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Morphometric Measurements of Mesiodistal Width of Mandibular Canines and Intercanine Width and Their Significance in Gender Differentiation

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Abstract

Background: Teeth, the strongest tissue in the human body, are important in gender identification. When postmortem records are few, then the measurement of teeth may give accurate differentiation between males and females. This study aimed to acquire odontometric data from the young population in the southeastern part of Kosovo and get insight into using that data for gender identification.

Methods and Results: This cross-sectional study involved 100 subjects (50 men and 50 women) aged between 12 and 18, selected from schools in southeastern Kosovo. The parameters used for this study design were the mesiodistal width (MDW) of lower canines and the distance between them – intercanine width (ICW). A pre-examination study card with dental history was compiled for each subject. Odontometric measurements were taken with a digital Vernier caliper on clear plaster models of the lower jaw. The anthropometric study revealed that the left mandibular canine was larger than the right mandibular canine in both female and male subjects, and the mandibular canines were significantly larger in males than females. The left mandibular canine showed greater gender dimorphism than the right mandibular canine in the mesiodistal diameter. The ICW did not show any sexual dimorphism.

Conclusion: For gender identification purposes, this study provides essential information regarding odontometric measurements on the Albanian population of southeastern Kosovo.**(International Journal of Biomedicine. 2024;14(4):696-699.)**

Keywords: odontometry • sexual dimorphism • teeth • forensic odontology

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Abbreviations

ICW, intercanine width; **MDW**, mesiodistal width; **MC**, mandibular canine.

Introduction

Personal identification is an important and challenging task in forensic science. Many methods are employed for identification. The most commonly used techniques are DNA comparison and fingerprints. DNA comparison is very costly and can only be accomplished by some. Fingerprints, sometimes in burns, cannot be used because of severe decomposition.[1-3]

Sometimes, it is necessary to implement cost-effective methods, like odontometric measurements. Canines show greater resistance to pathological alteration and trauma.[4] Canines, among all teeth, are considered "key teeth" and have shown the greatest sexual dimorphism. Moreover, canines are the least affected by caries, periodontal disease, abrasion from brushing, and occlusal loading. These attributes make them reliable to exhibit the greatest sexual dimorphism.[5,6] The notable difference between canines in determining sex has been found to be due to the influence of the Y chromosome. On the other hand, the X-linked genetic influence on tooth width was relatively uniform for all teeth.[7] Several studies have shown that the MDW of canines in males was higher than in females.[8-10]

This study aimed to acquire odontometric data from the young population in the southeastern part of Kosovo and get insight into using that data for gender identification.

Materials and Methods

This cross-sectional study involved 100 subjects (50 men and 50 women) aged between 12 and 18, selected from schools in southeastern Kosovo. Two investigators collected the data. The parameters used for this study design were the mesiodistal width (MDW) of lower canines and the distance between them – intercanine width (ICW). A pre-examination study card with dental history was compiled for each subject. Odontometric measurements were taken with a digital Vernier caliper (0-150 mm) on clear plaster models of the lower jaw (Figures 1 and 2).

Fig. 1. *Measurement of MC width.*

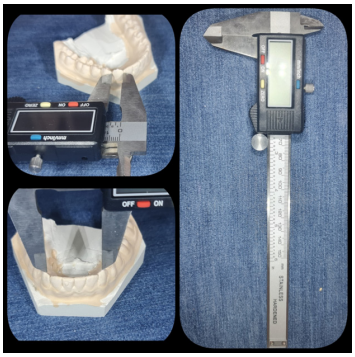


Fig. 2. *Odontometric measurements with Vernier caliper.*

Sample inclusion criteria: healthy subjects, caries-free teeth (both MCs), fully erupted canines.

Sample exclusion criteria: subjects with carious teeth, periodontopathic teeth, herpetic lesions of lips, and plaster models not well prepared.

Statistical analysis was performed using the statistical software package SPSS version 23.0 (SPSS Inc, Armonk, NY: IBM Corp). Baseline characteristics were summarized as frequencies and percentages for categorical variables and mean ± standard deviation (SD), minimum (Min), maximum (Max), and range for continuous variables. The Mann-Whitney U Test was used to compare the differences between the two independent groups. Sexual dimorphism for MDW was calculated with the following formula: Percentage (%) of sexual dimorphism = [(Xm/Xf)-1] ×100%, where Xm = mean male tooth dimension, Xf = mean female tooth dimension. A probability value of $P<0.05$ was considered statistically significant in all cases.

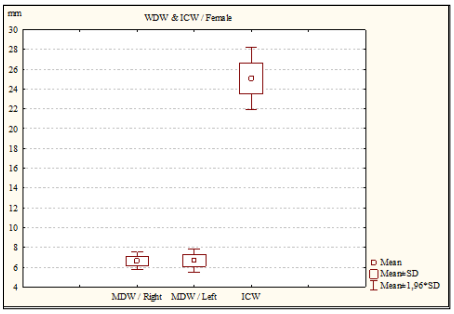
Results

In female subjects, the MDW of the left mandibular canine (MC) (6.68 ± 0.59 mm) was insignificantly larger than the MDW of the right MC (6.62 ± 0.46 mm) (P=0.89) (Table 1, Graph 1, Table 2). The mandibular ICW was 25.07 ± 1.59 mm (Table 2).

Table 1.

The mandibular canine MDW and ICW in female subjects.

Variable	Valid n	Mean	CI -95.00%	CI +95.00%	Min	Max	Range	SD
MDW/Right	50	6.62	6.49	6.76	6.00	7.90	1.90	0.46
MDW/Left	50	6.68	6.51	6.85	6.00	8.00	2.00	0.59
ICW	50	25.07	24.62	25.52	21.00	28.00	7.00	1.59



Graph 1.

Table 2.

The mandibular canine MDW / Female / Right & Left.

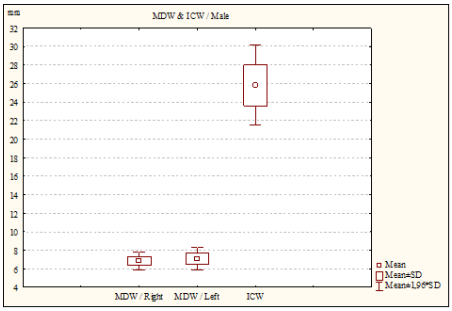
Variable	Rank Sum Right	Rank Sum Left	U	Z adjusted	*P*-level	Valid n	Valid n
MDW / Right & Left	2506.00	2544.00	1231.00	-0.13	0.89	50	50

In male subjects, the MDW of the left MC (7.07 ± 0.62 mm) was insignificantly larger than the MDW of the right MC (6.86 ± 0.48 mm) (P=0.06) (Table 3, Graph 2, Table 4). The mandibular ICW was 25.80 ± 2.20 mm (Table 3).

Table 3.

The mandibular canine MDW and ICW in male subjects.

Variable	Valid n	Mean	CI -95.00%	CI +95.00%	Min	Max	Range	SD
MDW/Right	50	6.86	6.72	6.99	5.80	8.00	2.20	0.48
MDW/Left	50	7.07	6.89	7.24	6.00	8.90	2.90	0.62
ICW	50	25.80	25.18	26.43	21.00	30.00	9.00	2.20



Graph 2.

Table 4.

The mandibular canine MDW / Male / Right & Left.

Variable	Rank Sum Right	Rank Sum Left	U	Z adjusted	*P*-level	Valid n	Valid n
MDW / Right & Left	2260.50	2789.50	985.50	-1.88	0.06	50	50

The MDW of the right MC and, to a greater extent, the left MC in the male subjects was significantly larger than in the female subjects (P=0.006 and P=0.0008) (Tables 5 and 6). The mandibular ICW in males was insignificantly larger than in females (P=0.11) (Table 7).

Table 5.

The mandibular canine MDW / Right / Female & Male

Variable	Rank Sum Female	Rank Sum Male	U	Z adjusted	*P*-level	Valid n	Valid n
MDW / Right	2137.00	2913.00	862.00	-2.75	0.006	50	50

Table 6.

The mandibular canine MDW / Left / Female & Male

Variable	Rank Sum Female	Rank Sum Male	U	Z adjusted	*P*-level	Valid n	Valid n
MDW / Left	2045.50	3004.50	770.50	-3.35	0.0008	50	50

Table 7.

The mandibular ICW / Female & Male

Variable	Rank Sum Female	Rank Sum Male	U	Z adjusted	P-level	Valid n	Valid n
ICW	2294.50	2755.50	1019.50	-1.59	0.11	50	50

Discussion

As part of the masticatory apparatus, teeth are the strongest tissue in the human body, the most stable and durable, even at high temperatures. Of all teeth, canines show the greatest resistance to pathological changes and trauma, and they are the least affected by caries and periodontal disease. Canines showed the greatest sexual dimorphism, so these attributes make them reliable in evaluating sexual dimorphism.[11]

Teeth are calcified structures. Even when human bodies are damaged beyond recognition, and their bodies have undergone decomposition, teeth may serve as good material to identify them because their structure is resistant to trauma, pathological alteration, and high temperature.[7]

The measurements of crown diameters serve as a good tool for gender identification.[12,13] Several studies have shown that female teeth are smaller in every dimension than males. We found that the right and left MCs were significantly larger in males than in females. In the current study, we calculated sexual dimorphism and found it to be 3.62% and 5.83% in the MDW of the right and left MCs, respectively. Therefore we concluded that the left MC exhibits greater sexual dimorphism than the right MC in the mesiodistal parameter. Similar results were presented by Kapila et al.,[14] Ayoub et al.,[9] and Rajarathnam et al.,[7] who stated that left MCs are more sexually dimorphic than the right MCs. On the contrary, Khaitan et al.[15] found that the right MC displayed greater sexual dimorphism. Also, Shrestha et al.,[16] in a sample of the Nepalese population, found that the left MC showed lower sexual dimorphism than the right one.

We found that the mean value of mandibular ICW in the male subjects was insignificantly larger than that in the female subjects. On the contrary, studies performed by Alanazi et al.,[17] Kaeswaren and Weinheimer,[18] Syed et al.,[19] Awwad,[20] and Gandhi et al.[21] concluded that the mean ICW was statistically significantly less in female subjects than in male subjects.

In conclusion, for gender identification purposes, this study provided essential information regarding odontometric measurements on the Albanian population of southeastern Kosovo. The left MC was larger than the right MC in both female and male subjects, and the MCs were significantly larger in males than females. The ICW did not show any sexual dimorphism. Therefore, this study concludes that the left MC shows greater gender dimorphism than the right MC in the mesiodistal diameter.

Ethical Considerations

Ethical approval for this study was obtained from the Ethical Committees of the Faculty of Dentistry of Ss. Cyril and Methodius University in Skopje (Nr 02-150115) and the Dental Chamber of Kosovo, Republic of Kosovo (N#19). All participants provided written informed consent.

Competing Interests

The author declares no competing interests.

References

1. Gandikota C, Venkata YP, Challa P, Juvvadi SR, Mathur A. Comparative study of palatal rugae pattern in class II

div 1 and class I individuals. J Pharm Bioallied Sci. 2012 Aug;4(Suppl 2):S358-63. doi: 10.4103/0975-7406.100271. PMID: 23066290; PMCID: PMC3467934.
2. Maheswari TNU, Gnanasundaram N. Role of Lip prints in Personal Identification and criminalization. Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology [serial online], 2011;12(1) (January - June 2011)
3. Caldas IM, Magalhães T, Afonso A. Establishing identity using cheiloscopy and palatoscopy. Forensic Sci Int. 2007 Jan 5;165(1):1-9. doi: 10.1016/j.forsciint.2006.04.010. Epub 2006 May 24. PMID: 16725290.
4. Alanazi AA, Almutair AM, Alhubayshi A, Almalki A, Naqvi ZA, Alassaf A, Almulhim B, Alghamdi SA, Mallineni SK. Morphometric Analysis of Permanent Canines: Preliminary Findings on Odontometric Sex Dimorphism. Int J Environ Res Public Health. 2022 Feb 13;19(4):2109. doi: 10.3390/ijerph19042109. PMID: 35206303.
5. Kapila R, Nagesh KS, R Iyengar A, Mehkri S. Sexual dimorphism in human mandibular canines: a radiomorphometric study in South Indian population. J Dent Res Dent Clin Dent Prospects. 2011 Spring;5(2):51-4. doi: 10.5681/joddd.2011.011. Epub 2011 Jun 14. PMID: 23019509; PMCID: PMC3429995.
6. Patel RA, Chaudhary AR, Dudhia BB, Macwan ZS, Patel PS, Jani YV. Mandibular canine index: A study for gender determination in Gandhinagar population. J Forensic Dent Sci. 2017 Sep-Dec;9(3):135-143. doi: 10.4103/jfo.jfds_64_16. PMID: 29657490; PMCID: PMC5887636.
7. Rajarathnam BN, David MP, Indira AP. Mandibular canine dimensions as an aid in gender estimation. J Forensic Dent Sci. 2016 May-Aug;8(2):83-9. doi: 10.4103/0975-1475.186364. PMID: 27555724; PMCID: PMC4970419.
8. Srivastava PC. Correlation of odontometric measures in sex determination. Journal of Indian Academy of Forensic Medicine. 2010;32(1):56-61.
9. Ayoub F, Shamseddine L, Rifai M, Cassia A, Diab R, Zaarour I, Saadeh M, Rouhana G. Mandibular canine dimorphism in establishing sex identity in the lebanese population. Int J Dent. 2014;2014:235204. doi: 10.1155/2014/235204. Epub 2014 Feb 10. PMID: 24672548; PMCID: PMC3941160.
10. Kumawat RM, Dindgire SL, Gadhari M, Khobragade PG, Kadoo PS, Yadav P. Mandibular canine: A tool for sex identification in forensic odontology. J Forensic Dent Sci. 2017 May-Aug;9(2):109. doi: 10.4103/jfo.jfds_41_16. PMID: 29263620; PMCID: PMC5717770.
11. Angadi PV, Hemani S, Prabhu S, Acharya AB. Analyses of odontometric sexual dimorphism and sex assessment accuracy on a large sample. J Forensic Leg Med. 2013 Aug;20(6):673-7. doi: 10.1016/j.jflm.2013.03.040. Epub 2013 Apr 28. PMID: 23910859.
12. Grewal DS, Khangura RK, Sircar K, Tyagi KK, Kaur G, David S. Morphometric Analysis of Odontometric Parameters for Gender Determination. J Clin Diagn Res. 2017 Aug;11(8):ZC09-ZC13. doi: 10.7860/JCDR/2017/26680.10341. Epub 2017 Aug 1. PMID: 28969265; PMCID: PMC5620906.
13. Rani ST. Applicability of odontometric dimensions and indices in sexual dimorphism among Nalgonda population. J Forensic Dent Sci. 2017 Sep-Dec;9(3):175. doi: 10.4103/jfo.jfds_42_16. PMID: 29657496; PMCID: PMC5887642.
14. Kapila R, Nagesh KS, R Iyengar A, Mehkri S. Sexual dimorphism in human mandibular canines: a radiomorphometric study in South Indian population. J Dent Res Dent Clin Dent Prospects. 2011 Spring;5(2):51-4. doi: 10.5681/joddd.2011.011. Epub 2011 Jun 14. PMID: 23019509; PMCID: PMC3429995.
15. Khaitan T, Ramaswamy P, Sudhakar S, Smitha B, Uday G. Role of mandibular canines in establishment of gender. Egyptian Journal of Forensic Sciences. 2014;4(3):71-74.
16. Shrestha S, Shakya R, MEHTA DK, SHRESTHA S. Estimation of sex using mandibular canine index in a young Nepalese population. Anatomy. 2019;13(3):163-167.
17. Alanazi AA, Almutair AM, Alhubayshi A, Almalki A, Naqvi ZA, Alassaf A, Almulhim B, Alghamdi SA, Mallineni SK. Morphometric Analysis of Permanent Canines: Preliminary Findings on Odontometric Sex Dimorphism. Int J Environ Res Public Health. 2022 Feb 13;19(4):2109. doi: 10.3390/ijerph19042109. PMID: 35206303; PMCID: PMC8871690.
18. Kaeswaren Y, Weinheimer AZ. The use of mandibular and maxillary canine teeth in establishing sexual dimorphism in the Malaysian population of selangor. J Forensic Sci & Criminal Inves. 2019;11(3).
19. Syed MA, Selarka B, Tarsariya V. Sexual dimorphism in permanent maxillary and mandibular canines and intermolar arch width: Endemic study. Journal of Indian Academy of Oral Medicine and Radiology. 2015;27(3):405.
20. Awwad RA. Gender Dimorphism of Canines in a Sample of Egyptian Population. Advanced Dental Journal. 2020;2(3):151-161.
21. Gandhi N, Jain S, Kahlon H, Singh A, Gambhir RS, Gaur A. Significance of mandibular canine index in sexual dimorphism and aid in personal identification in forensic odontology. J Forensic Dent Sci. 2017 May-Aug;9(2):56-60. doi: 10.4103/jfo.jfds_15_16. PMID: 29263608; PMCID: PMC5717773.

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