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Evaluation of the perception of lip-line canting

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The purpose of this study was to determine the detectable level and esthetically acceptable level of lip-line canting and investigate the difference between the perceptive abilities of dental professionals and laypersons. Hand-drawn frontal facial images with lip-line canting of 0–5 degrees were prepared. A set of 10 randomly organized images was given to four groups (orthodontists, general dentists, dental students, and laypersons) consisting of 20 evaluators each. A paper survey comprising questions on perception using the visual analog scale for esthetics was administered to the evaluators. All the groups detected the lip-line canting level when it was >2 degrees and did not perceive images of lip-line canting with minor variations of 0–2 degrees as unaesthetic. However, there were no statistical differences among the groups. The results of this study on the perception and esthetically acceptable level of lip-line canting can be a practical index in the diagnosis and treatment of patients with facial asymmetry and lip-line canting.

Keywords: Facial asymmetry, Lip-line canting, Dental esthetics

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Introduction

Recently, exposure of people to visually appealing faces by the mass media has increased, and this has led them to gradually raise their esthetic standards.[1]. As the public's interest in cosmetics and esthetics has been continuously increasing, the demand for cosmetic and esthetic dentistry has also risen[1]. There are various facial features involved in the assessment of facial esthetics, and facial asymmetry is one of its important components[2]. All individuals, even if perceived as normal, have some facial asymmetry[3]. People with ideally proportioned and symmetric faces are not always considered beautiful[4,5]. On the other hand, it is also reported that faces with abnormal proportions and asymmetry tend to be less appealing[6].

A number of variables can influence facial asymmetry, such as the chin deviation, imbalances in dental mid-lines, transverse occlusal plane, interpupillary line, and lip line. The occlusal and lip-line cantings are the most noticeable features in a patient with facial asymmetry[7]. However, there is no defined borderline determining the distinction between symmetry and asymmetry, or normal and abnormal, in terms of the nature of soft-tissue[6]. Therefore, the borderline is determined based on one's subjective standards in the perception of facial asymmetry[6]. The recognition of facial asymmetry related to esthetics depends and varies as per the individual's perception[8], and one can be more or less sensitive towards the same object. Additionally, trained and observant eyes can detect imbalances, disharmony, or asymmetries more easily[9]. Many studies reported that dental professionals, particularly orthodontists, are less tolerant than laypersons towards dental disharmony[10-14].

Previous studies on facial asymmetry in dental esthetics mostly included patients with occlusal line canting. Many studies reported that 3 degrees of occlusal plane cant or occlusal canting >2-4 degrees could be detected by a layperson[15-17]. Additionally, there are many studies on lip asymmetry or lip-line canting[7,18-19]. However, as creating esthetic smiles has become one of the most important features in recent esthetic dentistry, those studies on lip asymmetry were conducted with smiling faces. In other words, no studies evaluated the lip-line canting of faces with the lips in the resting position.

The purpose of this study was to determine the detectable level and esthetically acceptable level of lip-line canting of a face in resting position. Furthermore, the differences between the perceptive abilities of dental professionals and laypersons were also investigated.

Materials and Methods

Image construction

A frontal, gender-neutral, facial image was drawn by hand. The amount of lip-line canting degrees was measured (0-5 degrees) and the lips were rotated clockwise (from the viewer's aspect) by using Adobe Photoshop CC (Figure 1). The image was printed to a size closest to that of an actual face. The size of the image was determined with reference to the mean intercanthal distance observed in Koreans (36 mm)[20].

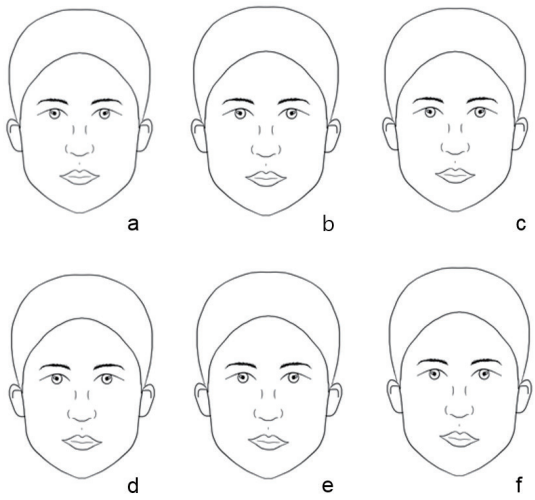

Figure 1. Images constructed with different levels of lip-line canting (a-f: 0 degrees to 5 degrees canting)

Questionnaire

The questionnaire consisted of two parts, where the first part included age, gender, and occupation of the evaluators. The second part included brief instructions with a sample of the questions of the survey. There were two questions for each image (total 20 questions, 2 questions for 10 images):

1. Do you notice the lip-line canting?
2. How esthetic is the image?

A visual analog scale (VAS) was used for ratings. The scale was sectioned evenly and labeled with scores from 0 to 5, where both ends represented the extremes of esthetics from “least esthetic” (0) on the left to “most esthetic” (5) on the right. All the evaluators were instructed to mark a point along the scale as per their perception of the esthetics using whole numbers from 0 to 5[1,21].

Sample

This study included four groups of orthodontists, general dentists, dental students, and laypersons, where each group comprised of 20 people. The groups of orthodontists (12 men, 8 women; aged 40.4 ± 5.1 years) and general dentists (12 men, 8 women; 34.4 ± 7.8 years) consisted of graduates from the Chonnam National University, School of Dentistry and Chosun University School of Dentistry. The dental students (12 men, 8 women; 28.4 ± 3.1 years) were from the Chonnam National University School of Dentistry. The laypersons group (10 men, 10 women; 32.4 ± 10.3 years) consisted of people who were not related to the dental profession.

Surveying

The image was printed on A4 paper and 10 images were prepared, wherein the images of 1-4 degrees canting were included twice to increase the reproducibility and reliability. The images were randomly organized and placed on an acryl ring stand to prevent the images from tilting when held by hand.

The survey was conducted by each evaluator analyzing all images one by one in an enclosed area with consistent distance between the images and the evaluators (approximately 90 cm). Once the evaluators received the questionnaire, brief instructions were given and the evaluators were directed to focus only on the lips. The images on the ring stand were turned over manually, 10 seconds were given for each image, and the evaluators answered both questions for each image. The evaluators were not allowed to go back to the previous questions.

Statistic methods

Once all the questionnaires were completed, the data were collected in a spreadsheet table (Ex-

cel 2010; Microsoft Corp) and statistical analysis was performed using statistics software (IBM SPSS Statistics v22; IBM Corp). Normal distribution test was performed for each group to compare the mean and standard deviation of the detection of lip-line canting and acceptance level of esthetics. One-way repeated measures tests (ANOVA) were performed to confirm the level of the average detectable degree of each group and the whole. Furthermore, repeated measures ANOVA tests were conducted once again to confirm the degree of esthetics for each group.

Results

The results of normal distribution test showed that all groups could perceive the presence of lip-line canting >2 degrees. The mean values of the three groups of orthodontists, general dentists, and dental students for the perception of lip-line canting were higher than the overall average (0.756 ± 0.34), but that of the laypersons (0.575 ± 0.37) was lower than the overall average. However, the result of the ANOVA test did not show a statistically significant difference in the mean values of perception between the four groups (p-value = 0.059), which implied that there was no difference in the perceptive ability of lip-line canting between the groups (p-value = 0.245). An additional statistical analysis of the perception of the 2 degrees lip-line canted image was performed, and the Duncan's Multiple Comparison test showed a significantly lower perception ability compared to the dental profession-related groups (p-value = 0.039) (Table 1, Figure 2).

Table 1. Mean and standard deviation (SD) for perception

Canting degrees (°)	Orthodontists (n=20)		General Dentists (n=20)		Dental Students (n=20)		Layperson (n=20)		Overall	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
0	0.200	0.41	0.150	0.37	0.200	0.41	0.000	0.00	0.138	0.35
1	0.300	0.41	0.125	0.32	0.350	0.43	0.175	0.34	0.238	0.38
2	0.775	0.34	0.825	0.25	0.850	0.33	0.575	0.37	0.756	0.34
3	0.875	0.28	0.925	0.25	0.850	0.33	0.800	0.34	0.863	0.30
4	0.975	0.11	1.000	0.00	0.975	0.11	0.950	0.15	0.975	0.12
5	0.950	0.22	1.000	0.00	1.000	0.00	1.000	0.00	0.988	0.11

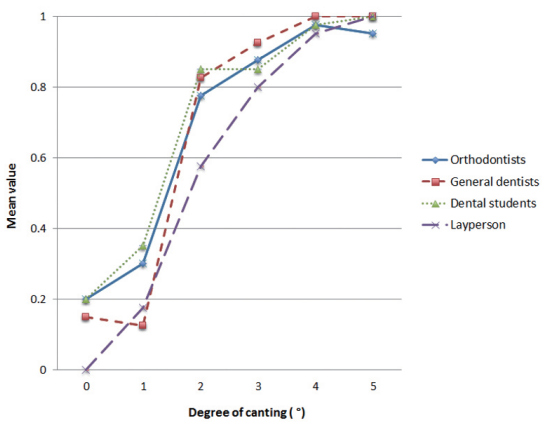

Figure 2. Mean values for perception of lip-line canting. This graph represents the results of Table 1.

With respect to the acceptance level of esthetics, none of the groups perceived the images of lip-line canting with minor variations from 0-2 degrees as unaesthetic. Similar to the result of perception ability, there was no statistically significant differences between the groups for the acceptance level of esthetics (p-value = 0.180) (Table 2, Figure 3).

Table 2. Mean and standard deviation (SD) for acceptance level of esthetics

Canting degrees (°)	Orthodontists (n=20)		General Dentists (n=20)		Dental Students (n=20)		Layperson (n=20)		Overall	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
0	4.050	0.76	4.300	0.92	3.925	0.92	4.650	0.59	4.231	0.84
1	3.875	0.73	4.063	0.98	3.950	0.67	4.318	0.72	4.051	0.79
2	3.170	1.00	3.300	0.87	3.075	0.98	3.425	0.96	3.243	0.95
3	2.833	0.96	2.888	0.93	2.788	0.89	3.058	0.90	2.886	0.91
4	2.008	0.81	2.125	0.76	1.925	0.88	2.413	1.02	2.118	0.88
5	1.125	0.86	1.400	0.77	1.225	0.73	1.525	0.88	1.319	0.81

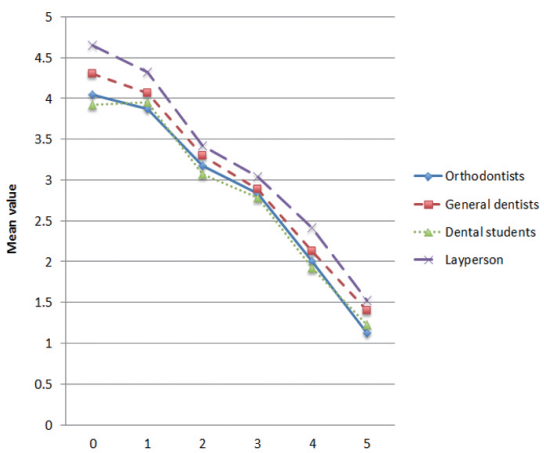

Figure 3. The mean values for acceptance level of esthetics of lip-line canting. This graph represents the result of Table 2.

Discussion

The objective of this study was to determine the detectable level of lip-line canting as perceived by different groups. Majority of the previous studies on the facial asymmetry focused on occlusal canting and lip-line canting with lips in the smiling position[8,11]. Some colleagues studied lip-line canting alone; however, they aimed to investigate the influence of orthognathic surgery on facial asymmetry patients with lip-line canting[7,21]. Although some lip-line canting does not need correction if it is compatible with the underlying skeleton[7], the number of patients desiring correction of facial asymmetry and lip-line canting has increased recently[22]. Furthermore, the amount of asymmetry could influence the treatment planning, for instance, the treatment may worsen or make the asymmetry more conspicuous[19]. Therefore, it is necessary to determine the borderline perceived as 'unattractive' for the patient to decide to undergo treatment.

Some considerations were reflected in order to produce appropriate images for this study, including gender-neutral images, size of images, level of lip-line canting, and number of images. First, gender-neutral images, such as faces with essential facial components like eyebrows, eyes, nose, lips, ears, and hair with no parting, were produced for the survey to eliminate any perception disturbances by other facial features. For the same reason, previous studies on occlusal canting and lip asymmetry used images that were trimmed down to include the mouth alone[8,14,21]. Second, the images were printed on A4 sized paper and the image size was set as close as possible to the average intercanthal distance observed in Koreans. It was reported that the average intercanthal distance in Koreans is 36 mm[20], and the intercanthal distance of the facial images used in this study was 29 mm. This was to make the size of the images similar to the actual size of human faces. Third, the previous study conducted on occlusal canting did not compare canting images with 2-4 degrees variation in the occlusal plane[8]. This study was conducted using images with lip-line canting from 0-5 degrees with a 1 degree

increase, based on a pilot study conducted before the actual study that confirmed that 1 degree variation range from 0-5 degrees canting was appropriate. Lastly, to increase the reliability and reproducibility of the results, a set of 10 images consisting of two copies of images of lip-line canting from 1-4 degrees, and one copy of two obvious images, such as no canting and 5 degrees canting, were prepared. The pilot study confirmed that the images with no canting and 5 degrees canting could be easily distinguished by all evaluators.

The result of this study showed that all groups of people could detect the lip-line canting >2 degrees. The average perceptive ability of laypersons was lesser than that of dental profession-related groups, but there was no statistically significant difference. Similar to the results of perceptive ability, the esthetically acceptable level of lip-line canting was ≤2 degrees. In other words, all groups evaluated the lip-line canting >3 degrees as unaesthetic. The detectable levels of facial asymmetry and lip-line canting from the previous studies seemed similar but were different. There were differences in the actual numerical values, but those values were within a narrow range of 2-4 degrees[15,23]. The values in this range may have significance in facial asymmetry, both clinically and academically, indicating that lip-line canting is one of the important features in diagnosis and treatment of patients with facial asymmetry.

The previous studies reported that dental professionals, especially orthodontists, had the highest perceptive ability towards minor variations in facial asymmetry, while the general populations had the lowest perceptive ability[8-10]. In contrast, the result of this study showed that there was no statistically significant difference in the abilities of perception and esthetic acceptance between the dental professional groups and laypersons. These unexpected and opposing results reflect the trends of Korean society very well. Since the recent exposure of public to the mass media has increased considerably, their interests and standards of esthetics have been continuously increasing[1]. Therefore, this result indicates that the general populations have their own standards of evaluation of esthetics, which are at par with experts like orthodontists and general dentists.

Despite the investigations from this study, there were some inevitable limitations. For example, it is possible that the individuals' subjective evaluations of the images affected the results. Moreover, the differences in the level of the individuals' concentration on questionnaires could have affected the outcomes. Since this study was conducted using hand-drawn images, they lacked reality. Further studies need to be carried out with actual photographs of patients with lip-line canting for a greater influence on the future direction and development of esthetic dentistry.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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한글초록

입술선 경사 인지도 평가

최진아, 김성덕, 조진형, 김선헌, 김민석

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본 연구는 입술선 경사도에 대한 인지 정도와 심미적으로 받아들일 수 있는 수준을 결정하고, 치과 전문가와 일반인의 인지 능력 차이를 조사하기 위해 시도되었다. 0도에서 5도의 입술선 경사도를 가진 사람 정면 얼굴 이미지를 제작하여 준비하였다. 각각 20명의 평가자로 구성된 치과교정과 전문의, 일반 치과의사, 치과대학생 및 일반인의 네 그룹에 무작위로 섞인 10개의 이미지를 제시한 후 입술선 경사도의 존재여부에 대한 질문과 시각아날로그척도로 구성된 심미도에 대한 설문 조사를 실시하였다. 모든 그룹은 입술선 경사도가 2도 이상일 때 감지할 수 있었다. 모든 그룹은 0도에서 2도까지의 입술선 경사 이미지는 비심미적이지 않다고 평가하였다. 그러나 두가지 상황에서 모두 그룹간 통계적 유의차는 없었다. 입술선 경사에 따른 인지 가능 정도와 심미적으로 허용 가능 수준에 대한 본 연구 결과는 입술선 경사도를 갖는 안면 비대칭 환자의 진단과 치료에서 중요한 지표가 될 수 있을 것으로 사료된다.

주제어: 안면 비대칭, 입술선 경사도, 치과 심미성