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RESEARCH ARTICLE

EVALUATION OF FACIAL AND DENTAL MIDLINE DEVIATIONS IN CHILDREN

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ABSTRACT

Background: The diagnosis of den to-facial asymmetry has been discussed significantly, but the esthetic significance of facial and dental midline symmetries has been inconclusive with respect to upper and lower arch dentition.

Aim: The purpose of the present study is to evaluate the extent of deviation of dental midline from the facial soft tissue midline and its association with different malocclusions.

Materials and Methods: This cross sectional double blind study was conducted in a randomly selected sample of 500 children of 12-17 years. The molar relation and the presence of any malocclusions were noted. Impressions of both maxilla and mandibular arches were made in each subject and study cast were prepared. The following three points were marked on the face: bridge of the nose, base of the upper lip and chin to determine the facial midline. The dental midline(DMD) was assessed by verifying the coincidence of the vertical lines between the central incisors in the maxillary and mandibular arch.

Results: All the data obtained was subjected to statistical analysis using chi square test. The study population consisted of 500 subjects, for statistical convenience the group of the subjects were divided into three groups 12-13 years, 14-15 years, 16-17 years. The coincidence of facial and dental midline (FDMC) was found to be statistically significant in 12-13, 14-15 years age groups (pvalue-0.00). No statistical significance was found in 16-17 years age group. **Conclusion:** FDMC and minor discrepancies as less as 2mm should be considered as normal and an important objective in orthodontic treatment planning.

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INTRODUCTION

Dental esthetics has a high impact on the facial attractiveness, in addition it imparts stability and permanence of the dental composition. Although coincidence of facial and dental midline is a well-established objective in orthodontic treatment, the available literature provides little or no data regarding the extent of deviation that occurs in any dentition and guidance to resolve problems pertaining to facial and dental midline. The diagnosis of den to-facial asymmetry has been discussed significantly, but the esthetic significance of facial and dental midline symmetries has been inconclusive with respect to upper and lower arch dentition.

Aim

The purpose of the present study is to evaluate the extent of deviation of dental midline from the facial soft tissue midline and its associated malocclusions.

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Objectives

- To determine the coincidence of facial and dental midline. (FDMC)
- To assess the association of dental midline deviation (DMD) in relation to malocclusion in age group of 12-17 years.

MATERIALS AND METHODS

This cross sectional double blind study was conducted in a randomly selected sample of 500 children of 12-17 years who visited the Department of Pedodontics and Preventive Dentistry for seeking treatment at Rajarajeswari dental college and hospital Bengaluru. After obtaining the informed consent the children were included in the study. The randomization of the children to be included in the study was based on the outpatient (op) number allotted. Required sample size of Subjects (n-500) allotted with odd outpatient numbers eg, 1, 3, 5, etc were included in the study. Subjects with skeletal malocclusions, midline diastema, congenital or acquired maxillofacial deformities, patients undergone any prior orthodontic treatment were excluded from the study (Agarwal

et al., 2015). All the subjects had permanent dentition with intact first permanent molar in maxillary and the mandibular arch. The obtained data were examined by a separate investigator who was blinded to the study.

Assessment of Facial Midline and Dental Midline

Each subject was seated in the dental chair with head rest in a fixed position. The subjects were asked to close the mouth in maximum intercuspation. The molar relation and the presence of any malocclusions were noted. Impressions of both maxilla and mandibular arches were made in each subject and study cast were prepared. The following three points were marked on the face: bridge of the nose, base of the upper lip and chin to determine the facial midline (Onodera *et al.*, 2012). A metallic scale was used to assess the facial midline. Vertical lines were drawn in between the maxillary and the mandibular central incisors, in the patient as well as on the study cast. The dental midline (DMD) was assessed by verifying the coincidence of the vertical lines between the central incisors in the maxillary and mandibular arch. Any shift in the dental midline either to right or left was evaluated and quantified by using a vernier caliper as $< 2\text{mm}$ or $> 2\text{mm}$. Later the coincidence of the facial midline with dental midline (FDMC) was evaluated. Any deviations were correlated with the associated malocclusion.

RESULTS

All the data obtained was subjected to statistical analysis using chi-square test. The study population consisted of 500 subjects which included males ($n=240$), females ($n=260$). For statistical convenience the group of the subjects were divided into three groups 12-13 years ($n=283$), 14-15 years ($n=203$), 16-17 years ($n=14$). In present study out of 283 subjects in the 12-13 years age group, 235 subjects showed FDMC while 49 subjects showed no FDMC, in the 14-15 years age group 193 subjects out of 203 showed FDMC while 10 didn't show FDMC. FDMC was found to be statistically significant in the both the above age groups ($p\text{-value}=0.00$). However no statistical significance was found in 16-17 years age group (Table-I). Out of the 500 subjects evaluated it was found that 61 subjects show dental midline deviation (DMD).

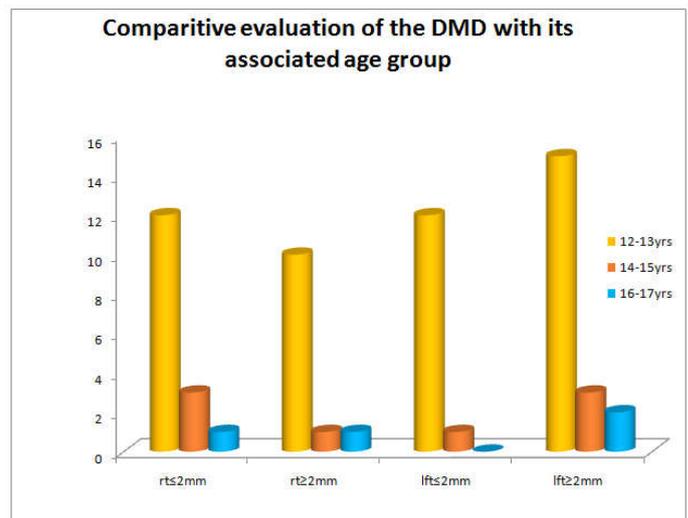
Table I. Comparative evaluation of the age groups with the FDMC

			Total	P value
	Non-FDMC	FDMC		
12-13yrs	49	235	284	.000 (significant)
14-15yrs	9	193	202	.000 (significant)
16-17yrs	4	10	14	.009 (not-significant)
Total	61	439	500	

FDMC: facial and dental midline co-incidence.

Table II. Comparative evaluation of the age groups with DMD

	Right side		Left side		Total
	$\leq 2\text{mm}$	$\geq 2\text{mm}$	$\leq 2\text{mm}$	$\geq 2\text{mm}$	
12-13yrs	12	10	12	15	49
14-15yrs	3	1	1	3	8
16-17yrs	1	1	0	2	4
Total	16	12	13	20	61



DMD: dental midline deviation.

Graph 1.

Out of 61 subjects 49 subjects in the 12-13 years age group, 8 subjects in 14-15 years, 4 in 16-17 years showed DMD either to the right or left. There was no statistical significance in the comparison of age to the shift of the dental midline either to the right or left by $\leq 2\text{mm}$ or $\geq 2\text{mm}$ ($p\text{-value}=.858$) (Table II, graph I). Most of the subjects in the study showed angle's class I molar relation.

DISCUSSION

Dentofacial symmetry is considered to be one of the characteristic features of facial esthetics. The harmony of the dental midline with the facial components contributes significantly to the esthetics (Lindauer *et al.*, 1998) (Zhang *et al.*, 2010). Perfect bilateral symmetries seldom exist in living organisms and right and left side differences are present. These dentofacial asymmetries may cause functional as well as esthetic problems (Agarwal *et al.*, 2015). Hence the present investigation aimed to study the extent of FDMC and also DMD. The relative location of the dental midline to the facial soft tissue midline is an important factor for orthodontic diagnosis and treatment plan (Lindauer *et al.*, 1998). It is found that most of the patients presenting for orthodontic treatment do not show FDMC. In the present study, of the 500 subjects, 428 (87.8%) of the subjects showed FDMC while 72 (12.2%) didn't show FDMC. These results are in accordance to a similar study done by Khan M.F *et al* who found 82.8% FDMC and 17.2% non FDMC (Khan *et al.*, 2014). Another study conducted in Saudi Arabia population also showed similar results (Alqarni *et al.*, 2014), another study also showed similar results (Miller *et al.*, 1979). Both these studies have not evaluated the association of FDMC with the malocclusions. In the study done by Grabber and Lucker dental malocclusions were considered to be more significant factors than midline deviations in determining the esthetic appearance of an individual (Graber *et al.*, 1980). However in contrast Hulsey attributed dentofacial symmetry to be one of the important factors in achieving an attractive smile (Hulsey *et al.*, 1970). In the present study subjects in the 12-13 years and 14-15 years age group shows statistical significant results with respect to FDMC associated with Angle's class I molar relation, while no statistical significance was found in the 16-17 year age group. As FDMC is considered to be most important objective in orthodontic diagnosis and treatment

plan, it is very important to record the minor deviations also. These minor deviations are often subjective and may be acceptable or unacceptable based on other facial characteristics as shown in the study conducted by Beyer and Lindauer in 1998. On comparison of the different age groups to the DMD no statistical significance was found either to the right or left by <2mm or >2mm. A deviation of 2mm was taken into consideration as a DMD of 2mm or more appears to be easily detectable by most individuals (Cardash *et al.*, 2003). The available literature discuss the various methods for correcting dental midline asymmetries, but no definitive guidelines are available in relation to the amount of deviation and the treatment that should be initiated which is influenced by various factors like age, dental & skeletal malocclusions (Agarwal *et al.*, 2015). In case of DMD, the facial midline can be taken as a guide to determine the fault. It also helps in determining whether the fault lies in maxillary or the mandibular midline or both. It may also give us the clue in identifying the actual cause of DMD which could be attributed to intra-arch alignment or rotation of the maxilla or mandible around arbitrary vertical axis (Ackerman *et al.*, 2012).

According to the present study subjects who showed DMD exhibited malocclusions such as unilateral crossbite, class I molar relation on one side and class II on the other side, class III molar relation, crowding, lingually erupted canines, palatally positioned lateral incisors. These findings are in accordance to the studies reported by other authors (Rilo *et al.*, 2008) (Lewis *et al.*, 1976) (Alcan *et al.*, 2006). In our study DMD was found more on the left side as compared to the right side. This could be attributed to the presence of malocclusion on the left side. These results are in contrast to a study conducted by Svanholt and Solow (Svanholt *et al.*, 1977). It is also important to understand the skeletal and dental determinants are responsible for malocclusions and their role in assessing the facial and dental midline deviations. Premature loss of deciduous teeth in the buccal segment are known to have an impact on the eruption and position on the permanent dentition (Lewis *et al.*, 1976). Deviation in midline may occur in both the arches, sometimes this may be temporary and permanent. Early exfoliation of deciduous teeth may lead to space loss resulting in crowding, ectopic eruption or impaction of permanent dentition which may lead to DMD (Casamassimo *et al.*, 2005). Premature loss of canines and primary first molars are known to have a profound influence on the anterior segment than the posterior segment of teeth (Dean *et al.*, 2004). Pathological and traumatic causes which may lead to loss of teeth can also cause DMD and should also be dealt as case studies in understanding midline deviations. Within the limitation of this study it can be said that longitudinal studies are required to assess the influence of the above said factors in the assessment of FDMC and DMD.

Conclusion

The symmetrical dental and facial arrangement is an important component of an attractive smile. Any discrepancies in either of the above may impair the esthetics of an individual. In clinical practice we encounter malocclusions associated with facial and dental midline deviations which may increase the complexity and the duration of the treatment. As the orthodontic literature doesn't provide any guidance to the

clinician in resolving such problems, the findings of the present study suggest that facial and dental midline coincidence and FDMC with minor discrepancies less than 2mm should be considered as an important objective in orthodontic treatment planning where ever possible.

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