

INTERMAKSILARNI ODNOSI VELIČINE ZUBA KOD OSOBA SA MALOKLUZIJOM III KLASSE

INTERARCH TOOTH SIZE DISCREPANCY IN SUBJECTS WITH CLASS III MALOCCLUSION

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Kratak sadržaj

Postojanje ravnoteže u veličini zuba preduslov je gornje i donje vilice za formiranje dobre okluzije. Cilj rada bio je da se ispita postojanje nesklada intermaksilarne veličine zuba. Ispitana je ukupno 41 osoba sa stalnom denticijom i okluzalnim odnosom u III klasi. Merenje je izvršeno nonijusom sa tačnošću od 0,01 mm. Razlike između polova kao i odstupanja od standardnih vrednosti testirane su t- testom.

Osobe muškog pola imaju veće zube od osoba ženskog pola, najizraženija razlika je kod donjih očnjaka. Prednji i ukupni Boltonov indeks ne pokazuje polni dimorfizam. Prosečna vrednost za ukupni Bolton indeks kod osoba ženskog pola ne odstupa od standardnih vrednosti, prosečna vrednost za ukupni Bolton indeks kao i za prednji Bolton indeks kod osoba oba pola u našem istraživanju značajno je veća od standardnih vrednosti.

Ključne reči: veličina zuba, Boltonova analiza

Uvod

Saznanja koja se odnose na veličinu zuba u humanoj populaciji od velike su važnosti za mnoge naučne grane: anatomija, antropologija, sudska medicina, klinička stomatologija. U ortodontiji, postavljanje dijagnoze i određivanje plana terapije zahteva dobro poznavanje veličine zuba jer stabilna okluzija zavisi od dobre interkuspidacije zuba.¹ Korektna analiza prostora je neophodna ako se želi postići optimalna okluzija po završetku ortodontskog lečenja² a krajnji cilj je dobra statistička i funkcionalna okluzija.¹

Summary

The existence of balance between the toothsize of the upper and lower arches is a prerequisite to form good occlusion. The aim of the paper was to analyze the existence of disharmony in interarch tooth size. Fortyone subjects with permanent dentition and class III occlusal relation were tested within this research. The measurement was performed using a nonius, 0,01mm of accuracy. Gender differences as well as deviations from standard values were tested by means of t-test.

Theeth are usually bigger in males than in females and the most expressive difference is seen in the lower canines. The anterior and overall Bolton ratios did not find any gender dimorphism. The average value for the overall Bolton ratio found in females did not deviate from standard values, but the average values for the overall Bolton ratio as well as for the anterior Bolton ratio found in both sexes were, as it was found in our research, significantly higher than standard values.

Keywords: tooth size, Bolton analysis

Introduction

The knowledge related to tooth size in human population is of great significance for many scientific branches: anatomy, anthropology, forensic medicine and clinical dentistry.

In orthodony, making diagnosis and the determination of the plan of therapy require good knowledge of teeth size because stable occlusion depends on good tooth intercuspitation.¹ If we want to achieve an optimal occlusion after orthodontic treatment has been finished², the correct analysis of area is needed and the final aim is good static and functional occlusion.¹

Preduslov za dobru okluziju jeste da zubi budu proporcionalni u veličini.³⁻⁷ Nesklad u veličini zuba između maksilarnog i mandibularnog zubnog luka često je uzrok disharmoničnih okluzalnih odnosa.

Veličina zuba je naslednog karaktera,⁸⁻¹² mada se u literaturi mogu naći i radovi koji zastupaju stav da su bitni uticaji lokalnih etioloških faktora.^{13,14}

Povezanost veličine zuba i pola osobe potvrđuju ispitivanja brojnih autora koja pokazuju da osobe muškog pola imaju veće zube od osoba ženskog pola.¹⁵⁻²¹ Povezanost veličine zuba i etničke pripadnosti takođe je potvrđena,^{3,15,20,22-25} dok su oko veličine zuba kod različitih ortodontskih anomalija podeljena mišljenja. Veličina zuba razlikuje se kod različitih malokluzija.^{15,26-29} Postoje i drugačiji stavovi da ne postoji uticaj veličine zuba na pojavu ortodontskih anomalija.^{5,30,31}

Postojanje intermaksilarnog nesklada u veličini zuba određuje se vrednostima datim od strane W. Boltona, 1952. godine, koji je svoje ispitivanje sproveo na studijskim modelima 55 osoba sa stalnom denticijom i osobinama idealne okluzije, pri čemu pol i etnička pripadnost uzorka nisu jasno naznačeni.³² Boltonova analiza diskrepance intermaksilarnih odnosa zuba bazira se na merenjima meziodistalnih promera stalnih zuba. Kada se zbir širina 12 donjih stalnih zuba (od prvog molara jedne do prvog molara druge strane zubnog niza) podeli zbirom širina 12 gornjih zuba dobija se vrednost nazvana ukupni Boltonov indeks od $91,3\% \pm 0,26$.

Kada se zbir šest donjih prednjih zuba (od očnjaka jedne do očnjaka druge strane zubnog niza) podeli sa zbirom širina šest gornjih prednjih zuba dobija se vrednost prednjeg Boltonovog indeksa od $77,2\% \pm 0,22$.

Samo sa korektnim odnosima veličine gornjih i donjih zuba (u opsegu datom Boltonovim standardima) može se postići dobra interkuspidacija, pravilna dubina preklopa i incizalni stepenik.

Cilj rada

Cilj ove studije bio je da se odredi polni dimorfizam intermaksilarnih odnosa veličine zuba (prednji i ukupni indeks po Boltonu) kod osoba sa malokluzijom III klase i stalnom denticijom i da se našim ispitivanjem dobijene

A prerequisite for good occlusion is that teeth should be proportional in their size.³⁻⁷ Disharmony in tooth size between the maxillary and mandibular tooth arches is often the cause for disharmonious occlusal relationships.

Tooth size is of inherent character,⁸⁻¹² although there may be seen some studies that encourage the attitude that local etiological factors are essential.¹³⁻¹⁴

The connection between tooth size and sexes has been confirmed in researches conducted by many authors and the results of those researches show that males have bigger teeth than females.¹⁵⁻²¹ The connection between tooth size and ethnic affiliation has also been confirmed^{3,15,20,22-25} while the opinions are divided about the tooth size in case of some orthodontic anomalies. Tooth size differences are found among the different kinds of malocclusion.^{15,26-29} There are also different attitudes that assert that there is no influence of tooth size on occurrence of orthodontic anomalies.^{5,30,31}

The existence of interarch disharmony in tooth size is determined by the values set in 1952. by W. Bolton who carried out his research on study models of fifty five patients with permanent dentition and with characteristics of ideal occlusion while the sex and ethnic affiliation of the sample patient are not clearly designated³². Bolton's analysis of interarch tooth relation discrepancy is based on the measurements of the mesiodistal width of permanent teeth. When the sum of the widths of twelve permanent lower teeth (from the first molar on one side to the first molar on another side of teeth string) is divided by the sum of the widths of twelve upper teeth, we get the value so-called the overall Bolton ratio of $91,3\% \pm 0,26$.

When the sum of six front lower teeth (from the canine on one side to the canine on another side of teeth arch) is divided by the sum of the widths of six front upper teeth, we get the value so-called the anterior Bolton ratio of $77,2\% \pm 0,22$.

Only with the correct relationships between the size of upper and lower teeth (in scope given by Bolton ratios), good intercuspidation, regular depth of overbite and overjet may be achieved.

Aim of work

The aim of this study was to determine gender dimorphism of the interarch tooth size relationships (the anterior and overall Bolton ra-

vrednosti intermaksilarnih odnosa uporede sa standardnim vrednostima.

Materijal i metod

Ispitivanje je sprovedeno na Klinici za stomatologiju u Nišu, na Odeljenju za ortopediju vilica. Ispitivanjem je obuhvaćena ukupno 41 osoba sa stalnom denticijom, uzrasta od 18 do 25 godina, sa teritorije Niša i okoline. Ispitanici koji su zadovoljili određene kriterijume (prisustvo potpuno izniklih zuba stalne denticije od prvog molara jedne do prvog molara druge strane zubnog niza, odsustvo meziodistalne ili okluzalne abrazije, karijesnih lezija, plombi II klase, odsustvo protetskih ili kompozitnih nadoknada, odsustvo anomalija oblika, strukture i razvoja zuba) klinički su obrađeni, uzeti su im precizni otisci na osnovu kojih su urađeni studijski modeli.

Meren je meziodistalni promer zuba od prvog stalnog molara jedne do prvog stalnog molara druge strane, od mezijalne kontaktne tačke do distalne kontaktne tačke u najvećoj interproksimalnoj razdaljini, pri čemu se tanki kraci mernog instrumenta postavljaju paralelno sa uzdužnom osovinom zuba u predelu kontaktnih tačaka.

Merenja su izvršena digitalnim nonijusom (Mitutoyo, Tokyo, Japan) sa preciznošću od 0,01mm. Sva premeravanja izvršena su od strane jednog ispitivača. Greška premeravanja određena je ponovljenim merenjem deset modela odabranih metodom slučajnog uzorka i merenih deset dana posle prvog merenja od strane istog ispitivača. Analiza greške određena je Wilcoxon statističkim testom. Rezultati nisu pokazali postojanje signifikantnih razlika između dva premeravanja.

Na osnovu dobijenih vrednosti određeni su ukupni i prednji Bolton indeks prema postojećim formulama:

Ukupni Bolton indeks (%) = mandibularni zbir MD 12 /maksilarni zbir MD 12 x 100.

Prednji Bolton indeks (%) = mandibularni zbir MD 6 frontalnih zuba /maksilarni zbir MD 6 frontalnih zuba x 100.

Podaci dobijeni ispitivanjem obrađeni su kompjuterski, primenom MS Excel 2003. Korišćeni su sledeći statistički parametri: prosečna vrednost (X), standardna devijacija (SD), koeficijent korelacije (Cv), raspon minimalnih i maksimalnih vrednosti. Razlike

tios) for persons with class III malocclusion and with permanent dentition, but also the aim was to compare the values of interarch relationships that we got with standard values.

Materials and Methods

The research is carried out at the Clinic of Stomatology, Nis, Department of Jaw Orthopedics. The total number of people included in this research is forty one persons with permanent dentition, at the age between eighteen and twenty five, from Nis and the surrounding area. The examinees who satisfied the certain criteria (the presence of completely sprouted teeth of permanent dentition from the first molar on one side to the first molar on another side of teeth arch, the absence of mesiodistal or occlusal abrasion, caries lesions, class II fillings, the absence of prosthetic or composite substitutes, the absence of shape, structure and dental development anomalies) were clinically prepared, they were taken their toothprints on which basis study models were made.

The mesiodistal width of teeth was measured from the first permanent molar on one side to the first permanent molar on another side, from the mesial contact point to the distal contact point in the largest interproximal distance whereupon the thin legs of a measuring instrument were placed parallel to the vertical tooth axle at the area of contact points.

The measurements were performed using a digital nonius (Mitutoyo, Tokyo, Japan) 0,01mm of accuracy. All measurements were performed by one researcher. Measurement error was determined by repeated measurement of ten models, chosen by the method of accidental sample and measured ten days after the first measurement had been taken by the same researcher. An analysis of error was determined by the Wilcoxon statistic test. In results, there were no signs of significant differences between the two measurements. The overall and anterior Bolton ratios were determined on basis of the values we had got and according to the current formulas :

Overall Bolton ratio (OBR)(%)= mandibular sum MD 12/maxillary sum MD 12x 100.

Anterior Bolton ratio (ABR)(%)= mandibular sum MD of the 6 frontal teeth/maxillary sum MD of the 6 frontal teeth x 100.

između polova i između našeg uzorka i Boltonovih standarda testirane su t- testom. Dobijene vrednosti za meziodistalni promer zuba desne i leve strane ne pokazuju statistički značajne razlike tako da su prosečne vrednosti između polulukova korišćene u statističkim analizama.

Rezultati

Prosečna vrednost meziodistalnog promera gornjih centralnih sekutića kod osoba muškog pola iznosi 8,74 mm, a kod osoba ženskog pola 8,63 mm (tab.1). Postojeća razlika za gornje centralne sekutiće nije na nivou statističke značajnosti.

Prosečna vrednost meziodistalnog promera gornjih lateralnih sekutića kod osoba muškog pola iznosi 6,68 mm, a kod osoba ženskog pola 6,60 mm (tab.1). Postojeća razlika za gornje lateralne sekutiće nije na nivou statističke značajnosti.

Prosečna vrednost meziodistalnog promera gornjih očnjaka kod osoba muškog pola iznosi 7,93 mm, a kod osoba ženskog pola 7,69 mm (tab.1). Postojeća razlika nije statistički značajna.

Prosečna vrednost meziodistalnog promera gornjih prvih premolara kod osoba muškog pola iznosi 6,88 mm, a kod osoba ženskog pola 6,75 mm (tab.1). Postojeća razlika za prve premolare nije na nivou statističke značajnosti.

Prosečna vrednost meziodistalnog promera gornjih drugih premolara kod osoba muškog pola iznosi 6,76 mm, a kod osoba ženskog pola 6,50 mm (tab.1). Postojeća razlika nije na nivou statističke značajnosti.

Prosečna vrednost meziodistalnog promera gornjih prvih molara kod osoba muškog pola iznosi 9,96 mm, a kod osoba ženskog pola 9,94 mm (tab.1). Postojeća razlika nije na nivou statističke značajnosti.

Prosečna vrednost meziodistalnog promera donjih centralnih sekutića kod osoba muškog pola iznosi 5,60 mm, a kod osoba ženskog pola 5,51 mm (tab.2). Postojeća razlika za donje centralne sekutiće nije na nivou statističke značajnosti.

Prosečna vrednost meziodistalnog promera donjih lateralnih sekutića kod osoba muškog pola iznosi 6,07 mm, a kod osoba ženskog pola 6,09 mm (tab.2). Postojeća razlika za donje lateralne sekutiće nije na nivou statističke značajnosti.

The data we had got through the research were computing processed by MS Excel 2003. The following statistic parameters were used : average value (X), standard deviation (SD), coefficient of correlation (Cv), the range of minimal and maximal values.

The differences between sexes and between our sample and Bolton standards were tested by t-test. The values got for mesiodistal width of teeth on the right and left side did not prove any statistically significant differences so that the average values between half arches were used in statistical analyses.

Results

The average value of the mesiodistal width of the upper central incisors in males is 8,74 mm but in females 8,63 mm (table 1). The current difference for the upper central incisors does not reach the level of statistical significance.

The average value of the mesiodistal width of the upper lateral incisors in males is 6,68 mm but in females 6,60mm (table 1). The current difference for the upper lateral incisors does not reach the level of statistical significance.

The average value of the mesiodistal width of the upper canines in males is 7,93 mm but in females 7,69 mm (table 1). The current difference does not reach the level of statistical significance.

The average value of the mesiodistal width of the upper first premolars in males is 6,88 mm but in females 6,75 mm (table 1). The current difference for the first premolars does not reach the level of statistical significance.

The average value of the mesiodistal width of the upper second premolars in males is 6,76 mm but in females 6,50 mm (table 1). The current difference does not reach the level of statistical significance.

The average value of the mesiodistal width of the upper first molars in males is 9,96 mm but in females 9,94 mm (table 1). The current difference does not reach the level of statistical significance.

The average value of the mesiodistal width of the lower central incisors in males is 5,60 mm but in females 5,51 (table 2). The current difference for the lower central incisors does not reach the level of statistical significance.

Tabela 1. Polne razlike meziodistalnog promera zuba gornje vilice kod osoba sa malokluzijom III klase
Table 1. Gender differences of mesiodistal width of maxillar teeth in subjects with class III malocclusion

Zub Tooth	Gender/Pol	n	X	SD	Cv	Min	Max	t-test	p
I1	Male/muški	21	8,74	0,39	5,87	5,86	7,43		
	Female/ženski	20	8,63	0,42	6,31	5,86	7,29	0,6277	0,5210
I2	Male/muški	21	6,68	0,55	6,40	7,60	9,56		
	Female/ženski	20	6,60	0,57	6,55	7,30	9,74	0,6426	0,5372
C	Male/muški	21	7,93	0,47	5,90	6,72	8,78		
	Female/ženski	20	7,69	0,36	4,69	7,20	8,55	1,8776	0,0679
P1	Male/muški	21	6,88	0,20	2,95	6,55	7,40		
	Female/ženski	20	6,75	0,45	6,59	5,89	7,33	1,1769	0,2464
P2	Male/muški	21	6,50	0,21	3,28	6,25	7,08		
	Female/ženski	20	6,76	0,71	10,57	6,10	9,46	1,6271	0,1118
M1	Male/muški	21	9,94	0,77	7,73	8,84	11,58		
	Female/ženski	20	9,96	0,51	5,17	8,84	10,76	0,1017	0,9195

Prosečna vrednost meziodistalnog promera donjih očajnika kod osoba muškog pola iznosi 6,95 mm, a kod osoba ženskog pola 6,71 mm (tab.2). Postojeća razlika je statistički značajna (t- test 3,38; $p < 0,01$).

Prosečna vrednost meziodistalnog promera donjih prvih premolara kod osoba muškog pola iznosi 7,13 mm, a kod osoba ženskog pola 6,96 mm

The average value of the mesiodistal width of the lower lateral incisors in males is 6,07 mm but in females 6,09 mm (table 2). The current difference for the lower lateral incisors does not reach the level of statistical significance.

The average value of the mesiodistal width of the lower canines in males is 6,95 mm but in females 6,71 mm (table 2). The current differ-

Tabela 2. Polne razlike meziodistalnog promera zuba donje vilice kod osoba sa malokluzijom III klase
Table 2. Gender differences of mesiodistal width of mandibular teeth in subjects with class III malocclusion

Zub Tooth	Gender/Pol	n	X	SD	Cv	Min	Max	t-test	p
I1	Male/muški	21	5,60	0,21	3,70	5,18	5,87		
	Female/ženski	20	5,51	0,24	4,35	5,08	5,78	1,23	0,2276
I2	Male/muški	21	6,07	0,37	6,04	5,43	6,73		
	Female/ženski	20	6,09	0,29	4,79	5,60	6,64	0,17	0,8621
C	Male/muški	21	6,95	0,24	3,48	6,49	7,25		
	Female/ženski	20	6,71	0,21	3,16	6,37	7,20	3,38	**0,0016
P1	Male/muški	21	7,13	0,21	2,95	6,88	7,73		
	Female/ženski	20	6,96	0,50	7,19	5,92	7,69	1,41	0,1660
P2	Male/muški	21	6,93	0,46	6,64	6,25	7,80		
	Female/ženski	20	6,82	0,23	3,41	6,44	7,21	0,93	0,3593
M1	muški	21	10,71	0,63	5,86	9,40	11,91		
	Female/ženski	20	10,54	0,43	4,07	9,32	11,15	0,97	0,3397

(tab.2). Postojeća razlika za prve premolare nije na nivou statističke značajnosti.

Prosečna vrednost meziodistalnog promera donjih drugih premolara kod osoba muškog pola iznosi 6,93 mm, a kod osoba ženskog pola 6,82 mm (tab.2). Postojeća razlika nije na nivou statističke značajnosti.

Prosečna vrednost meziodistalnog promera donjih prvih molara kod osoba muškog pola iznosi 10,71 mm, a kod osoba ženskog pola 10,54 mm (tab.2). Postojeća razlika nije na nivou statističke značajnosti.

Prosečna vrednost prednjeg Boltonovog indeksa u našem ispitivanju kod osoba muškog pola iznosi 80,25 sa standardnom devijacijom 4,07 (tab.3). Prosečna vrednost prednjeg Boltonovog indeksa kod osoba ženskog pola iznosi 79,61 sa standardnom devijacijom 2,81 (tab.3).

Prosečne vrednosti za prednji Boltonov indeks ne pokazuju polni dimorfizam (t-test 0,588) (tab.5).

Prosečna vrednost ukupnog Boltonovog indeksa kod osoba muškog pola iznosi 93,29 sa standardnom devijacijom 3,41 (tab.4). Prosečna vrednost ukupnog Boltonovog indeksa kod osoba ženskog pola iznosi 91,76 sa standardnom devijacijom 2,01 (tab.4).

ence is of statistical significance (t- test 3,38; $p < 0,01$).

The average value of the mesiodistal width of the lower first premolars in males is 7,13 mm but in females 6,96 mm (table 2). The current difference for the first premolars is not of statistical significance.

The average value of the mesiodistal width of the lower second premolars in males is 6,93 mm but in females 6,82 mm (table 2). The current difference does not reach the level of statistical significance.

The average value of the mesiodistal width of the lower first molars in males is 10,71 mm but in females 10,54 mm (table 2). The current difference does not reach the level of statistical significance.

In our research, the average value of ABR in males is 80,25 with standard deviation of 4,07 (table 3). The average value of ABR in females is 79,61 with standard deviation of 2,81 (table 3).

The average values of ABR do not indicate gender dimorphism (t-test 0,588) (table 5).

The average value of OBR in males is 93,29 with standard deviation of 3,41 (table 4).

The average value of OBR in females is 91,76 with standard deviation of 2,01 (table 4). The average values of OBR also do

Tabela 3. Upoređene vrednosti prednjeg Boltonovog indeksa sa našim nalazima kod osoba sa malokluzijom III klase

Table 3. Comparison of anterior Bolton ratio values our in subjects with Class III malocclusion

Gender/Pol		n	X	SD	Cv	Min	Max	t-test	p
Male Muški	Our findings Naši rezultati	21	80,25	4,07	5,07	74,69	93,59		
	Bolton	55	77,20	1,65	2,14	74,50	80,40	4,686	***0,0000
Female Ženski	Our findings Naši rezultati	20	79,61	2,81	3,53	75,66	85,52		
	Bolton	55	77,20	1,65	2,14	74,50	80,40	4,570	***0,0000

Tabela 4. Upoređene vrednosti ukupnog Boltonovog indeksa sa našim nalazima kod osoba sa malokluzijom III klase

Table 4. Comparison of overall Bolton ratio values with our findings in subjects with Class III malocclusion

Gender/Pol		n	X	SD	Cv	Min	Max	t-test	p
Male Muški	Our findings Naši rezultati	21	93,29	3,41	3,65	87,13	103,84		
	Bolton	55	91,30	1,91	2,09	87,50	95,80	3,225	**0,0019
Female Ženski	Our findings Naši rezultati	20	91,76	2,01	2,19	86,94	95,53		
	Bolton	55	91,30	1,91	2,09	87,50	95,80	0,913	0,3642

Prosečne vrednosti ukupnog Boltonovog indeksa takođe ne pokazuju razlike između polova (t-test 1,740) (tab.6).

Prosečne vrednosti prednjeg Boltonovog indeksa kod naših ispitanika oba pola značajno su veće od vrednosti Boltonovih standarda koje iznose $77,20 \pm 1,65$. Razlika je na nivou $p < 0,001$ (tab.3).

Prosečne vrednosti ukupnog Boltonovog indeksa kod naših ispitanika muškog pola razlikuju se statistički od vrednosti Boltonovih standarda koje iznose $91,30 \pm 1,91$; (t-test 3,22; $p < 0,01$) (tab.4). Kod osoba ženskog pola prosečna vrednost je takođe veća u odnosu na standardne vrednosti ali ne na nivou statističke značajnosti.

Rezultati izvršenog istraživanja pokazuju širok raspon od najnižih do najviših vrednosti intermaksilarnih odnosa veličine zuba. Uprkos tome, važno je naglasiti da je u našem uzorku

not indicate differences between sexes (t-test 1,740) (table 6).

The average values of ABR in our examinees of both sexes are significantly higher than the values of the Bolton standards which are $77,20 \pm 1,65$.The difference is at the level of $p < 0,001$ (table 3).

The average values of OBR in our male examinees differ statistically from the values of the Bolton standards which are $91,30 \pm 1,91$; (t-test 3,22; $p < 0,01$)(table 4). In females, the average value is also higher in relation to standard values but it does not reach the level of statistical significance.

The results of the research indicate the wide range from the lowest to the highest values of interarch relationships of tooth size. Despite this, it is important to emphasize that about three quarters of the examinees in our research were within the scope of ± 1 SD.

Tabela 5. Polne razlike vrednosti prednjeg Boltonovog indeksa kod osoba sa malokluzijom III klase

Table 5. Gender differences of anterior Bolton ratio in subjects with class III malocclusion

Gender Pol	n	X	SD	Cv	Min	Max	t-test	p
Male Muški	21	80,25	4,07	5,07	74,69	93,59		
Female Ženski	20	79,61	2,81	3,53	75,66	85,52	0,588	0,5598

Tabela 6. Polne razlike vrednosti ukupnog Boltonovog indeksa kod osoba sa malokluzijom III klase

Table 6. Gender differences of overall Bolton ratio in subjects with class III malocclusion

Gender Pol	n	X	SD	Cv	Min	Max	t-test	p
Male Muški	21	93,29	3,41	3,65	87,13	103,84		
Female Ženski	20	91,76	2,01	2,19	86,94	95,53	1,740	0,0897

Tabela 7. Broj ispitanika u okviru ± 1 SD i ± 2 SD kod osoba sa malokluzijom III klase

Table 7. Number of examinees within the scope of ± 1 SD ± 2 SD in subjects with Class III malocclusion

Anterior Bolton Ratio Prednji Boltonov index		Anterior Bolton Ratio Ukupni Boltonov index	
X \pm SD	X \pm SD	31	X \pm SD
75,65-84,25	76,46-83,42	75,61%	89,66-95,43
X \pm 2SD	X \pm 2SD	40	X \pm 2SD
71,35-88,55	72,97-86,90	97,56%	86,78-98,31

oko tri četvrtine ispitanika bilo u okviru ± 1 SD. U okviru ± 2 SD nalazi se preko 90% ispitanika (tab.7).

Diskusija

Preduslov za dobru okluziju jeste postojanje ravnoteže u veličini zuba gornje i donje vilice.

Postoji veliki broj radova koji potvrđuju da je veličina zuba genetski determinisana,⁸⁻¹² iako određeni autori, pored nasledne komponente, navode i spoljašnje uticaje lokalnih etioloških faktora.^{13,14}

Brojna ispitivanja pokazala su da osobe muškog pola imaju krupnije zube od osoba ženskog pola.¹⁵⁻²¹

Opisane su velike razlike u veličini zuba kod osoba različite etničke pripadnosti.^{3,15,20, 22-25}

Osobe crne rase imaju veće zube nego osobe bele rase^{3,22,23} dok je kod osoba žute rase veličina zuba nešto manja nego kod pripadnika bele rase.¹⁹ Kod određivanja odnosa veličine zuba moraju se uzeti u obzir i etničke varijacije.^{15,33,34}

Kada je u pitanju veličina zuba kod različitih ortodontskih anomalija postoje podeljena mišljenja. Lavelle,¹⁵ Sperry,²⁶ Nie i Lin,²⁸ Araujo Souki²⁹ nalaze da osobe sa malokluzijom III klase imaju veće zube u donjoj vilici i da su prednji i ukupni Boltonov indeks značajno veći kod osoba sa ovom ortodontskom anomalijom. Ispitivanja Sperry²⁶ i Ta Ta²⁵ pokazuju da osobe sa malokluzijom II klase imaju krupnije zube u gornjoj vilici i smanjene vrednosti Boltonovih odnosa.

Ispitivanja Crosby i Alexander-a⁵ kao i Alkofide i Hashim-a³¹ pokazala su da ne postoje značajne razlike za diskrepancu veličine zuba kod osoba sa različitim ortodontskim anomalijama.

Rezultati našeg ispitivanja sprovedenog na osobama sa malokluzijom III klase, pokazuju da osobe muškog pola imaju veće zube od osoba ženskog pola, što se poklapa sa brojnim istraživanjima.¹⁵⁻²¹ Najizraženije razlike pokazuju donji očnjaci ($p < 0,01$). Do ovakvih rezultata, došli su u svojim istraživanjima i Doris,³⁵ Adeymita¹⁸ i Bishara.²

Analiza diskrepance veličine zuba gornje i donje vilice predstavljena prednjim i ukupnim Boltonovim indeksom pokazala je da su prosečne vrednosti slične kod naših ispitanika oba pola (prednji Boltonov indeks 79,06 kod osoba muškog pola, 79,52 kod osoba ženskog

There are over ninety percent of the examinees within the scope of ± 2 SD (table 7).

Discussion

A prerequisite for good occlusion is the balance between the upper and lower tooth size.

There are many studies that confirm that tooth size is genetically determined⁸⁻¹² although, beside the inherent component, some authors cite the outer influence of local etiological factors.^{13,14}

In a number of researches it has been indicated that males usually have larger teeth than females.¹⁵⁻²¹

The great differences in tooth size in persons of different ethnic affiliation have been described.^{3, 15, 20, 22-25}

Persons of black race have larger teeth than persons of white race,^{3,22,23} while the tooth size of yellow race people is a little smaller than the tooth size of white race people.¹⁹ In determination of the relationships between tooth sizes, ethnic variations must be taken into consideration.^{15,33,34}

The opinions are divided when it comes to tooth size in different orthodontic anomalies.

Lavelle,¹⁵ Sperry,²⁶ Nie and Lin,²⁸ Araujo Souki²⁹ find that people with class III malocclusion have bigger teeth on the lower jaw and that the anterior and overall Bolton ratios are significantly higher in people with this orthodontic anomaly. The researches by Sperry²⁶ and Ta Ta²⁵ show that people with class II malocclusion have bigger teeth on the upper jaw but also have reduced values of the Bolton ratios. The researches by Crosby and Alexander⁵ as well as Alkofid and Hashim³¹ have shown that there were no significant differences for tooth size discrepancy in people with various orthodontic anomaly. The results of our research carried out on people with class III malocclusion show that males have bigger teeth than females, which coincides with numerous researches.¹⁵⁻²¹ The most expressive differences have been found in the lower canines ($p < 0,01$). In their researches, Doris,³⁵ Adeymit¹⁸ and Bishara² came to these same results that the most expressive gender differences are exactly in these teeth.

The analysis of tooth size discrepancy of the upper and lower jaw represented by the anterior and overall Bolton ratios, has shown that the average values of our examinees of both sexes are similar (ABR in males is 79,06 ; in females

pola; ukupni Boltonov indeks 91,55 kod osoba muškog pola, 91,26 kod osoba ženskog pola). Ovi rezultati ukazuju na nepostojanje polnog dimorfizma za prednji i ukupni Boltonov indeks. Rezultati našeg ispitivanja poklapaju se sa nalazima prethodnih ispitivača koji takođe ne nalaze polni dimorfizam u vrednostima Boltonovih odnosa,^{3,5,20,34,36,37} mada ima i drugačijih rezultata.²³

Prosečna vrednost prednjeg Boltonovog indeksa dobijena našim ispitivanjem kako za muški tako i za ženski pol, značajno je veća od vrednosti koja je data originalnim istraživanjem autora i poklapa se sa rezultatima prethodnih autora.^{6,7,24, 31} Dobijene razlike mogu se objasniti etničkim karakteristikama.^{3,15,20,22-25} Treba uzeti u obzir i velike varijacije u morfologiji a naročito u širini gornjih lateralnih sekutića koji direktno utiču na vrednosti prednjeg Boltonovog indeksa.^{28,38,39}

Prosečne vrednosti ukupnog Boltonovog odnosa kod naših ispitanika ženskog pola ne pokazuju razlike u odnosu na vrednosti dobijene u originalnom istraživanju ovog autora, što se poklapa sa nalazima drugih autora^{24,31,38} dok vrednosti kod osoba muškog pola pokazuju značajno veće vrednosti u odnosu na standardne vrednosti.

Rezultati ovog ispitivanja pokazali su veliki raspon od niskih do visokih vrednosti oba Boltonova indeksa u poređenju sa Boltonovim normama. Freeman i sar.,⁴ Crosby i Alexander⁵ takođe prikazuju slično odstupanje (veće od dve standardne devijacije) u odnosu na postojeće vrednosti. Ovakvi rezultati jesu posledica različitosti ispitivanog uzorka jer su originalne Boltonove norme izračunate na osnovu ispitivanja 55 osoba sa osobinama idealne okluzije pri čemu nam podaci o broju ispitanika muškog i ženskog pola kao i etnička pripadnost osoba iz ovog ispitivanja nisu poznati.

Zaključak

Na osnovu dobijenih rezultata mogu se izvući sledeći zaključci:

1. osobe muškog pola sa malokluzijom III klase odlikuju se krupnijim zubima od osoba ženskog pola, pri čemu su najizraženije razlike u veličini donjih očnjaka,
2. prosečne vrednosti prednjeg i ukupnog Boltonovog indeksa ne pokazuju statistički značajne razlike između polova,

is 79,52) (OBR in males is 91,55 ; in females is 91,26). These results point to non-existence of gender dimorphism for the anterior and overall Bolton ratios. The results of our research coincide with the results of the preceding researchers which also do not find gender dimorphism for the values of the Bolton ratios,^{3,5,20,34,36,37} although there are some different results.²³

The average value of the anterior Bolton ratio for males as well as for females, obtained through our research, is significantly higher than the value obtained by the original research of the author and coincides with the results by the preceding authors.^{6,7,24,31} The obtained differences may be explained by ethnic characteristics.^{3,15,20,22-25} Wide variations in morphology and especially in the widths of the upper lateral incisors which directly affect the values of the anterior Bolton ratio, should be taken into consideration.^{28,38,39}

The average values of the overall Bolton ratio in our female examinees do not indicate any differences in relation to the values obtained through the original research by this author, which coincides with the data obtained by the other authors^{24,31,38} while the values in males are significantly higher than standard values.

In comparison with the Bolton standards, the results of this research have shown a wide range of the values of both Bolton ratios, from low to high values. Freeman et al.,⁴ Crosby and Alexander⁵ also present the similar deviation (higher than two standard deviations) in relation to existing values. This kind of results are the consequence of the diversity of the examined sample because the original Bolton standards have been calculated on the basis of the research of fifty five persons with ideal occlusion while the data of the number of male and female examinees as well as the ethnic affiliation of the people included in this research, remain unknown.

Conclusion

On the basis of the obtained results, we may conclude:

1. Males with Class III malocclusion are characterized by bigger teeth than in females, while the most expressive differences are in the size of the lower canines.
2. The average values of the anterior and overall Bolton ratios do not show sex differences of statistical significance.

3. prosečne vrednosti prednjeg Boltonovog indeksa kod osoba oba pola statistički su značajno veće od vrednosti Boltonovih standardnih vrednosti,
4. prosečne vrednosti ukupnog Boltonovog indeksa kod osoba muškog pola statistički su značajno veće od vrednosti Boltonovih standardnih vrednosti,
5. prosečne vrednosti ukupnog Boltonovog odnosa kod osoba ženskog pola bliske su vrednostima Boltonovih standardnih vrednosti.

Obavljeno ispitivanje potvrđuje neophodnost primene Boltonove analize intermaksilarnih odnosa veličine zuba pre početka ortodontske terapije jer predstavlja dobru dijagnostičku i prognostičku metodu.

Dobijeni rezultati upućuju na potrebu daljih i opsežnijih ispitivanja ove problematike kojoj na našim prostorima do sada nije pridavana veća pažnja.

3. The average values of the anterior Bolton ratio in both sexes are significantly statistically higher than the Bolton standard values.
4. The average values of the overall Bolton ratio in males are significantly statistically higher than the Bolton standard values.
5. The average values of the overall Bolton ratio in females are close to the Bolton standard values.

The research done confirms the necessity of applying the Bolton analysis of interarch tooth size before the beginning of orthodontic therapy, because it presents a good diagnostic and prognostic method.

The obtained results point to the necessity of the further and larger research of these problems which have not been paid much attention in our region till now.

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