Treatment-associated changes in malocclusion and oral health–related quality of life: A 4-year cohort study

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Introduction: The impact of orthodontic treatment on oral health–related quality of life (OHRQoL) in adolescents being treated in orthodontic practices has not yet been explored longitudinally. The aim of this cohort study was to describe the changes in both malocclusion and OHRQoL with orthodontic treatment. **Methods:** One hundred seventy-four patients (ages, 10-17 years; 64.4% girls; 81.6% European) underwent 2-arch, fixed-appliance treatment in a 4-year prospective study conducted across 19 specialist orthodontic practices throughout New Zealand. They were assessed before treatment, at debond (when 87.4% of the baseline sample were reassessed), and at a mean 21 months postdebond (when 59.4% of the baseline sample were reassessed). OHRQoL was measured using the Child Perceptions Questionnaire, and the Dental Aesthetic Index was used to measure occlusion. **Results:** Among the 104 patients who took part in all 3 assessments, little change in OHRQoL overall was seen at the end of treatment, despite considerable improvement in malocclusion (with the mean Dental Aesthetic Index score falling from 35.9 at baseline to 21.3 at debond). The mean Child Perceptions Questionnaire 11-14 was slightly greater at debond, and this was most notable in the functional limitations subscale. By the end of the study (21 months postdebond, on average), the decreases in Child Perceptions Questionnaire 11-14 scores were all substantial, especially in the emotional well-being and social well-being subscales. **Conclusions:** Malocclusion affects orthodontic patients' OHRQoL before treatment. A temporary increase in symptomatic impacts seen by the debond stage appears to ameliorate with time, with the benefits of orthodontic treatment for OHRQoL manifesting themselves some months later. (Am J Orthod Dentofacial Orthop 2016;150:811-7)

T he aims of orthodontic treatment are to improve appearance, to correct the occlusal function of the teeth, and to eliminate occlusion that could damage long-term oral health.[1] In reality, much (if not most) is undertaken for psychosocial reasons rather than to improve oral health.[2] This means that determining the impact of orthodontic treatment on patients' oral health–related quality of life (OHRQoL) is important. In the nearly 4 decades since the use of sociodental indicators was first mooted, considerable development of appropriate measures has occurred.[3] The most frequently used child OHRQoL instrument has been the 37-item Child Perceptions Questionnaire (CPQ_{11-14}),[4] in which a higher score indicates poorer OHRQoL.[5]

Cross-sectional studies have confirmed an association between malocclusion and poorer OHRQoL, although not all have observed it to be strong.[6-19] Accordingly, orthodontic treatment would be expected to lead to an improvement in OHRQoL. Documentation of such improvements using longitudinal studies is surprisingly scarce, given the central importance of the psychosocial effects of orthodontics.[20]

Some authors have examined OHRQoL changes in the first few months of treatment only,[21] during treatment itself,[22] or for changes in individual malocclusion traits that may be treated more quickly, such as a midline diastema.[23] The only long-term investigation of orthodontic treatment-associated OHRQoL changes had methodologic deficiencies: this involved a 20-year follow-up in the United Kingdom of 12- to 13-year-olds who had been first assessed in 1981. The authors found few psychological

benefits of orthodontic treatment, but the study's poor follow-up rate and use of a nonvalidated OHRQoL instrument meant that the findings have questionable utility.[24,25] Three shorter-term longitudinal studies have used more comprehensive pretreatment and posttreatment assessments.[17,26,27] All 3 observed short-term improvements in OHRQoL associated with orthodontic treatment, but whether those improvements were sustained in the medium term remained unanswered. Moreover, all 3 studies were conducted with patients in dental school orthodontic clinics, as was a Brazilian study in which significantly better OHRQoL was found in patients in retention than before treatment.[28] An adult study made similar observations.[29] In no adolescent study were the medium-term treatment-associated changes in OHRQoL determined, and none documented changes among patients being treated in practices outside dental schools. There is a need for "real-world" observations of treatment-associated changes in malocclusion and OHRQoL.

The aim of this study was to describe the changes in malocclusion and OHRQoL associated with orthodontic treatment in a 4-year prospective study conducted in 19 specialist orthodontic practices in New Zealand.

MATERIAL AND METHODS

Ethical approval for the study was granted by the Multi-regional Ethics Committee (MEC/0611/143) in Wellington, New Zealand. Informed consent was obtained in writing from the participants and their parents.

Longitudinal data were obtained from baseline and follow-up assessments in a 4-year prospective study conducted in 19 private specialist orthodontic practices throughout New Zealand. Participants were assessed at pretreatment, immediately posttreatment, and at an end-of-study point a mean of 21 months after treatment.

All 75 orthodontists in New Zealand were invited to participate. Patients were randomly selected from those awaiting treatment with the 19 orthodontists (from all over the country) who accepted the invitation. They had a mean age of 49 years, and 26% were women; among the specialist orthodontists in practice in New Zealand at the time, the mean age was 52 years, and 20% were women. Inclusion in the study did not alter the provided orthodontic treatment in any way. Included in the study were patients between the ages of 10 and 17 years who were to undergo full maxillary and mandibular fixed orthodontic treatment (not involving headgear or other extraoral appliances) and who consented to take part. Specifically excluded were patients in 2-phase orthodontic treatment (with a separate identifiable skeletal change phase before the placement of appliances), those about to leave the area or practice, surgical patients, and those with major craniofacial abnormalities (eg, cleft lip and

palate). We used only records routinely taken as part of a best-practice protocol in orthodontic treatment, and the STROBE guidelines were adhered to. No control group was used because withholding treatment is unethical.

Sociodemographic information was obtained from participants' parents or guardians, and included age, sex, and self-identified ethnic group. Socioeconomic status (SES) data were collected using an occupationally based measure, the New Zealand Socio-Economic Index of Occupational Status, which allocates a score from 10 to 90, with 10 representing the lowest and 90 the highest SES.[30] Since occupational information was obtained for both parents, the household SES was determined to be the higher of the 2 ratings. Occupations with scores of 10 to 39 were categorized as "low SES," and scores of 40 to 59 were "medium SES"; those scoring higher were "high SES".

OHRQoL was measured using the CPQ_{11-14}, with the treating orthodontist giving each participant the questionnaire to complete at the office appointment.[5] The scale collects information relating to the previous 3 months. Response options are "never" (scoring 0), "once or twice" (1), "sometimes" (2), "often" (3), and "every day or nearly every day" (4). The overall score is the sum of the individual item scores, and 4 subscale scores can be computed for the domains of oral symptoms, functional limitations, emotional well-being, and social well-being. A high score indicates poorer OHRQoL. The measure has been shown to be valid[9] and responsive, with the minimally important difference for the overall CPQ_{11-14} score determined to be 4 scale points.[31] As a concurrent validity check, participants responded to the question "how much does the condition of your teeth, lips, jaws or mouth affect your life overall?" (scored on a 5-point ordinal scale ranging from "excellent" to "poor"), with validity deemed to be acceptable if there was an ascending gradient in mean CPQ_{11-14} scores across those response categories.

Clinical measurements were made from duplicate records sent by each treating orthodontist. Malocclusion was assessed from models and photographs using the Dental Aesthetic Index (DAI), which assigned a malocclusion score using 10 clinician-measured occlusal components that were weighted, summed, and added to a constant (13) to give 1 DAI score.[32] Higher scores represented poorer dental esthetics. Participants were then allocated to orthodontic treatment need categories, with scores of 25 or lower indicating "minor or no" treatment need, 26 to 31 indicating a definite malocclusion, 32 to 35 a severe malocclusion, and 36 or more a handicapping malocclusion.[33] The clinical assessor (D.L.H.) underwent training and calibration in a pilot study, with repeated assessments of 20 sets of casts