Original article:

Evaluation of dental to facial midline discrepancies and its influence on dental attractiveness ratings in Gujarati (Indian) Population

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Abstract:

Backgorund: Esthetically the dental midline should coincide with the facial midline. The location of the facial midline depends largely on the judgement of the clinician. The amount of deviation between these two midlines that is noticeable to the observer has not been fully investigated.

Purpose: The observable deviation between the anterior tooth and facial midlines in a limited sample of dentate subjects was recorded.

Material and methods: Full facial-view, standardized photographs (1.5 x 0.5) of selected 250 subjects, were examined by 10 observers: 5 dental and 5 nondentalpersonnels who were given only a brief explanation of facial and tooth midlines. The examiners asked whether the facial and anterior tooth midlines deviated. The photographs then were scanned onto a computer screen, and the facial midline was determined by bisecting the distance between the medial angles of the eyes. The distance between a line perpendicular to this point and the contact point of the central incisors was measured by one examiner. The photographs were grouped according to the midline deviation: group A, <1 mm; group B, 1 to 2 mm; and group C >2 mm. The observers' detection rates for the midline deviation were compared and subjected to x^2 (chi-square) analysis of variance to identify significant differences at the 95% level of confidence.

Results: Dental and non-dental personnels demonstrated considerable variation in detection of dental and facial midline discrepancies. For Group A detection rate within dental personnel was significant while for non-dental personnel it was insignificant. While for group B it was significant for both dental and non-dental personnels.

Conclusion: The results of this study suggest that the greater the deviation of dental and facial midlines, the higher the detection rate and its influence on dental attractiveness ratings irrespective of observer.

Key words: Midline, facial midline, dental midline, esthetics

Introduction

"An artificial denture is a boon to the patient, but artificially looking denture is a curse to the patient." As teeth form an integral part of facial esthetics their placement should be compatible with facial features. An important consideration in arrangement of the anterior teeth is the matter of symmetry; a key factor being the establishment of the dental midline. Esthetic is enhanced when the medial surfaces of both maxillary central incisors (dental midline) coincides with the facial midline.

Discrepancy between dental midline and facial midline are commonly found in population. So this study throws light on acceptable discrepancies between dental and facial midline among the natural dentition within Gujarati (Indian) population and shows if the discrepancy exceeds beyond acceptance level it would affect the attractiveness rating in society.

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So, the main aim of this study was to find the detection rate of discrepancies between dental and facial midline within dental and non-dental personnel.

Materials and method

Four hundred Gujarati Indian students of dental college, Ahmedabad were clinical examined of which 250 subjects were selected between age group of 17-25 years with bilaterally symmetrical face with no scar marks and pathological lesions. All the subjects had medium and high lip line, so tip of interdental papilla can be easily located and with full complement of teeth in both jaws with no fixed or removable prosthesis on anterior teeth. There was absence of carious lesion, periodontal disease and no implementation of orthodontic treatment. There was absence of spacing and crowding in anterior segment of maxillary teeth.

Method[1]:

Full facial view, standardized photograph of 250 subjects was taken.

Camera was made fixed by mounting it on a tripod at a distance of 1.3 meter from subject, and the diaphragm was set on 5.6 with 60 shutter speed and lens setup on 80 . Thus the distance between the subject and object was kept fixed in all photographs, for standardization of method.

Before taking each subjects photographs distance between Nasion and tip of interdental papilla was measured on patients face (Fig. I) for 3 times to avoid any discrepancy due to soft tissue movement and mean of those readings was taken. The same distance was measured on each subject's photograph to obtain reproduction ratio, which was 1.5 x 0.5 respectively (Fig. II).

The photographs were examined by 5 dental and 5 non-dental personnel. They were allowed to observe the photograph in 10 seconds from any distance and angle and asked whether anterior tooth midline and facial midline coincides or not.

All photographs of 4"x6" size were taken on CD with 200 resolution and this magnification was kept constant for each photograph. The images were aligned with the inter pupillary line made parallel to the framework of the screen. With the help of cursor a horizontal line was drawn by joining medial angles of both eyes, and it was bisected by vertical perpendicular line represented as facial midline. Dental midline was located between two central incisors and distance between dental and facial midline was measured.

The photographs were grouped according to the size of deviation (Fig. III) (Fig. IV) (Fig.V).

Group A :< 1 mm

Group B : 1-2 mm

Group C :> 2 mm

The observer's detection rates were compared and subjected to x^2 (chi-square) analysis to identify significant differences at the 95% level of confidence.

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Data and results

In Group-A recorded subjects were 228, in Group-B 22 and no subject was recorded in Group-C. Detection rate for dental and facial midline discrepancy within dental and non-dental personnel is tabulated in Table I, II, III and also represented in Graph-1 and Graph-2.

Table I and Graph-1 demonstrates that for Group-A there is a significant difference among dental and non-dental personnel to detect discrepancy between dental and facial midline.

Table II and Graph-1 demonstrates that detection rate for Group-B within dental and non-dental personnel is significant. For non-dental personnel it was ranging 35-55%, which was relatively significant than Group-A.

Table III and Graph-2 demonstrates overall detection rate within dental personnel it was significant while in non-dental personnel it was insignificant.

So, there is a demonstrable co-relation between amount of discrepancy present between dental midline and facial midline and its detection rate. The greater the deviation of dental and facial midline, the higher the detection rate, irrespective of observer.

Referring the fisher's x^2 table $1x^2$ (chi-square) value for 4 degree of freedom corresponding to the comparable probability (P) significant level was checked.

As the calculated value of x^2 (chi-square) as shown in Table IV is high for Group-A, it is statistically significant (P<0.001).

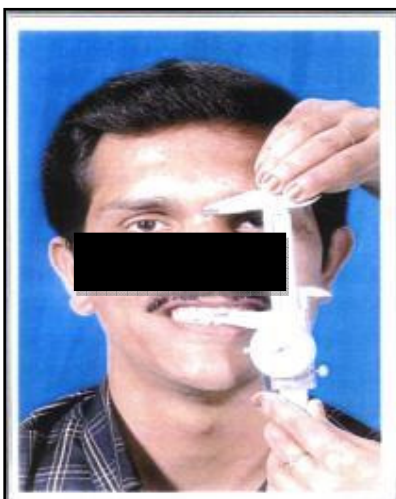For Group-B x^2 value was not significant at 99% level of confidence (P<0.05).

Fig.I Showing a method of measuring distance from nasion to tip of interdental papilla between maxillary central incisors on subject's face.

Fig.II Showing a method of measuring distance from nasion to tip of interdental papilla between maxillary central incisors on photograph.
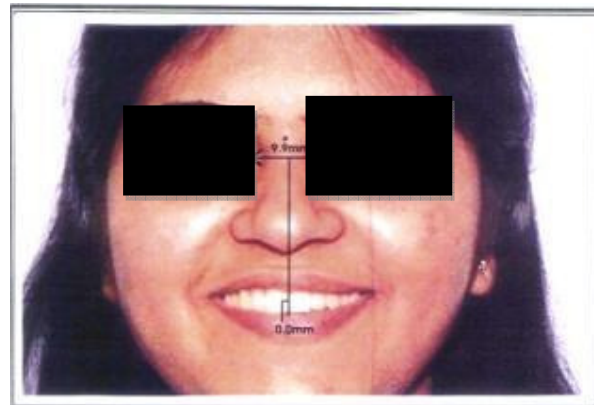

Fig. III Showing a subject where no discrepancy is present between dental and facial midline.
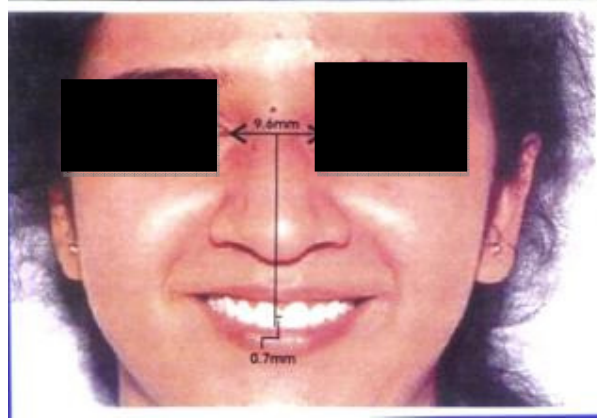
FIG. IV Showing a subject from Group A where 0.7 mm discrepancy is present between dental and facial midline.
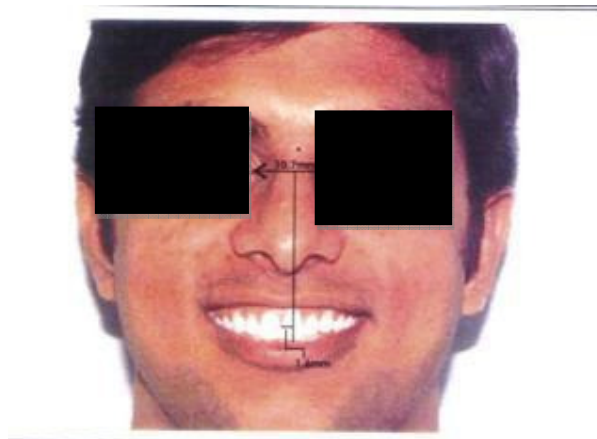

Fig. V: Showing a subject from Group B where 1.6 mm discrepancy is present between dental and facial midline.

Graph: 1 showing detection rate of dental midline and facial midline discrepancies for Group A and Group B

by dental and nondental observers
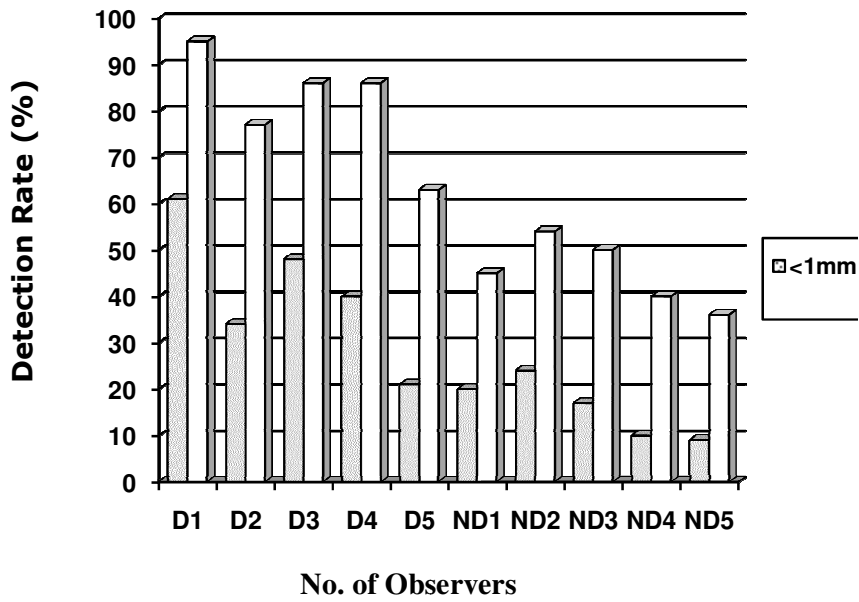
No. of Observers

Graph: 2 showing detection rate of dental midline and facial midline discrepancies in all 250
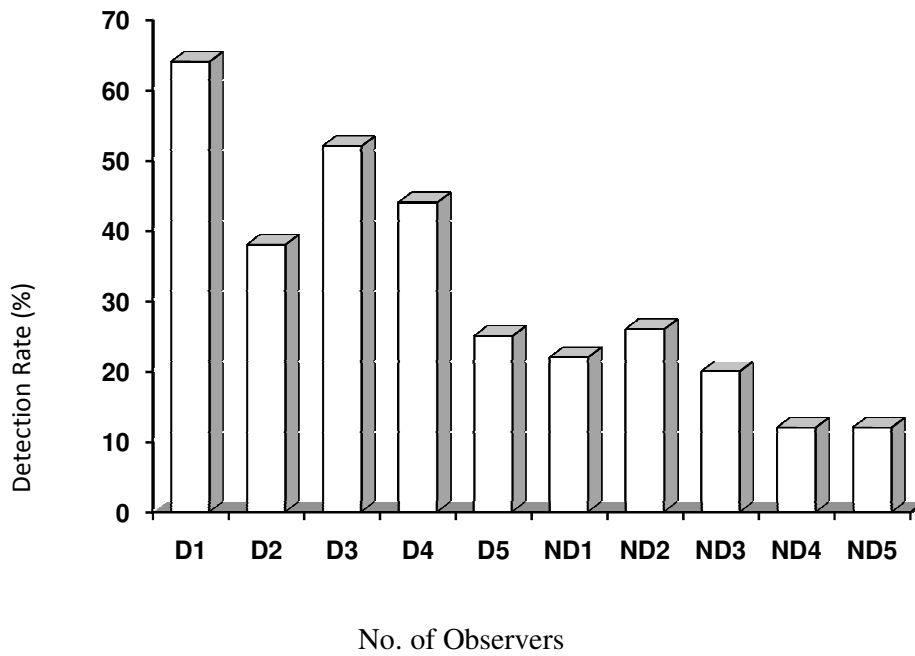
subjects by dental and nondental observers

No. of Observers

Table : I - Detection rate for midline discrepancy in Group A (< 1 mm deviation

Observers	Detected Photographs	Undetected Photographs	Total Photographs	Detection rate (%)
D_1	141	87	228	61.84
D_2	78	150	228	34.21
D_3	111	117	228	48.68
D_4	95	136	228	40.35
D_5	50	178	228	21.92
ND_1	47	181	228	20.61
ND_2	55	173	228	24.12
ND_3	41	187	228	17.98
ND_4	23	205	228	10.08
ND_5	22	206	228	9.64

D= Dental Observer   ND = Non dental observer

Table : II Detection rate for midline discrepancy in Group B (1-2 mm deviation)

Observers	Detected Photographs	Undetected Photographs	Total Photographs	Detection Rate %
D_1	21	1	22	95.45
D_2	17	5	22	77.27
D_3	19	3	22	86.36
D_4	19	3	22	86.36
D_5	14	8	22	63.63
ND_1	10	12	22	45.45
ND_2	12	10	22	54.54
ND_3	11	11	22	50.00
ND_4	9	13	22	40.90
ND_5	8	14	22	36.36

Table : III - Detection rate for midline discrepancy in all 250 subjects.

Observers	Detected Photographs	Undetected Photographs	Total Photographs	Detection Rate %
D_1	162	88	250	64.8
D_2	95	155	250	38.0
D_3	130	120	250	52.0
D_4	111	139	250	44.4
D_5	64	186	250	25.6
ND_1	57	193	250	22.8
ND_2	67	183	250	26.8
ND_3	52	198	250	20.8
ND_4	32	218	250	12.8
ND_5	30	220	250	12.0

D= Dental Observer ND = Non dental observer

Table IV: (Chi-square) value

Group	Dental personnel	Non-Dental Personnel
A	84.80	27.32
B	8.53	1.82
Overall	87.53	26.8

P<0.001 for Group A and overall which is significant.

    P<0.05 for Group B which is not significant.

Discussion

In this study the observable deviation between the dental midline and the facial midline in 250 Gujarati (Indian) subjects was recorded and their detection rates were compared with the measurements which were taken on a computer screen.

Lombardi[2] and Anthony Tjan H.L.et al [3] stated intheir studies that proper midline location isnecessary for stability and produces a desirableeftect of 'cohesiveness' or oneness' of the dentalcomposition.Ernest L. Miller et al have observed in their study that facial and maxillary midline usually coincide[4] For aesthetically pleasing results mesial surfaces of maxillary central

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incisors should be in contact with an imaginary line that bisects the face. Various investigators had used different landmarks to locate the dental and facial midlines[5].

In the present study attempts were made to use the philtrum and the tubercle of the upper lip on the computerized image as a facial midline. The borders of these structures were indistinct, hence their midpoints were difficult to identify. Therefore to be more precise in this study bisecting line of the intercanthal distance was taken as the facial midline.

Observational study was done on each subjects photograph rather than doing directly on the face as detection in the patient would probably be considered more difficult because the face is constantly moving and dynamic movements of the tissues are distracting, besides the patient may become conscious.

Before taking each subjects photograph distance between nasion and tip of interdental papilla was measured on the patients face for three times to avoid any discrepancy due to soft tissue movements and average of these three readings were taken. Nasion was selected as the reference point as it is easier to locate and the second reference point selected was interdental papilla between maxillary central incisors, which covers the skeletal landmark interdental superiors.

Data and results of the study suggest that dental as well as non dental personnel's ability to detect midline discrepancy is more significant in Group B than Group A. But at the same time detection ability of dental observers is significant even for Group A were less than 1 mm deviation is present. It clears that dental personnel are more sensitive to midline deviation. Beyer J W also confirmed this in his study. [6]

The results of this study also suggest that the greater the deviation of dental and facial midline,

the higher the detection rate and its influence on dental attractiveness ratings irrespective of observer , is conformity with finding of Johnston CD, Burden D.J.[7]

As the dental and facial midlines are not always coinciding, location of the dental midline should depend on facial midline rather than considering other intraoral landmarks. Deviation upto 1 mm goes unnoticeable but as the deviation increases detection rate also increases so in this situation facial midline should be considered in location of dental midline. This study can be used as a guide in subjects who do not wish the reproduction of their original dentition in dentures.

Modifications and compromises can be made in location of the dental midline in relation to the facial midline, where evident asymmetry of face and jaw is present due to any developmental, congenital or acquired disease.

Frush and Fishersuggested that the vertical long axis of the midline is more critical than its mediolateral position. Provided that the central incisor midline is parallel to the facial midline, the dentist may safely place the anterior tooth midline up to 2 mm from the facial midline in this population.[8]

According toKokichVo Jr. Dentists were more critical than laypeople when evaluating asymmetry[9]. In this stud y also out of 250 Gujarati (Indian) subjects very few were aware of the discrepancy in their dental and facial midline. So most of the time this discrepancy goes unnoticeable but as being a prosthodontist we must try to give the best possible results while locating dental midline which is a prime factor in aesthetic requirement of dentures.

Summary and conclusion

An important consideration in arrangement of artificial teeth is a matter of symmetry; a key factor being the exact location of dental midline which

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should coincide with facial midline. As discrepancies between dental and facial midline are commonly present in population, their rate of occurrence and effect on dental attractiveness ratings must be studied.

The results of this study suggest that the greater the deviation of dental and facial midline, the higher the detection rate and its influence on dental attractiveness ratings irrespective of observer.

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