

ORIGINAL RESEARCH

Facial Photographs and Study Models in Assessment of Orthodontic Treatment Needs: A Comparative Study

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ABSTRACT

Aim: The purpose of the study was to compare and evaluate the examiner differences when assessing orthodontic treatment needs using facial photographs and study models.

Materials and methods: Thirty subjects (9 males, 21 females) who displayed a definite, severe or very severe malocclusion as per dental esthetic index scores were considered for the study. The diagnostic study models and facial photographs were assessed for each patient by two consulting orthodontists and one postgraduate orthodontic student. Visual analog scale (VAS) was used to assess. Separate assessment was made from study models and facial photographs by two orthodontists and one postgraduate student.

The orthodontic treatment needs were higher from study models compared with facial photographs ($p < 0.001$) for all the three examiners.

Results: A considerable variation in the intraexaminer and interexaminer consistency from the assessment of orthodontic treatment needs from facial photographs was shown. There were higher for orthodontic treatment needs from study models than facial photographs. Reduced intraexaminer and interexaminer variability from assessment of orthodontic treatment needs from facial photographs may suggest a specific method to achieve a more uniform evaluation of orthodontic treatment needs.

Keywords: Malocclusion, Needs assessment, Dental photography, Dental model.

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INTRODUCTION

Facial esthetics have an important influence on social behavior and perception in our society. The orofacial complex and its architecture is a functionally designed, delicately balanced, precision tuned and an amazingly complex phenomenon. The importance of occlusion to good oral health is well-understood by the orthodontists universally. Diagnostic records like facial photographs and impressions of teeth which are made into models are additional items that are gathered, along with a clinical assessment are used to ensure an accurate diagnosis which then leads to an ideal plan of treatment. Some of the studies show that facial photographs and study models when used as a means of assessment of orthodontic treatment needs, there is a considerable diversity.¹

Several attempts have been made to categorize malocclusions and level of treatment needs using various indices. The dental esthetic index (DAI) was accepted by World Health Organization (WHO)² as an international cross-cultural index in the assessment of orthodontic treatment needs.

The DAI has the ability to grade malocclusions of study models or patients into four severity groups. Despite the favorable qualities of DAI, the index is limited by its inability to include some missing molars, impacted teeth, posterior cross bites and midline discrepancies in the computations of its case scores, thereby limiting any comprehensive esthetic assessment.³⁻⁵

The comprehensive esthetic assessment includes both the dental as well as overall facial appearance. The present study was thus designed to compare the facial photographs and study models as a means of assessment of orthodontic treatment needs and to evaluate any examiner differences when assessing the treatment needs.

MATERIALS AND METHODS

The present study aimed at comparing the diagnostic study models and facial photographs for the assessment of orthodontic treatment needs.

The assessment was carried out by two consulting orthodontist and one postgraduate student in orthodontics. The study included the patients reporting to a private orthodontic clinic with a principle concern to improve facial as well as dental appearance.

The clinical examination of 30 patients was carried out by experienced orthodontist.

The examiners comprised of two qualified orthodontists (orthodontist A and Orthodontist B) and one postgraduate student of orthodontics. DAI was applied to each patient willing to participate in the study. DAI criteria permits analysis of each of the separate components of the index or grouped under anomalies of dentition, space and malocclusion. Patients with definite, severe or very severe malocclusion according to DAI score were included in the study. The regression equation used for calculating standard DAI scores is as follows:

$$\text{(Missing visible teeth} \times 6) + \text{crowding} + \text{(spacing)} + \text{(diastema} \times 3) + \text{(largest anterior maxillary irregularity)} + \text{(largest anterior mandibular irregularity)} + \text{(anterior maxillary overjet} \times 2) + \text{(anterior-posterior molar relation} \times 3) + 13.$$

The materials for assessment included pretreatment study models showing occlusion and digital color facial photographs. A standard clinical sets of profile, frontal, frontal smiling, and three-quarter photographs were taken prior to study for each patient. Each examiner was asked to assess the full set of photographs as well as study models. Visual analog scale (VAS) was used to score the orthodontic treatment needs of each patient's dentition from the study models and overall appearance from facial photographs.

The study was reproduced after 3 weeks by the all the three examiners. The assessment was carried out similarly. The baseline scores and the scores reproduced after 3 weeks by all the three examiners were recorded. The data was entered and analysis was carried out using SPSS statistical package (SPSS Inc., Chicago, USA). Kruskal-Wallis one-way ANOVA was used to compare the mean scores between various examiners. Wilcoxon matched paired test was used to compare the mean values at the baseline as well as after 3 weeks. For pairwise comparison Mann-Whitney U test was employed in this study.

RESULTS

Comparison of assessment scores for study models and facial photographs by three examiners showed significant differences ($p < 0.05$). There were higher scores for study models compared to facial photographs at baseline as well as when reproduced after 3 weeks (Table 1).

Table 2 shows a statistically significant difference in assessing orthodontic treatment needs using facial photographs among three examiners at the baseline and after 3 weeks. Pairwise comparison of scores for facial photographs at baseline as well as and reproducibility after 3 weeks showed significant differences between examiners 1 and 2, and examiners 2 and 3.

Table 3 shows no statistically significant difference in assessing orthodontic treatment needs using study models among three examiners at the baseline and after 3 weeks. Pairwise comparison of scores for study models at baseline as well as and reproducibility after 3 weeks did not show significant differences between examiners 1 and 2, 1 and 3, and 2 and 3.

DISCUSSION

The present findings of the study shows that the overall (mean VAS scores) orthodontic. Treatment needs as assessed by two qualified orthodontists and one postgraduate student were higher from study models than from facial photographs. Similar findings were reported by Sherlock et al¹ and attributed to the fact that the photograph is a two-dimensional representation of a three dimensional subject, so this can affect the overall rating of orthodontic treatment needs from the facial photographs when compared with that of study models.

Al Yami et al,⁶ in their study to asses dental and facial esthetics in adolescents reported that the assessment of

Table 1: Comparison of assessment scores for study models and facial photographs

Models	Examiner 1 (orthodontist A)		Examiner 2 (orthodontist B)		Examiner 3 (postgraduate student)	
	Baseline (mean \pm SD)	After 3 weeks (mean \pm SD)	Baseline (mean \pm SD)	After 3 weeks (mean \pm SD)	Baseline (mean \pm SD)	After 3 weeks (mean \pm SD)
Study	6.90 \pm 0.66	6.40 \pm 1.00	7.07 \pm 0.78	6.73 \pm 0.94	6.83 \pm 0.79	6.40 \pm 1.04
Photographs	4.80 \pm 0.81	4.60 \pm 0.77	3.83 \pm 0.99	4.27 \pm 0.64	4.03 \pm 0.72	3.73 \pm 0.74
Z-value	-6.3573	-5.5589	-6.5421	-6.4682	-6.6530	-6.4312
p-value	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***

***Significant at 0.1% level of significance ($p < 0.001$)

Table 2: Comparison of assessment scores for facial photographs

Examiner	Baseline (BL) (mean \pm SD)	After 3 weeks (mean \pm SD)	Difference between BL and 3 weeks (mean \pm SD)
1 (orthodontist A)	4.80 \pm 0.81	4.60 \pm 0.77	0.20 \pm 0.55
2 (orthodontist B)	3.83 \pm 0.99	4.27 \pm 0.64	-0.43 \pm 0.50
3 (postgraduate student)	4.03 \pm 0.72	3.73 \pm 0.74	0.30 \pm 0.60
H-value	17.9526	18.1033	23.4266
p-value	0.0001***	0.0001***	0.0000***
<i>Pair-wise comparison by Mann-Whitney U test</i>			
1-2	0.0003***	0.0370*	0.0001***
1-3	0.0003***	0.0001***	0.4685 [§]
2-3	0.2691 [§]	0.0049**	0.0000***

*Significant at 5% level of significance ($p < 0.05$), **Significant at 1% level of significance ($p < 0.01$), ***Significant at 0.1% level of significance ($p < 0.001$); [§]Not significant ($p > 0.05$)

Table 3: Comparison of assessment scores for study models

Examiner	Baseline (BL) (mean ± SD)	After 3 weeks (mean ± SD)	Difference between BL and 3 weeks (mean ± SD)
1 (orthodontist A)	6.90 ± 0.66	6.40 ± 1.00	0.50 ± 0.90
2 (orthodontist B)	7.07 ± 0.78	6.73 ± 0.94	0.33 ± 0.48
3 (postgraduate student)	6.83 ± 0.79	6.40 ± 1.04	0.43 ± 0.57
H-value	1.9701	2.0567	0.5939
p-value	0.3734*	0.3576*	0.7431*
<i>Pairwise comparison by Mann-Whitney U test</i>			
1-2	0.3366*	0.2488*	0.7117*
1-3	0.6789*	0.9646*	0.8883*
2-3	0.2311*	0.2311*	0.4598*

*Not significant ($p > 0.05$)

orthodontic treatment needs using facial photographs and study models are influenced by various factors, and both should be evaluated when arriving at a proper treatment plan. Though the present study shows orthodontic treatment needs were higher from study models compared to facial photographs, the assessment of need for treatment should include evaluation of both dental as well as facial appearance since, the decision to seek orthodontic treatment is frequently the result of concerns about appearance.⁷

The lower scores for the treatment needs assessment from facial photographs in the present study may be attributed to the fact that only anterior dentition is visible and various malocclusion traits in the posterior region cannot be assessed from the photographs. The successful planning and provision of orthodontic treatment requires information on the need of orthodontic treatment. Exploration of the literature reveals a wide variation in the assessment of the need for orthodontic treatment using facial photographs and plaster study models. Some of the variations have been attributed to subjectivity of the method of evaluation with an inherent problem of validity and reliability.^{8,9}

In the present study, the mean VAS scores for assessment of orthodontic treatment needs from study models for all the investigators (two qualified orthodontists and one postgraduate student) did not differ significantly ($p > 0.05$) (Table 3) both at the baseline and after 3 weeks. Similarly when assessment was done using facial photographs the mean scores differed significantly at baseline and reproducibility after 3 weeks. There was no intra- as well as interexaminer consistency in the prediction of orthodontic treatment needs among all the examiners at baseline and after 3 weeks from facial photographs ($p < 0.05$) (Table 2). They exhibited a poor reproducibility. Similar findings have been reported by Sherlock et al.¹ In their study of the total six examiners there was no correlation among the four examiners for assessment of treatment needs from both study models and facial photographs.

Strauss et al¹⁰ also concluded that individual variations can occur from facial photographs when used for assessing orthodontic treatment needs.

Similarly, when comparison was done among the examiners for baseline and reproducibility of scores for study models the observed differences in the mean VAS scores were not statistically significant (Table 3). Phillips¹¹ in their epidemiologic investigation to rate facial attractiveness found a significant differences among various panel of examiners. Richmond et al¹² found significant variation among examiners and concluded that in order to achieve a uniform evaluation of orthodontic treatment needs a specific method has to be used. Richmond and Daniels,¹³ in their international survey to assess professional variation in the assessment of orthodontic treatment needs 76% of the professionals obtained a consensus on the need of treatment from study models. Gesch et al,¹⁴ revealed that there were examiner differences in assessing orthodontic treatment needs from study models.

CONCLUSION

Comparison between study models and facial photographs as a means of assessment orthodontic treatment needs revealed significant differences. There were higher needs from study models when compared to facial photographs. Comparison done among the examiners also revealed differences from facial photographs. Hence, the variability among the examiners for assessment orthodontic treatment needs from facial photographs may suggest the absence of specific criteria and requirement of an ideal index for evaluating orthodontic treatment need.

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