

Assignment and compression of facial index and modified smile index (MSI)

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Abstract

Aim: Ideal facial esthetic and smile as one of its components are the major topics in orthodontic treatment. One important goal in modern orthodontics is harmony between facial soft tissue in static and dynamic state. The objective of this study is evaluation of correlation between facial index and modified smile index (MSI).

Materials and methods: This study was a descriptive-cross sectional study. 130 patients who referred to orthodontic department of dental faculty of Yazd shahid sadoughi university of medical science were chosen. The facial index of subjects were determined on the basis of Farkas study as $(N'-Gn' \div Zy-Zy \times 100)$. Then photographs of their social smile from frontal view were captured and inter commissural distance (IC) and inter labial gap (ILG) were also measured and MSI was determined as $[(ILG \div IC) \times 100]$. By using SPSS software and statistical analysis (T-test and Pearson correlation) mean value of MSI and facial index was attained in men and women and The correlation rate between facial index and MSI was also evaluated.

Results: The results of statistical analysis (T-test and Pearson correlation) showed that:

The facial index mean value was 107.68 ± 7.15 (108.39 ± 7.26 in men and 106.98 ± 7.03 in women). there was no statistical difference between 2 sexes. (Pvalue: 0.265) The MSI mean value was 17.76 ± 3.79 (17.33 ± 3.75 in men and 18.19 ± 3.80 in women). there was no statistical difference between two sexes. (Pvalue: 0.198) There was no statistical correlation between facial index and MSI (Pvalue: 0.920)

Conclusion: There are different faces and MSI but there is no correlation between facial form and smile type.

Key words: Facial index, MSI, Esthetic.

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Ideal facial esthetic is one of major components of modern orthodontic treatment.¹ Because dentofacial appearance as a key element of human physical attractiveness and the most important determining factor in physical appearance² affects social attractiveness and personal relations.³

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Attractiveness is not a relative value but a determined anatomic, quantified quality. In an ideal attractive face, relative indices are in range of $\text{mean} \pm 1\text{SD}$, statistically.⁴

Mean is not the sole factor of attractiveness but is one of the more important factors and make a basal line for evaluation of attractiveness⁵ which is affected by personal tact, culture, racial and sexual differences⁶.

But, in a proportionate face, indices are arranged in normal range of $\text{mean} \pm 2\text{SD}$. This range shows health but does not show attractiveness essentially.⁴ Farkas evaluated facial proportions ⁷ and introduced landmarks, lines and indices and one of

those indices is facial index ($(N'-Gn' / Zy-Zy \times 100)$) (Table 1). Faces are divided into three forms (leptoprosopic, mesoprosopic and euryprosopic) according to facial index.

In euryprosopic faces, facial index is lower and face is round, but in leptoprosopic faces, facial index is higher and face is long⁸.

According to soft paradigm in contemporary orthodontics, there is more emphasis on facial esthetic.⁹ Also smile is the second character of face which people consider in evaluation of attractiveness (after eyes).¹⁰ Actually mouth and teeth are considered in facial esthetic basically.³

Today patient concern not only about static condition of facial tissues but also its dynamic condition.⁵

Alavi and Safari evaluated anthropometric facial indices in Isfahan population and concluded with attention to different races and variation in body dimension in different parts of country, anthropometric indices of face and cranium should be measured in different Iranian populations, and compared with others.¹¹

Ackerman et al. evaluated dynamic lip-tooth relations and also, smile index, inter labial gap, inter commissural distance, and tooth show.¹² Grummons et al. concluded that width of maxillary dentition should be in proportion with facial pattern, and best proportion is attained with dentition in proper width and symmetric condition.¹³

Isiksal et al. evaluated esthetic of smile, relation of apparent width of dentition and inter-canine width to smile width and smile index in patient treated by extraction or non-extraction and control group.¹⁴

Defreitas et al. evaluated facial height in young Brazilian white and blacks with normal occlusion and concluded that there are racial and sexual differences between people in facial height and boys have longer faces.¹⁵

Krishnan et al. evaluated social smile by visual analogue scale, smile curve, buccal

corridor, modified smile index (MSI) and concluded that there is no correlation between facial index and MSI.¹⁶

In a proportional face, smile should be in proportion with face. In other words a broad smile in a long face may not be pretty other so much. The aim of this study is determining modified facial index and smile index in both sexes and evaluation of correlation between them.

Material and Methods

This was a descriptive- cross sectional study. 130 patients (65 men, 65 women) who referred to orthodontic department of dental faculty of shahid sadoughi university of medical sciences were chosen by simple sampling method based on inclusion criteria: Age 18-35 years.

Malocclusion severity and vertical discrepancy accommodated with grade 1 or 2 of IOTN.

Absence of apparent asymmetry in facial structure or facial animation.

Absence of lip scar or environmental/congenital defect in face, specially in lips.

Point, lines, and indices

N': soft tissue nasion, the most concave aspect of the bridge of the nose in the centerline.

Gn': soft tissue gnathion, the most everted point of the chin in the center line.

ZY: zygion the most lateral point of each zygomatic arch.¹⁷

N'- Gn': linear distance of N'- Gn' (Figure 1)

Zy-ZY: linear distance of zy on both sides (Figure 1)

Inter commissural distance: linear distance between inner corners of lips (Figure 2)

Inter-labial gap: vertical distance of inferior border of upper lip and superior border of lower lip in facial center line.(16)

Facial index (based on Farkas study): $N'-Gn' / ZY-ZY \times 100$

Modified smile index (MSI): $\text{Inter labial gap} \div \text{inter commissural distance} \times 100$

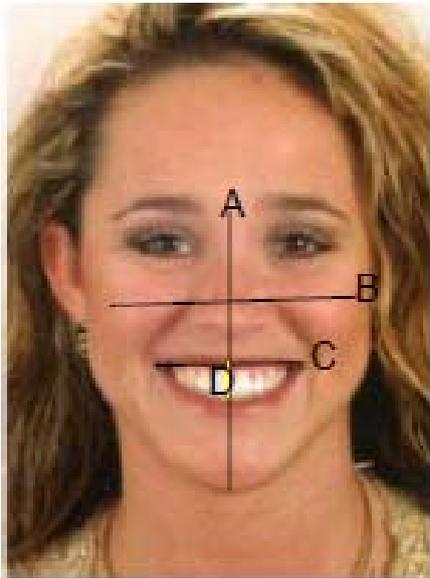


Figure 1. Lines, which are used in this study

A: N'-Gn'
IC
B: ZY-ZY
D: ILG C:

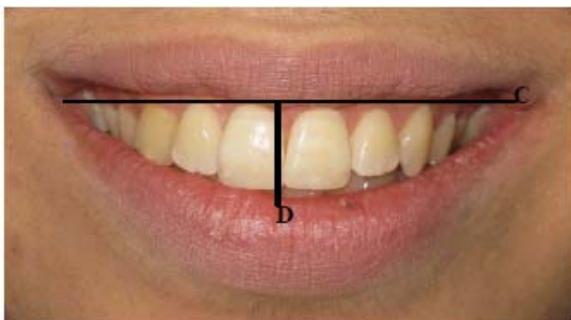


Figure 2. Social smile in one subject

Actually smile index was designed by Ackerman and Ackerman¹⁸ as smile width (Inter-commissural distance) divided by

inter labial gap which is division of width by length.

In Krishnan study¹⁶ which was done to comparison of smile and facial index, modified smile index was used as above. So the comparison could be made more accurate. In this study MSI was used as Krishnan study.

Method

Vertical distance of N-Gn and horizontal distance of both side Zy were measured by digimatic Collis (CD-15 Mitutoyo- Japan) With 0.01mm accuracy and facial index was calculated.

Then photographs of social smile (conscious smile in social condition)¹⁹ of patients were captured in standard condition as:

Patients were in natural head position. They should look at a distant point and move their head somewhat up and down to keep comfortable position and maintain it.²⁰ To stabilize camera (G9 Canon, 12 megapixel) tripod were used. The distance of camera lens with labial surface of upper anterior teeth were 27 centimeters and lens was along with central tooth labial surface to make frontal view and photographs were taken.

Photographs were uploaded to computer and inter-labial gap (ILG) and inter-commissural distance (IC) were measured by ruler of adobe Photoshop(CS5), and then MSI was determined.

Statistical analysis

Facial indices and MSIs were determined and were analyzed by SPSS software (v1.6), t-test, Pearson correlation test. MSI and facial index in men and women were compared and correlation between MSI and facial index were evaluated.

Results

Mean of MSI in men was 17.33 ± 3.75 and in women was 18.19 ± 3.80 and in both sexes was 17.76 ± 3.79 .

Statistical difference was not significant between two sexes (p.value= 0.108) (Table 1).

Mean of facial index in men was 108.39 ± 7.26 and in woman was 106.98 ± 7.03 and in both sexes was 107.68 ± 7.15 .

Statistical difference was not significant between two sexes (p.value=0.265) (Table 2).

Correlation of MSI and facial index was evaluated by Pearson correlation test (Table 3). Correlation of MSI and facial index was positive (0.020) but not significant statistically (p.value = 0.825).

Discussion

Face as a descriptor of personal thought is the main relation element of a person and its beauty is more important than other parts of body. 21 In modern orthodontics, based on soft tissue paradigm, malocclusion is treated according to soft tissue characteristics. Today, patients are concerned not only about static condition of their soft tissue but also about its dynamic condition.⁵

According to basic biologic rule "difference", there are different types of face with different dynamic conditions.⁸

The aim of this study is evaluate facial index and MSI in both sexes and determine the correlation between two variables. Results could be used in establishment or maintaining of proportion between smile and face in orthodontic treatment. Mean of facial index in 130 patient was 107.68 ± 7.15 .

Table1. Anthropometric indices of young people

Index	Measurement	Male	Female
Facial	n-gn/zy-zy	88.5(5.1)	86.2(4.6)
Mandible-face width	Go-go/zy-zy	70.8(3.8)	70.1(4.2)
Upper face	n-sto-/zy-zy	54.0(3.1)	52.4(3.1)
Mandibular width-face height	Go-go/zy-zy	80.3(6.8)	81.7(6.0)
Mandibular	Sto-gn/go-go	51.8(6.2)	49.8(4.8)
Mouth-face width	Ch-ch \times 100/zy-zy	38.9(2.5)	38.4(2.5)
Lower face-face height	Sn-gn/n-gn	59.2(2.7)	58.6(2.9)
Mandible-face height	Sto-gn/n-gn	41.2(2.3)	40.4(2.1)
Mandible-upper face height	Sto-ng/n-sto	67.7(5.3)	66.5(4.5)
Mandible-lowerr face height	Sto-ng/sn-gn	69.6(2.7)	69.1(2.8)
Chin-face height	Sl-gn \times 100/sn-gn	25.0(2.4)	25.4(1.9)

Table 2: Mean and standard deviation of facial index and MSI

Variable	Sex	Number	Mean	standard deviation	P. value
Modified smile index	Men	65	17.3392	3.75268	0.198
	Women	65	18.1977	3.80734	
	-	130	17.7685	3.7900	
facial index	Men	65	108.3900	7.26799	0.256
	Women	65	106.9854	7.03591	
	-	130	107.6877	7.1599	

Table 3: Correlation of variables

Index	Pearson correlation (r)	Sig. (2-tailed)
MSI And FI*	.020	.825

108.39±7.26 in men and 106.98± 7.03 in women) and the difference between two sexes was not, statistically significant (p value=0.265). The most important study on facial proportions is Farkas study. Mean of facial index in Canadians is less than Iranians (girls 86.2±4.6, boys 88.5±5.1). It seems face in Canadians is rounder. In study of Alavi et al. on Iranians in Isfahan, facial index was more than Canadians. (women 108.9±6.5 and men 110.4±8.3).¹¹ Facial index of Indians in Krishnan study was 92.51± 6.33.

(It seems that Arians (Indian and Iranian) are more leptoprosopic than Canadians which might be produced by an obtuse cranial base angle in this race, and it might be true in Europeans of Aryan descend. But in all races, women are more euryprosopic. This is not statistically significant but it could be resulted by pattern of breath and quantity of air exchange it could result in facial form which is more leptoprosopic in men and more euryprosopic in women.

But men could be euryprosopic and women, leptoprosopic.⁴ and so the difference is not statistically significant.

Defeitas et al. in a study on facial height in Brazilian young adult with normal occlusion concluded that facial height in men is more than female because of more late movement of mandible in cephalo-caudal direction in men.¹⁵

Mean of MSI in 130 patient was 17.76 ± 3.79 (18.19 ± 3.8 in women, 17.33 ± 3.75 in men) and difference between two sexes was not statistically significant (P.value=0.198). Smile index in Ackerman study, (inter commissural distance divided by inter labial), was 5.64.⁹

MSI designed by Krishnan et al. and is to divide the smile length by smile width. The aim of designing MSI was to introduce an index which was comparable with facial index and other antropometric indices. The mean of MSI in their study was 46.04 ± 6.76 .¹⁶ Difference in results of these study may be resulted by different method of measurement, photographic condition, illumination and personal difference in determining landmarks.

In the last part of the study, correlation of two variables was evaluated. Results showed that the correlation was direct, positive but deficient and statistically, not significant. The MSI is more when facial index is highe, it means in leptoprosopic faces, smile is narrow. Facial soft tissue is not dependent on underlying hard tissues completely but they are descriptive of them. In attractive faces, smile should be proportionate with dentition and face. This study was one of limited study of comparison of smile index by anthropometric indices and showed there is not a correlation between them. The results are in accordance with Krishnan (the only study of this type). There are different types of face which have different MSIs but there is no correlation between them.

References

- 1- Ritter DE, Gandini LG , Pinto Ados S, Ravelli DB, Locks A. Analysis of the smile photograph. *World J Orthod* 2006;7(3):279-85.
- 2- Ritter DE, Gandini LG, Santos Pinto A, Locks A. Esthetic Influence of negative space in the buccal corridor during smiling. *Angle Orthod* 2006; 76(2): 198-203.
- 3- Burstone CJ. The intergumental profile. *Am J Orthod* 1958; 44:1-25.
- 4- Farkas LG, Kolar JC. Anthropometrics and art in the aesthetics of womens's faces. *Clin plast surg* 1987; 14(4):599-616.
- 5- Edler R, Agarwal P, Wertheim D, Greenhill D. The use of anthropometric proportion indices in the measurement of facial attractiveness. *European J Orthod* 2006; 28 (3): 274-81.
- 6- Pogrel MA. What are normal esthetic values?. *J Oral Maxillofac Surg* 1991; 49: 963-9.
- 7- Farkas LG. Anthropometry of head and face. 2nd ed. New York: Raven press.1994:21-2.
- 8- Enlow DH. Facial growth: 3rd ed. Philadelphia: WB Saunder Co.1996: 122-33.
- 9-Schabel BJ, Franchi L, Baccetti T, McNamara JA Jr. Subjective vs objective evaluations of smile esthetics. *Am J Orthod Dentofac Orthop* 2009;135(4 Suppl):72-9.
- 10- Nanda R. Biomechanics and esthetic strategies in clinical orthodontics. Philadelphia: Elsevier.2005:94-109.
- 11- Alavi Sh, Safari A. An investigation on facial and cranial anthropometric parameters among Isfahan young adults. *Tehran Journal of dental medicine* 2003; 16(1):19-28.
- 12- Ackerman M B, Brensinger C, Landis J R. An Evaluation of dynamic lip-tooth characteristics during speech and smile in adolescents. *Angle orthod* 2004;74(1): 43-50.
- 13- Grummons D, Ricketts RM. Frontal cephalometrics: practical applications, part 2. *World J Orthod* 2004;5(2):99-119.

14- Isiksal E, Hazar S, Akyalcin S. Smile esthetics: perception and comparison of treated and untreated smiles. *Am J Orthod Dentofacial Orthop* 2006;129(1):8-16.

15- De Freitas LMA, Pinzan A, Janson G, Freitas KMS, De Freitas MR, Henriques JFC. Facial height comparison in young white and black Brazilian subjects with normal occlusion. *Am J Orthod Dentofacial Orthop* 2006;131(6):706-12.

16-Krishnan V, Daniel ST, Lazar D, Asok A. Characterization of posed smile by using visual analog scale, smile arc, buccal corridor measures, and modified smile index. *Am J Orthod Dentofacial Orthop* 2008;133(4): 515-23.

17- Jacobson A, Jacobson RL. Radiographic cephalometry from basic to 3-D imaging. 2nd ed. Chicago: Quintessence. 2006:250-65.

18- Ackerman MB, Ackerman JL. Smile Analysis and Design in the Digital Era. *JCO* 2002; 36(4):221-36.

19- Profit W, Fields HW, Sarver DM. Contemporary orthodontics. 4th ed. Philadelphia: Mosby Elsevier. 2007:176-91.

20- Koury ME, Epker BN. Maxillofacial esthetics: anthropometrics of the maxillofacial region. *J Oral Maxillofac Surg* 1992;50(8):806-20.

21-Heravi F, Ahrari F, Bayani SH. Beautiful smile created by orthodontic treatment. 1st ed. Mashad: Andishe Avar publishing Co. 2007:12 (Persian).