellicle and tooth structure, and the behavioural factors such as eating and drinking habits, hydration levels and oral hygiene. A comprehensive 6-day diet diary is recommended. In cases where intrinsic acids are suspected or have been identified, referral to the appropriate health professional is required. This review provides us with a good overview of erosion and is certainly worth a read.

Comment (DB): Dental erosion in children is one of the more challenging conditions for practitioners to deal with. Deciduous teeth are known to be more susceptible to erosion due to their thin enamel layer and morphological differences. Saliva has been shown to play a significant role in protecting teeth from erosion. This is not only due to its buffering capacity, but also to pellicle formation, which is shown to have a protective quality against erosion. Distinct differences were found in the chemical composition of pellicle between permanent and primary teeth. Early diagnosis of erosion on deciduous teeth has been highlighted as essential, so that the cause can be identified and precautions taken to protect permanent dentition from erosion.

Reference: *Aust Dent J* 2010;55(4):358-67

<http://tinyurl.com/AustDentJ-55-358>



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Tooth-brushing behaviour in 6–12 year olds

Authors: Sandström A et al

Summary: The authors evaluated the toothbrushing behaviour of 82 children aged 6, 8, 10 and 12 years. Unbrushed teeth were stained with a disclosing tablet and photographed, after which the children were videoed brushing their teeth "as they do at home". Photographs were then retaken and the children questioned about oral hygiene habits, fluoride and who had taught them to brush. Children aged 6 years had a significantly higher ratio between the sum of plaque scores before and after brushing than those aged 10 years ($p < 0.05$). The amount of time spent brushing was negatively correlated with this ratio ($r = -0.31$; $p < 0.01$), and children from the youngest age group had the lowest correlation; the amount of time spent brushing was significantly lower in children aged 6 years than in older children ($p < 0.05$).

Comment (JL): It came as no surprise to me to read in this article that many children display nonacceptable oral hygiene, with 6-year olds spending less time brushing than older children, and poor plaque removal from buccal surfaces over all age groups in this study. After data analysis, the authors concluded that in younger children, there is no connection between brushing time and plaque removal. Due to their lack of motor skills, children aged around 6 years are too young to be responsible for their brushing and still require considerable parental input. Although 7- to 8-year olds could be given increased responsibility, parental help and advice up to age 10 years is recommended. Children aged 8–12 years need to brush for longer periods of time (a minimum of 2 minutes) as this improves the outcome.

Comment (DB): This study looked at the removal of disclosed plaque from buccal surfaces of incisors and canines by children. Photos of teeth were taken before and after toothbrushing, and children were videoed while brushing. Videoing may have resulted in the children being more thorough than usual; however, results still showed a definite decrease in plaque removal for the 6- to 8-year age group. Techniques were generally taught by parents, with only a small number of children being taught by a dental professional. Many of the children lacked a methodical approach to toothbrushing and focused primarily on brushing the occlusal surfaces of teeth; however, this study found that it was the time spent, more than the technique that made the most difference to effective plaque removal. This study reiterates the message that parents/caregivers should assist daily with children's toothbrushing until the age of 8 years, and continue to offer advice until 10 years of age.

Reference: *Int J Paediatr Dent* 2011;21(1):43–9

<http://onlinelibrary.wiley.com/doi/10.1111/j.1365-263X.2010.01080.x/full>

Independent commentary by Deanna Beckett (DB).

Deanna graduated as a Dental Therapist in 1996 and is currently employed as a Professional Practice Fellow with the Bachelor of Oral Health programme at the School of Dentistry, University of Otago. In addition to her university position, Deanna holds a fortnightly weekend clinic at the Fiordland Dental Centre, providing oral healthcare for children and adolescents in the greater Fiordland area. Before joining the University staff, Deanna also worked as a Dental Therapist in a variety of schools in the Mid Central, Nelson/Marlborough and Otago areas.

Independent commentary by Jonathan Leichter (JL) DMD, Cert Perio (Harvard).

Dr Leichter is currently Senior Lecturer in the Department of Oral Sciences at the University of Otago. Dr Leichter joined the faculty after 20 years in fulltime private practice in New York and Boston, 18 of which were spent in specialist practice limited to periodontology and implant dentistry. Trained at Tufts University and obtaining his specialist training at Harvard University, he has been actively involved in clinical dental implant practice since 1984. Since 2002, he has supervised and mentored postgraduate students in periodontology, endodontics and prosthodontics. His research interests and publications are in the field of periodontology, dental trauma and laser applications in dentistry.

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Disclaimer: This publication is not intended as a replacement for regular medical education but to assist in the process. The reviews are a summarised interpretation of the published study and reflect the opinion of the writer rather than those of the research group or scientific journal. It is suggested readers review the full trial data before forming a final conclusion on its merits.

One-year effects of vitamin D and calcium supplementation on chronic periodontitis

Authors: Garcia MN et al

Summary: The 51 subjects in this study were enrolled in one of two groups – those taking vitamin D and calcium supplementation and those who were not. The study population consisted of postmenopausal females and males aged 50–80 years with moderate-to-severe chronic periodontal disease and a minimum of two mandibular and one maxillary posterior teeth. Clinical, radiographic and nutritional analyses were carried out and all subjects received periodontal maintenance therapy at 3-month intervals. The study spanned a 1-year period. Participants who took supplements had total calcium and vitamin D intakes of 1769 mg/day and 1049 IU/day, respectively, and the respective intakes for those who did not take supplements were 642 mg/day and 156 IU/day. Clinical parameters of periodontal health improved significantly over the study period in both groups, and the adjusted p values for the between-group differences for the collective clinical measures were 0.028, 0.034 and 0.058 at baseline, 6 months and 12 months respectively.

Comment (JL): Intake of calcium or vitamin D is less than desirable in most of the world's population, with 1 billion people worldwide estimated to have vitamin D deficiency. As this leads to a negative calcium balance and bone loss, it is not unreasonable to expect a similar effect on the alveolar bone. After statistical analysis, the authors concluded that calcium and vitamin D supplementation had a modest positive effect on periodontal health. However, periodontal health improved in all patients attending regularly for treatment. The sample size was small, subjects were relatively periodontally healthy and serum 25(OH)D levels were not determined. An RCT on the effect of vitamin D on periodontitis is needed to shed further light on this topic.

Comment (DB): The purpose of this study was to find a link between calcium and vitamin D supplementation and improved periodontal status. Participants in this study were followed for 12 months and underwent 3-monthly periodontal examinations and treatment. The basis for the hypothesis is from current knowledge that vitamin D and calcium are fundamental for bone mineralisation and the prevention of osteoporosis. The results showed that taking vitamin D and calcium supplements may help periodontal health, with moderate improvements in periodontal health noted for the group taking supplements as compared with the control group. Consistent dental care was also a factor in an improvement of periodontal status for both groups. Higher levels of calcium and vitamin D may show a more marked improvement in periodontal health.

Reference: *J Periodontol* 2011;82(1):25–32

<http://www.joponline.org/doi/abs/10.1902/jop.2010.100207>

Patterns of soft drink consumption and primary tooth extractions in Queensland children

Authors: Slater PJ et al

Summary: This paper examined tooth extraction due to caries and soft drink consumption patterns in Queensland children aged ≤ 12 years in 2003 and 2008. Data were collected via telephone interviews and were self-reported. Both frequency and volume of soft drink consumption, and soft drink consumption between meals, were associated with increased risks of tooth extraction in both the 2003 and 2008 surveys. The 2008 survey showed there had been a decline in the proportion of children who consumed soft drinks daily or several times per week and an increase in those who never consumed soft drinks.

Comment (JL): The data collection methods used in this study may well have compromised the quality of the data, as retrospective self-reported data can be inaccurate. In addition, fluoride exposure of the children was not taken into account, and the intake of other fluids, such as fruit juice or cordial, was not included in the questionnaire. Soft drinks were defined as carbonated drinks and sports or energy drinks. With these shortcomings in mind, I found myself questioning the validity of some of the authors' findings. However, the bottom line and recommendations were of value and totally in keeping with the advice I give to parents of all paediatric patients: moderate the child's intake of soft drinks and try to ensure that consumption is at mealtimes with food rather than between meals. Soft drink consumption in Australia has recently shown a decline with a greater tendency to bottled water, but I do not know if NZ is experiencing a similar trend.

Comment (DB): The results of this study did not show a statistically significant link between increased soft drink consumption and tooth extractions between 2003 and 2008 in Queensland. This may have been influenced by the fact that the study was retrospective and reliant on the participants' memories and the self-reported data collected by telephone operators. Teeth extracted due to trauma were unable to be identified and omitted. The fruit juice, cordial and diet intake of participants was not determined, and the individual dmft scores and fluoride status of study participants were not available. The patient's own beliefs, and dental practitioner's individual clinical preferences, can influence the decision to extract or save a tooth. Studies that include a full clinical examination may be more helpful. This paper recognised these limitations, and it supports the current recommendations that the frequency of soft drink consumption be moderated, and that they be consumed with meals, rather than between meals.

Reference: *Aust Dent J* 2010;55(4):430–5

<http://onlinelibrary.wiley.com/doi/10.1111/j.1834-7819.2010.01265.x/abstract>

0.2% Chlorhexidine mouthwash with an antidiscoloration system versus 0.2% chlorhexidine mouthwash

Authors: Solis C et al

Summary: In this comparative, crossover, double-masked study, 15 patients with chronic periodontitis used either a mouthwash containing 0.2% chlorhexidine or one with 0.2% chlorhexidine and an antidiscolouration system (ADS) for 15 days; 80% of the participants adhered to the protocol. It was found that the two mouthwashes had similar antiplaque and antigingivitis effects, with a significant, marked decrease in staining associated with the test ADS mouthwash ($p < 0.01$).

Comment (JL): For those periodontal patients unable to achieve optimal levels of plaque control by mechanical means, other strategies are required. Chemomechanical agents are valuable adjuncts, with chlorhexidine considered the gold standard agent for its clinical efficacy. It has broad-spectrum antibacterial activity, low toxicity and a strong affinity for epithelial tissues and mucous membranes. Its substantivity results in reduced levels of microorganisms in the saliva of up to 90% for several hours. On the downside, chlorhexidine's side effects include staining, taste alterations and mucosal erosions. I look forward to more studies with larger sample sizes and commercial availability of the ADS mouthwash, as decreased staining would certainly increase patient compliance and make subsequent scaling a little less labour-intensive for the operator!

Comment (DB): Chlorhexidine mouthwash is the 'gold standard' mouthwash for those with periodontal problems. However, a significant side effect of this mouthwash is staining of teeth, which can be aesthetically displeasing. This small prospective clinical comparative study looked at the side effects of chlorhexidine mouthwash and compared them with the side effects of a chlorhexidine mouthwash with an ADS. The trial involved 15 patients with periodontal disease who were otherwise in good health. Plaque, gingival and Brex staining indices were recorded at 7 and 15 days. The findings were positive, with a definite decrease in staining for those using the ADS system, as compared with those using the original chlorhexidine mouthwash. Other side effects, such as taste and burning, did not appear to be significantly different between the two products. The main question was whether the antidiscolouration system would render the chlorhexidine less efficient. This study showed no significant difference in efficacy between the two mouthwashes.

Reference: *J Periodontol* 2011;82(1):80–5

<http://www.joponline.org/doi/abs/10.1902/jop.2010.100289>

Can drawing be considered a projective measure for children's distress in paediatric dentistry?

Authors: Aminabadi NA et al

Summary: The authors of this paper looked at the post-treatment drawings of 54 children aged 4–11 years who needed pulp therapy and restorative treatment of carious primary teeth. The Frankl and the Sound, Eye and Motor (SEM) scales were also used as objective behavioural measures of distress during the treatment. It was found that drawing was highly correlated with both standard SEM and Frankl scales for evaluating children's distress (Spearman's $\rho = -0.555$ and $+0.483$, respectively; $p < 0.001$), and could be regarded as a valid assessment tool.

Comment (JL): It is important that we can accurately assess the level of our paediatric patient's emotional status so that treatment is appropriate for the child's current state. Younger children experience difficulty verbally describing experiences as they lack the language abilities and cognitive development. Drawing is nonverbal, nonthreatening, usually nondirective and can help identify feelings and desires that a child may be unable to express verbally. It also transcends language limitations and cultural barriers. In this study, it was easily used, didn't need expensive equipment, was not time-consuming and was enjoyed by the children with some even considering it a reward!

Comment (DB): Child psychiatrists and psychologists have successfully used drawing for decades to analyse the emotional status of children. Drawing is fun, nonthreatening and familiar to all ethnic and socioeconomic backgrounds. Alternative methods for assessing pain and anxiety have limitations, as children may not have the ability to differentiate between pain, anxiety and emotion. To assess the effectiveness of using this method in paediatric dentistry, children were given the opportunity to draw a picture after dental care. Allowing children to create their own images gave them the freedom to express their feelings without adult intervention. The findings suggested that the 4- to 6-year olds had increased levels of anxiety. I found this study to be interesting and thought provoking. It would be interesting to see a similar study done within the school dental service in NZ.

Reference: *Int J Paediatr Dent* 2011;21(1):1–12

<http://onlinelibrary.wiley.com/doi/10.1111/j.1365-263X.2010.01072.x/full>

Safety of oscillating-rotating powered brushes compared to manual toothbrushes

Authors: Van der Weijden FA et al

Summary: This systematic review examined the literature to compare the soft and/or hard tissue safety outcomes of oscillating-rotating powered toothbrushes (ORPBs) compared with manual toothbrushes. PubMed-MEDLINE, Cochrane-CENTRAL and EMBASE were used to search for appropriate studies. Thirty-five articles met all the eligibility criteria for this review – 31 of them human clinical trials and four *in vitro* studies; generalisation of the results of the four *in vitro* studies was not possible due to heterogeneity in the objectives and methods. Nineteen trials reported a commercial sponsor. Among two trials with a safety primary outcome, gingival recession did not differ between the two types of brushes. None of the five trials with safety as a surrogate parameter reported any between-group differences, while there were few brushing-related adverse events reported in 24 trials reporting safety as a secondary outcome. The authors concluded that ORPBs are safe compared with manual toothbrushes.

Comment (JL): Although brushing of teeth is a risk factor for soft or hard tissue damage, it has been found that, over a lifetime of normal use, perhaps 10–15µm of enamel will be removed. Gingival abrasion does occur, but more as a result of inappropriate brushing techniques. This article confirmed to me that patients can choose to use either a manual or a 'power brush', provided that their technique is correct and that they are indeed using it on a regular twice-a-day basis.

Comment (DB): The efficacy of ORPBs has been clinically proven; however, few studies have been conducted with the main purpose of evaluating the safety of powered and manual toothbrushes. This review compared studies over the last two decades that have either directly or indirectly looked at safety of toothbrushing on hard and soft tissues. 31 *in vivo* articles and four *in vitro* articles were identified as eligible for data extraction and analysis. One *in vitro* study found toothbrushing forces were significantly higher with manual toothbrushes than ORPBs. Other studies found no significant difference between the two brushes. Incorrect or abusive toothbrushing techniques were identified as a primary reason for soft tissue damage, and this was irrespective of which type of toothbrush was used. The message to the public is that ORPBs are as safe to use as manual toothbrushes.

Reference: *J Periodontol* 2011;82(1):5–24

<http://www.joponline.org/doi/abs/10.1902/jop.2010.100393>

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