

## ŠIRINA ZUBNIH LUKOVA KOD MALOKLUZIJE III KLASE

### ARCH WIDTHS IN CLASS III MALOCCLUSION

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#### Apstrakt

*Uvod:* Malokluzija III klase je ortodontska anomalija nastala kao posledica prerazvijenosti mandibule u svim pravcima u kombinaciji sa dobro razvijenom ili nerazvijenom maksilom.

*Cilj ovog ispitivanja je bio da se uporede transverzalne dimenzije zubnih lukova kod osoba sa malokluzijom III klase i osoba sa normalnom okluzijom. Materijal.* Ispitivanjem je obuhvaćeno 50 osoba sa malokluzijom III klase i 50 osoba sa normalnom okluzijom, uzrasta od 17 do 20 godina. Merene su transverzalne dimenzije zubnih lukova u predelu vrha očnjaka, premolara i molara. Razlike između ispitivanih grupa testirane su t - testom. Rezultati. Ispitivanje je pokazalo da osobe sa malokluzijom III klase imaju manje vrednosti širine maksilarnog zubnog niza i veće vrednosti širine mandibularnog zubnog niza u odnosu na osobe sa normalnom okluzijom. *Zaključak.* Osobe sa malokluzijom III klase se odlikuju značajno užim maksilarnim zubnim lukom u odnosu na osobe sa normalnom okluzijom što ukazuje da je u tretmanu malokluzije III klase često neophodna ekspanzija maksilarnog luka.

*Ključne reči:* Malokluzija, zubni lukovi, ortodontska anomalija.

#### Abstract.

**Background:** Class III malocclusion is result of development of mandible and undevelopment of maxilla.

*The aim of this study was to compare the transverse dimensions of the dental arches of Class III groups with a group of untreated normal occlusion subjects. Methods.* This study was performed using measurements of dental casts of 50 Class III malocclusion and 50 normal occlusion, ages 17-20. Inter canine, inter premolars and inter molars widths measurements were taken. Independent samples t-test was applied for comparing the groups. **Results.** All maxillary dental arch widths were significantly narrower in Class III group, except inter canine width for woman. Mandibular dental arch widths were larger in Class III group.

**Key words:** Malocclusion, dental arches orthodontic anomaly.

#### Uvod

Malokluzija III klase je ortodontska anomalija koja nastaje kombinacijom nepravilnosti zuba, vilica i kranijalne baze. U osnovi ova malokluzija je posledica nerazvijenosti maksile i prerazvijenosti mandibule.<sup>1</sup> Naslednog je karaktera pa se različiti varijeteti pojavljuju u istim familijama u zavisnosti od ekspresivnosti gena<sup>2,3</sup>, iako ima stavova da kombinacija genetskih i negenetskih faktora dovodi do fenotipske izraženosti malokluzije III klase.<sup>4,6</sup>

Pored karakterističnog izgleda lica i specifične kraniofacijalne morfologije pacijente sa ovom anomalijom odlikuju i određene den-

#### Introduction

Class III malocclusion is an orthodontic anomaly that arises as a result of the combination of teeth, jaw and cranial base abnormalities. The etiology of malocclusion is mostly based on maxillary underdevelopment and mandibular overdevelopment.<sup>1</sup> Although there are some opinions that the combination of genetic and non-genetic factors may result in the phenotypic expression of class III malocclusion,<sup>2,3</sup> the anomaly is hereditary and different varieties can be present in the same families depending on gene expression.<sup>4,6</sup>

Apart from characteristic facial appearance and specific craniofacial morphology, patients

toalveolarne karakteristike. Odnos bočnih zuba je u polutrećoj ili punoj trećoj klasi sa pozitivnim incizalnim stepenikom različite izraženosti (do 1 cm). Donji bočni zubi su upadljivo lingvalno inklinirani tako da spoljašna površina bazalnog dela mandibule pravi veći luk od zubnog niza, što zajedno sa retroinklinacijom donjih i proinklinacijom gornjih inciziva doprinosi ublažavanju kliničkih manifestacija anomalije (dentoalveolarna kompenzacija)<sup>4</sup>.

Veličina i oblik gornjeg i donjeg zubnog luka se moraju pažljivo sagledati u pogledu njihove transverzalne i sagitalne neusklađenosti, raspoloživog prostora za smeštaj zuba u zubni niz, estetike i stabilnosti denticije te su od velike važnosti u postavljanju ortodontske dijagnoze i donošenju plana tretmana.<sup>7</sup> Iz tih razloga su promene širine lukova tokom rasta kod osoba sa normalnom okluzijom i komparacija širine zubnih lukova kod osoba sa različitim okluzalnim odnosima intenzivno proučavani.<sup>8-13</sup>

Uysal i sar.<sup>13</sup> nalaze veće transverzalne dimenzije mandibularnog zubnog niza kod osoba sa malokluzijom III klase u predelu interkaninog i intermolarog rastojanja.

Braun i sar.<sup>14</sup> opisuju da je kod osoba sa malokluzijom III klase maksilarni zubni luk širi u odnosu na osobe sa normalnom okluzijom dok Herren i Jordi-Guilloud<sup>15</sup> nalaze da je maksilarni zubni niz nešto uži kod ispitanika sa malokluzijom III klase.

Cilj ovog ispitivanja je da se utvrdi postojanje razlike u širini zubnih lukova kod osoba sa malokluzijom III klase i osoba sa normalnom okluzijom.

## ***Materijal i metod***

Ispitivanje je obavljeno na odeljenju za Ortopediju vilica Klinike za stomatologiju u Nišu. Analizirano je ukupno 100 studijskih modela osoba sa stalnom denticijom, oba pola. Nakon kliničke analize pacijenata uzeti su im precizni otisci i zagrižaj u vosku u položaju centralne okluzije na osnovu kojih su urađeni studijski modeli.

Svi ispitanici su podeljeni u dve grupe. U prvoj grupi bilo je 50 osoba sa malokluzijom III klase (25 muškog i 25 ženskog pola) koje su izabrane na osnovu sledećih kriterijuma: od-

with class III malocclusion are also distinguished by certain dentoalveolar characteristics. The posterior teeth relationship is either in half class III or complete class III malocclusion with positive overjet at a different level of expression (up to 1 cm). The mandibular posterior teeth are lingually inclined, therefore, the outer side of mandibular base forms an arch larger than the dental arch width, which, associated with the retroinclination of mandibular incisors and proinclination of maxillary incisors, moderates the clinical manifestation of class III malocclusion (dentoalveolar compensation).<sup>4</sup>

The size and shape of the arches have considerable implications in orthodontic diagnosis and treatment planning, regarding their transverse and sagittal disharmony, the space available for teeth, dental aesthetics, and stability of dentition.<sup>7</sup> Researchers have studied the growth of arch widths in subjects with normal occlusion, but the comparison of arch widths in subjects with different occlusal relationships has also been the subject of their study.<sup>8-13</sup>

Uysal et al.<sup>13</sup> found the increased transverse widths for the mandibular arch in subjects with class III malocclusion in the region of intercanine and intermolar distances.

Braun et al.<sup>14</sup> described the wider maxillary arch in people with class III malocclusion in comparison to people with regular occlusion, whereas, Herren i Jordi-Guilloud<sup>15</sup> described the narrower maxillary arch in people with the anomaly.

The aim of our research was to define the difference in arch widths in between subjects with class III malocclusion and subjects with normal occlusion.

## ***Materials and methods***

The research was carried out at the Clinic of Stomatology, Nish, Department of Jaw Orthopedics.

We analysed the total number of 100 study models for permanent dentition. After the clinical analysis, precise teeth impressions and wax bites in centric occlusion were taken from the patients and the study models were made.

All the subjects were divided into two groups. The first group included 50 people with class III malocclusion (25 male and 25 female subjects). They were chosen according to the following criteria: the relationship between

nos bočnih zuba u III klasi, negativni incizalni stepenik, narušena facijalna estetika i bez prethodnog ortodontskog tretmana .

U drugoj grupi bilo je 50 osoba sa normalnom okluzijom (20 muškog i 30 ženskog pola) koje su izabrane na osnovu sledećih kriterijuma: odnos bočnih zuba u I klasi, bez većih nepravilnosti zubnih nizova, grupa zuba i pojedinih zuba i dobrom facijalnom estetikom.

Na studijskim modelima analizirane su transverzalne dimenzije gornjih i donjih zubnih lukova u predelu sledećih tačaka :

- vrhova očnjaka ( interkanino rastojanje C-C),
- vrhova bukalnih kvržica prvih premolara (interpremolarno rastojanje P1-P1),
- vrhova bukalnih kvržica drugih premolara (interpremolarno rastojanje P2-P2),
- vrhova bukomezijalnih kvržica prvih stalnih molara (intermolarno rastojanje M1-M1).

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.

Podaci dobijeni ispitivanjem obradjeni 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 između ispitivanih grupa testirane su t- testom.

## **Rezultati**

Upoređivanjem polnih razlika vrednosti transverzalnih dimenzija zubnih lukova osoba sa malokluzijom III klase i osoba sa normalnom okluzijom utvrđeno je postojanje statistički značajnih razlika, pa su razlike između grupa upoređivane posebno za osobe muškog a posebno za osobe ženskog pola.

Prosečne vrednosti širine maksilarnog zubnog niza osoba muškog pola manje su kod osoba sa malokluzijom III klase u odnosu na nor-

posterior teeth in class III, negative overjet, abnormal facial appearance, and no orthodontic treatment history.

The second group included 50 people with normal occlusion (20 male and 30 female subjects). They were chosen according to the following criteria: the relationship of posterior teeth in class I, no dental arch abnormalities, no abnormalities of teeth groups or a single tooth, and nice facial appearance. The study models were analysed for transverse widths of the upper and lower dental arch in these regions:

1. tips of canines (intercanine distance C-C),
2. tips of buccal papillae of the first premolars (intermolar distance P1-P2),
3. tips of buccal papillae of the second premolars (intermolar distance P2 - P2),and
4. tips of buccomesial papillae of the first permanent molars (intermolar distance M1-M2).

All 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 measurements 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.

The data we got through the research were processed by Ms Excel 2003. The following statistical parameters were used : average value (X), standard deviation (SD), coefficient of correlation (Cv), the range of minimal and maximal values. Differences between groups were tested by t-test.

## **Results**

Comparison of gender differences for the transverse widths of dental arches in subjects with class III malocclusion and subjects with normal occlusion confirmed statistically significant differences. Therefore, the differences between groups were compared separately by gender.

Compared to subjects with normal occlusion, the average values for the maxillary arch width were decreased in male patients with class

malnu okluziju, u svim ispitivanim promerima. Ne postoji statistički značajna razlika u predelu interkaninog rastojanja između ispitivanih grupa, dok je rastojanje između premolara i molara statistički značajno manje kod osoba sa malokluzijom III klase ( P1,  $p < 0,01$ ; P2,  $p < 0,05$ ; M1,  $p < 0,01$ ) (tab.1).

Prosečne vrednosti širine maksilarnog zubnog niza osoba ženskog pola takođe su manje kod osoba sa malokluzijom III klase u odnosu na normalnu okluziju, sa izuzetkom interkaninog rastojanja, ali nisu dobijene statistički značajne razlike (tab. 2).

III malocclusion, for all measurements. There was no statistically significant difference in the region of intercanine distance between groups. The distance between premolars and molars was significantly decreased in people with class III malocclusion ( P1,  $p < 0,01$ ; P2,  $p < 0,05$ ; M1,  $p < 0,01$ ) (Table 1).

Compared to subjects with normal occlusion, the average values for the maxillary arch width were also decreased in female subjects with class III malocclusion, except for intercanine distance, but no statistically significant differences were found (Table 2).

*Tabela 1. Razlike širine maksilarnog zubnog niza kod osoba muškog pola sa malokluzijom III klase i normalnom okluzijom*

*Table 1. Differences in maxillary widths between male subjects with class III malocclusion and male subjects with normal occlusion*

	Tip okl.	N	x	SD	Cv	min-max	t-test
C-C	III	25	33,67	2,71	8,05	29,62-39,00	1,81
	I	20	34,95	1,75	5,01	32,40-39,00	
P1-P1	III	25	40,08	3,61	9,00	34,31-48,00	3,12
	I	20	42,90	2,02	4,71	39,40-46,50	
P2-P2	III	25	45,48	4,13	9,07	38,64-52,79	1,95
	I	20	47,70	2,99	6,26	39,80-52,30	
M1-M1	III	25	49,98	4,53	9,06	42,12-60,00	2,93
	I	20	53,32	2,58	4,84	45,6-56,70	

*Tabela 2. Razlike širine maksilarnog zubnog niza kod osoba ženskog pola sa malokluzijom III klase i normalne okluzije*

*Table 2. Differences in maxillary widths between female subjects with class III malocclusion and female subjects with normal occlusion*

	Tip okl.	N	x	SD	Cv	min-max	t-test
C-C	III	25	32,95	2,3	6,97	29,57-38,97	0,89
	I	30	32,45	1,72	5,30	22,80-28,10	
P1-P1	III	25	38,90	3,26	8,38	32,42-45,98	1,48
	I	30	39,99	1,96	4,89	33,80-42,80	
P2-P2	III	25	44,19	4,49	10,17	35,54-51,04	1,24
	I	30	45,33	1,80	3,98	41,50-50,30	
M1-M1	III	25	48,89	4,76	9,74	39,95-60,33	1,30
	I	30	50,70	2,05	4,04	46,50-56,00	

Prosečne vrednosti širine mandibularnog zubnog niza u svim ispitivanim promerima kod osoba muškog pola sa malokluzijom III klase veće su u odnosu na normalnu okluziju ali nisu dobijene statistički značajne razlike (tab.3).

Prosečne vrednosti širine mandibularnog zubnog niza kod osoba ženskog pola sa malokluzijom III klase veće su u svim ispitivanim promerima u odnosu na normalnu okluziju. Jedina statistički značajna razlika nadjena je u predelu interkaninog rastojanja (C-C,  $p < 0,01$ ) (tab 4).

Compared to subjects with normal occlusion, the average values for the mandibular arch width were increased in male subjects with class III malocclusion for all measurements, although no statistically significant differences were found (Table 3).

Compared to normal occlusion, the average values for the mandibular arch width were increased in female subjects with class III malocclusion, for all measurements. A single statistically significant difference was found in the region of intercanine distance (C-C,  $p < 0,01$ ) (Table 4).

*Tabela 3. Razlike širine mandibularnog zubnog niza kod osoba muškog pola sa malokluzijom III klase i normalnom okluzijom*

*Table 3. Differences in mandibular widths between male subjects with class III malocclusion and male subjects with normal occlusion*

	Tip okl.	N	<b>x</b>	<b>SD</b>	<b>Cv</b>	<b>min-max</b>	<b>t-test</b>
C-C	III	25	26,70	1,06	3,98	24,94-28,50	0,3
	I	20	26,60	1,20	4,51	23,80-29,10	
P1-P1	III	25	35,03	3,21	9,22	31,30-37,90	0,22
	I	20	34,86	1,64	4,69	28,90-40,79	
P2-P2	III	25	40,69	2,57	6,31	35,40-46,62	0,37
	I	20	40,44	1,89	4,68	36,60-44,20	
M1-M1	III	25	45,94	2,90	6,36	41,20-49,20	0,51
	I	20	45,55	2,03	4,41	39,23-49,78	

*Tabela 4. Razlike širine mandibularnog zubnog niza kod osoba ženskog pola sa malokluzijom III klase i normalnom okluzijom*

*Table 4. Differences in mandibular widths between female subjects with class III malocclusion and female subjects with normal occlusion*

	<b>Tip okl.</b>	<b>N</b>	<b>x</b>	<b>SD</b>	<b>Cv</b>	<b>min-max</b>	<b>t-test</b>
C-C	III	25	25,62	2,14	8,34	21,23-31,71	2,04
	I	30	24,70	1,10	5,28	22,80-28,10	
P1-P1	III	25	32,43	2,81	8,68	27,90-38,03	0,16
	I	30	32,33	1,57	4,87	30,20-36,00	
P2-P2	III	25	38,55	3,10	8,04	33,32-45,75	0,44
	I	30	38,23	2,07	5,41	35,20-43,20	
M1-M1	III	25	44,33	2,96	6,69	37,95-48,98	0,88
	I	30	43,70	2,12	4,84	40,20-48,70	

## Diskusija

Poznavanje dimenzija zubnih lukova u humanoj populaciji je važno za kliničare ortodonte, protetičare, oralne hirurge, antropologe<sup>17</sup>.

Transverzalne dimenzije zubnih lukova u predelu interkaninog i intermolarog rastojanja ne menjaju se posle trinaeste godine kod osoba ženskog pola, odnosno šesnaeste godine života kod osoba muškog pola<sup>18-21</sup>.

Imajući u vidu ove podatke, za naše ispitivanje smo odabrali pacijente starosti od 17 do 20 godina, smatrajući da su kod ovih osoba zubni lukovi dostigli kompletnu transverzalnu razvijenost.

U literaturi ima malo ispitivanja koja razmatraju transverzalne dimenzije zubnih lukova kod osoba sa malokluzijom III klase.<sup>13,14,16</sup> Ovo ispitivanje je preduzeto sa ciljem poredjenja transverzalnih dimenzija dentalnih lukova osoba sa malokluzijom III klase i normalnom okluzijom, što pored ostalih parametara može biti od posebnog značaja pri postavljanju dijagnoze i određivanju plana terapije.

Naši nalazi su pokazali da se osobe muškog pola sa malokluzijom III klase u komparaciji sa normalnom okluzijom odlikuju manjim transverzalnim dimenzijama maksilarnog zubnog luka u svim ispitivanim promerima, sa postojanjem statistički značajne razlike u predelu prvih i drugih premolara i prvih stalnih molara. Kod osoba ženskog pola rastojanje između očnjaka je nešto veće kod malokluzije III klase, što se može tumačiti vestibularnijim položajem maksilarnih očnjaka usled nedostatka prostora za njihov smeštaj. U ostalim ispitivanim promerima širina maksilarnog zubnog niza je manja kod osoba sa malokluzijom III klase bez postojanja statističke značajnosti.

Naši nalazi se poklapaju sa nalazima Uysal i sar.<sup>13</sup>, Herren i Jordi-Guilloud<sup>15</sup> i Kuntz i sar.<sup>16</sup> koji takođe nalaze manju transverzalnu razvijenost maksilarnog zubnog niza kod osoba sa malokluzijom III klase. Drugi autori pak nalaze da je kod osoba sa malokluzijom III klase maksilarni zubni luk širi u odnosu na osobe sa normalnom okluzijom (Braun i sar.).<sup>14</sup> Oni objašnjavaju ovaj iznenadjujući rezultat postojanjem skeletne anteroposteriorne diskrepance, odnosno činjenicom da je kod malokluzije III klase mandibularni luk u celini isturen u odnosu na maksilu.

## Discussion

Having a good knowledge of maxillary and mandibular dental arch widths in human population is very important for clinical orthodontists, prosthetists, oral surgeons and anthropologists.<sup>17</sup>

The transverse widths of dental arches in the regions of intercanine and intermolar distances do not change after age 13 in females, that is, after age 16 in males.<sup>18-21</sup>

The subjects included in our research were chosen on the basis of these previous studies. The subjects were from 17 to 20 years old, therefore, we assumed that the arches of the subjects studied were fully transversely developed.

There have been few studies on transverse widths of dental arches in people with class III malocclusion.<sup>13,14,16</sup> Our research was to compare the transverse widths of dental arches in people with class III malocclusion to the widths in people with normal occlusion which, along with other parameters, may be crucial for diagnosis and therapy planning.

Our results indicate that, in comparison to normal occlusion, the transversal width of the maxillary arch is lower for all measurements in male subjects with class III malocclusion. There is a statistically significant difference in the region of the first and second premolars and the first permanent molars. The intercanine distance is increased in female subjects with class III malocclusion, which can be the result of vestibularly positioned canine teeth caused by insufficient space in the arch. For all the other measurements, the maxillary arch width is decreased in male subjects with class III malocclusion, with no statistically significant difference.

Our results coincide with the results obtained by Uysal et al.<sup>13</sup>, Herren i Jordi-Guilloud<sup>15</sup> and Kuntz et al.<sup>16</sup> who have also found the transverse underdevelopment of the maxillary arch in male subjects with class III malocclusion. Some authors have found that, in comparison to normal occlusion, the maxillary width is increased in people with class III malocclusion (Braun et al.).<sup>14</sup> They explained this surprising result by frequently referring to the anteroposterior skeletal discrepancy and the fact that the mandibular arch is advanced relative to the maxillary arch.

Širina mandibularnog zubnog niza kod naših ispitanika sa malokluzijom III klase pokazuje veće vrednosti u svim ispitivanim promerima u odnosu na normalnu okluziju. Jedina statistička značajnost je prisutna u nivou interkaninog rastojanja kod osoba ženskog pola, što se poklapa sa nalazima Uysal i sar.<sup>13</sup>, koji takodje nalaze veće transverzalne dimenzije mandibularnog zubnog niza ali u svim ispitivanim promerima, kod osoba sa malokluzijom III klase.

Vrednosti širine donjeg zubnog niza kod osoba sa malokluzijom III klase su veće nego kod normalne okluzije i razlike se povećavaju od očnjaka prema prvim stalnim molarima. Moguće objašnjenje za veće vrednosti širine donjeg zubnog luka po nekim autorima leži u većoj meziodistalnoj širini donjih zuba ( Sperry i sar<sup>22</sup>, Lavelle<sup>23</sup>, Nie i Lin<sup>24</sup>, Hnat i sar<sup>25</sup>, Filipović<sup>26</sup> ).

Logično bi bilo očekivati veće vrednosti transverzalnih dimenzija mandibularnog zubnog luka kod osoba sa malokluzijom III klase zbog prerazvijenosti donje vilice. Postojanje lingvalne inklinacije donjih bočnih zuba u sklopu kompenzatornog mehanizma koji se javlja kod malokluzije III klase utiče na smanjenje transverzalnih dimenzija donjeg zubnog niza kod osoba sa ovom anomalijom. Naši nalazi o postojanju nešto većih vrednosti ali bez statističke značajnosti u predelu interkaninog, interpremolarog i intermolarog rastojanja kod osoba sa malokluzijom III klase, potvrđuju postojanje ovog mehanizma.

## **Zaključak**

Na osnovu dobijenih rezultata mogu se izvući sledeći zaključci:

širina maksilarnog zubnog luka manja je kod osoba sa malokluzijom III klase oba pola u svim ispitivanim promerima u odnosu na normalnu okluziju sa izuzetkom interkaninog rastojanja kod osoba ženskog pola;

širina mandibularnog zubnog luka veća je kod osoba sa malokluzijom III klase, kod oba pola, u svim ispitivanim promerima u odnosu na normalnu okluziju.

U procesu postavljanja ortodontske dijagnoze i lečenja ove kompleksne nepravilnosti potrebno je uzeti u obzir i specifične dentoalveolarne karakteristike ove malokluzije.

Compared to normal occlusion, the mandible width in subjects with class III malocclusion is increased for all measurements. A statistical significance is present only in the region of intercanine distance in female subjects, which coincides with the results obtained by Uysal et al.<sup>13</sup> Their findings indicate the increased transverse mandibular width in subjects with class III malocclusion, for all measurements.

Compared to normal occlusion, the mandibular widths are increased in subjects with class III malocclusion, and the differences are increasing from the canines to the first permanent molars. Some authors consider the increased mesiodistal width of the mandibular arch contributing to the increased mandibular width (Sperry et al.<sup>22</sup>, Lavelle<sup>23</sup>, Nie i Lin<sup>24</sup>, Hnat et al.<sup>25</sup>, Filipović<sup>26</sup>).

Therefore, we can expect the increased transverse width of the mandibular arch in people with class III malocclusion, as a result of overdeveloped mandible. Lingual inclination within a compensatory mechanism present in class III malocclusion decreases the transverse mandibular width in people with the anomaly. Our result confirm the increased widths with no statistically significant differences in the regions of intercanine, interpremolar and intermolar distances in people with class III malocclusion. Therefore, the results suggest the presence of a compensatory mechanism.

## **Conclusion**

According to the results, we conclude:

1. Compared to normal occlusion, the maxillary width is decreased in both male and female subjects with class III malocclusion for all measurements, with the exception of intercanine distance in females

2. Compared to normal occlusion, the mandibular width is increased in both male and female subjects with class III malocclusion for all measurements

3. Class III malocclusion is a complex anomaly with specific dentoalveolar characteristics that need to be carefully considered in orthodontic diagnosis and treatment.

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