An assessment of preventive care offered to an orthodontic patient by oral health therapists in NSW Australia

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Abstract

Objective: The aim of this study was to record dental therapists and oral health therapists (therapists) planned preventive oral health care for a patient with poor oral hygiene undergoing orthodontic treatment.

Materials and Methods: A cross-sectional survey using a clinical vignette of a patient with poor oral hygiene undergoing a fixed appliance therapy was undertaken to record the preventive care offered to this individual by therapists working across sixteen New South Wales Local Health Districts (LHDs). This orthodontic vignette was inserted in-between two dental caries related vignettes. Data were coded and descriptive statistics were used to report the findings.

Results: One hundred and seventeen therapists returned questionnaires giving a 64.6% response rate of whom 82.0% (N=95) completed the orthodontic vignette. Adopting motivational interviewing techniques to facilitate communication with patient and parent was recommended by 88.4% (N=84) respondents, 98.0% (N=93) offered oral hygiene instruction, 70.5% (N=67) recorded plaque levels and used disclosing solution and 60.0% (N=57) offered dietary advice. Recommended to use at home products included fluoride toothpaste 1450ppm F (80.0%; N=76); 5000ppm F toothpaste (59.0%; N=24) and casein phosphopeptide amorphous phosphates plus fluoride paste (CPP-ACPF) (33.3%; N=32). Less than 20% offered fissure sealants.

Conclusion: Preventive advice and care was offered inconsistently by therapists in this study. In order to ensure that all therapists adopted a scientifically based approach to prevention, LHD clinical directors should implement continuous professional education programs for therapists to improve patient's health outcomes.

Introduction

Orthodontic care is available to disadvantaged eligible adolescents under 18 years of age through the New South Wales (NSW) public oral health services, providing they or their parents are holders of a government medicare health care card[1, 2,3]. The policy criteria for referral of patients to specialist orthodontists states that 'eligible patients who have active dental caries, chronic marginal gingivitis or whose oral hygiene is not at an optimal level should not be offered orthodontic treatment'[1]. Additionally, the policy clearly stipulates that if the patient is unable to maintain acceptable oral hygiene standards during treatment and does not respond to an improvement program, orthodontic treatment should be discontinued[1].

Orthodontic treatment often commences during adolescence which is a significant period for behaviour, personality and self-image development[4]. Orthodontic brackets, wires, ligatures and other appliance parts create areas that encourage plaque biofilm accumulation and food stagnation which present challenges for adolescents to adequately maintain the daily optimum level of oral hygiene required during the treatment period[4, 5].

Enamel demineralisation (white spot lesions, WSLs) is an adverse complication associated with fixed appliances therapy, as is chronic hyperplastic gingivitis with increased pocket depths, with slight, however significant loss of periodontal support associated with plaque biofilm retention[5-8]. Increased gingivitis and gingival hyperplasia are reported as problems during orthodontic treatment, however, rarely leading to periodontitis[9]. Salivary flow is altered by an orthodontic fixed appliance which interrupts the saliva's 'self-cleansing' action of eliminating food waste, leading to demineralisation of the dental enamel[5, 10].

Several factors are associated with increased risk of developing WSLs, dental caries and gingivitis:

(i) the adolescent's ability to maintain motivation for an effective daily oral hygiene regime,

(ii) build-up of the plaque biofilm which increases oral bacterial activity lowering saliva pH, (iii) adolescent's tend not to follow advice or do not see themselves as vulnerable to health problems and

(iv) a high consumption of carbonated drinks and sugar containing snacks[4, 5].

The NSW public health system offers all adolescents under 18 years of age free oral health care and preventive advice provided in the majority of cases, by dental therapists and oral health therapists (therapists) [3]. These clinicians have a fundamental role and responsibility for the prevention of oral disease, particularly dental caries and periodontal disease[10,11, 12]. Thus they are able to assist the orthodontic patient's treatment pathway with much needed regular preventive care and advice[5, 6, 10]. However, Satur et al's[11] study reported that therapists offered less preventive care to their patients in rural areas due to a greater demand for emergency dental care and urgent treatment compared to metropolitan areas. A study investigating the provision of dental care to more than 29 000 adolescent patients in NSW over a one year period reported that the offer of preventive care and advice varied from 32 - 55 percent of therapists' clinical activity[13].

The development of WSLs and gingivitis leading to the need for periodontal treatment during orthodontic treatment is preventable[10]. Researchers recommend dentists [and Therapists] should assess each patient's risk factors at the initial visit and throughout their course of care and offer appropriate preventive agents and therapies such as fluoride treatments, antimicrobials, xylitol gum, casein phosphopeptide amorphous calcium phosphate (CPP-ACP) paste, dietary counselling and oral hygiene instruction[5, 6, 10]. There is currently a dearth of information on the clinical preventive practice of therapists, particularly for orthodontic patients accessing the NSW public oral health service. Therefore, the purpose of this study was to use a clinical vignette to record what preventive oral health care therapists would offer to an adolescent patient undergoing orthodontic treatment.

Methods

Clinical vignettes have been defined as recreations of actual clinical scenarios which can be used to elicit participants' knowledge, attitudes and perceptions in accordance with their clinical practice in their natural milieu[14-16]. Vignettes may be distinct and standardised enabling all participants to respond to the same stimulus[17]. A cross-sectional self-administered survey using a clinical vignette for therapists working within all the sixteen Local Health Districts (LHDs) of NSW Health was developed. The survey also encompassed demographic information about the participants.

Based on research literature and academic curriculum teaching, clinical problems commonly seen in adolescents were chosen by an advisory team made up of two paediatric dental specialists, an academic clinical curriculum convenor and two experienced therapists. Three vignettes based on these problems were created and photographs were used to help the therapists visualise the clinical issues. The orthodontic case scenario for this study was inserted in-between the two dental caries vignettes that are not reported in this paper. The clinical intra-oral photograph was provided with full written consent by the patient and guardian for research use, with personal details and location de-identified.

The orthodontic vignette was designed using the classic clinical dental presentation with a focus on: (i) history of the chief complaint, (ii) overall dental history, (iii) clinical examination and (iv) diagnostic tests. These were used by the therapists to develop an assessment and management plan. The orthodontic vignette described a 14 year old male patient (TJ) who presented with his mother because of concerns regarding a halitosis problem (Figure 1). Therapists were requested to use the scenario description, photograph and charting provided for the vignette, aligned with their clinical practice protocols[18] to respond to the following questions:

I. What treatment, if any, would you carry out for TJ today?

II. Would you bring TJ back to the clinic for treatment, if yes, what?

The vignette was pilot tested with five therapists who were working in the Australian Capital Territory, and minor amendments were made prior to commencement of the main survey.

The names and contact details for all therapists working within the NSW public oral health services were obtained by contacting directors of each of the sixteen LHDs. An information document outlining the research inviting participants to voluntary consent to participate by completing and returning the survey was developed. One hundred and ninety two potential participants were identified. Survey questionnaires, information document and return postage-paid envelopes were mailed and reminder letters posted out two weeks later. Further reminders to non-respondents were undertaken 1 month, 2 months and 3 months after the initial mailing.

A coding index system was constructed from the first 35 written responses guided by The Australian national dental schedule system[19]. These codes were reviewed, amended and confirmed in consultation with the advisory team, with subsequent responses coded and entered into a Microsoft excel database; later collapsed into key clinical preventive categories. Respondent's narratives to clarify clinical decisions were also uploaded and analysed. To ensure rigor, two independent non-clinician oral health professionals were recruited to review and confirm data entry, data coding and narrative upload prior to data analysis. The advisory group systematically reviewed and verified data analysis processes within specific timeframes.

Ethics approval for the study was obtained from the Hunter New England Local Health District Lead Health and Research Ethics Committee (HREC) Reference No. 12/02/15/5.04 and all sixteen Local Health Districts. This research has been conducted in full accordance with the World Medical Association Declaration of Helsinki.

Results

Following the initial mail out, further information was received on therapist numbers. The original sample of 192 was reduced by 11 due to retirements and job changes, giving a final sample of 181, of whom 117 (64.6%) responded. Respondents were: (i) dental therapists (79.1%; N=91), (ii) dental hygienists (1.7%; N=2) and (iii) oral health therapists (19.1%; N=22). Most (61.5%; N=45) respondents worked in rural LHDs compared to metropolitan LHDs (38.4%; N=72). The mean time since completion of their academic qualification was 21.9 years (SD 12.7).

Ninety five (82.0%) of the 117 respondents completed the orthodontic vignette reported in this paper. Therapists noted that this patient suffered from halitosis because he was having difficulties cleaning his teeth due to his fixed orthodontic appliance. Types of preventive oral health care recommended for the patient by the therapists is shown in Table 1.

Immediate care (Question 1) consisted of an oral examination (27.5%; N=28), bitewing radiographs (15.8%; N=15), plaque disclosing (N=67; 70.5%) and recording a Plaque Index or Periodontal Screening (7.4%; N=7); and providing oral hygiene instruction and advice on tongue cleaning (98.0%; N=93) (Table 1). As the chief complaint was halitosis, the majority of respondents (82.2%; N=78) focused on toothbrushing instruction which included asking the patient whether he cleaned his tongue. Education regarding the importance of tongue cleaning to reduce the bacterial load which might be contributing to the halitosis was part of the care plan.

The use of super-floss and piksters as tools to improve cleaning in-between teeth was recorded by 63.1% (N=60) of the respondents. Motivational interviewing techniques such as having the patient demonstrate how he currently brushed his teeth, followed by the therapist using a hand mirror to show where he needed to improve was suggested by 88.4% (N=84) of

the participants. The majority (68.4%; N=65) reported that after offering oral hygiene instruction, they would undertake a professional clean (removal of plaque and calculus). Sixty percent (N=57) provided dietary advice with a focus on sugar consumption and its impact on bacterial growth as a contributor to halitosis. Placement of fissure sealants was recorded by 17.9% (N=17) of the respondents.

Eighty percent (N=76) would offer advice on fluoride toothpaste (1000 ppmF – 1450 ppmF) including use of Neutra Fluor 5000 (25.3%, N=24) and Tooth Mousse (33.7%, N=32) for the management of demineralised enamel areas. Mouth rinses were also recommended (24.2%, N= 23) which included the use of antibacterial agents such as chlorhexidine, Neutra Fluor 900 mouthwash (900ppm F, once: weekly) and saline rinses in conjunction with the oral hygiene regime.

When asked if they would bring the patient back for further treatment (Question 2), 44.2% (N=42) stated they would bring the patient back weekly until the condition had stabilised and to monitor the oral hygiene home practices and gingival health (Table 2). Approximately a third (28.4%, N=27) would appoint him fortnightly, and if there was no improvement or there was evidence of further deterioration of gingival health they would inform TJ that an early referral back to the orthodontist for de-banding was almost inevitable to prevent further oral health issues. Less than 5% (N=3) recommended bringing the patient back in one month; 15.8% (N=15) suggested a six month review and 5.3% (N=5) offered re-appointment 12 months (Table 2). Just over a quarter (26.3%; N=25) stated they would discuss other possible reasons for halitosis, suggesting TJ and his mother should seek medical advice if the problem did not improve (Table 1).

Discussion

The objective of this study was to record therapists' planned preventive oral health care for an orthodontic adolescent patient using a clinical vignette. Most adolescents accessing public oral health systems are from disadvantaged backgrounds and the working poor[20]. There is a dearth of research in the area of preventive clinical practices to support public orthodontic patients, thus, this study utilising a clinical vignette to record Therapist's preventive care plans has provided valuable information. Furthermore, there is a major flaw in the NSW public oral health system for tracking referral of eligible adolescent patients to orthodontic specialist services and follow-up care. Thus, there is scope for future clinical research into the referral and feedback processes to ensure continuous patient quality care.

NSW Health which commissions the public dental service does not have a policy or protocol specifically for preventive care for patients under orthodontic treatment. However, there are general preventive oral health care policies on the use of pit and fissure sealants, topical fluorides, and smoking cessation advice[21-24]. Therapists should apply these same principles to all orthodontic patients.

This study found fairly adequate levels of motivational interviewing to facilitate communication with the patient to enhance his oral hygiene instruction including the use of a hand mirror as an educational tool demonstrating an interactive learning session. However, the infrequent use of the plaque index and periodontal screening recorded by the therapists is a major concern considering the patient's very poor gingival health and halitosis. Furthermore, the use of tri-plaque disclosing solutions, a relatively simple procedure should have been recommended by all therapists to monitor the patient's, current and future oral hygiene practices[5, 25].

Hadler-Olsen et al's[5] public health study in Norway of adolescents under 16 years of age reported assessment of plaque levels using plaque disclosing tablets in conjunction with oral hygiene instructions was important. Adolescents were provided with an oral health kit containing an orthodontic toothbrush, interdental brushes, plaque disclosing tablets, fluoride toothpaste and mouth rinse to facilitate the preventive regime[5]. Those (N=9) who complied with the comprehensive oral hygiene regime developed on average one new WSL, patients with moderate compliance (N=27) 1.4 WSLs and those (N=4) with poor compliance developed 3.3 WSLs[5]. Instituting a comprehensive oral hygiene regimen for orthodontic patients was reported as challenging by Hadler-Olsen et al[5], but it illustrates the importance of providing rigorous preventive measures for orthodontic patients.

A study by Derk et al[26] review of orthodontic practices use of measurements to prevent decalcification during fixed appliance treatment and to compare these measures with the available scientific evidence, found that many orthodontists failed to implement procedures in their dental establishments to prevent enamel demineralisation. Thus, these authors[26] recommended the development of practice guidelines for the prevention of enamel demineralisation. If this strategy is to be used by public oral health services, then clinical quality improvement mechanisms would have to be adopted to monitor the implementation and compliance of clinicians to ensure improved patient health outcomes, as part of clinical governance[27].

Dietary advice was offered by 60 percent of the respondents, which is disappointing considering the critical role sugar plays in plaque formation and the aetiology of dental caries. Some form of advice on restricting sugary foods and drinks in-between meals and healthy alternatives for snacks should have been part of the immediate care option[6, 10].

Only a small proportion (17.9%) suggested that fissure sealants should be offered at this visit, which shows that the majority of respondents had focused on the main clinical problems of gingivitis and halitosis. The patient was described as caries free so sealants were not an urgent requirement.

Application of topical fluoride varnish (and gels) recorded in this study was low (47.3%), and as the patient is described as having no previous dental caries, it is not an immediate urgent issue to discuss fluoride and other remineralising products. This is better left to future visits as too much information at the initial visit will confuse both the mother and the patient. However, due to the increased caries risk in fixed appliance therapy it is vital that the patient is given this information in an early follow-up appointment.

Nevertheless, the majority of respondents did recommend the use of 1450ppm F toothpaste (80%); 25.3% recommended 5000ppm F and 33.7% offered CPP-ACPF. A study conducted by Sonesson et al[8] to establish the efficacy of daily toothbrushing with 5000ppm F toothpaste on enamel demineralisation, found the prevalence of WSLs was significantly lower in the group using the high fluoride toothpaste ($p=0.04$). There was an 18.1% incidence in the high fluoride toothpaste group, in comparison to the reference group 26.6%[8]. Therefore, an orthodontic patient's WSLs risk should be assessed and a suite of remineralising agents such as use of 5000ppm F toothpaste in conjunction with CPP-ACP agents should be discussed and advice offered at future visits, to ensure optimal levels of calcium, phosphate and fluoride ions are present in the saliva to support enamel remineralisation during orthodontic treatment[10].

Gingivitis leading to gingival enlargement (gingival hypoplasia) can be controlled by adopting high standards of oral hygiene. However, Zachrisson & Zachrisson's[9] longitudinal study of forty nine 11-13 year old patients at the commencement of treatment reported that

despite good oral hygiene and sodium fluoride rinsing performed twice weekly throughout the study, most patients developed generalised moderate gingival hyperplasia. The authors reported gingival health improvement was noted after the first month of orthodontic band removal. Conversely, the review by Blinkhorn et al[28] relating to the effectiveness, safe delivery and patient usage of triclosan/copolymer toothpaste found strong support for its positive medicinal effect on preventing biofilm formation and promoting gingival health with twice daily use to control plaque and slow progression of periodontal disease. Thus, LHDs in NSW should review the scientific efficacy of oral health products regularly to ensure their appropriate prescription to assist patients' oral health home regimes.

This study found inconsistencies in the patient's follow-up timeframes to monitor the patient's oral hygiene status a concern. Considering the presenting clinical oral health status of the patient, 20% of the respondents recorded a follow-up timeframe between 6 to 12 months, which is deemed far too long to offer support ensuring improved patient oral health outcomes. A study by Bardal et al[22] reported findings over a period of 6 months, they found that monitoring oral hygiene at 6 weeks, 12 weeks and 24 weeks gave positive results in terms of good gingival health for orthodontic patients. Therefore a review of timeframes for vulnerable adolescents undergoing fixed orthodontic treatment with public health systems should be developed and publicised.

It was somewhat surprising to note that 15.8% of the respondents would take bitewing radiographs at the first visit. The diagnostic yield will be compromised by the orthodontic brackets and the patient is a low caries risk. The heavy deposits of plaque will predispose the patient to smooth surface lesions which will not be shown on a bitewing. The US Food and Drug Administration in collaboration with the American Dental Association[29] urges dental professionals to minimise radiation exposure. A patient who is receiving orthodontic care will

have a full treatment planning schedule of radiographs, therefore it is most unwise to prescribe further radiographs which will be of little diagnostic value.

A potential limitation for this study was capturing and reporting of the multifaceted preventive activities during the communication interplay between the clinician and patient. Similar difficulties recording clinical preventive activities have been previously reported by Tickle et al[30]. Caution therefore should be exercised in the generalisation of this study's findings.

Nonetheless, this study utilising a vignette as a way of replicating a real event to elicit Therapists' clinical preventive care planning according to how they would behave in the real world, has yielded new information to assist NSW public oral health services to develop clinical preventive care quality improvement programs.

Conclusion

Preventive oral health strategies reported by respondents for the clinical management of a patient undergoing fixed orthodontic treatment varied markedly. It is recommended that rigorous preventive care and clinical treatment for adolescents should be embedded in the clinical practice of therapists for disadvantaged and high risk patients. Clinical directors should provide therapists with ongoing scientific professional education on the management of dental caries and periodontal disease including the resourcing of relevant oral health products to offer patients in order to ensure good clinical outcomes. Additionally, evaluation mechanisms to monitor implementation and compliance to NSW Health preventive policies and protocols should be a component of annual clinical governance processes. [10, 24 10, 23]

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Author contributions

All authors contributed to the design of the study. AVM, ASB and FAB participated in analyzing the data and drafting the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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Table 1. Therapists record of oral health treatment for orthodontic patient 'Today' (N=95)

	N	%
Comprehensive oral examination	28	27.5
Bitewing radiographs	15	15.8
Intra-oral photographs	6	6.3
Plaque Index (PI) or Periodontal Screening Record (PSR)	7	7.4
Plaque disclosing	67	70.5
Oral hygiene including tongue cleaning instruction	93	98.0
Use of a hand mirror as oral hygiene instruction patient-learning tool	78	82.2
Use Motivational Interviewing (coaching technique) for TJ *(and parent)*	84	88.4
Dietary advice	57	60.0
Super Floss and Piksters	60	63.1
Professional cleaning (plaque and calculus removal)	65	68.4
Topical fluoride applications (varnish and gels)	45	47.3
Fluoride toothpaste (Colgate Total antibacterial, 1450ppm F)	76	80.0
Recommend use of Neutra Fluor 5000 (5000ppm F)	24	25.3
Recommend use of mouth rinse (chlorhexidine, antibacterial agents, saline rinses and Neutra Fluor 900ppm F)	23	24.2
Recommend use of Tooth Mousse plus fluoride (CPP-ACPF)	32	33.7
Fissure sealants	17	17.9
Issue oral health products and relevant brochures	15	15.8
Seek medical practitioner advice (if oral health practices improve and halitosis persists as it may be due to other underlying health issues)	25	26.3

439 **Table 2. Therapists' management plan for follow-up of orthodontic patient (N=95)**

Would you bring TJ back, if yes, what treatment would you provide?	N	%
Weekly follow-up. Review patient oral hygiene and preventive home care practices. Provide oral hygiene support where indicated. Seek medical practitioner advice if halitosis has not improved.	42	44.2
Fortnightly follow-up. Review patient oral hygiene and preventive home care practices. Communicate with orthodontist if condition has not improved with consideration for de-band (therapist caution TJ and parent). Seek medical practitioner advice if halitosis has not improved.	27	28.4
One month follow-up. Recall appointment, general review of patient's oral hygiene practices. Repeat above oral hygiene and home care advice. Seek medicalpPractitioner advice if halitosis has not improved.	3	3.1
6 months recall appointment. Review and undertake general oral health care examination.	15	15.8
12 months general oral health recall. Regular oral health review.	5	5.3

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