

Mixed-methods assessment of perceptions of mandibular anterior malalignment and need for orthodontic retreatment

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Introduction: Postorthodontic occlusal changes may stem from true relapse or may be a consequence of characteristic temporal changes. The aims of this research were to identify occlusal discrepancies related to the mandibular labial segment prompting a decision to undergo orthodontic retreatment. **Methods:** A mixed-methods assessment was undertaken comprising a qualitative analysis involving focus groups exploring the relative importance of a range of occlusal features in the decision to undergo retreatment and investigating the motives for seeking retreatment. Quantitative assessment of these occlusal discrepancies was undertaken by 50 lay and 50 professional raters. **Results:** Several themes were identified in the qualitative analysis, with dental esthetics a major motive in seeking retreatment; variations in both the perception of relapse and retainer wear were identified. Horizontal irregularities of the mandibular anterior teeth were consistently perceived as the most severe. The professionals had slightly higher odds for suggesting the need for retreatment than did the laypeople, although this did not have statistical significance (odds ratio, 1.23; 95% confidence interval, 0.52-2.19; $P = 0.65$). **Conclusions:** The perception of mandibular labial segment irregularity and its influence on the need for orthodontic retreatment are complex and multifaceted. Nevertheless, horizontal discrepancies of the mandibular incisors were regarded as the most significant by both lay and professional raters. (*Am J Orthod Dentofacial Orthop* 2016;150:592-600)

Orthodontists are increasingly resigned to instability associated with most tooth movements. Posttreatment changes may stem from true relapse caused by unstable tooth positioning, physiologic recovery of investing tissues, or characteristic time-related changes.^{1,2} Thus, the requirement for indefinite retention and occasionally the need for orthodontic retreatment when retention is unsuccessful are well established. The latter may arise from poor compliance with removable

retainers, detachment or residual activity of fixed retainers, or iatrogenic changes during fixed retention.³⁻⁵

Orthodontic relapse and maturational changes often manifest in the mandibular anterior region. Such changes may include contact point displacements, rotations, angulation or inclination changes, and vertical movements either in isolation or in combination. These changes are brought into sharper focus by increased mandibular incisor exposure and reduced maxillary incisor exposure with age. However, the decision to undergo or recommend orthodontic retreatment is arbitrary. Clinicians typically have a lower tolerance for orthodontic irregularity than do patients.⁶⁻⁸ Most research has focused on maxillary anterior discrepancies. Moreover, although Little's irregularity index, the most accepted for quantifying relapse, solely accounts for horizontal displacements, there is little appreciation of the relative importance of this and other possible manifestations of malalignment.

Furthermore, little emphasis has been placed on the implications of relapse and mandibular anterior discrepancies from the patient's perspective. Malocclusion may have sociopsychologic effects and implications on oral health-related quality of life.⁹ It is therefore important that the relationship between occlusal discrepancies, social

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consequences, and motives for correction are more clearly understood. The premium on appropriate retreatment decisions is intensified by the failure of previous treatment and the potential for iatrogenic damage, including root resorption, associated with potentially protracted, albeit intermittent, treatment.

Qualitative methods have been adopted relatively recently in orthodontic research to shed light on decision making in patients undergoing combined orthodontic-surgical treatment.¹⁰ These approaches may afford a more detailed appreciation of patient-centered factors complementing established quantitative techniques. The aims of this research were therefore to identify a threshold level of mandibular labial segment irregularity prompting a decision to undergo orthodontic retreatment among adults and to evaluate the relative importance of various mandibular anterior discrepancies in this decision. A secondary aim was to compare lay and professional opinions related to the relative importance of occlusal features on the decision to undergo orthodontic retreatment. The null hypothesis was that there is no specific occlusal feature or severity level associated with a decision to retreat an orthodontic patient for mandibular labial segment irregularity.

MATERIAL AND METHODS

The study had a mixed-methods design incorporating a qualitative component involving layperson focus group interviews to explore opinions relating to changes affecting the mandibular anterior teeth and attitudes to occlusal discrepancies prompting a decision to undergo orthodontic retreatment in adulthood followed by a quantitative, cross-sectional analysis to determine the severity of specific occlusal discrepancies. The study was approved by the research ethics committee of Queen Mary University of London (QMREC 1330d).

Focus group interviews

Laypeople were recruited via posters circulated in boroughs neighboring the Royal London Hospital, Barts, and The London School of Medicine and Dentistry. Inclusion criteria for participants were age 18 years or older, fluent English speakers, and not professionally linked to dentistry. A maximum of 6 participants were permitted per focus group with equal numbers of men and women, when possible. Basic demographics were obtained before the interviews to facilitate participant allocation to a specific group to ensure ethnic diversity and sex balance.

A topic guide was designed as an aide-mémoire to improve the consistency of data collection during the focus group interviews and to ensure that salient issues

were covered in a systematic fashion. Semistructured, open-ended focus group interviews were facilitated by an interviewer (M.K.K.) in a nonclinical setting. All interviews were recorded and continued until no further comments were proposed by the participants. The interviews were supplemented with visual aids where appropriate, including study models of aligned and malaligned dental arches, removable retainers, and photographs of dental malalignment and fixed retainers. The interviews were transcribed verbatim and evaluated using framework analysis.¹¹ Framework analysis allowed an overview of the textual data from the interview transcripts, facilitating visualization and examination.

Cross-sectional analysis of study models

Fifty orthodontic professionals and 50 laypeople were invited to assess study models reflecting a range of mandibular labial segment discrepancies and to complete a corresponding questionnaire. The study models ($n = 18$) were fabricated from impressions of various typodont setups, with each model altered to represent 1 of 5 occlusal discrepancies of the mandibular labial segment likely to be of concern to prospective patients, reflecting opinions from the focus group interviews. The discrepancies were made manually on the typodont, with contact point displacements recorded using digital calipers, and angulation, inclination, and rotational changes measured using a protractor and acrylic jigs, with readings remeasured on separate occasions, 2 days apart, to confirm repeatability.

Duplicate models were made of certain discrepancies ($n = 4$) to confirm intraexaminer variability, with 1 study model fabricated to represent ideal alignment (control). A maxillary study model with ideal arch alignment was also constructed to facilitate occlusion with the mandibular study models and aid assessment, where applicable.

Initial piloting of the response questionnaires of both orthodontic professionals and laypeople and the assessment of readability using the Flesch Reading Ease scale (54.0) and the Flesch-Kincaid Grade Level (8.1) were undertaken, indicating appropriateness for a reading age of 13 years. Thereafter, the professional group was recruited at the British Orthodontic Society conference at the Edinburgh International Conference Centre (September 2014). The lay group was recruited from the orthodontic department at Whipps Cross University Hospital, London, incorporating either friends or relatives of patients at the department.

The models were divided into 3 groups of 6 (Table 1), with participants ranking each occlusal feature in order of severity using a numeric grade of 1 to 6, with 1 representing the least severe and 6 the most severe occlusal feature. The participants were then asked to select which

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