CPQ Dentistry (2019) 1:3
Research Article

The Evaluation of the New Beauty Proportions of the Face and Profile of the Most Famous Models of the Last Decade

Latifa El Mouden*, Salma Jdii, Safaa Elbaghdadi & Farid El Quars

Department of Dentofacial Orthopedics, University of Hassan II Casablanca, Morocco

***Correspondence to:** Dr. Latifa El Mouden, Department of Dentofacial Orthopedics, University of Hassan II Casablanca, Morocco.

Received: 03 June 2019

Published: 12 June 2019

Keywords: *Models; Beauty; Photogrammetry; Orthodontics*

Abstract

Objective

Facial aesthetic has always been a major preoccupation, for patients as well as dentists, orthodontists, maxillofacial and plastic surgeons. Therefore, this study was conducted to evaluate the new female facial proportions that can influence the appreciation of facial beauty based on the most prominent models of the last decade "face photos" to consider the impact of its new values on current orthodontic therapeutic choices.

Methods

A photogrammetric cross-sectional descriptive study of a sample of the most famous model photos was conducted. To verify the reliability of the comments between the score and the manipulation of the measurement software a test-retest with a 30-day interval was performed.

Results

The comparison between the means of the measured face ratios at the two samples showed significant differences ($p < 0.05$) between the two groups, reflecting an increase in the percentage of

the upper third of the face in the sample of the new models and a decrease in the percentage of the lower third of the face in the same group. The comparison of the measured angles showed a significant difference for the distal chin angle and the chin protrusion in favor of an increase in the group of new models.

Conclusion

The comparative analysis of facial and contour measurements in photos of the new and the 90s models in this study showed a significant reduction in the height of the lower third of the face and an increase in the protrusion of the chin for the sample of new models.

Introduction

A popular axiom about physical attractiveness states: "Beauty is in the eyes of the one who is watching". In the 21st century, we live in a world full of norms and rules that we try to respect. This is the case, for example, when we discuss physical appearance; and therefore physical beauty criteria in men and women. However, women's image projected by the media, such as advertising and fashion magazines, seem to be perfect and most Modern women are constantly trying to improve themselves to rise to this "ideal" beauty.

The use of the classic standards was propagated by the artists and the anatomists of 17th and 19th centuries in the field of the medicine. However, scientific and systematic studies on the attractiveness took their sense during the last 30 years [1].

The conception of beauty was never so eclectic and free as today. The feminine beauty exists under diverse forms, for example, all the ethnic groups can be represented, or any style of clothing, in addition to the opening of the world through the media.

To measure the facial proportions allows obtaining invaluable indications and criteria of diagnosis as well as information potentially usable in the clinical practice. This is the way in the reconstructive and aesthetic surgery, the proportions are estimated by using anthropometric techniques and guidelines to correct the deformations and/or the disproportions. In addition, orthodontics or maxillofacial surgical techniques are used to obtain aesthetically superior results for patients [2].

In the early years of orthodontics, the "Angle paradigm" asserted that a perfect occlusion had to be obtained, and then the beauty of the face would follow. In subsequent years, the development of cephalometric analysis drew orthodontists' attention on dental and facial structures. More recently, it has been recognized that orthodontic and surgical treatments should focus on the harmony and soft tissue proportions of the profile.

For this reason, facial analysis has become today a fundamental step in the evaluation of patients requiring aesthetic or reconstructive facial interventions. Anthropometric and soft tissue analysis was used to define the soft-tissue relationships of different parts of the face and this set the standards for preoperative objective facial analysis based on standard photometric methods. More recently, the evolution of technology has provided us with several precise three-dimensional methods for measuring anthropometric parameters such

as plaster facial scans, digitization of anatomical landmarks recorded directly to patients, and laser surface scan. Dimensional methods for measuring anthropometric parameters such as plaster facial scans, digitization of anatomical landmarks recorded directly to patients, and laser surface scanners [3]. Thus we try to maintain, to find or to get closer as far as possible, during our treatments, to standardized aesthetic, facial and cephalometric standards. However, old standards of beauty determined by anthropometric, photometric and cephalometric data cannot match current public perceptions of facial beauty; for this, the validity of conventional canons must be questioned when they are used to restore more contemporary faces.

It is in this approach that this study has been performed; to describe the mathematical differences of measurements, taken in the photographs of the most famous models; then to discuss the influence of the new criteria on the current orthodontic therapeutic choices. The null hypothesis is that there is no significant difference between the two samples.

Material and Method

Type of Study

This work consists of a descriptive cross-sectional study; In a sample of the most prominent models seen all over the world in the last decade; Through the most prestigious fashion magazines versus the most celebrity models of 90s.

Study Population

The list of new models was selected through their appearance in the cover of fashion magazines in their new editions. A comparison group was also composed of a sample of the most famous models of the 90s from exhaustive web research.

Method

After web research, a list of 50 of the most famous new models and a list of 48 old models were established. Face and profile photos were gathered from the web for each model. Photos were standardized, rotated along the sagittal axis in front photos and according to the plane of Frankfort for the profile photos; all photos were converted to black and white. All photos selected were taken with neutral expressions, closed mouth with no visible teeth, hair pulled back, with no or minimal makeup.

Two categories of photos were obtained:

- Front pictures to face analysis
- Profile photos for profile analysis.

Landmarks were drawn on the front and profile photos of each model photo by two operators for each of the two categories.

Table 1: *Reference points of the face and profile used in the study.*

Reference points of the face (Fig. 1: Reference points of the face):		Profile reference points (Fig. 2: Profile reference points):	
T	trichion: intersection of hairline with the median sagittal axis	SE	sellion: the most prominent point of the cutaneous front situated between the super-ciliary arches, and above the nose.
G	glabella: the most salient point of the cutaneous front located between the eyebrows, and above the nose.	P	pro-nasal: the most anterior point of the nose.
SE	sellion: the most concave point of the tissue covering the naso-frontal suture.	C	columella: highest point of the columella.
SO	supraorbital: bone projection above the orbit and below the forehead.	CA	wing curvature: point of wing curvature or point of wing crest.
Z	zygion: the most lateral point of the face on the zygomatic bone.	LS	upper lip: mucocutaneous junction and the vermilion margin of the upper lip.
SN	sub nasal: junction point of the cutaneous part of the upper lip and the nasal septum.	LI	lower lip: mucocutaneous junction and vermilion margin of the lower lip.
CH	cheilion: point located at each labial corner.	PG	pogonion: the most anterior point of the chinar symphysis.
GN	gnathion: The midpoint located on the lower edge of the chin.	MD	remote chin: The point of the most distant chin of the Tragion.
		M	chin: lower point than the anterior portion of the chin.
		T	tragion: highest point of the tragus.

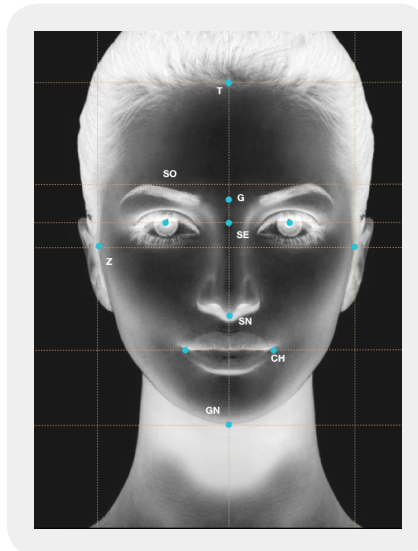

Figure 1: *Landmark Points of the Face*

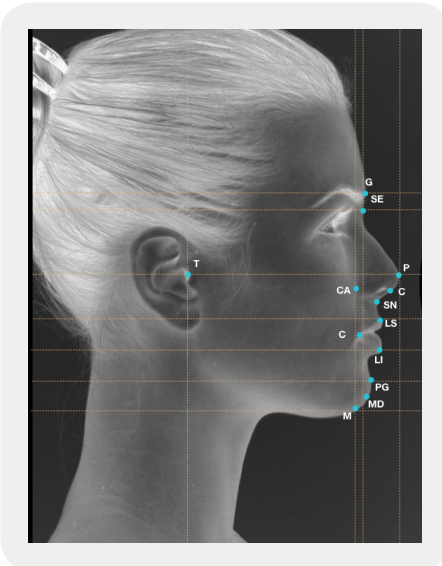

Figure 2: *Landmark Points of the Profile*

For the models in the comparison group, old photos of the models in the same age range as the study group; were chosen to counteract the effect of facial changes related to the aging process.

The photometry or the measurement of the distances and angles through the previously described markers was carried out by two investigators (the analysis of face by one and the analysis of profile by the other) by the software GIMP version 2.8.22 (http: //www.gimp.org/downloads/).

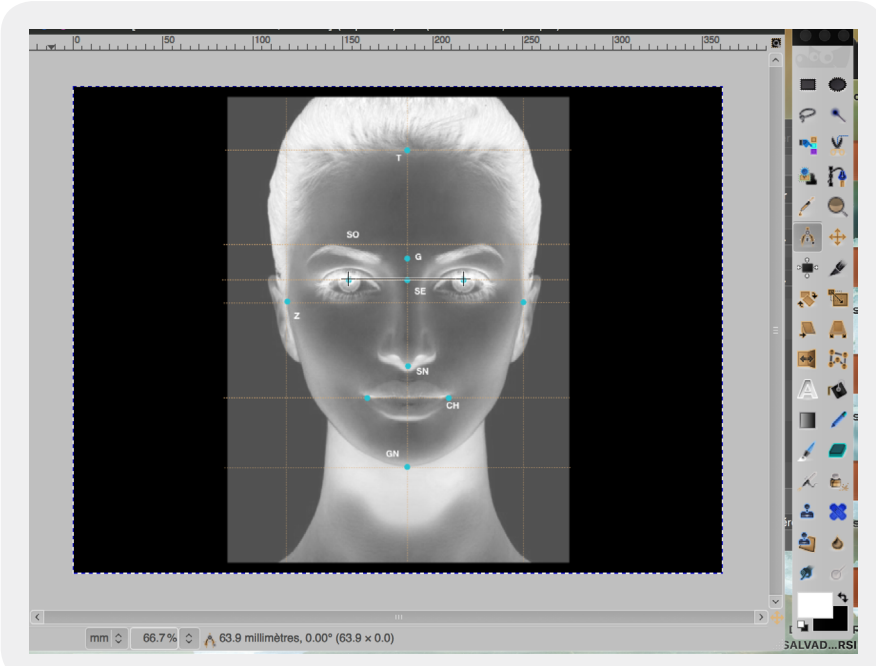

Figure 3: *Illustration of the GIMP measurement method for the front view photo*

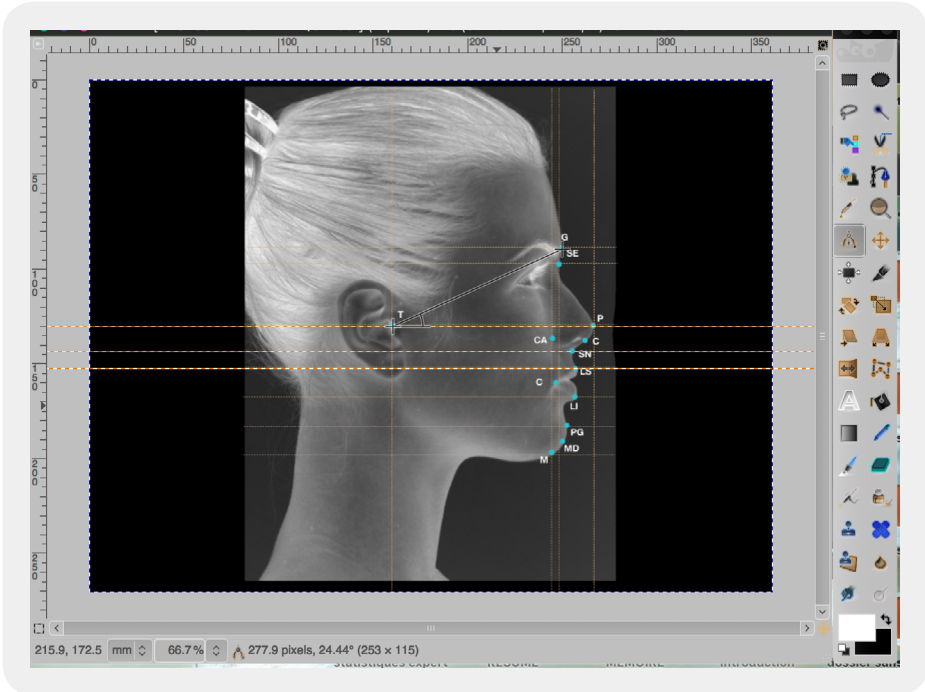

Figure 4: *Illustration of the GIMP measurement method for the profile view picture*

Distances and angles were measured for each photo.

Table 2: *The different proportions and angles measured for the analysis of face and profile*

Proportions of the face analysis		**Angles of profile analysis**	
Height-Width ratio of the face	Trichion-Gnathion / Zygion-Zygion	**Naso-frontal angle**	G ; SE ; P
The classic facial index	Sellion-Gnathion / Zygion-Zygion	**Nasal angle**	SE ; P ; SN
The facial index	Supra-Orbital -Gnathion / Interpupillary Distance	**Nasolabial angle**	C ; SN ; LS
Upper face ratio	Trichion-Glabelle * 100 / Trichion-Gnathion	**Naso-mental angle**	SE ; P ; PG
Average face ratio	Glabella-nasal * 100 / Trichion-Gnathion	**Facial Convexity**	G ; SN ; PG
Lower face ratio	Nasal - Gnathion * 100 / Trichion-Gnathion	**Projection of the upper lip**	SN ; PG; LS
DIC-DIP Report (Ricketts)	Inter-pupillary Distance / Inter-Commissural Distance	**Projection of the lower lip**	SN ; PG ; LI
Report of the maxillary bases	Stomion-Gnathion / Nasal-Gnathion	**Chin protrusion**	CA ; PG ; M

Distal angle of the "classic" chin	**Distal angle of the chin**	M ; MD ; PG
Convexity of the profile	T ; PG ; G	
	T ; G ; PG	

Statistical Analysis

The statistical data for this study were captured, analyzed and compared using the Microsoft Excel 2010 software; and the Spss software, Version 23.0. Armonk, NY: IBM Corp.

The Student's T test was used for the intergroup comparison with alpha level of significance alpha =5% (corresponds to a 95% confidence) . P <0.05 value was considered significant.

Reliability Test

A Test-Retest was performed for face and profile analysis to verify intra-investigator stability by calculating the intra-class correlation coefficient (ICC) with a 4 week interval between the two measurements.

Results

Descriptive Characteristics of the Samples

Our study sample consisted of collected frontal view and lateral view photographs, taken from 50 models for the study group and 48 models for the comparison group.

54% of the first group were of European origin while 38% were of American origin, 4% of Asian origin, 2% of African origin and 2% of Australian origin. In the comparison group 40.4% were of European origin, while 53.2% were of American origin, 2.1% African, Australian and Asian.

The Reliability Intra Investigators

The ICC calculated for the Retest test for the reliability of the face measurements was at 0.98 (0.97-0.99) with a 95% confidence interval (CI), as for the ICC of the reliability of the profile measurements, it was at 0.94 (0.76-0.99) with 95% CI.

Outcomes for Facial and Profile Measurements

The results of the various measurements made on the face and profile photos of the models selected in the study and comparison groups were obtained using the GIMP version 2.8.22 software.

Using the Student's T test with a significance threshold of p <0.05, the comparison between the means of the ratios measured at the sample face of the new and the old models showed significant differences between the two groups, reflecting increases in the percentage of the upper third of the face in the sample of new models and a decrease in the percentage of the lower third of the face in the same group.

Table 3: *Comparison of facial measurements between study group and comparison group*

	Models of the last decade				Models of 90s				P value	Significance
	M(°)	SD	Min value	Max value	M(°)	SD	Min value	Max value		
Height-Width ratio of the face	1,333	0,014	1,180	1,480	1,320	0,120	1,130	1,560	0,525	NS
The classic facial index	0,818	0,049	0,730	1,010	0,830	0,042	0,720	0,930	0,647	NS
The facial index	2,034	0,092	1,830	2,280	2,039	0,092	1,050	2,320	0,865	NS
Upper face ratio	33,424	4,228	25,940	40,930	32,024	1,916	26,900	38,980	0,015	S
Average face ratio	34,078	1,358	29,150	40,820	34,329	1,195	28,850	38,460	0,554	NS
Lower face ratio	32,316	2,348	27,610	37,300	33,799	1,549	28,960	39,040	0,001	S
DIC-DIP Report	1,278	0,085	1,080	1,430	1,274	0,007	1,120	1,500	0,815	NS
Report of the maxillary bases	0,671	0,035	0,610	0,730	0,674	0,007	0,610	0,750	0,065	NS

The comparison of the angles measured in the two samples by the Student's T test showed a significant difference for the distal angle of the chin and the protrusion of the chin.

Table 4: *Comparison of profile measurements between the study group and comparison group*

	Models of the last decade				Models of 90s				P value	Significance
	M(°)	SD	Min value	Max value	M(°)	SD	Min value	Max value		
Naso-frontal angle	132,468	11,084	84,700	155,900	136,028	6,208	115,800	270,300	0,082	NS
Nasal angle	100,438	7,356	77,800	113,600	98,816	0,778	86,850	110,230	0,247	NS
Nasolabial angle	99,189	12,711	71,570	126,600	96,579	5,728	60,200	125,400	0,323	NS
Naso-mental angle	132,730	5,834	112,800	145,200	133,808	6,449	124,180	141,400	0,307	NS
Facial Convexity	172,761	5,447	162,700	193,000	172,841	0,134	162,900	179,800	0,933	NS
Projection of the upper lip	5,484	2,450	0,200	11,800	4,831	2,298	1,000	17,200	0,229	NS
Projection of the lower lip	5,588	3,735	0,100	14,900	5,061	1,973	0,400	25,900	0,509	NS
Chin protrusion	126,465	10,000	102,200	155,500	121,955	12,233	100,300	141,070	0,017	S

Distal angle of the chin	140,615	9,182	119,930	170,390	135,274	6,449	116,100	152,960	0,003	S
Distal angle of the "classic" chin	60,447	12,993	49,500	145,000	56,961	2,461	37,000	71,700	0,090	NS
Convexity of the profile	69,179	5,329	53,900	81,140	68,661	0,976	51,500	81,250	0,662	NS

Discussion

Before discussing the results of our study, it is important to talk over the bias that it may involve. Among the main errors that can be included in this survey, we can describe two types:

- Sampling bias
- Measurement bias

This work focused on the faces of the most fashionable models. This being based on an exhaustive web search. However, the use of photographs downloaded from the internet doesn't allow standardization of measurements. The fact that the head can be slightly rotated, can lead to reducing the accuracy of measurements. In addition, the different photographs were taken on different scales, which made the calculation of reproducible linear measurements impossible. For those reasons, we were limited in our analysis to angular measurements and ratios of distances.

Measurement biases can relate to all the values studied. They are attributable to the investigator during the survey of anatomical points, and a factor of unpredictability also lies in the measurements made by the software. Each of these errors can contribute to distorting the results .They can intervene like a risk to decrease the power of the statistical test. To minimize these bias for their share of investigators and software, an intra-investigator test-retest was performed to test their stability, using the CCI with scores greater than 0.90 for all comparisons, reflecting good reliability of the measurements performed.

The definition of beauty is dynamic and changes over time. The beautiful face is a fundamental theme that has been debated by philosophers and, more specifically, by plastic surgeons, psychologists, estheticians, and orthodontists. The beauty of the face has been studied from the point of view of science, philosophy and sociocultural phenomena [4].

Although there is a distinction between the main objectives of "beauty" and the requirements of the viewer as defined by Socrates, who distinguished two forms of arrhythmia and who considered beauty as partly objective and subjective [5].

As a result, the aim of this study was to develop an objective scale for measuring facial attractiveness. This will be achieved by determining average facial and contour ratios for the most famous new models. Also, to compare these averages with those older models from the 90s, as well as determining the direct influence of these new proportions on current orthodontic therapies.

Many authors have reported that the average faces are different from the attractive faces and that the attractive faces differ greatly depending on the breed. Recently, some researchers have attempted to unify the beauty of the face using the concept of golden proportions. Namely, the divine proportion or the golden ratio has shown many limitations of traditional morphometry in research on facial attractiveness [4]. A face is perceived as attractive when its facial shape approximates the average or facial means of a population [5]. Although cephalometric facial analysis is still a specific method for assessing facial beauty. The ideal values are based on the old average values of the general population. This results cannot be used as supporting data to reflect the concepts. Contemporary beauty or attractive face configurations. The values suggested by old cephalometric standards have not changed for many years. In the present, the use of these standards alone produces inconsistencies between the perspectives of physicians and the desires of patients.

Face Analysis

The Facial Index

The comparison of the facial index value between the two groups did not show any significant differences.

A study conducted by Mommaerts *et al* [6] on the reliability of clinical measures used in the determination of facial indexes concluded that the facial index should be 0.87 by the same author in 2011 [2]. A Comparative study between the ideal proportions of contemporary and ancient faces confirmed that contemporary female faces differed from all others assessed. In fact, the beautiful face has a significantly small classic facial index, indicating that the height of the face is less, or the width of the face is larger. According to the concept of the Dental smile design, the prominent cheekbones are considered a beauty feature and provide a younger look.

Facial Vertical Proportions

Facial Vertical Proportions: As a rule, the face can be divided into three equal thirds. In our study, the new models group had shortening of the lower part against an increase in the upper part of the face in comparison with the former models group.

Mommaerts confirmed that a small chin in a woman is always better than a large chin, in both vertical and transverse dimensions [2]. According to Prendergast, facial levels are rarely equal. Among Caucasians, the third part of the face is less than the middle's part. In East Asia, the average third of the face is often larger [7].

The Ricketts Index

Kini *et al* conducted a study on the correlation of anthropometric measures with dental measurements, according to his statistics the ratio of Ricketts is 1.29 [8]. Thus, Banu *et al* found a value of 1.31 in an assessment study of the correlation of facial measurements and confirmed that the current description of the labial beauty consists of open fleshy lips and plumper [9]. A study conducted by Torsello *et al*, whose objective was to determine whether neoclassical canons were still valid for describing the beauty of the face in Italian women. This study confirmed that a decrease in the distance between the eyes was observed as well as a relative widening of the inter-commissural distance [3].

The Ratio of the Maxillary Bases

In his comparative study between ancient and contemporary faces Mommaerts concluded that the stomion-gnathion portion is equivalent to more than double the portion of the upper lip of the nasal sub-stomion. A good gun for both sexes today must have a stomion-gnathion distance of 70% of the subnasal-stomion distance [2].

Profile Analysis

The Convexity of the Profile

A study conducted by Milosevic *et al* showed an angle (g, sn, pg) in women of 169.05 ± 4.72. These results are therefore lower than the values of our sample which confirms that the current beautiful profiles are more convex [6].

The Lips

The study conducted by Bisson and Grobbelaar concluded that the beauty canons evolve towards more prominent and thicker lips [10].

Other studies also suggested that the Caucasian face featured a markedly more protruding upper lip [11].

The Nose

In our study the nasal angle (se, prn, sn) showed a non-significant difference between the two groups. However, it can be said that the nasal angle is more closed in contemporary faces.

For Sforza *et al* the nasal angle is more acceptable at 94.99 ± 5.01 and the values found in this study fall within this range [12].

Various studies on the Profile showed different values for the nasal angle. There could be many reasons for the inconsistency between different studies such as racial origin, head orientation, measurement methodology, and age. Some studies were anthropometrically other photometric, while some looked at very young subjects [10,13].

With regard to the nasofrontal angle (g, se, prn) in this study it is more closed in new models. This is in agreement with the results of the study conducted by Li *et al* on the morphometric analysis of nasal forms and angles in young adults [14].

According to the study of a plastic surgeon, Pousti *et al* on the management of the nasofrontal angle in rhinoplasty, the ideal angle for women should be 134° [15].

Relationship Between the Nose and the Lips

The nasolabial angle is formed by two independent lines, one on the nose, another on the upper lip. The angular measurement described by these two lines is a resultant of their individual inclination. This angle

alone provides insufficient information because it does not reveal which component is responsible for the variability of its value. It could be the nose, the lip, or both. Thus, the nasolabial angle can be modified by orthodontic treatments and depends on the anteroposterior position or the inclination of the upper anterior teeth.

In the study of Armijo *et al* on profile photographs of 10 men and 10 women who underwent rhinoplasty performed by senior surgeons. The authors found an apparent upper rotation of the nose and concluded that the ideal nasolabial angle for women is 97.7 ± 2.32 [16].

According to Bergman regardless of whether an orthodontic or surgical correction is indicated, this angle must be 102 ° ± 8 [17].

The Chin

The comparison of the chin protrusion angle revealed a statistically significant difference between the two groups in this study.

The distal angle of the "classic" chin also shows a significant difference between the two groups. We notice an apparent and statistically significant increase in chin angles resulting in a more protruding chin over time.

Ousehal *et al* confirmed that a review of the photographs in the literature showed that the chin is more prominent in contemporary canons than 30 or 40 years ago [18].

In recent decades, there has been a growing interest in improving facial aesthetics in orthodontic treatment planning [19-22].

As a result, very recent studies examining the assessment of changes in visual attention; influenced by facial angles and smiling during the evaluation of facial attractiveness, have revolutionized the evaluation of facial aesthetics [23,24].

Conclusion

Determining the aesthetics of the face is considered highly subjective. To improve it, orthodontists need to be aware of what the public sees as an ideal profile. Considering that malocclusions affect psychological conditions and cause changes in appearance, it can be assumed that the presence of malocclusion may influence the perception of facial attractiveness and/or facial esthetics. Thus, to establish a personalized diagnosis in cosmetic dentistry; the objective morphological features observed at different facial angles and the subjective perception studies according to different models of malocclusion may be useful in the future.

Ethical Statement

The study was approved by the doctoral committee of Hassan II University that serves as the ethics committee.

Consent to Participate: Not applicable

Bibliography

1. Gao, Y., Niddam, J., Noel, W., Hersant, B. & Meningaud, J. P. (2018). Comparison of aesthetic facial criteria between caucasian and east asian female populations : an esthetic surgeon's perspective. *Asian Journal of Surg., 41*(1), 4-11.

2. Mommaerts, M. Y. & Moerenhout, B. A. (2011). Ideal proportions in full face front view, contemporary versus antique. *J Craniomaxillofac Surg., 39*(2), 107-110.

3. Torsello, F., Mirigliani, L., D'Alessio, R. & Deli, R. (2010). Do the neoclassical canons still describe the beauty of faces? An anthropometric study on 50 Caucasian models. *Prog Orthod., 11*(1), 13-19.

4. Pancherz, H., Knapp, V., Erbe, C. & Heiss, A. M. (2010). Divine proportions in attractive and nonattractive faces. *World Journal of Orthodontics, 11*(1), 27-36.

5. Principe, C. P.& Langlois, J. H. (2011). Faces differing in attractiveness elicit corresponding affective responses. *Cognit. Emot., 25*(1), 140-148.

6. Milosevi, S. A., Varga, M. L. & Slaj, M. (2008). Analysis of the soft tissue facial profile of Croatians using of linear measurements. *J Craniofac Surg., 19*(1), 251-258 .

7. Prendergast, P. M. (2012). Facial Proportions. In : Erian A., Shiffman M. (eds) Advanced Surgical Facial Rejuvenation. Springer, Berlin, Heidelberg, 2012.

8. Kini, A. Y. & Angadi, G. S. (2013). Biometric ratio in estimating widths of maxillaryanterior teeth derived after correlating anthropometric measure-ments with dental measurements. *Gerodontology, 30*(2), 105-111.

9. Banu, R., Dandekeri, S., Shenoy, K. K., Shetty, S., Bhat, V. & Ragher, M. (2017). An *In Vivo* Study to Compare and Evaluate the Correlation of the Facial Measurements with the Combined Mesiodistal Width of the Maxillary Anterior Teeth between Males and Females. *J Pharm Bioallied Sci., 9*(Suppl 1), S127-S131.

10. Bisson, M. & Grobbelaar, A. (2004). The esthetic properties of lips : A comparison of models and nonmodels. *Angle Orthodontist, 74*(2), 162-166.

11. Rhee, S. C. (2017). Differences between Caucasian and Asian attractive faces. *Skin Res Technol., 24*(1), 73-79.

12. Sforza, A., Bufalari, I., Haggard, P. & Aglioti, S. M. (2010). My face in yours : visuo-tactile facial stimulation influences sense of identity. *Soc. Neurosci., 5*(2), 148-162.

13. Dong, Y., Zhao, Y., Bai, S., Wu, G., Zhou, L., *et al.* (2011). Three-dimensional anthropometric analysis of chinese faces and its application in evaluating facial deformity. *J Oral Maxillofac Surg., 69*(4), 1195-1206.

14. Li, K. Z., Guo, S., Sun, Q., Jin, S. F., Zhang, X., Xiao, M., Wang, C. C., Sun, X. & Lv, M. Z. (2014). Anthropometric nasal analysis of Han Chinese young adults. *J Craniomaxillofac Surg., 42*(2), 153-158.

15. Pousti, S., Jalessi, M. & Asghari, A. (2010). Management of nasofrontal angle in rhinoplasty. *Iranian Red Crescent Med J., 12*(1), 7-11.

16. Armijo, B., Brown, M. & Guyuron, B. (2012). Defining the ideal nasolabial angle. *Plast Reconstr Surg., 129*(3), 759-764.

17. Bergman, R. T. (1999). Cephalometric soft tissue facial analysis. *Am J Orthod Dentofacial Orthop., 116*(4), 373-389.

18. Ousehal, L., Lazrak, L., Serrhini, I. & Elquars, F. (2011). Evaluation of facial esthetics by a panel of professionals and a lay panel. *International Orthodontics, 9*(2), 224-234.

19. Bowman, S. J. (2001). Facial esthetics in orthodontics. *Aust Orthod J., 17*(1), 17-26.

20. Hickman, L., Firestone, A. R., Beck, F. M. & Speer, S. (2010). Eye fixations when viewing faces. *J Am Dent Assoc., 141*(1), 40-46.

21. Baudouin, J. Y. & Tiberghien, G. (2004). Symmetry, averageness, and feature size in the facial attractiveness of women. *Acta Psychol (Amst)., 117*(3), 313-332.

22. Van der Geld, P., Oosterveld, P., Van Heck, G. & Kuijpers- Jagtman, A. M. (2007). Smile attractivenesxs self-perception and influence on personality. *Angle Orthod., 77*(5), 759-765.

23. Seol Hee, K., Soonshin, H., Yeon-Ju, H., Jae-Jin, K., Kyung-Ho, K. & Chooryung, J. C. (2018). Visual attention during the evaluation of facial attractiveness is influenced by facial angles and smile. *The Angle Orthodontist., 88*(3), 329-337.

24. Jeffrey, T., Gu, M. S., David Avilla, B. A., Zlatko Devcic, M. D., *et al.* (2018). Association of Frontal and Lateral Facial Attractiveness. *JAMA Facial Plast Surg., 20*(1), 19-23.