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'AJ' Angle: The Aesthetic Norm for Soft Tissue Profile

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Abstract

The parameters for determining the aesthetics varies among individuals and also among population. Aesthetics is considered to be the perception of beauty. The norms for individuals vary among populations based on their ethnic and racial background. Therefore, while formulating a treatment plan, the clinician should take into account the optimal aesthetics of the given population, in order to derive the best possible outcome from a treatment. Here, angular measurements are derived from photogrammetric analysis considering its easy accessibility in the clinical setup. A norm is being formulated for the South Indian population considered in the study. The gender differences in the angular measurement are taken into consideration, to make the clinician aware of the aesthetic requirements of the specific individual. A new angular measurement called the AJ angle, or the Aesthetic J angle is derived so as to guide the clinician for better understanding of the soft tissue profile to be considered aesthetic for the population under study. While this study achieves its objectives by assessing the preliminary data that shows trends and patterns in angular forms, we still believe, further work is required in this aspect to develop a data set that can be applied to clinical practice.

Keywords: Aesthetics, AJ angle, Soft tissue Profile

Introduction

One of the most important parameters about aesthetics which most people are sensitive about is face[1]. Quality of life of an individual is affected by the facial features which is known to impact the physical appearance, psychological well-being and self-esteem of an individual[2]. One of the objectives of any treatment is to enhance the dentofacial features, thereby enable esthetic harmony and optimal functional occlusion[3,4]. The standards and norms that are considered optimal for a particular race or ethnic groups might not match the needs of other groups. Therefore, it is imperative that the clinician is aware of the facial features which are deemed to the aesthetic by specific racial and ethnic groups[5].

Setting up of specific norms for a given population helps the clinician to customize the treatment plans based on the individual's facial patterns and proportions that coincide with the demographics[6]. This will in turn help in creating a natural and aesthetic appearance to the individual relative to their demographic requirements[7]. As we consider the facial harmony as the goal in achieving a proper aesthetic outcome, the soft tissue envelope of the individual is of prime importance[8]. Understanding of the soft tissue proportions will aid in evaluating a patient at the first visit and help in diagnosis and treatment planning[9].

There are a multitude of studies on analysis of soft tissues, craniofacial structures and facial balance[10]. There has been literature on determination of various soft tissue parameters using cephalometrics[11]. Studies has also included soft tissue facial analysis based on standardized photogrammetric methods[12]. Considering the various methods that are available soft tissue analysis, the photogrammetry (i.e. analysis of photographs) is regarded as the conventional approach for soft tissue analysis[13].

Objective

Orthodontics deals with the alteration of the dentofacial structures and also plays a major role in establishing optimal esthetics. Therefore this study seeks to develop a photogrammetric soft tissue angular norms for a sample of South Indian Population of 16-30 years of age group with Skeletal Class I relationship based on Cephalometric analysis with pleasing soft tissue profile and also to find out if there is any gender dimorphisms in the angular measurement obtained. This angular value will serve as a guide for establishing aesthetic outcome in finishing protocols also.

Materials and Methods

A total of 40 samples were collected with equal gender distribution of 20 males and 20 females who complied with the inclusion criteria. Samples included Lateral Cephalogram and Right Lateral View Photograph which was obtained from the same camera by the same operator to avoid any operator bias and allow standardization of the samples. On the Photograph, 2 lines were marked in order to derive and angular measurement between then. The points for the first line was from soft tissue Nasion (N') to soft tissue Pogonion (pog'). For the second line the exterior most point on the upper and lower lips were considered. The angle formed between them was called the AJ angle or the Aesthetic J angle (Fig:1).

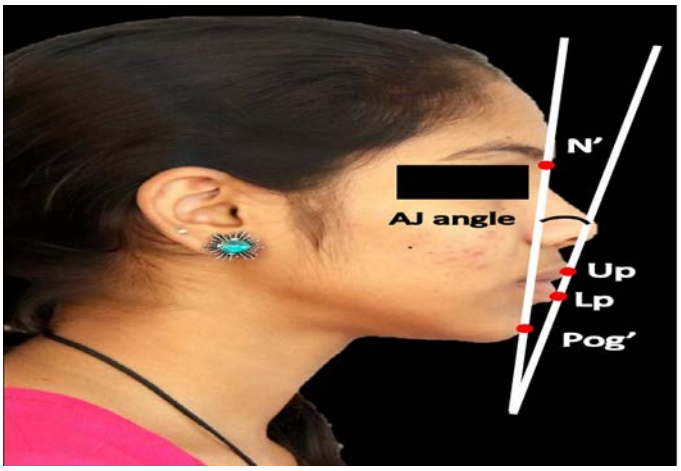


Fig: 1- Landmarks and Reference lines used in this investigation

Landmarks	Description
N', Soft tissue nasion	The deepest point in the middle of the frontonasal curve
Pog', Soft tissue Pogonion	The most anterior point of the chin
Up, Upper Prominence	Most prominent point on the upper lip
Lp, Lower Prominence	Most prominent point on the lower lip

Inclusion criteria

1. 16-30 years of age (taken into consideration to reduce effect of aging on facial dimensions)
2. Skeletal Class I relation based on the ANB angle of 2
3. No history of trauma to the craniofacial region
4. No history of any cosmetic surgery to the face.

The printouts of all the photographs were cropped to match the dimensions of 4"x6" dimension in order to avoid any enlargement errors in measurements.

The SPSS (statistical Package for Social Sciences) version 20. (IBM SPASS statistics [IBM corp. released 2011] software for windows was used for data analysing. To compare the male and female values. A Student T test was used. In order to assess the method error, 15 photographs were randomly selected and remeasured within a 4-week interval after the first evaluation. The reliability and reproducibility of the method was determined using intra-class coefficient (ICC). ICC showed significant consistency between main and repeated records.

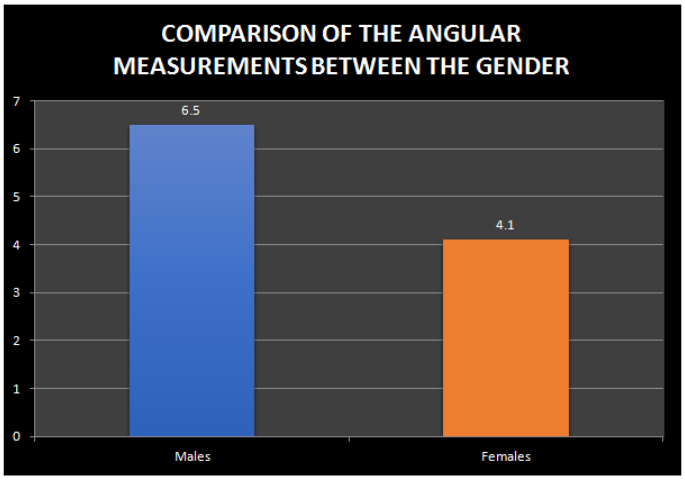
Results

Our sample consisted of 40 individuals (20 males & 20 females) with a mean age of 23.42. Comparison of the angular measurements i.e. AJ angle between genders using Mann Whitney test gives a statistically significant difference (Table 1).

Table 1: Comparison of the Angular Measurements between The Gender Using Mann Whitney Test

	N	Minimum	Maximum	Mean	S.D	Mean diff	U value	P value
DM	20	5	7	6.50	.607	2.4	7.00	0.00*
Non-DM	20	3	6	4.10	.788			

Graphical representation of the values among males gives a mean AJ angle of 6.5° and 4.1° for females (Graph 1).



Graph1: Comparison of the angular measurements between the Genders

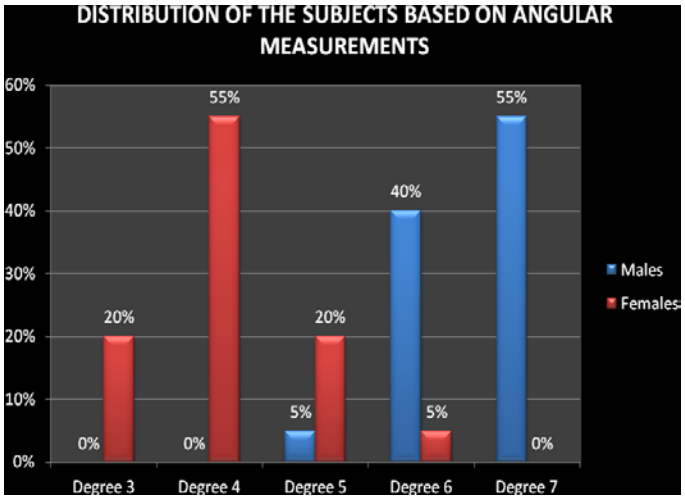
The distribution of the subjects based on the AJ angle values shows that 55% of the male population considered in the study gave an angular value of 7°. While the AJ angle for 55% of females were 4° (Table 2).

Table 2: Distribution of the Subjects Based on Angular Measurements

Angular measurements		Gender		Total
		Males	Females	
3	Count	0	4	4
	Percent	0.0%	20.0%	10.0%
4	Count	0	11	11
	Percent	0.0%	55.0%	27.5%
5	Count	1	4	5
	Percent	5.0%	20.0%	12.5%
6	Count	8	1	9

	Percent	40.0%	5.0%	22.5%
7	Count	11	0	11
	Percent	55.0%	0.0%	27.5%
Total	Count	20	20	40
	Percent	100.0%	100.0%	100.0%
Chi-square value- 33.24				
P value- 0.00*				

Distribution of the subjects based on AJ angle is depicted graphically (Graph 2).



Graph 2: Distribution of the subjects based on angular measurements

Discussion

The purpose of this study was to put up a norm for identifying the aesthetic outcome of a treatment and to set a goal on finishing the treatment at the optimal esthetic result. Many factors are known to affect the soft tissue profile, ethnicity being one of them[14]. The inclusion criteria and overall design of this study was devised to put up a guide for the south Indian population which could be helpful in formulating treatment plans in creating a balanced facial profile consistent with the norms in achieving a natural look[15]. Patients who had undergone aesthetic surgery of had history of trauma was excluded from this study as their artificial features may have confounded our study which is intended to characterize natural patterns[16].

This study examined patients with Skeletal Class I pattern which may not necessarily reflect the aesthetically pleasing features. However, the primary goal was to characterize typical and atypical facial features using a new yardstick so that it can be used as a reference for consideration in treatment planning. The ability to easily utilize the photogrammetric analysis in clinical settings and its intuitive abilities is one of the major driving force for selecting this method for this study. In addition to its clinical accessibility, it has made data collection and analysis more effective, efficient and easily approachable. Moreover, the cost effectiveness of this method as compared to other methods, gives it an extra edge over the usually considered techniques for soft tissue assessment. Furthermore, unlike the other available methods, subjects are not exposed to radiation, thus making it a safe option for population-based studies[17]. So, the noteworthy benefit of photogrammetry-based results is their accessibility and easier application among clinicians. Most plastic surgeons primarily use photographs for total facial aesthetic procedures, and when using angular measurements, there is no confounding impact by image resizing[18].

Our data analysis mainly focussed on comparing angular values between male and female individuals. Our analysis showed statistically significant differences between male and female groups for the AJ or Aesthetic J angle. Therefore, the values suggested that there were distinctive differences in the angular measurement or the AJ angle among gender. In view of the objective of the study we have characterized the norm for males and females in South Indian population based on the AJ angle.

Relative to the surgical planning for cosmetic procedures and treatment of facial aesthetics, we feel our results can

be used to reassess or to confirm the outcome of the treatment achieved by the clinician.

While this study achieves its objective by assessing preliminary data that shows trends and patterns in angular norms, further research into this area would be highly beneficial to widen the database. This should entail assessment of larger study population in order to derive a more definite data for the South Indian population.

Conclusion

The results obtained in our study showed sexual dimorphism in angular measurement of AJ angle. This can be used as a reference guide for comparison with records of subjects that have same soft tissue profile, ethnic characteristics and following the same photogrammetric technique. While this preliminary data shows a green signal for future clinical application, a further development in database can allow Orthodontists and Surgeons to determine and evaluate any deviations from the given norm for a specific population and put forward a treatment plan to achieve a natural look to the individual.

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