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ANTHROPOLOGICAL CRITERIA IN CREATING A SMILE DURING THE FABRICATION OF COMPLETE DENTURES

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When making complete dentures, both functional and aesthetic criteria need to be met so that the patient can accept the prosthetic restoration more easily and be satisfied with it. The aim of the research was to determine smile parameters as anthropological criteria for the selection of teeth when making complete dentures.

The study included 91 dental students, i.e., 32 (35.2%) males and 59 (64.8%) females. The observation of parameters was performed by clinical examination, and all the measurements were done using a vernier. The following were analyzed: smile arch, lip line, commissure height, curvature, length and lift of the upper lip, and symmetry of the smile.

The results showed the distribution of different types of the studied parameters and their presence among female and male subjects with a full set of teeth, with and without statistical significance.

Considering the described anthropometric parameters and a specific approach to each patient gives good results when choosing the size, shape, and position of teeth in the process of making complete dentures. The beauty of a smile is reflected primarily in proportionality and symmetry.

Keywords: artificial teeth, anthropometry, complete dentures

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INTRODUCTION

Making complete dentures is a complex task given that it requires compliance with defined biomechanical principles to perform the functions of the orofacial system, i.e., chewing, swallowing, and speaking, and at the same time remain in its position on the mucous membrane of the prosthetic support. In addition to functional criteria, aesthetic criteria need to be met as well, so that the patient can accept the prosthesis restoration more easily and be satisfied with it (1). When making complete dentures, the selection of teeth in terms of shape, size, and position is essential. On the other hand, the relationship to each other and the soft structures of the oral cavity must not be neglected, all with the aim of creating a harmonious anatomical and morphological composition capable of performing all the functions intended for it. Therefore, determining the smile arch and smile line, and creating a smile is a great challenge in modern dentistry (2, 3).

The study aimed to determine smile parameters as anthropological criteria for the selection of teeth during the fabrication of complete dentures.

METHODS

The study was conducted at the Clinic for Dental Medicine, Faculty of Medicine, University of Niš, and included 91 dental students–32 (35.2%) males and 59 (64.8%) females. The mean age of the subjects was 22.16 ± 1.53 years. The youngest subject was 20 and the oldest 27 years of age. The age structure was uniform in men and women ($p = 0.918$).

The subjects were familiar with the purpose of the study and were asked to sign the consent, previously approved by the Ethics Committee of the institution (decision number 14/72019-5EO).

Table 1. *Defined studied anthropometric parameters*

Anthropometric parameters	Result	Note
Lip line	High Medium Low	Entire teeth and gingiva above are seen Partial teeth and interdental papilla (normal) are seen Teeth are not visible or are barely visible
Upper lip length		The distance between the subnasal and the lowest point of the philtrum at rest
Commissure height		The distance between the horizontal that touches the nose and the commissures of the lips
Smile arch	Consonant Non-consonant	The imaginary curves of the upper front teeth and the inner edge of the lower lip are parallel The teeth are sharpened, and these two lines are not parallel
Upper lip lift	% Regarding the original length	Willing smile
Upper lip curvature Upper lip line	Raised Flat Lowered	When smiling corners of the lips are set higher than the central position At the same level as the central position Below the central position
Smile symmetry	Yes No	The bipupillary line and line passing through the commissures are parallel

Each of the subjects was sitting on a dental chair, with the head supported by a headrest. The lower edge of the mandible was parallel to the floor.

The observation of parameters was performed by clinical examination, and measurements were provided using a vernier. The following were analyzed: smile arch, lip line, commissure height, curvature, length and lift of the upper lip, and symmetry of the smile, and a table was filled in with the values of the studied parameters (Table 1).

RESULTS

Table 2 shows the position of the lip line of the subjects. There is no significant difference in the distribution of the lip line position regarding gender ($\chi 2 = 5.746$; $p = 0.057$). The majority of subjects of both sexes exhibited a medium lip height position, which is the most acceptable from an aesthetic point of view. The smallest number of subjects had a low lip height position. In this case, the visibility of the front teeth was reduced, or the incisal thirds of the lower teeth were visible when speaking, which is more often a characteristic of elderly subjects.

Table 3 shows the length of the upper lip and the height of the commissures in the subjects and their distribution regarding gender. The upper lip was significantly longer in men ($Z = 2.027$; $p = 0.043$). There was no difference in the commissure height between men and women.

Table 4 shows the distribution of smile consonance regarding gender. The smile arch was significantly different between men and women ($\chi 2 = 5.579$; $p = 0.018$). In men, consonant and non-consonant smile arches were equally represented, whereas in women, the consonant type was significantly more prevalent.

The upper lip lift in subjects of both sexes is shown in Table 5. The percentage of the upper lip lift was significantly higher in men than in women ($Z = 2.229$; $p = 0.026$).

The curvature of the upper lip in male and female subjects is shown in Table 6.

Table 2. *Lip line regarding gender*

Lip line	Total n (%)	Men n (%)	Women n (%)	
High	28 (30.8%)	5 (15.6%)	23	39.0
Medium	44 (48.4%)	20 (62.5%)	24	40.7
Low	19 (20.9%)	7 (21.9%)	12	20.3

*p ≤ 0.057

Table 3. *Upper lip length and commissure height regarding gende*

	Men		Women	
	x̄	sd	x̄	sd
Upper lip length (mm)	20.84	2.68	19.68	2.69
Commissure height (mm)	24.81	2.85	24.02	3.56

upper lip length p ≤ 0.043; commissure height p ≤ 0.247

Table 4. *Smile arch regarding gender*

Smile arch	Total n (%)	Men n (%)	Women n (%)
Non-consonant	31 (34.1%)	16 (50.0%)	15 (25.4%)
Consonant	60 (65.9%)	16 (50.0%)	44 (74.6%)

*p ≤ 0.018

Table 5. *Upper lip lift regarding gender*

	Men		Women	
	x̄	sd	x̄	sd
Upper lip lift (%)	17.86	2.62	16.63	2.30

*p ≤ 0.026

Table 6. *Upper lip curvature regarding gender*

Upper lip (line) curvature	Total n (%)	Men n (%)	Women n (%)
Raised	64 (71.7%)	23 (71.9%)	41 (70.7%)
Flat	26 (28.9%)	9 (28.1%)	17 (29.3%)

*p ≤ 0.905

Table 7. *Smile symmetry regarding gender*

Smile symmetry	Total n (%)	Men n (%)	Women n (%)
No	2 (2.2%)	1 (3.1%)	1 (1.7%)
Yes	88 (97.8%)	31 (96.9%)	57 (98.3%)

*p ≤ 0.666

There was no significant difference in the distribution of the curvature of the upper lip line regarding gender ($\chi 2$ = 0.014; p = 0.905).
Smile symmetry in male and female subjects is shown in Table 7. There was no statistically significant difference in smile symmetry regarding gender ($\chi 2$ = 0.186; p = 0.666).

DISCUSSION

The study aimed to observe the defined smile parameters and examine their representation and distribution regarding gender in the population with a full set of teeth, i.e., in dental students.
The exposure of the upper teeth and gingiva depends on the position of the upper lip line. On the other hand, the smile line of the lower lip slightly touches the cutting edges of the upper front teeth (4). Concerning visibility, there are three types of upper lip line: high, medium, and low. Each type affects tooth visibility and thus the aesthetics of the face (5). A low lip line is the least aesthetically acceptable given that it covers the gingiva and most of the teeth, making them barely visible (6). With age, the upper lip is more relaxed and covers the upper central incisors to a greater extent, which results in the lower teeth being more visible than the upper ones (7).
Literature data show that tooth visibility in complete denture wearers should amount to 2 to 4 mm (8). Considering that the study showed that the largest number of subjects had a middle position of the lip line, the obtained results are in positive correlation with the data from the available literature. The midline of the lips allows tooth visibility from 1 to 3 mm and is considered the most aesthetically acceptable. With a high lip line, the gingiva and teeth are rather visible, which does not look good and is clinically difficult to correct (9).
The smile arch can be defined as the ratio of the contour of the incisal edges of the upper front teeth and the curvature of the lower lip in a social smile. The contour of teeth should match the contour of the lower lip. The curvature of the incisal edges of upper teeth is a hypothetical curve drawn across them. (10). The line connecting the incisal edges of the front teeth of complete dentures should be parallel to the bipupillary line (11). Achieving the optimal smile arch in edentulous patients is a great challenge, and its realization provides us with excellent results.
The upper lip lift is especially important because of the relationship between the upper lip line and the gingival margin of the upper incisors. We distinguish three basic forms of a smile: high, medium, and low (12). A high smile is not desirable for denture wearers, because, in addition to teeth, the pink acrylic part of the denture plate will be also visible, which gives the smile an artificial appearance. The results suggested there was a difference in the studied parameters between the sexes, which should be taken into consideration in order to restore the naturalness and symmetry of the smile to the patient after tooth loss. The uniformity of tooth setting without considering the described anthropometric factors would not lead to the desired results and restore individuality in the appearance and smile of each patient.
The beauty of a smile lies primarily in proportionality and symmetry. The study showed variability in the form and position of the described anthropological determinants between the sexes. As it concerns subjects with a full set of teeth, conclusions can be drawn about the representation of different anthropological criteria in designing smiles in this geographical area. Considering the described anthropometric parameters and a specific approach to each patient will give good results in the choice of size, shape, and position of teeth when making complete dentures.

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Competing interest

The authors declare no relevant conflicts of interest.

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