

Perception of changes in soft tissue profile in silhouettes after face mask therapy

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Abstract

Introduction: Soft tissue profile marks the basis for diagnosis and treatment planning in Orthodontics. The purpose of this study was to evaluate the change in soft tissue profile after treatment with face mask therapy in Class III patients as perceived by Orthodontists, General Dentists and Laypersons.

Material and Methods: 10 patients between ages of 8-10 years, treated with facemask appliance for 12 months' duration were included in the study. Pre and post treatment records were taken. Silhouettes were created from lateral profile images. Sample size of 81 evaluators including 27 Orthodontists, 27 General Dentists and 27 Laypersons were asked to rate the images of pre and post treatment to quantify the change they perceived on visual analog scale.

Results: Majority preferred post treatment profiles. On quantitative analysis it was found that there was variability amongst groups.

Conclusions: Orthodontists, General Dentists and majority of Lay persons appreciate improvement in lateral profile after treatment with face mask as indicated by the fact that all groups of examiners preferred the post treatment profile silhouettes. On quantitative assessment, magnitude of these changes was found to be insignificant among all groups of evaluators.

Keywords: Animation; lateral profile; perception

Introduction

Orthodontists play an integral role in achieving optimal facial esthetics as a result of treatment. A large number of patients visit Orthodontist's office for the sake of a balanced and attractive face. A concave profile depicting skeletal class III can be due to a retrognathic maxilla, prognathic mandible or combination of both.¹ Soft tissue characteristics of class III include concave profile, depressed mid face area, prominent

chin, thin upper lip and a fuller lower lip.²

Treatment of skeletal class III is more challenging and should be conducted at an early age in order to avoid morbidity of surgery at a later age when growth is finished and avoid psychological stress to patients.³ Treatment strategies at early ages aim to treat contributing factors of skeletal class III. Cases of retrusive maxilla are treated by using orthopedic appliances e.g. facemask or reverse pull headgear while chin cup therapy is reserved for patients having prognathic mandible and a low vertical pattern. Combination of therapies is used if both jaws are at fault.^{4,5,6}

Face mask therapy is extensively used in patients having predominantly maxillary deficiency. It affects and remodels the circum-maxillary sutures and brings about

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forward displacement of maxilla,⁹ conferring a balanced and straight profile which is the most preferred facial form.¹⁰ Kilic et al⁷ concluded from their study that facemask improves facial profile by mobilizing maxilla and surrounding soft tissues anteriorly and concomitant downward and backward rotation of the mandible. This also causes protrusion of upper lip and slight posterior positioning of lower lip.⁸ A number of studies on evaluation of soft tissue changes after face mask therapy using cephalograms and photographs have been conducted, but perception based on silhouettes defining perception of Orthodontist, General Dentist and Lay persons has not been established in Pakistan. Hence, aim of this study was to determine the perception of Orthodontists, General Dentists and Lay people about changes in profile after treatment with facemask comparing pre and post treatment silhouettes of lateral profiles.

Material and Methods

This study was conducted at Department of Orthodontics, de'Montmorency College of Dentistry, Lahore, Pakistan. Informed consent was sought from participating patients and evaluators. 10 patients aged 8-10 years who were treated with face mask therapy for a duration of 12 months having skeletal class III with retrognathic maxilla, full cusp class III molar relationship, CVM growth stage I, in mixed dentition and lastly having no prior history of Orthodontic treatment were included in the study for developing silhouettes. Patients having hyper-divergent growth pattern, developmental syndromes, missing teeth and anterior open bite were excluded from study. Extra-oral photographs in lateral profile view were taken before and after face mask therapy. Using these photographs silhouettes were constructed using Adobe Photoshop CS 5 Software to assess soft tissue changes. These silhouettes were then printed on paper, with each paper containing pre and post treatment images of same patient. Each paper was numbered as

image1 to image 10. Pre and post treatment photos were marked as A and B randomly so that all A photos were not pre-treatment and vice versa (Figure 1). Thus a total of 20 images were created.

A total of 81 assessors participated in this study. The sample was calculated using world health organization (WHO) sample size calculator where, power of the study was kept at 80% and level of significance at 5%. The sample size came out to be 81. The sample examiners were divided in three groups each containing 27 participants each. This first group entailed Orthodontic residents, second group comprising of general dentists having no training in Orthodontics and lastly were lay persons who had no knowledge of dentistry. Orthodontic residents were recruited from the Department of Orthodontics, de'Montmorency College of Dentistry, Lahore and were divided in two groups. First group included residents having three or greater than three years of training and the second group was of residents with less than three years of experience. General dentists were again classified into two groups depending on their work experience similar to the dichotomy between Orthodontic resident's groups. All of these were again from Punjab Dental Hospital, Lahore. Lay persons included in the study were taken from OPD of Punjab Dental Hospital, Lahore. Patients/people who did not have any knowledge about dentistry nor Orthodontics were considered to be lay persons.

Each of these judges received twenty images of lateral profiles silhouettes (Figure 1). All of the evaluators were instructed to rate the difference between lateral profiles, put forth their opinion on the given page in the form of rating the distinction between both images on Visual Analog Scale (VAS). VAS consisted of 10 cm horizontal line with marking from 0 to 10 after each cm. Zero denoted no difference between both images and 10 depicted a total different and excellent lateral profile. A 5 score on the VAS depicted mixed opinion / preference meaning thereby that both images

were equally esthetic. After giving instructions to assessors, we asked them to sit in a peaceful room and gave them 1 minute to assess images and grade them on the VAS.

Associations between examiner groups and pre-treatment (T1) and post treatment (T2) profile preference was evaluated by chi-square. Normality of the VAS score among the examiner categories was evaluated by Shapiro-wilk test. Internal reliability Cronbach's Alpha (0.879), Inter item correlation ranging from (0.143 to 0.624) was ascertained. None of the items achieved higher Cronbach's Alpha than 0.879. The perceived changes from T1 to T2 profiles on the VAS score were assessed by the analysis of variance (ANOVA) with the Tukey Post-Hoc Test. Chi-square was performed to assess the preference of pre and post treatment profile preference based on experience of the participants while Independent samples t-Test was performed to assess the difference between the mean VAS score for the same categories. P-value less than 0.05 was considered as significant. Statistical analysis was performed with SPSS software (version 25.0; IBM, Armonk, NY)



Figure 1: Silhouettes created from lateral photographs. Image A and Image B respectively.

Results

The results for the Orthodontic residents group showed 40.7% Orthodontic residents rated post treatment profile as the preferred one whereas 59.3% had mixed opinion about the pre and post treatment profile improvement. When the sub-groups among

Orthodontic residents were considered, those having less than three years of training had a 50:50 responses i.e. 50% of that sub group clearly chose the post treatment profile as the preferred one whereas 50% were unsure of which one was better. Whereas, residents with training tenure greater than 3 years, 30.8% preferred post treatment profiles whereas 69.2% were not sure or had a mixed preference.

Table I: Mean VAS score of the three groups. Post hoc Tukey comparison between the three groups.

	Orthodontists (1) (n=27)	General Dentists (2) (n=27)	Lay persons (3) (n=27)	Post-Hoc Tukey test P-value		
Variable	Mean \pm S.D.	Mean \pm S.D.	Mean \pm S.D.	1-2	1-3	2-3
VAS	6.41 \pm 1.34	6.87 \pm 1.61	5.69 \pm 1.12	0.434	0.142	0.006*

Amongst the General Dentists' group on the whole, 37% rated post treatment profile as the preferred one whereas 63% had mixed opinion about the pre and post treatment profile improvement. When the sub-groups among General Dentists were considered, 76.9% those having less than three years of experience preferred post treatment profile whereas only 23.1% were unsure of which one was better. 100% of General Dentists having an experience of more than three years were not sure or had a mixed preference amongst the two profiles ($p=0.534$) (Figure 2). One-way ANOVA showed that there was an overall significant difference between the mean VAS score among the three groups ($F=5.037$, $p=0.009$). Post hoc Tukey test indicated that the difference between general dentists and lay persons was significant, whereas it was insignificant between the other two groups. (Table I).

Comparison of mean VAS score of orthodontists and general dentists is depicted in Figure 3. The mean VAS score for orthodontist with less than 3 years of clinical experience was 5.48, which was not significantly different statistically from those who had more than 3 years of clinical

experience. Similar results were seen for general dentists group, the difference between the two subgroups based on clinical experience was not significant with mean VAS score being 5.71 and 7.95 respectively for the subgroup with less than and more than

three years of clinical experience. However, the difference between VAS scores was significant between orthodontists with more than 3 years of clinical experience and general dentists with less clinical experience.

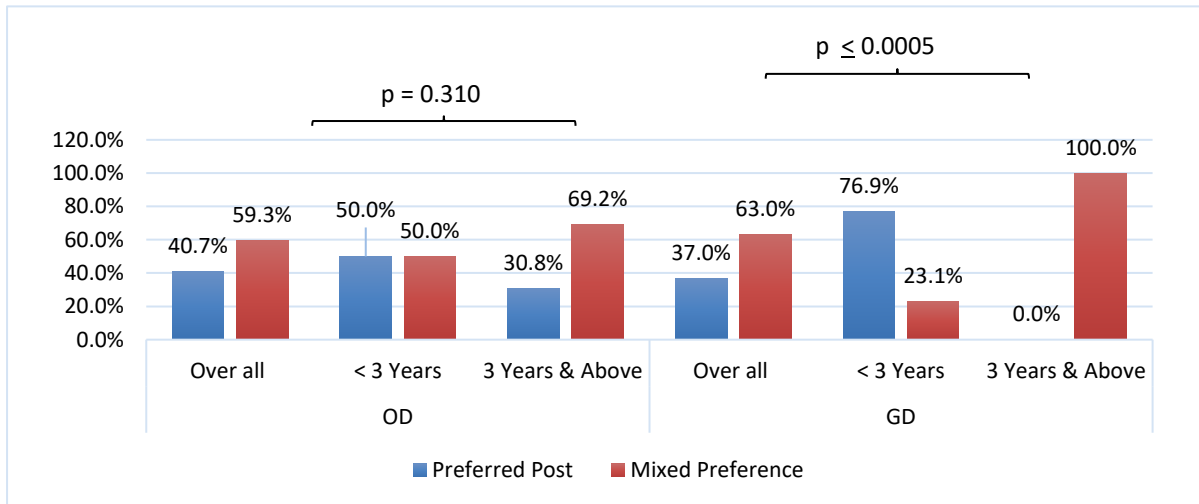


Figure 2: Profile preferences of Orthodontists (OD) and General Dentists (GD) plotted according to their clinical experience. * $p \leq 0.05$ is significant

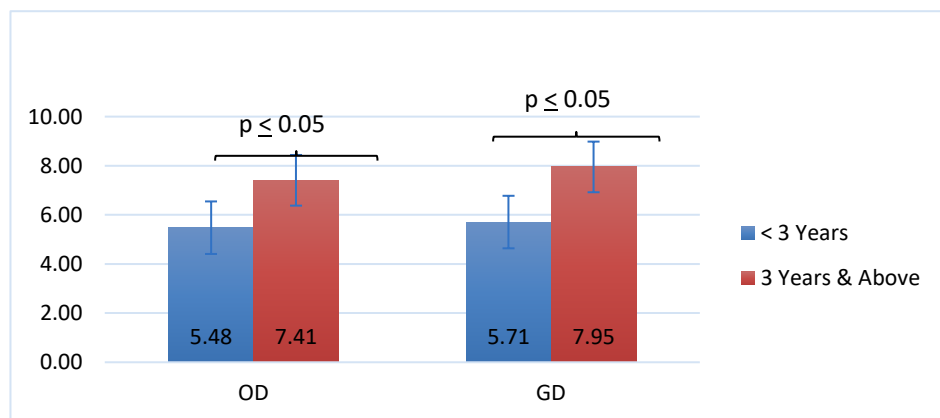


Figure 3: Mean VAS score for Orthodontists (OD) and General Dentists (GD) with their experience. * $p \leq 0.05$ is significant.

Discussion

Skeletal class III malocclusion is difficult to treat and most authors suggest early orthopedic intervention to reduce the future surgical morbidity and psychosocial embarrassment associated with it. Facemask therapy has widespread use in treatment of maxillary retrognathism in young patients¹¹. In recent years face mask therapy with or

without associated palatal expansion has become a common technique to correct a developing hypoplastic maxillary class III malocclusions.¹² Effects of facemask include forward movement of maxilla, downward and backward rotation of mandible, increase in lower anterior facial height, proclination of maxillary incisors, retroclination of mandibular incisors and associated soft tissue changes.

From all aspects of facial analysis, profile view is most important for treatment planning.¹³ Several studies have been conducted all over the world on position of lips and jaws with reference to profile of the patient.¹⁴ Cephalometric soft tissue analyses, photographs, clinical examination and silhouettes in profile view are different methods to analyze the profile of the patients and to compare the pre and post treatment results. Silhouettes can be preferred over actual photographs since they avoid distraction from hair styles, facial complexion, color of eyes and cheek bone prominence.¹⁵ Cox and Van der Linden¹⁶ found concurrence in the esthetic judgment or preference between two professionally diverse groups of evaluators (ten orthodontists and ten laypersons). The results of their study support the findings of this study which also found no significant difference in profile preference between orthodontists and laypersons. Contrasting results were reported by Yin et al¹⁷, who also evaluated psychoticism scores in their study and concluded that esthetic preference is influenced by self-perception. No significant difference was seen in the preferences of general dentists and orthodontists which was similar to the results reported by Park et al¹⁸, who found that there was similar zone of acceptability of facial profiles for orthodontists and general dentists. De Smith and Dermaut¹⁹ also investigated the influence of maxillomandibular relation, the lower facial height and dorsum of nose on profile preference. They compared the difference in perception of general dentist and orthodontist. The results were similar to the findings of this study, indicating that orthodontic training had no significant effect on profile preference. Similar results have been reported in another study²⁰, which found no significant difference in profile evaluation between orthodontists and general dentists, but the perception of vertical proportions and facial symmetry differed between the two groups. However, the profile

preference differed based on the number of years of clinical experience. The mean VAS score of orthodontists with a clinical experience of more than three years was significantly more than the general dentists with less years of clinical practice.

Thus, the results of this study indicate that general dentists, orthodontists and laypersons recognize the improvement in profile produced by facemask therapy, but there is no significant difference in the profile perception of the three groups. However, the results of this study need to be taken with caution since the groups were not stratified based on age, gender, ethnicity, self-perception and level of education of layperson. These factors have been shown to influence the profile perception.^{20, 21, 22, 23} Further studies which investigate the same parameters on a larger sample and take into account different variables are thus needed.

Conclusions

Treatment with facemask produces noticeable change in patient's profile. Orthodontists, General Dentists and majority of laypersons appreciate improvement in profile.

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