

Sexual Dimorphism Of Mandibular Canine Among Chennai Population - An Observational Study.

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ABSTRACT:

BACKGROUND: Behavioral and structural changes between genders from the same species is known as sexual dimorphism. Gender determination has important implications in forensic science. Canine is one of the strongest teeth present in the human dentition as they are larger compared to other teeth in the oral cavity.

AIM: To assess the sexual dimorphism of left mandibular canine among chennai population.

MATERIALS AND METHODS: The study included a sample of 40 mandibular casts between the age group of 18-25 years. The mesiodistal width of the left mandibular canine was measured by using a digital caliper. The recorded results were statistically analyzed using independent T-test to assess the gender differentiation.

RESULT: The mesiodistal width of left mandibular canine was more in males (mean=6.43±0.93) compared to that of females (mean=6.30±0.61). The p-value was found to be 0.119 (<0.05).

CONCLUSION: Measurement of mesiodistal width of the mandibular canine might be for gender determination. This will provide a vital role in forensic identification of individuals.

KEYWORDS: Sexual dimorphism, mandibular canine, forensic odontology, teeth, mesiodistal width, innovative technology, novel method

INTRODUCTION:

Not all species living in this world are similar in shape, size and also may not have the same function, mode of living etc. it will vary species to species and organism to organism. Behavioral and structural changes between two genders of the same species is termed as sexual dimorphism (1). Often sexual dimorphism is very much important and plays a vital role in forensic science. Forensic odontology deals with the investigation of an organism's tooth.(2)

Forensic odontology deals with proper handling, examination, and evaluation of dental evidence, which will be presented before the justice. The forensic evidence that may be derived from the teeth will allow us to find the age (in children) and identification of the person to whom the teeth may belong to. Knowledge of forensic odontology requires a number of disciplines, since the dental records obtained can identify an individual and also can afford the information needed by the authorities to establish identification in a case.(3).

Teeth(enamel) being the hardest tissue often are resistant to quick decomposition after the body is discovered after a mass destruction or excavated during a crime scene. This plays a vital role in identification of postmortem changes like tissue injury (3,4).Forensic odontology deals with, Diagnostic evaluation of injuries to jaw, teeth or soft tissues, Identification of individuals (gender) from mass disaster or a crime scene,examination and evaluation of bite marks or assaults.(2).

Mandibular canine is one of the strongest teeth present in the oral cavity due to its thick structure(5)]. Eruption of the mandibular canine will be around 9 years of age during the development of the child. Canines being located in the corners of the mouth, have long and single roots with single and a pointy cusp in the oral cavity(6) .Studies on Gender dimorphism of mandibular canine are scarce in the Chennai population. The Aim of the study was to investigate the accuracy of mesiodistal width of left mandibular canine in gender determination.

MATERIALS AND METHODS:

A cross sectional hospital based study was conducted among the chennai population. The casts were selected from the department of Oral Pathology from saveetha dental college and hospitals-chennai. The casts were selected within the 18-25 years age group as the attrition will be minimal during this age group. Casts with all fully erupted teeth, no spacing, periodontally healthy teeth, non carious and non attrited teeth, diastema or crowding and subjects with no clinical evidence of any restoration, orthodontic treatment, and trauma were selected. The exclusion criteria for selection of

study sample were the presence of partially erupted teeth and patients with occlusal abnormalities and teeth showing physiologic or pathologic wear and tear and patients with deleterious oral habits. Mesiodistal width of the left mandibular permanent canine was measured using a digital vernier caliper and recorded in an excel spreadsheet. The statistical analysis was performed to assess the gender difference using Independent T-test in SPSS software (version-23) and significance was considered when p value was <0.05 .

RESULT:

The study included a sample size of 40 casts consisting of 20 male casts and 20 female casts. The mean difference of mesiodistal width of left mandibular canine was higher in males (mean= 6.43 ± 0.93 mm) as compared to females (mean= 6.31 ± 0.61 mm) (Fig 1). But the results obtained showed no significance with a p value of 0.119 (significance= $p < 0.05$).

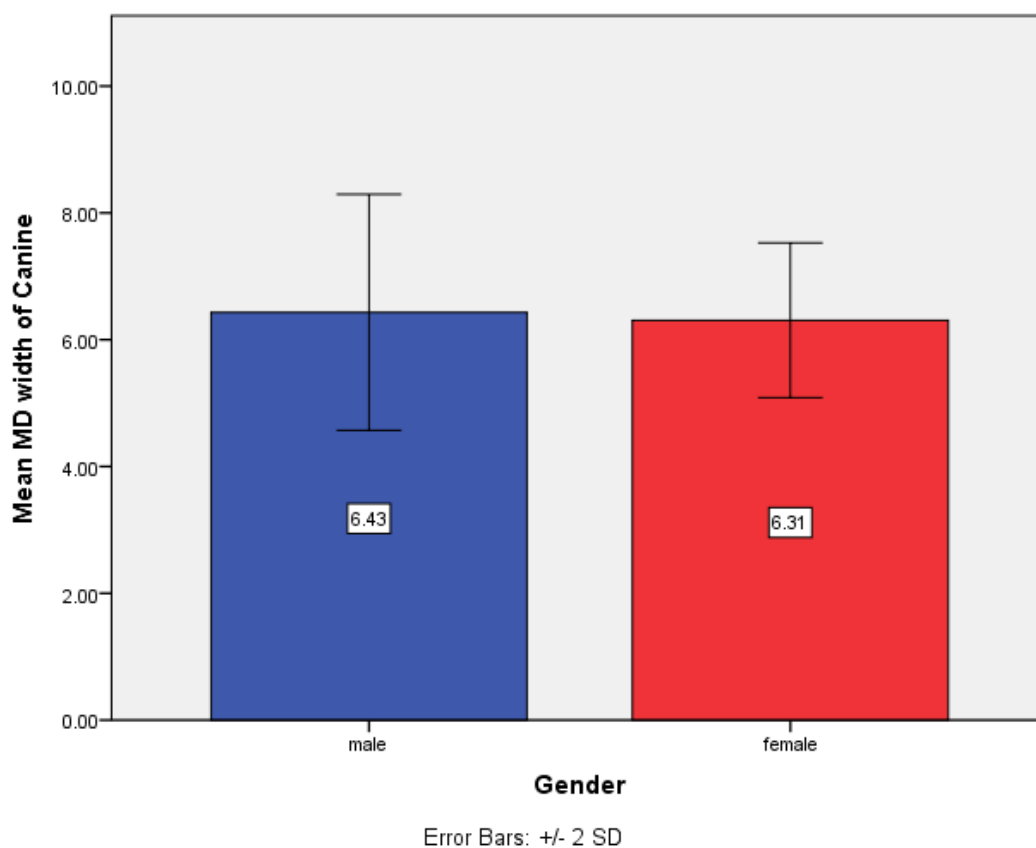


Figure 1:- The bar graph represents the association between the gender and the mean width of the left mandibular canine. The X axis represents the gender and the Y axis represents the mean mesiodistal width of the permanent left mandibular canine. Blue represents the mean width of male and the red represents the mean width of the female . The mean mesiodistal of the left maxillary

canine of males is 6.43 mm and females is 6.31mm. Independent t-test for equality of means shows p value of 0.119 (p value >0.05) Hence ,it is statistically not significant.

DISCUSSION:

It is the dentist who identifies and accumulates, correlates, and evaluates the biomechanical information and assesses the selection of artificial teeth so that it will meet the esthetic and functional needs of the patient (7). Variation is an important characteristic feature of an individual when it comes to appearance (8) . The tooth size standards based on odontometric investigations or forensic investigations can be used in determining age and gender of an individual.

The mandibular canines are least exposed to plaque, calculus, heavy occlusal loading, abrasion from brushing, periodontal disease and one of the last teeth to be extracted with respect to age (9). Canines are also more likely to survive severe trauma such as air disasters and hurricanes. All these findings indicate that the mandibular canines might be considered as a key tooth for the purpose of personal identifications(10) . Convincingly, the canines in the mandible can be easily available, as the mandible is the strongest bone in the human body and persists in a well-preserved state longer than any other bone, Hence this method of using mandibular canine dimensions are advantageous as it is easy, rapid, and cost-effective, requires no elaborate apparatus, and is suited for situations where large a number of samples has to be brought in and analyzed for gender estimation. In the present study the values of mesiodistal width were observed to be significantly greater in males with a mean value of 6.43mm and with a standard deviation of 0.930 and for females the mean value obtained was 6.31mm with a standard deviation of 0.610. The mandibular canine shows the greatest dimorphism in most human beings (11), In the present study it showed that the size of female canine were significantly larger than that of male canine and showed dimorphism which was opposite to the study conducted on primates (12) (13) another study which supports is which stated that teeth with highest dimorphism were canine, and varies from organism to organism depending on their geographical origin.

Factors which can affect the size and dimorphism of a tooth also depend on proper maintenance of the teeth and also the nutrition taken by the patient (14). Results obtained in the present study may be different compared to other studies because of very less sample size. The casts were collected only from Chennai population and will not be enough and requires a wide range of samples to come to a clear conclusion to determine gender dimorphism, proper conclusion will be obtained if both the canines of left and right are measured unlike this study (only the left canine) hence for this study the mesiodistal width of female were more as compared to that of males.

Future scope as there are less studies conducted in chennai population on the topic of sexual dimorphism it will be useful for forensic investigation and less time consuming for identification and examination of the specimens. In the present generation forensic odontology is considered to be a specialized and the most reliable method for the identification of a deceased patient, particularly when the patient has multiple fatality incidents. Although this reputation has been gained from the application of forensic odontology in both individual identification as well as in disaster situations over the past years(15). Therefore, the success of forensic odontology may be achieved totally only if all the dental specialists or all the dental institutions maintain a proper record of their own patients with proper documentations such as name, age, gender, number of teeth present in the patient, filled teeth, dentures, and other restorations, morphological variations of teeth and mucosa with photographs and radiographs. All these records will help the experts to identify the deceased patient and criminals by comparing them with the postmortem records prepared by examining deceased individuals during investigations, in homicide or a mass disaster. Proper conclusion may be obtained if the measurements of both left and right permanent mandibular canine were taken. Our team has extensive knowledge and research experience that has translated into high quality publications.

(16),(17),(18),(19),(20),(21),(22),(23),(24),(25),(26),(27),(28),(29),(30),(31),(32),(33),(34),(35)

CONCLUSION:

In the present study the values of mesiodistal width were greater in females when compared to males. Further studies with larger sample size should be done to generalize the results. These odontometric records will assist the forensic odontologists for gender determination.

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AUTHORS CONTRIBUTION:

N.Vishal Prakasam - Literature search , data collection, analysis, manuscript drafting.

Dr. Reshma Poothakulath Krishnan - Data verification , manuscript drafting.

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REFERENCES:

1. Kotian S. Sexual Dimorphism-An Odontometric Approach [Internet]. Vol. 01, Anthropology. 2013. Available from: <http://dx.doi.org/10.4172/2332-0915.1000104>
2. Namene J, Doggalli N. Challenges in forensic odontology age estimation methods [Internet]. Vol. 3, International Journal of Forensic Odontology. 2018. p. 46. Available from: http://dx.doi.org/10.4103/ijfo.ijfo_16_18
3. Tripathi R. Practice of Forensic Odontology [Internet]. Handbook of Forensic Odontology and Medical Jurisprudence. 2016. p. 1–1. Available from: http://dx.doi.org/10.5005/jp/books/12824_2
4. Trengrove HG. Forensic odontology in disaster victim identification [Internet]. Forensic Odontology. 2016. p. 286–335. Available from: <http://dx.doi.org/10.1002/9781118864418.ch9>
5. Permanent Mandibular Canine [Internet]. An Illustrated Atlas of Tooth Carving and Wax-Up Techniques. 2020. p. 85–8. Available from: <http://dx.doi.org/10.1002/9781119573609.ch10>
6. Turnbull NR, Lai NN. Eruption of a permanent mandibular canine in a 5-year-old boy [Internet]. Vol. 13, International Journal of Paediatric Dentistry. 2003. p. 117–20. Available from: <http://dx.doi.org/10.1046/j.1365-263x.2003.00431.x>
7. Pamecha S, Dayakara HR. Comparative Measurement of Mesiodistal Width of Six Anterior Maxillary and Mandibular Teeth in Rajasthan Population [Internet]. Vol. 12, The Journal of Indian Prosthodontic Society. 2012. p. 81–6. Available from: <http://dx.doi.org/10.1007/s13191-012-0117-x>
8. David TJ, Lewis J. Forensic Odontology: Principles and Practice. Academic Press; 2018. 338 p.
9. Reddy V, Saxena S, Bansal P. Mandibular canine index as a sex determinant: A study on the population of western Uttar Pradesh [Internet]. Vol. 12, Journal of Oral and Maxillofacial

Pathology. 2008. p. 56. Available from: <http://dx.doi.org/10.4103/0973-029x.44577>

10. Anderson DL, Thompson GW. Interrelationships and sex differences of dental and skeletal measurements. *J Dent Res*. 1973 May;52(3):431–8.
11. 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;9(2):56–60.
12. Zingeser MR. *Craniofacial Biology of Primates*. S Karger Ag; 1973. 273 p.
13. Acharya AB, Mainali S. Sex discrimination potential of buccolingual and mesiodistal tooth dimensions. *J Forensic Sci*. 2008 Jul;53(4):790–2.
14. Yuen KK, So LL, Tang EL. Mesiodistal crown diameters of the primary and permanent teeth in southern Chinese--a longitudinal study. *Eur J Orthod*. 1997 Dec;19(6):721–31.
15. Rathod V, Desai V, Pundir S, Dixit S, Chandraker R. Role of forensic dentistry for dental practitioners: A comprehensive study. *J Forensic Dent Sci*. 2017 May;9(2):108–9.
16. Princeton B, Santhakumar P, Prathap L. Awareness on Preventive Measures taken by Health Care Professionals Attending COVID-19 Patients among Dental Students. *Eur J Dent*. 2020 Dec;14(S 01):S105–9.
17. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. *Clin Oral Investig*. 2020 Sep;24(9):3275–80.
18. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. *J Oral Pathol Med*. 2019 Apr;48(4):299–306.
19. R H, Hannah R, Ramani P, Ramanathan A, Jancy MR, Gheena S, et al. CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene [Internet]. Vol. 130, *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*. 2020. p. 306–12. Available from: <http://dx.doi.org/10.1016/j.oooo.2020.06.021>
20. Antony JVM, Ramani P, Ramasubramanian A, Sukumaran G. Particle size penetration rate and effects of smoke and smokeless tobacco products - An invitro analysis. *Heliyon*. 2021 Mar

1;7(3):e06455.

21. Sarode SC, Gondivkar S, Sarode GS, Gadgil A, Yuwanati M. Hybrid oral potentially malignant disorder: A neglected fact in oral submucous fibrosis. *Oral Oncol.* 2021 Jun 16;105390.
22. Hannah R, Ramani P, WM Tilakaratne, Sukumaran G, Ramasubramanian A, Krishnan RP. Author response for "Critical appraisal of different triggering pathways for the pathobiology of pemphigus vulgaris—A review" [Internet]. Wiley; 2021. Available from: <https://publons.com/publon/47643844>
23. Chandrasekar R, Chandrasekhar S, Sundari KKS, Ravi P. Development and validation of a formula for objective assessment of cervical vertebral bone age. *Prog Orthod.* 2020 Oct 12;21(1):38.
24. Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *Eur J Dent.* 2018 Jan;12(1):67–70.
25. Jeevanandan G, Thomas E. Volumetric analysis of hand, reciprocating and rotary instrumentation techniques in primary molars using spiral computed tomography: An in vitro comparative study. *Eur J Dent.* 2018 Jan;12(1):21–6.
26. Ponnulakshmi R, Shyamaladevi B, Vijayalakshmi P, Selvaraj J. In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats. *Toxicol Mech Methods.* 2019 May;29(4):276–90.
27. Sundaram R, Nandhakumar E, Haseena Banu H. Hesperidin, a citrus flavonoid ameliorates hyperglycemia by regulating key enzymes of carbohydrate metabolism in streptozotocin-induced diabetic rats. *Toxicol Mech Methods.* 2019 Nov;29(9):644–53.
28. Alsawalha M, Rao CV, Al-Subaie AM, Haque SKM, Veeraraghavan VP, Surapaneni KM. Novel mathematical modelling of Saudi Arabian natural diatomite clay. *Mater Res Express.* 2019 Sep 4;6(10):105531.
29. Yu J, Li M, Zhan D, Shi C, Fang L, Ban C, et al. Inhibitory effects of triterpenoid betulin on inflammatory mediators inducible nitric oxide synthase, cyclooxygenase-2, tumor necrosis factor-alpha, interleukin-6, and proliferating cell nuclear antigen in 1, 2-dimethylhydrazine-induced rat colon carcinogenesis. *Pharmacogn Mag.* 2020;16(72):836.
30. Shree KH, Hema Shree K, Ramani P, Herald Sherlin, Sukumaran G, Jeyaraj G, et al. Saliva as a

Diagnostic Tool in Oral Squamous Cell Carcinoma – a Systematic Review with Meta Analysis [Internet]. Vol. 25, Pathology & Oncology Research. 2019. p. 447–53. Available from: <http://dx.doi.org/10.1007/s12253-019-00588-2>

31. Zafar A, Sherlin HJ, Jayaraj G, Ramani P, Don KR, Santhanam A. Diagnostic utility of touch imprint cytology for intraoperative assessment of surgical margins and sentinel lymph nodes in oral squamous cell carcinoma patients using four different cytological stains. *Diagn Cytopathol*. 2020 Feb;48(2):101–10.
32. Karunagaran M, Murali P, Palaniappan V, Sivapathasundharam B. Expression and distribution pattern of podoplanin in oral submucous fibrosis with varying degrees of dysplasia – an immunohistochemical study [Internet]. Vol. 42, *Journal of Histotechnology*. 2019. p. 80–6. Available from: <http://dx.doi.org/10.1080/01478885.2019.1594543>
33. Sarode SC, Gondivkar S, Gadgil A, Sarode GS, Yuwanati M. Oral submucous fibrosis and heterogeneity in outcome measures: a critical viewpoint. *Future Oncol*. 2021 Jun;17(17):2123–6.
34. Raj Preeth D, Saravanan S, Shairam M, Selvakumar N, Selestina Raja I, Dhanasekaran A, et al. Bioactive Zinc(II) complex incorporated PCL/gelatin electrospun nanofiber enhanced bone tissue regeneration. *Eur J Pharm Sci*. 2021 May 1;160:105768.
35. Prithiviraj N, Yang GE, Thangavelu L, Yan J. Anticancer Compounds From Starfish Regenerating Tissues and Their Antioxidant Properties on Human Oral Epidermoid Carcinoma KB Cells. In: *PANCREAS*. LIPPINCOTT WILLIAMS & WILKINS TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA ...; 2020. p. 155–6.