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Procjena estetskih karakteristika zuba i okolnih anatomskih struktura

Assessment of Esthetic Characteristics of the Teeth and Surrounding Anatomical Structures

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Sažetak

Svrha rada: Željela se ustanoviti razlika u percepciji estetike prednjih gornjih zuba s obzirom na anatomske varijacije, oblik zubnih lukova, izgled gingive i linije osmijeha, te općenito izgled donje trećine lica između triju skupina procjenjivača. **Materijali i metode:** U istraživanje je bilo uključeno 60 ispitanika s trajnom potpunom dencijom, bez protetičkih radova i s Angleovom klasom I, čija je donja trećina lica tijekom osmijeha fotografirana. Te fotografije zatim su procjenjivale osobe iz opće populacije (21), doktori dentalne medicine (20) i specijalisti stomatološke protetike (20) koristeći se modificiranim OES upitnikom (Orofacijalna estetska ljestvica). **Rezultati:** Procjenjivači iz opće populacije najlošije su ocijenili oblik zuba, boju zuba i izgled zubnih lukova, a najbolje izgled zubnog mesa, a protetičari su pak najbolje ocjene dali ($p < 0,01$) obliku i boji zuba, izgledu zubnih lukova i usnica te općenito izgledu donje trećine lica, a najlošije izgledu zubnog mesa ($p < 0,01$). Muškarci i osobe u dobi od 36 do 55 godina najbolje su ocijenili oblik i boju zuba, izgled zubnih lukova i usnica te općenito izgled donje trećine lica. U procjeni zubnog mesa najtolerantniji su bili ocjenjivači u dobi iznad 55 godina ($p < 0,01$). **Zaključak:** Uzimajući u obzir dob, spol i profesionalnu izobrazbu, može se zaključiti da svi kriteriji imaju svoj doprinos u procjeni estetike zuba i okolnih struktura. Rezultati ovog istraživanja mogu pomoći pri planiranju stomatoloških zahvata.

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Uvod

Osmijeh je važan u ekspresiji lica, on utječe na čovjekovu percepciju privlačnosti i temelj je socijalne interakcije (1). Dentalna estetika uvijek je bila predmet rasprave jer, kako znamo, ljepota je u očima promatrača i može varirati od osobe do osobe, ovisno o njezinu iskustvu i socijalno-ekonomskom položaju te obrazovanju (2, 3).

Važnu ulogu u dentalnoj estetici i esteticima osmijeha imaju veličina i oblik prednjih gornjih zuba (4). Anderson i suradnici (5) u svojem su istraživanju pokazali da ortodonti i doktori dentalne medicine preferiraju zaobljenije zube kad je riječ o ženama, a opća populacija nije zapažala razliku u obliku zuba. S druge strane, svi su ispitivači smatrali da su osmijehu muškarca prikladniji četvrtasto-ovalni zubi. Vidljivo je da opća populacija nema jasno oblikovano mišljenje, nego je poprilično neutralna u vezi s oblikom zuba i nije joj osobito važna estetika osmijeha, a profesionalci su itekako svjesni važnosti oblika vidljivih zuba i njegova utjecaja na opći dojam osmijeha.

Uz oblik i veličinu gornjih prednjih zuba, u dentalnoj estetici vrlo je važan uzajaman odnos zuba i zubnog luka, a

Introduction

The smile plays an important role in facial expressions. It affects a person's perception of attractiveness and it is a basis of social interactions (1). Dental esthetics has always been a subject of debate, since it is a well-known fact that beauty lies in the eye of the beholder, but it can vary from person to person, depending on their experience and socio-economic status and education (2, 3).

The size and shape of the anterior upper teeth play an important role in dental esthetics and smile esthetics (4). In their research, Anderson et al. (5) showed that orthodontists and dentists prefer rounder teeth in women, while persons in general population did not notice the difference in the form of the teeth. On the other hand, all examiners considered the square-oval teeth to be more suitable for a man's smile. It is evident that the individuals belonging to general population do not have a clearly formulated opinion –their attitude toward the form of the teeth is neutral and they do not consider the form of the teeth to be particularly relevant to the esthetics of the smile, whereas the professionals are well aware

pritom se najvažnijim smatra odnos inciziva i kanina. Taj odnos temelji se na teoriji *zlatne proporcije* (*zlatnog reza*) i dinamičke simetrije (6). *Zlatnom proporcijom* teoretski se određuje idealna veličina zuba u njihovu uzajamnom odnosu (1 : 0,681) (2, 3).

Kokich i suradnici prvi su počeli istraživati različitosti u percepciji orofacijalnih struktura, poput različite percepcije osmijeha kao lijepoga i manje lijepoga (7, 8). Istraživanje je pokazalo da stupanj izobrazbe doktora dentalne medicine utječe na percepciju ljepote zuba i osmijeha, a osobe koje pripadaju općoj populaciji bile su najmanje kritične.

Pinho je upotpunio navedena istraživanja, uključivši i specijaliste protetičare uz opću populaciju i specijaliste ortodonte u istraživanje o percepciji asimetrije ruba gingive i pomaka sredine zubnog luka (9). Rezultati upućuju na to da ortodonti uočavaju pomak sredine već od jednog milimetra, protetičari od tri milimetra, a opća populacija ga uopće ne zapaža. Asimetrija ruba gingive od samo 0,5 milimetara vidljiva je doktorima dentalne medicine, a opća populacija zapaža asimetriju tek kad je veća od dva milimetra.

Zanimljivo je da se u većini dosadašnjih istraživanjima nije mnogo pozornosti posvećivalo specijalistima stomatološke protetike te se nije uspio dobiti uvid i dopuniti spoznaje o njihovoj percepciji dentalne estetike.

Ker i suradnici (10) istraživanje su temeljili na kompjutorskoj obradi fotografije donje trećine lica te su htjeli pokazati kolik raspon varijacija pacijenti prihvaćaju i do koje granice smatraju da je slika prihvatljiva. Svrha njihova istraživanja bila je zabilježiti granicu između idealnog i prihvatljivog osmijeha. Rezultati su pokazali da opća populacija prepoznaje idealan osmijeh, ali da je raspon prihvatljivih varijacija velik, što je također potvrđeno u istraživanju Rodriquesa i suradnika (11).

Kad je riječ o razlikama u percepciji prema spolu, rezultati Philipsa i suradnika (12) pokazali su da postoji značajna razlika u ocjenjivanju bukalnih koridora i atraktivnosti osmijeha između muškaraca i žena, odnosno muškarci su tolerantiji u vezi s malim/blagim bukalnim koridorom negoli žene. Utjecaj spola uočava se i u istraživanju utjecaja spola na razliku u percepciji orofacijalnih varijacija. Geron i Atalia (13) zaključili su na temelju rezultata istraživanja da su žene tolerantnije na vidljivost zubnog mesa pri osmijehu.

Velik broj istraživanja estetike osmijeha temelji se na ispitivanjima iz opće populacije i doktora dentalne medicine različitih stupnjeva profesionalne izobrazbe. Zato su Žagar i Knezović (14) uključili pacijente koji su pri osmijehu procjenjivali estetiku svojih zuba i okolnih mekih struktura. Rezultati pokazuju da žene više pozornosti posvećuju detaljima, što nam može pomoći pri izradi protetičkih nadomjestaka i izradi smjernica u estetskoj rehabilitaciji prednjih zuba i okolnih struktura.

Sve gore navedene referencije temelje se na različitim kriterijima procjene (razne ljestvice – dihotomna, Likertova itd.) i različitim pitanjima. Nedavno je uveden jedinstven upitnik (orofacijalna estetska ljestvica) s osam pitanja koja se odnose samo na estetiku orofacijalne regije. Stomatologinja JL Larson uvela je navedeni upitnik u stomatološka istraživanja i istaknula njegova izvrsna psihometrijska svojstva (15, 16). U

of the importance of the form of visible teeth and its impact on the general impression of the smile.

In addition to the shape and size of the upper anterior teeth, the relationship between the teeth and dental arch has a very important role in dental esthetics, wherein its most important aspect is the ratio of incisors and canines (1). This relationship is based on the theory of golden proportions (the golden section) and dynamic symmetry (6). The concept of the golden proportions theoretically determines the ideal size of the teeth in their relation (1: 0.681) (2, 3).

Kokich et al. were the first to begin the exploration of differences in the perception of orofacial structures, such as different perceptions of the smile, as beautiful and less beautiful (7, 8). Their research showed that the level of education of dentists affected the perception of the beauty of teeth and smiles, while individuals belonging to the general population exhibited the least amount of criticism.

In his study on perception of asymmetry of the gingival margin and of the shift of the middle arch (9), Pinho has complemented the above mentioned research by including specialists in prosthodontics, along with the general population and specialists in orthodontics. The results showed that the orthodontists observed the shift of the middle arch of just 1 mm, the prosthodontists of 3 mm, while the general population did not even notice the shift. The asymmetry of the gingival margin of only 0.5 mm was visible to the dentists, while individuals belonging to the general population noticed the asymmetry only when it exceeded 2 mm.

It is interesting that in the most of the previous researches not much attention has been given to the specialists in prosthodontics, hence failing to get an insight that would improve the knowledge on their perception of dental esthetics.

Ker et al. (10) based their research on computer manipulation of a photo of a part of the lower third of the face, and they wanted to determine the range of variation which was accepted by patients and, also, to determine to what extent the patients found those images acceptable. The aim of this study was to record the boundary between the ideal and the acceptable smile. The results showed that individuals belonging to general population recognized a perfect smile, but that the range of acceptable variations was wide. The research conducted by Rodriques et al. also confirmed those findings (11).

As for the differences in perception according to gender, the results of Philips et al. (12) showed that there were significant differences in the evaluation of buccal corridors and attractiveness of the smiles between male and female individuals. In other words, men were more tolerant to small / moderate buccal corridors than women. The influence of gender was also visible in the research on the impact of gender differences in perceptions of orofacial variations. Based on the results of the research, Geron and Atalia (13) concluded that women were more tolerant to the visibility of the gums in the smile.

A large number of studies on smile esthetics are based on data collected from the subjects from general population and on data collected from the dentists with various educational backgrounds. Therefore, Žagar and Knezović (14) in-

hrvatskome kulturnom okružju Peršić i suradnici preveli su i ispitali taj upitnik koji se pokazao zadovoljavajućim (17).

Svrha ovog rada bila je provesti istraživanje sa sljedećim ciljevima:

1. utvrditi postoji li statistički značajna razlika između dviju skupina procjenjivača – opće populacije i doktora dentalne medicine u percepciji anatomskih varijacija prednjih zuba i okolnih struktura
2. utvrditi postoji li statistički značajna razlika između triju skupina procjenjivača (opća populacija, doktori dentalne medicine i specijalisti stomatološke protetike), odnosno utvrditi razliku u njihovoj percepciji anatomskih varijacija prednjih zuba i okolnih struktura
3. utvrditi postoji li statistički značajna razlika u procjeni anatomskih varijacija prednjih zuba i okolnih struktura s obzirom na spol procjenjivača
4. utvrditi postoji li statistički značajna razlika u procjeni anatomskih varijacija prednjih zuba i okolnih struktura s obzirom na dob procjenjivača.

Hipoteza ovog istraživanja bila je da doktori dentalne medicine i protetičari lošije ocjenjuju odstupanja od idealnih karakteristika zuba i okolnih struktura, negoli opća populacija.

Materijali i metode

U istraživanje je bilo uključeno 60 dobrovoljnih ispitanika. To su većinom bile mlađe osobe (19 – 40 g.), a s obzirom na to da su kriteriji zahtijevali trajnu potpuno ozublenu denticiju (osim umnjaka) i uglavnom intaktne gornje prednje zube, svi ispitanici bili su Angleove klase I i bile su dopuštene samo blage rotacije zuba ili kompresije. Svi potencijalni ispitanici s gingivnom upalom ili hiperplazijom, većom recesijom desni, parodontno-kirurškim zahvatima u gornjem prednjem interkaninom području, ispunima ili kronicama te traumatskim ozljedama, bili su isključeni iz istraživanja.

Svi ispitanici bili su obaviješteni koja je svrha i način provedbe istraživanja, te su potpisali pristanak. Objasnjeno im je da istraživanje nije opasno za njihovo zdravlje te da se provodi u skladu s etičkim načelima i Ženevskom konvencijom. Po-

cluded some patients who were to estimate the esthetics of their teeth and the surrounding soft structures of their smile. The results have shown that women focus more on details, which can be helpful in making prosthetic replacements and developing guidelines for esthetic rehabilitation of the anterior teeth and their surrounding structures.

All of the above references are based on different criteria of assessment (diverse scales: dichotomous, Likert, etc.) and on various issues. A unique questionnaire (Orofacial Aesthetic Scale) comprising 8 questions relating only to the esthetics of the orofacial region has recently been introduced. Larsson introduced this questionnaire into dental research and pointed out to its excellent psychometric properties (15, 16). In the Croatian cultural environment, Peršić et al. translated and examined the same questionnaire and it was shown to have satisfactory characteristics (17).

The purpose of this paper was to carry out a study with the following goals:

1. to determine whether there was a statistical difference in perception of anatomical variations of the anterior teeth and the surrounding structures between two groups of assessors, those from general population and the dentists,
2. to determine whether there was a statistical difference between the three groups of assessors (general population, doctors of dental medicine and specialists in prosthodontics), or rather to determine the difference in their perception of anatomical variations of the anterior teeth and their surrounding structures,
3. to determine whether there was a significant difference in the assessment of the perception of anatomical variations of the anterior teeth and the surrounding structures based on gender of the assessor,
4. to determine whether there was a significant difference in the assessment of the perception of anatomical variations of the anterior teeth and the surrounding structures based on the age of the assessor.

The hypothesis of this research was that general dentists and prosthodontists gave lower scores than the individuals from general population when it came to deviations from the ideal characteristics of the teeth and the surrounding structures.

Material and methods

The research included 60 patients who voluntarily participated in the study. The participants were mainly young people (19–40 years old). Since the criteria of the research were to have a permanent fully toothed dentition (excluding third molars) and mostly intact upper front teeth, all respondents belonged to Angle class I, and only a mild rotation of the teeth or compression were allowed. All potential subjects with gingival inflammation and hyperplasia, those with more severe gingival recession, the subjects with periodontal-surgical procedures in the top front intercanine area, or those with fillings or crowns and traumatic injuries were excluded from the study.

The patients were informed about the purpose and the method used in the research and they gave their written con-

datci su bili anonimni. Svaki ispitanik u svakom je trenutku mogao odustati od sudjelovanja. Istraživanje je odobrilo Etičko povjerenstvo Stomatološkog fakulteta.

Neposredno prije digitalnog fotografranja ženama su usnica uklonjeni tragovi šminke, a muškarci su morali biti obrijani kako bi procjenjivači na digitalnim fotografijama mogli vidjeti zube i usnice. Tijekom fotografranja svaki je ispitanik sjedio uspravno u stomatološkom stolcu, održavajući u istom položaju i glavu te gledajući ravno ispred sebe uz široko razmaknute usnice u osmijeh. Istraživanje se sastojalo od desetominutnog fotografranja prednjih zuba ispitanika i usana pri osmijehu te donje trećine lica.

Prednji zubi svakog ispitanika fotografrani su digitalnim fotoaparatom NIKON, 14,0 MEGA PIXELS, COOLPIX S3100 (Tokio, Japan) na standardiziranoj i unaprijed obilježenoj udaljenosti od 10 centimetara, u visini prednjih zuba svakog ispitanika.

Sve digitalne fotografije pohranjene su na memorijski štapić EMTEC od 8 Gb (Nikon, Tokio, Japan), a zatim složene na nekoliko fotografskih papira formata A4 (FUJI COLOR CRYSTAL ARCHIVE PAPER, FUJIFILM Holdings Corporation, Tokijo, Japan) i razvijene. Na svakom fotografskom papiru – predlošku nalazilo se osam fotografija s točno naznačenim rednim brojem pacijenta kako procjenjivači pri ispunjavanju tablice ne bi zamijenili ispitanike.

Prikupljene fotografije procjenjivala je 21 osoba iz opće populacije (nisu bile educirane za rad u ordinaciji dentalne medicine niti obavljaju poslove vezane za dentalnu medicinu i nisu prije toga bile uključene u istraživanje), 20 diplomiranih doktora dentalne medicine i 20 specijalista stomatološke protetike.

Koristeći se dijelom pitanja iz OES upitnika (Orofacijalna estetska ljestvica – vidi prilog), s ponuđenih fotografija 60 minuta procjenjivale su se estetske karakteristike zuba i okolnih anatomskih struktura. Hrvatska inačica OES upitnika prevedena je s izvorne engleske verzije (17). Procjenjivači su, gledajući slike osmijeha pacijenata, davali ocjene od 1 do 5 (1 = potpuno nezadovoljan, 5 = potpuno zadovoljan). Navedena ljestvica s ocjenama od 1 do 5 prihvatljiv je način ocjenjivanja u hrvatskome kulturološkom okružju. Iz OES upitnika nisu se koristila pitanja pod brojem 1 i 2.

Statistička obrada obavljena je Windowsovim statističkim programom SPSS 17, (Chicago, Illinois, SAD), a uključivala je jednosmjerni Kolmogorov-Smirnovljev test za ispitivanje normalnosti distribucije, deskriptivnu statistiku, t-test za nezavisne uzorke, metode parametrijske statistike za testiranje značajnosti razlika *one-way* ANOVA, Scheffeove post-hoc testove i ANOVA-u s tri faktora.

Rezultati

U tablici 1. deskriptivna je statistika ocjena za dio pitanja iz OES upitnika i srednje vrijednosti zbroja ocjena, ovisno o grupi procjenjivača [opća populacija (n = 21) i stoma-

sent. The patients were explained that the research posed no threat to their health and that it was to be carried out in accordance with ethical principles and the Geneva Convention. The data were anonymous. Each participant could have withdrawn from the study at any time. The Ethics Committee of the School of Dental Medicine approved the study.

Immediately prior to taking digital photographs, the female subjects removed traces of makeup from their lips and male respondents shaved, thus enabling the assessors to see their teeth and lips on the digital photographs. In the course of taking the photos, each subject was sitting in the dentist's chair in an upright position, holding the head upright and looking straight ahead with lips opened wide into a smile. The research consisted of taking pictures of the anterior teeth and the lips of subjects who smiled and of the lower third of the face in the duration of 10 minutes.

The front teeth of each subject were photographed using a digital camera NIKON, 14.0 Mega Pixels, COOLPIX S3100 (Tokyo, Japan) from a standardized and advance-marked distance of 10 cm, at the height of the front teeth of each of the respondents.

All digital images were stored on a Memory Stick EMTEC 8 GB (Nikon, Tokyo, Japan), and then arranged on a few A4 photo papers (FUJI COLOR CRYSTAL ARCHIVE PAPER, FUJIFILM Holdings Corporation, Tokyo, Japan) and developed. On each photo paper (template), there were 8 photos with precisely indicated number of the patient so that assessors would not confuse them when filling the tables.

The collected photos were then assessed by 21 individuals from the general population (who were neither trained to work in a dental office nor to perform tasks related to dentistry and who were not previously included in the study), 20 graduate dentists and 20 specialists in prosthodontics.

Using a part of the questions from the OAS questionnaire (Orfacial Aesthetic Scale, see Annex) the esthetic characteristics of the teeth and the surrounding anatomical structures on the photographs were assessed in duration of 60 minutes. The Croatian version of the OAS questionnaire was translated from the original English version (17). Looking at the pictures of smiles of the patients, the assessors rated them on a scale from 1 to 5 (1 = completely dissatisfied, 5 = completely satisfied). This rating scale from 1 to 5 is an acceptable method of assessing in the Croatian cultural environment. Questions under the number 1 and 2 from the OAS questionnaire were not used.

A statistical analysis was performed using the statistical program SPSS 17 for Windows (Chicago, Illinois, USA), and it included a one way Kolmogorov - Smirnov test for normality of distribution, descriptive statistics, the t-test for independent samples, methods of parametric statistics for testing the significance of differences – one way ANOVA, Scheffe post hoc tests and ANOVA test with 3 factors.

Results

Table 1 shows the descriptive statistics of the assessment of questions from the OAS questionnaire and the arithmetic mean of summed scores based on the group of assessors (gen-

Tablica 1. Deskriptivna statistika ocjena (dio OES upitnika) i srednje vrijednosti zbroja ocjena upitnika, ovisno o skupini procjenjivača (opća populacija i doktori dentalne medicine) te značajnost razlike između dviju navedenih skupina procjenjivača
Table 1 Descriptive statistics of the assessment (a part of the OAS questionnaire) and the arithmetic mean of summed scores based on the group of assessors (general population and dentists) and the significance of difference between these two groups of assessors

Pitanja • Questions	Skupina • Group	x	SD	t	df	p
Procjena izgleda usta (osmijeha, usnica, vidljivih zuba) • Assessment of the appearance of lips (smile, lips, visible teeth)	Opća populacija • General population	3.5	1.01	-4.481	3635	<0.001**
	Doktori dentalne medicine • Dentists	3.7	1.39			
Procjena izgleda zubnih lukova • Assessment of the appearance of dental arches	Opća populacija • General population	3.4	1.07	-6.291	3635	<0.001**
	Doktori dentalne medicine • Dentists	3.6	0.93			
Procjena oblika zuba • Assessment of the shape of the teeth	Opća populacija • General population	3.4	1.07	-10.211	3635	<0.001**
	Doktori dentalne medicine • Dentists	3.7	0.94			
Procjena boje zuba • Assessment of the teeth color	Opća populacija • General population	3.5	1.03	-9.012	3635	<0.001**
	Doktori dentalne medicine • Dentists	3.8	0.96			
Procjena izgleda zubnog mesa • Assessment of appearance of gums	Opća populacija • General population	4.2	1.06	8.184	3617	<0.001**
	Doktori dentalne medicine • Dentists	3.9	1.38			
Procjena općenito izgleda donje trećine lica, usta i zuba • Assessment of the general appearance of the lower third of the face, lips and teeth	Opća populacija • General population	3.5	1.00	-2.971	3634	<0.001**
	Doktori dentalne medicine • Dentists	3.6	0.84			
Srednja vrijednost zbroja pitanja • Arithmetical mean of the summed questions	Opća populacija • General population	3.6	0.84	-4.697	3617	<0.001**
	Doktori dentalne medicine • Dentists	3.7	0.79			

** statistički je značajna razlika između opće populacije i doktora dentalne medicine ($p < 0,001$) • There is a statistically significant difference between the general population and the dentists ($p < 0,001$)

Tablica 2. Deskriptivna statistika za ocjene dijela pitanja iz OES upitnika i srednje vrijednosti zbroja ocjena, ovisno o spolu svih procjenjivača te značajnost razlike između ocjena muških i ženskih ispitivača

Table 2 Descriptive statistics of the assessment on some questions from the OAS questionnaire and the arithmetic mean of summed scores based on the assessors' gender, and the significance of difference in ratings by male and female assessors

Pitanja • Questions	Spol ispitivača • Sex of the assessor	x	SD	t	df	p
Procjena izgleda usta (osmijeha, usnica, vidljivih zuba) • Assessment of the appearance of lips (smile, lips, visible teeth)	Ž. • Female	3.6	1.49	-1.303	3635	0.193 NS
	M. • Male	3.7	0.90			
Procjena izgleda zubnih lukova • Assessment of the appearance of dental arches	Ž. • Female	3.6	1.00	0.015	3635	0.988 NS
	M. • Male	3.6	0.96			
Procjena oblika zuba • Assessment of the shape of the teeth	Ž. • Female	3.6	1.03	0.039	3635	0.969 NS
	M. • Male	3.6	0.96			
Procjena boje zuba • Assessment of the teeth color	Ž. • Female	3.7	1.01	0.058	3635	0.954 NS
	M. • Male	3.7	0.98			
Procjena izgleda zubnog mesa • Assessment of appearance of gums	Ž. • Female	3.8	1.37	-8.746	3617	<0.001**
	M. • Male	4.2	1.13			
Procjena općenito izgleda donje trećine lica, usta i zuba • Assessment of the general appearance of the lower third of the face, lips and teeth	Ž. • Female	3.5	0.91	-3.948	3634	<0.001**
	M. • Male	3.7	0.88			
Arithmetical mean of the summed questions	Ž. • Female	3.6	0.85	-3.408	3617	0.001**
	M. • Male	3.7	0.74			

** statistički je značajna razlika između spolova ($p < 0,001$) • There is a statistically significant difference between the genders ($p < 0,001$)

tolozima ($n = 40$)). Tu su i rezultati testiranja značajnosti razlike ocjena između opće populacije i stomatologa (t-test za nezavisne uzorke).

Dodijeljene ocjene doktora dentalne medicine bile su statistički značajno više za sva pitanja, osim za procjenu izgleda zubnog mesa ($p < 0,001$) (tablica 1.); opća populacija procijenila je zubno meso estetski prihvatljivijim u odnosu na doktore dentalne medicine.

U tablici 2. prikazana je deskriptivna statistika za ocjene dijela pitanja iz OES upitnika i srednje vrijednosti zbroja ocjena, ovisno o spolu svih procjenjivača. Također su predstavljeni rezultati testiranja značajnosti razlike ocjena koje su dali muški i ženski ispitivači (t-test za nezavisne uzorke).

Opća populacija ($n = 21$) i doktori dentalne medicine ($n = 40$)). Također su predstavljeni rezultati testiranja značajnosti razlike ocjena između opće populacije i stomatologa (t-test za nezavisne uzorke). Također su predstavljeni rezultati testiranja značajnosti razlike ocjena koje su dali muški i ženski ispitivači (t-test za nezavisne uzorke).

Prisvojene ocjene bile su statistički značajno više za sva pitanja, osim za procjenu izgleda zubnog mesa ($p < 0,001$) (Tablica 1.); opća populacija procijenila je zubno meso estetski prihvatljivijim u odnosu na doktore dentalne medicine.

Table 2 shows the descriptive statistics of the assessment of questions from the OAS questionnaire and the arithmetic mean of summed scores based on gender of the assessor. It also presents the results of testing the significance of differ-

Tablica 3. Testiranje značajnosti razlike ocjena između triju skupina procjenjivača (opća populacija, doktori dentalne medicine, specijalisti protetike) [one-way ANOVA] (**= značajno pri 99 % pouzdanosti ($p < 0,001$))
Table 3 Testing of the significance of difference in scores between the three groups of assessors (general population, general dentists, specialists in prosthodontics) (one-way ANOVA) (**= significant at 99% of confidence level ($p < 0.001$))

Pitanja • Questions		Suma kvadrata • The sum of squares	df	Srednji kvadrat • The mean of squares	F	p
Procjena izgleda usta (osmijeha, usnica, vidljivih zuba) • Assessment of the appearance of lips (smile, lips, visible teeth)	Between Groups	38.346	2	19.173	11.888	<0.001**
	Within Groups	5861.103	3634	1.613		
	Total	5899.449	3636			
Procjena izgleda zubnih lukova • Assessment of the appearance of dental arches	Between Groups	63.181	2	31.591	33.228	<0.001**
	Within Groups	3454.942	3634	0.951		
	Total	3518.123	3636			
Procjena oblika zuba • Assessment of the shape of the teeth	Between Groups	120.409	2	60.204	61.880	<0.001**
	Within Groups	3535.615	3634	0.973		
	Total	3656.024	3636			
Procjena boje zuba • Assessment of the teeth color	Between Groups	136.985	2	68.492	72.074	<0.001**
	Within Groups	3453.399	3634	0.950		
	Total	3590.383	3636			
Procjena izgleda zubnog mesa • Assessment of appearance of gums	Between Groups	184.153	2	92.076	57.065	<0.001**
	Within Groups	5834.582	3616	1.614		
	Total	6018.734	3618			
Procjena općenito izgleda donje trećine lica, usta i zuba • Assessment of the general appearance of the lower third of the face, lips and teeth	Between Groups	13.640	2	6.820	8.456	<0.001**
	Within Groups	2930.126	3633	0.807		
	Total	2943.765	3635			
Srednja vrijednost zbroja pitanja • Arithmetical mean of the summed questions	Between Groups	683.496	2	341.748	14.648	<0.001**
	Within Groups	84363.686	3616	23.331		
	Total	85047.182	3618			

Tablica 4. Deskriptivna statistika za bodove pitanja i srednju vrijednost zbroja pitanja između svih triju skupina procjenjivača (opća populacija, doktori dentalne medicine, specijalisti protetike); također je prikazana značajnost razlike u bodovima za pitanja između svih triju skupina procjenjivača (one-way ANOVA, Sheffeov post hoc test) (* $p < 0,05$; ** $p < 0,001$)

Table 4 Descriptive statistics of the assessment of questions and the arithmetic mean of summed scores for all three groups of assessors (general population, general dentists, and specialists in prosthodontics). It also shows the significance of difference between points from all three groups of assessors (one-way ANOVA, Sheffe post hoc test) (* $p < 0.05$; ** $p < 0.001$)

Pitanja • Questions	Skupina procjenjivača • Group of assessors	N	x	SD	Sheffeov post hoc • Sheffe post hoc
Procjena izgleda usta (osmijeha, usnica, vidljivih zuba) • Assessment of the appearance of lips (smile, lips, visible teeth)	Opća populacija • General population	21	3.50	1.01	1 2 3
	Doktori dentalne medicine • General dentists	20	3.64	0.90	1 ***
	Specijalisti protetike • Specialists in prosthodontics	20	3.74	1.74	2 * 3 **
Procjena izgleda zubnih lukova • Assessment of the appearance of dental arches	general population	21	3.42	1.07	1 2 3
	general dentists	20	3.53	0.94	1 ***
	specialists in prosthodontics	20	3.74	0.91	2 * ** 3 ****
Procjena oblika zuba • Assessment of the shape of the teeth	general population	21	3.38	1.07	1 2 3
	general dentists	20	3.64	0.96	1 ****
	specialists in prosthodontics	20	3.82	0.91	2 * * ** 3 * * **
Procjena boje zuba • Assessment of the teeth color	general population	21	3.50	1.03	1 2 3
	general dentists	20	3.66	0.99	1 ***
	specialists in prosthodontics	20	3.97	0.90	2 * ** 3 ****
Procjena izgleda zubnog mesa • Assessment of appearance of gums	general population	21	4.23	1.06	1 2 3
	general dentists	20	4.04	1.16	1 ***
	specialists in prosthodontics	20	3.69	1.55	2 * ** 3 ****
Procjena općenito izgleda donje trećine lica, usta i zuba • Assessment of the general appearance of the lower third of the face, lips and teeth	general population	21	3.53	1.00	1 2 3
	general dentists	20	3.57	0.85	1 **
	specialists in prosthodontics	20	3.68	0.83	2 * 3 * * *
Srednja vrijednost zbroja pitanja • Arithmetical mean of the summed questions	general population	21	3.59	0.84	1 2 3
	general dentists	20	3.68	0.75	1 ***
	specialists in prosthodontics	20	3.77	0.83	2 * * 3 * * *

Ocjene muškaraca bile su statistički značajno više za procjenu izgleda zubnog mesa, općenite procjene izgleda donje trećine lica, usta i zuba te za srednju vrijednost zbroja bodova ($p < 0,001$) (tablica 2.), odnosno oni su ih procijenili estetski prihvatljivijima u odnosu na ženske ispitivače koji su posebno bili osjetljivi na izgled zubnog mesa.

Značajnost razlike ocjena između triju skupina procjenjivača (opća populacija, doktori dentalne medicine, specijalisti protetike) testirana je *one-way* ANOVA testom i nalazi se u tablici 3. Ustanovljeno je da postoji statistički značajna razlika u ocjenama između skupina procjenjivača ($p < 0,001$, tablica 3.). Kako bi se ustanovilo koja je skupina odgovorna za statistički značajnu razliku, primijenjeni su i Sheffeovi post-hoc testovi.

Deskriptivna statistika ocjena u svim trima skupinama procjenjivača (opća populacija, doktori dentalne medicine, specijalisti protetike) prikazana je u tablici 4., zajedno sa Sheffeovim post hoc testiranjem. Post-hoc testovi pokazali su da su specijalisti protetike pacijentima dali znatno više ocjene (izgled usta, zubnih lukova, oblika zuba, boje zuba i općenita procjena donje trećine lica). Post-hoc testovi također su pokazali da su procjenitelji koji pripadaju općoj populaciji ocijenili vidljivo zubno meso najvišim ocjenama ($*p < 0,05$; $**p < 0,001$), a protetičari najslabijim.

Značajnost razlike ocjena između triju skupina procjenjivača, ovisno o njihovoj dobi (< 35, 36 – 55, > 56) testirana je *one-way* ANOVA testom i prikazana je u tablici 5. Utvrđeno je da postoji statistički značajna razlika u ocjenama iz-

ence in ratings by male and female assessors (t-test for independent samples).

Male assessors gave significantly higher scores in assessing the appearance of the gums, the general appearance of the lower third of the face, mouth and teeth, and in the arithmetic mean of summed scores ($p < 0.001$) (Table 2). In other words, male assessors evaluated them as esthetically more pleasing compared to female assessors, who were particularly sensitive to the appearance of gums.

The significance of difference in scores between the three groups of assessors (general population, general dentists, and specialists in prosthodontics) was tested by a one-way ANOVA test and it is shown in Table 3. It was found that there was a statistically significant difference in scores between different groups of assessors ($p < 0.001$, Table 3). In order to determine which group was responsible for a statistically significant difference, the Scheffe post-hoc tests were conducted.

Descriptive statistics of the assessment in all three groups of assessors (general population, general dentists, and specialists in prosthodontics) is shown in Table 4, together with the results of Scheffe post hoc testing. Post-hoc tests showed that the specialists in prosthodontics gave significantly higher scores (appearance of the mouth, dental arches, teeth shape, teeth color and general assessment of the lower third of the face). Post-hoc tests also showed that the assessors belonging to the general population gave significantly higher scores to the visibility of the gums ($p < 0.05$, $**p < 0.001$), while the prosthodontists gave worst marks.

Tablica 5. Testiranje značajnosti razlike ocjena pitanja i srednje vrijednosti zbroja ocjena između triju skupina procjenjivača ovisno o njihovoj dobi (< 35, 36 – 55, > 56) (*one-way* ANOVA) (*= značajno pri 95 % pouzdanosti ($p < 0,05$); **= značajno pri 99 % pouzdanosti ($p < 0,001$))

Table 5 Testing of the significance of difference of marks and the arithmetic mean of summed marks between the three groups of assessors based on their age (<35, 36-55, >56) (*one-way* ANOVA) (*= significant at 95% of confidence level ($p < 0.05$); **= significant at 99% of confidence level ($p < 0.001$))

Pitanja • Questions		Suma kvadrata • The sum of squares	df	Srednji kvadrat • The mean of square	F	p
Procjena izgleda usta (osmijeha, usnica, vidljivih zuba) • Assessment of the appearance of lips (smile, lips, visible teeth)	Between Groups	38.219	2	19.109	11.845	<0.001**
	Within Groups	5860.838	3633	1.613		
	Total	5899.057	3635			
Procjena izgleda zubnih lukova • Assessment of the appearance of dental arches	Between Groups	20.918	2	10.459	10.866	<0.001**
	Within Groups	3497.011	3633	0.963		
	Total	3517.930	3635			
Procjena oblika zuba • Assessment of the shape of the teeth	Between Groups	21,462	2	10.731	10.728	<0.001**
	Within Groups	3634.191	3633	1.000		
	Total	3655.653	3635			
Procjena boje zuba • Assessment of the teeth color	Between Groups	37.203	2	18.602	19.022	<0.001**
	Within Groups	3552.681	3633	0.978		
	Total	3589.884	3635			
Procjena izgleda zubnog mesa • Assessment of appearance of gums	Between Groups	127.754	2	63.877	39.205	<0.001**
	Within Groups	5889.963	3615	1.629		
	Total	6017.717	3617			
Procjena općenito izgleda donje trećine lica, usta i zuba • Assessment of the general appearance of the lower third of the face, lips and teeth	Between Groups	8.124	2	4.062	5.026	0.007*
	Within Groups	2935.290	3632	0.808		
	Total	2943.414	3634			
Srednja vrijednost zbroja pitanja • Arithmetical mean of the summed questions	Between Groups	323.117	2	161.558	6.893	0.001**
	Within Groups	84722.903	3615	23.436		
	Total	85046.020	3617			

među dobni skupina procjenjivača ($p < 0,05$, $p < 0,001$, tablica 4.). Kako bi se ustanovilo koja je skupina odgovorna za statistički značajnu razliku, primijenjeni su i Sheffeovi post-hoc testovi.

Deskriptivna statistika za ocjene svih triju skupina procjenjivača, ovisno o njihovoj dobi (< 35, 36 – 55, > 56) zabilježena je u tablici 6., zajedno sa Sheffeovim post-hoc testiranjem. Post-hoc testovi pokazali su da su stariji pacijenti procijenili vidljivo zubno meso najvišim ocjenama, a zubne lukove najmanjima (* $p < 0,05$; ** $p < 0,001$)

Cijeli model u koji su bili uključeni čimbenici kao što su dob, spol i profesija tumače zavisne varijable (ocjene estetike) samo 18,2 posto ($R^2 = 0,182$).

The significance of difference in assessment between the three groups of assessors based on their age (<35, 36-55, >56) was tested by a one-way ANOVA test and is shown in Table 5. In order to determine which group is responsible for a statistically significant difference, the Scheffe post-hoc tests were conducted.

Descriptive statistics of the assessment for all three groups of assessors based on their age (<35, 36-55, > 56) is shown in Table 6, together with the results of Scheffe post hoc testing. Post-hoc tests showed that older patients assessed visible gums with significantly higher scores, while they gave significantly lowest scores to dental arches ($p < 0,05$, ** $p < 0,001$)

The whole model that includes factors of age, gender and profession interprets the dependent variables (grades of esthetics) as only 18.2% ($R^2=0.182$).

Tablica 6. Deskriptivna statistika za ocjene pitanja i srednju vrijednost zbroja ocjena za sve tri skupine procjenjivača, ovisno o njihovoj dobi (< 35, 36 - 55, > 56; također je prikazana značajnost razlike u ocjenama između svih triju dobni skupina procjenjivača (one-way ANOVA, Sheffeov post-hoc test) (* $p < 0,05$; ** $p < 0,001$)

Table 6 Descriptive statistics of the assessments of questions and the arithmetic mean of the summed scores based on the age of the assessors (<35, 36-55, > 56). The significance of difference between the scores in all three groups of assessors is also shown (one way ANOVA, Scheffe post hoc test) (* $P < 0.05$, ** $p < 0.001$)

Pitanja • Questions	Dobna skupina • Age group	N	x	SD	Sheffeov post hoc • Sheffe post hoc
Procjena izgleda usta (osmijeha, usnica, vidljivih zuba) • Assessment of the appearance of lips (smile, lips, visible teeth)	<35	32	3.53	0.95	1 2 3
	36-55	18	3.77	0.88	1 **
	>56	11	3.67	2.25	2 ** 3
Procjena izgleda zubnih lukova • Assessment of the appearance of dental arches	<35	32	3.55	0.97	1 2 3
	36-55	18	3.66	0.93	1 **
	>56	11	3.43	1.10	2 * ** 3 ***
Procjena oblika zuba • Assessment of the shape of the teeth	<35	32	3.59	0.99	1 2 3
	36-55	18	3.71	0.93	1 *
	>56	11	3.49	1.15	2 * ** 3 **
Procjena boje zuba • Assessment of the teeth color	<35	32	3.67	1.00	1 2 3
	36-55	18	3.85	0.94	1 **
	>56	11	3.57	1.06	2 ** ** 3 **
Procjena izgleda zubnog mesa • Assessment of appearance of gums	<35	32	3.92	1.28	1 2 3
	36-55	18	3.88	1.39	1 **
	>56	11	4.40	1.04	2 ** 3 ***
Procjena općenito izgleda donje trećine lica, usta i zuba • Assessment of the general appearance of the lower third of the face, lips and teeth	<35	32	3.58	0.92	1 2 3
	36-55	18	3.66	0.84	1
	>56	11	3.53	0.93	2 * 3 *
Srednja vrijednost zbroja pitanja • Arithmetical mean of the summed questions	<35	32	3.64	0.80	1 2 3
	36-55	18	3.75	0.78	1 **
	>56	11	3.67	0.86	2 ** 3

Nesigurnost mjerenja • Uncertainty of the measurement = 1,1

Rasprava

U svojem pristupu estetici zuba doktori dentalne medicine slijede pragmatično načelo postizanja simetrije i poboljšanja izgleda lica. Tijekom izrade protetičkoga rada oni nastoje postići i zadovoljiti pacijentovu viziju estetskoga izgleda nadomjestka, ali nažalost često se njihove percepcije estetski poželjnoga bitno razlikuju (18). Također treba istaknuti niz so-

Discussion

In their approach to the esthetics of teeth, dentists are led by pragmatic principles of achieving symmetry and improving facial appearance. In the course of denture fabrication, a dentist tries to satisfy the patient's vision of the esthetic appearance of the denture, but unfortunately, it often happens that their perception of what is esthetically pleasing differs

cijalnih, kulturoloških i psiholoških čimbenika koji još nisu u cijelosti objašnjeni, a utječu na definiranje idealne estetike u određenoj populaciji (19).

Većina istraživanja o toj temi u svijetu uzela je u obzir opću populaciju, doktore dentalne medicine i specijaliste ortodontije, a u rijetka su bili uključeni i specijalisti protetike, što je važno s obzirom na to da je velik postotak protetičkih namjesta u svim zahvatima u dentalnoj medicini.

Ovo nam je istraživanje pokazalo statistički značajnu razliku u rezultatima (ocjenama) između opće populacije, doktora dentalne medicine i specijalista protetike, odnosno ustanovilo je razliku u njihovoj percepciji anatomskih varijacija prednjih zuba i okolnih struktura, uzimajući u obzir i spol i dob procjenjivača.

Uspoređujući opću populaciju i doktore dentalne medicine, ocjene doktora dentalne medicine za sva su pitanja bile statistički značajno veće, osim za procjenu izgleda zubnog mesa ($p < 0,001$) (tablica 1.). Opća populacija ocijenila je liniju gingive estetski prihvatljivijom u odnosu na doktore dentalne medicine. Ovaj podatak može se tumačiti tako da doktori dentalne medicine, a osobito specijalisti stomatološke protetike, prirodan izgled ocjenjuju višim ocjenama, a opća populacija teži idealnoj estetici zuba, vjerojatno zbog utjecaja medija. Suprotno tomu, opća populacija manje vodi računa o zubnom mesu koje nije najvidljivije na prvi pogled, pa im je to vjerojatno manje važno, a doktori dentalne medicine toga su svjesni te i taj parametar uključuju u svoju procjenu i vrlo su kritični prema tome.

Može se pretpostaviti da bi prema izgledu zubnog mesa parodontolozi bili najkritičniji, što će biti tema daljnjeg istraživanja.

Analiza podataka prema spolu procjenjivača (tablica 2.) upućuje na nešto više ocjene i veću toleranciju muškaraca. Očekivalo se da će žene biti kritičnije prema estetici zuba.

Usporedba procjenjivača prema dobi (< 35, 36 – 55, > 56) pokazala je da su osobe srednje dobi dodjeljivale najviše ocjene, osim za zubno meso za koje su najviše ocjene dale osobe iz najstarije skupine (tablica 5. i 6.). Rezultat se može tumačiti većom kritičnošću mlađih osoba jer još nemaju velikih problema sa zubima, pa pozornost usmjeravaju isključivo na estetiku. Najstarija skupina najbolje ocjenjuje zubno meso, što može značiti da im je ono u estetici orofacijalne regije najmanje važno.

Zaključci

Na osnovi rezultata ovog istraživanja možemo zaključiti sljedeće: ispitanici iz opće populacije lošije su ocijenili orofacijalnu estetiku, u odnosu na doktore dentalne medicine, osim izgleda zubnog mesa za koje doktori dentalne medicine daju niže ocjene; doktori dentalne medicine niže su ocjene dali obliku i boji zuba, izgledu zubnih lukova i usnica, te

significantly (18). It should also be pointed out that there is a series of social, cultural and psychological factors that are not yet fully understood, but which can affect the definition of the ideal in esthetics in a given population (19).

Most of the research on this topic takes into account the general population, general dentists and specialists in orthodontics, while there are a small number of studies including specialists in prosthodontics, which is important since the fabrication of dentures represents a high percentage of all dental procedures.

This research has shown a statistically significant difference in the results (scores) among the general population, general dentists and specialist in prosthodontics, or rather it has determined the difference in their perception of anatomical variations of the front teeth and the surrounding structures by taking into account the age and the gender of the assessor.

Comparing the general population and the dentists, the dentists' ratings were significantly higher for all questions, except for the assessment of the appearance of gums ($p < 0.001$) (Table 1). The general population estimated the gums to be more esthetically pleasing compared to the assessment of the dentists. These data can be interpreted based on the fact that dentists, especially specialists in prosthodontics, give higher grades to natural looks, while the general population aspires to the ideal esthetics of teeth, probably due to the influence of media. In contrast, individuals belonging to general population pay less attention to the gums, which are not so visible at first glance, hence being less important to them, while dentists are aware of the role of gums and include this parameter in their assessment, and are very critical of it.

Periodontists were considered to be most critical to the appearance of gums, which can be the topic of further research.

The analysis of the data according to gender of the assessors (Table 2) points to somewhat higher ratings and greater tolerance of male assessors. The female assessors were expected to be more critical to the esthetics of the teeth.

The comparison of assessors according to their age (<35, 36-55, > 56) has shown that the middle-aged group gave highest scores, except for the gums where the highest scores were given by the oldest group of respondents (Table 5). The result can be explained by the fact that younger people are more critical since they have not yet had big problems with their teeth; hence, their attention is focused solely on the esthetics of the teeth. The oldest group of respondents gave the highest scores to the gums, which points to the fact that they are the least important to them in the esthetics of the orofacial region.

Conclusions

Based on the results, we concluded that respondents from the general population group gave lower scores to the orofacial esthetics than dentists, except for the appearance of the gums which got lower scores by dentists. General dentists gave lower scores to the shape and color of teeth, appearance of dental arches and lips, and general appearance of the lower

općenito izgledu donje trećine lica, u odnosu na specijaliste protetike koji su tolerantniji kad je riječ o odstupanjima od *idealne estetike*, a suprotno je za procjenu izgleda zubnog mesa – tu su specijalisti protetike kritičniji u odnosu na doktore dentalne medicine; žene su kritičnije u procjeni izgleda zubnog mesa u odnosu prema muškarcima; procjenjivači srednje dobi, od 36 do 55 godina, najbolje su ocijenili estetiku oblika i boje zuba, izgled zubnih lukova i usnica te općenito izgled donje trećine lica, a najstarija skupina najboljim je ocijenila izgled zubnog mesa.

Navedeni rezultati mogu pomoći doktorima dentalne medicine i specijalistima protetike u planiranju protetičke terapije jer znaju kriterije pacijenata.

Sukob interesa

Autori nisu bili u sukobu interesa.

Zahvala

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third of the face than prosthodontists. Prosthodontists were also more tolerant towards deviations from the “ideal esthetics” and more critical in assessing the appearance of the gums than general dentists. Female respondents were more critical in estimating the appearance of the gums. Middle-aged assessors (36-55 years old) gave the highest scores to the esthetics of the shape and color of the teeth, the appearance of dental arches and lips and the general appearance of the lower third of the face. The respondents belonging to the oldest group gave the highest scores to the appearance of the gums.

Since patient satisfaction is assumed to be an important indicator of quality of care, our research may help dental practitioners and prosthodontists to plan such a prosthetic therapy which would also meet the patient's criteria.

Conflict of interest

The authors declare no conflict of interest.

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Abstract

Purpose: To determine the differences in the perception of aesthetic characteristics of the front teeth which include anatomic variations, appearance of the gums and dental arches, smiles and the lower third of the face between three groups of assessors. **Materials and Methods:** The study included 60 patients with permanent fully toothed dentition with no prosthetic work done and with Angle class I, whose lower third of the face was photographed while smiling. Collected photos were then assessed by people of the general population (21), graduate doctors of dental medicine (20) and specialists in dental prosthetics (20) using a modified OAS questionnaire (Orofacial aesthetic scale). **Results:** General population assessors gave weakest scores to the appearance of teeth, tooth color and appearance of the dental arches, and they gave highest scores to the appearance of the gums. Specialists in dental prosthetics gave top scores ($p < 0.01$) for the shape and color of teeth, the appearance of the dental arches and lips and general appearance of the lower third of the face, and gave the worst scores for the appearance of the gums ($p < 0.01$). Male assessors and people aged 36-55 are the least critical in assessing the shape and the color of teeth, appearance of the arches and lips, and the general appearance of the lower third of the face. In assessing the gums the most tolerant assessors are patients over the age of 55 ($p < 0.01$). **Conclusion:** Considering the age and gender it can be concluded that all the criteria contribute to the assessment of the aesthetics of the teeth and surrounding structures. The results of this study may help in the planning of dental prosthetics procedures.

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Key words

Dental Esthetic; Tooth; Gingiva; Dental Arch; Smiling; Form Perception; Size Perception; Color Perception

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