IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 23, Issue 4 Ser. 5 (April. 2024), PP 42-45
www.iosrjournals.org

Comparison Of Mesiodistal And Buccolingual Width Of Buccal Shelf Area Of Edentulous Mandible In Patient's Oral Cavity, Master Cast And Finished Denture – A Clinical Study

Dr. Arun Gupta[1], Dr. Kinjal Italia[2], Dr. Sandesh Gosavi[3], Dr. Pratik Bhatnagar[4], Dr. Kishan Chothani[5] and Dr. Gunjan Gupta[6]

[1]Professor and Head, Department Of Prosthodontics, College Of Dental Science and Hospital, Amargadh, Bhavnagar – 364 210, Gujarat, India
[2]Pg Student – 3rd Year, Department Of Prosthodontics, College Of Dental Science and Hospital, Amargadh, Bhavnagar – 364 210, Gujarat, India
[3]Professor, Department Of Prosthodontics, College Of Dental Science and Hospital, Amargadh, Bhavnagar, – 364 210, Gujarat, India
[4]Reader, Department Of Prosthodontics, College Of Dental Science and Hospital, Amargadh, Bhavnagar – 364 210, Gujarat, India
[5]Senior Lecturer, Department Of Prosthodontics, College Of Dental Science and Hospital, Amargadh, Bhavnagar – 364 210, Gujarat, India
[6]Reader, Department Of Periodontics, College Of Dental Science and Hospital, Amargadh, Bhavnagar – 364 210, Gujarat, India

Abstract
We aimed to measure the mesiodistal and buccolingual widths of buccal shelf area in edentulous mandible on master cast and in finished denture in male edentulous patients (n=20) of south Saurastra region. Mark the external oblique ridge to crest of the ridge and buccal frenum to retromolar pad area and the area was measured with the help of using the MGW Digital Caliper (No. BO7XRL1FJ8), accurate to 0.01 mm. Data were statistically analyzed by IBM SPSS Version for one-way analysis of variance (ANOVA) and Post Hoc - Bonferroni test. Mean value of mesiodistal width was maximum in edentulous mandible (23.37) followed by finished denture (23.15) and master cast (23.04); no significant change in mesiodistal width of buccal shelf area was observed (p=0.92). Upon intergroup comparison, no significant changes were observed in mesiodistal width of buccal shelf area from intraoral to mast cast and in finished denture. Data on buccolingual width of buccal shelf area was maximum in edentulous mandible (9.903) followed by master cast (8.605) and finished denture (8.454). There was significant change in buccolingual width of buccal shelf area (p<0.05). To validate the results, further studies need to be carried out with larger sample size in different gender, ethnic groups and races.

Keyword: *Buccolingual width, Mesiodistal width, Buccal shelf area, Master cast, Digital caliper.*

Date of Submission: 11-04-2024 Date of Acceptance: 21-04-2024

I. Introduction

Teeth, the mineralized tissues are characterized by structures of extra-ordinary resistance to putrefaction and the effect of external agents like physical, trauma, heat, chemical and biological. Their size merit importance in orthodontics, prosthodontics, restorative dentistry, forensic dentistry and even anthropological studies[1-2]. Determining sex through dental traits is a common practice in forensic dentistry and anthropological studies[3]. The most common indices utilized in such studies are the measurement of mesiodistal and buccolingual widths which are convenient and reliable[4]. In addition, knowing the size of teeth in populations and individuals is critical for proper diagnosis, planning an appropriate treatment, and predicting the results of dental treatments[5,6].

Dental crowns might be larger in men than in women, especially in the case of the canines[7,8,9]. The teeth serve as one of the desirable items for human and sex identification[10]. Ebeling et al. suggested that there was an

upward trend in the mesiodistal size of the teeth. Even increase in size occurs between successive generations, in both the mesiodistal and in the vestibulolingual diameter[11]. A study conducted in southern Chinese population on mesiodiastal dimension of primary and permanent dentition reported sexual dimorphism which ranged from 0.06 – 1.97% and 0.36 – 5.27% in decidudous and permanent dentition respectively[12].

Within this context, we find paucity of data in southern Saurastra region, the present study was designed to assess and compare the mesiodistal and buccolingual width of buccal shelf area in edentulous mandible on master cast and in finished denture.

II. Materials And Methods

The study comprised of 20 edentulous male patients (aged: 50-75 years) of south Saurastra region, attending the Department of Prosthodontics, College of Dental Science and Hospital, Amargarh – 364 210, Gujarat, India. Informed consent from each subject and approval from the institutional ethical committee was received. Impressions were made with alginate and dental cast models were made in dental plaster.

It was ensured that the patients didn't have bony spicule or retained root piece and posterior flabby ridges. Selected patients had a mandibular ridge of Atwood's order 3, 4 and 5. Mark the external oblique ridge to crest of the ridge and buccal frenum to retromolar pad area. Area was measured with the help of using the MGW Digital Caliper (No. BO7XRL1FJ8), accurate to 0.01 mm (Fig 1.1 and Fig 1.2). Primary impression was made using impression compound, primary cast were made up of dental plaster. Custom tray was fabricated using auto polymerized acrylic resin. Tray extension checked in patient's mouth. Border molded using green stick compound; buccal shelf area marked and then transfers it on final impression. Final impression poured with dental stone. Buccal shelf area transferred on stone cast which were then measured using digital caliper (Figure 2). The denture was fabricated by conventional method. Finishing and polishing of denture was done and block-out of lingual undercut was done using modeling wax. The petroleum jelly was applied on tissue surface of denture and poured with dental plaster. The mesiodistal and buccolingual width of buccal shelf present on denture were measured (Figure 3). The changes in dimension of buccal shelf area from edentulous mandible to final impression and on complete denture prosthesis were measured. Data were statistically analyzed by IBM SPSS Version for one-way analysis of variance (ANOVA) and Post Hoc - Bonferroni test.

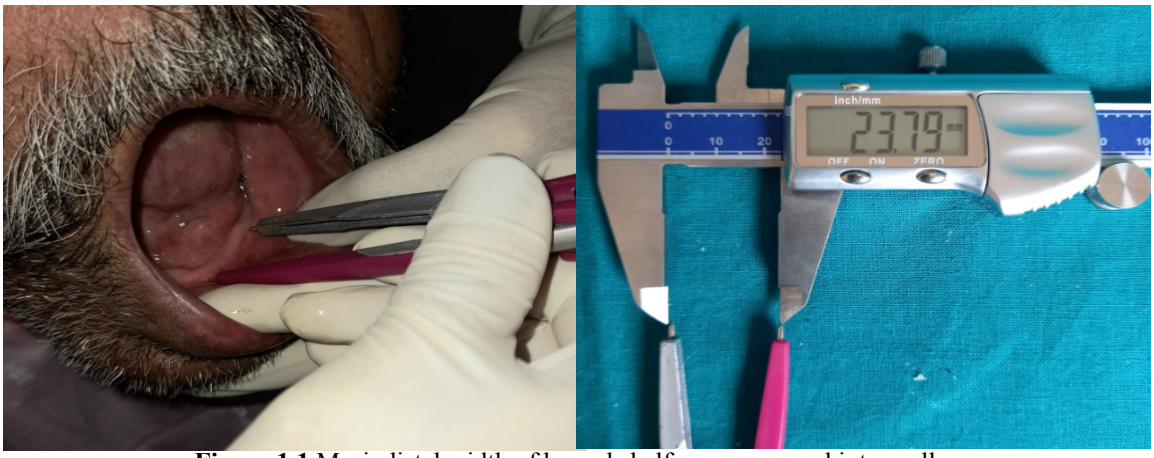

Figure 1.1 Mesiodistal width of buccal shelf area measured intraorally

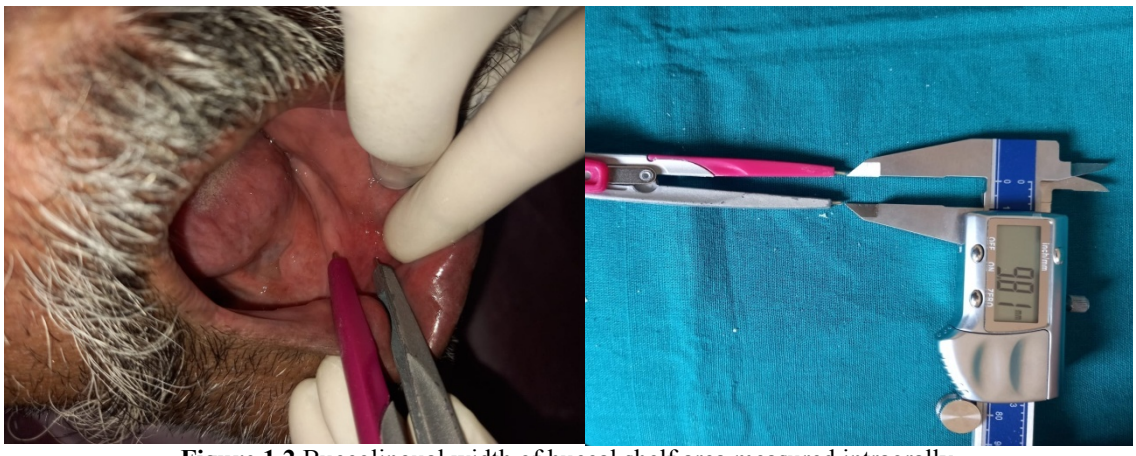

Figure 1.2 Buccolingual width of buccal shelf area measured intraorally

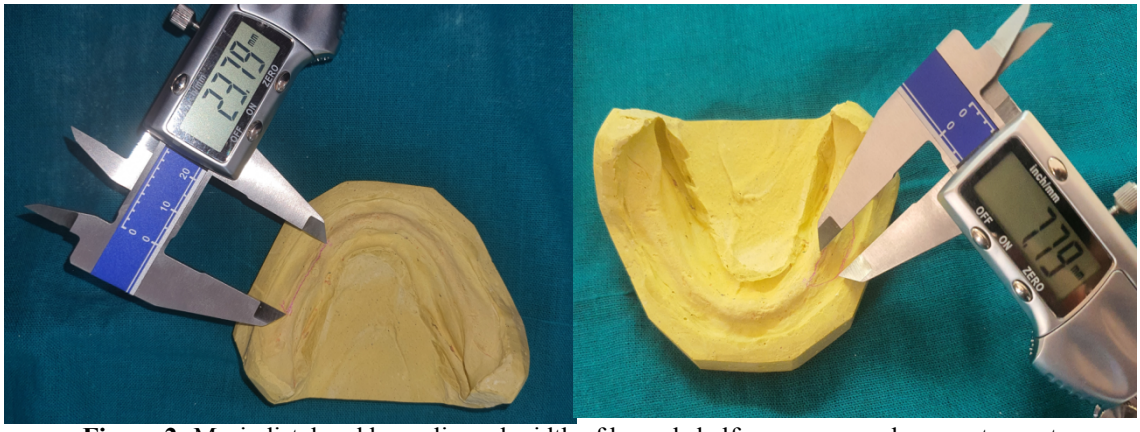

Figure 2: Mesiodistal and buccolingual width of buccal shelf area measured on master cast

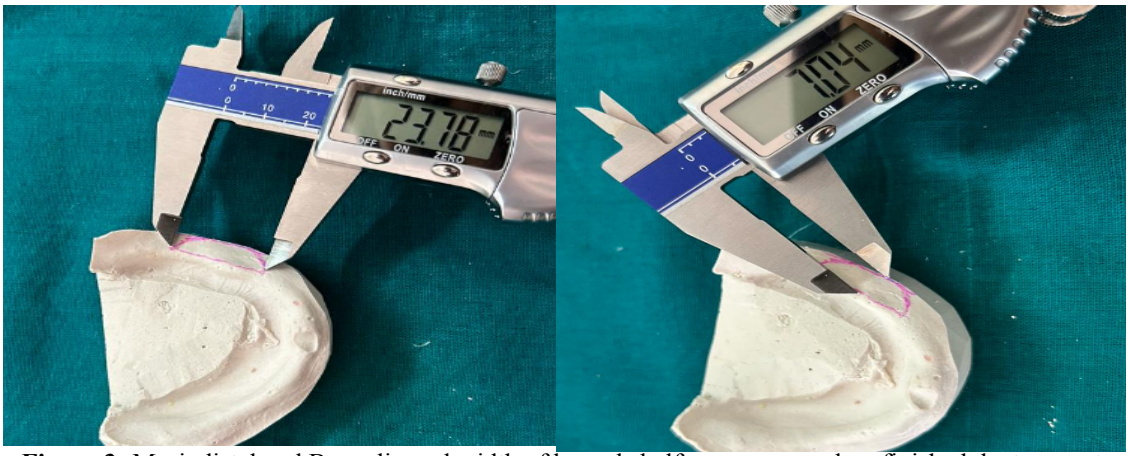

Figure 3: Mesiodistal and Buccolingual width of buccal shelf area measured on finished denture cast

III. Results

Data pertaining to mesiodistal width of buccal shelf area in edentulous mandible, master cast and finished denture were given in Table 1. Mean value of mesiodistal width was maximum in edentulous mandible (23.37) followed by finished denture (23.15) and master cast (23.04). There was no significant change in mesiodistal width of buccal shelf area ($p=0.92$). Upon intergroup comparison, no significant changes were observed in mesiodistal width of buccal shelf area from intraoral to mast cast and in finished denture (Table 2). Table 3 mentions the data on mean value of buccolingual width of buccal shelf area in edentulous mandible, master cast and finished denture. Mean value was maximum in edentulous mandible (9.903) followed by master cast (8.605) and finished denture (8.454). There was significant change in buccolingual width of buccal shelf area ($p<0.05$); however employing Post Hoc Tests - Bonferroni multiple comparisons to buccolingual width, no significant variation was observed between groups (Table 4).

Table 1: One-way ANOVA on mesiodistal width in different denture making steps

	Steps of denture making	n	Mean	Standard Deviation	F-value	p-value
Mesiodistal width	Edentulous mandible	20	23.37 (18.40-28.21)	2.83	0.07	0.92
	Master cast	20	23.04 (18.40-28.21)	2.81		
	Finished denture	20	23.04 (18.40-28.21)	2.78		

n = number of samples; Data in parenthesis indicate range

Table 2: Post Hoc Tests - Bonferroni multiple comparison of mesiodistal width in different denture making steps

	Steps of denture making	Comparisons with other group	Mean Difference	Significance
Mesiodistal width	Edentulous mandible	Master cast	.33500	1.0
		Finished denture	.22900	1.0

	Master cast	Edentulous mandible	-.33500	1.0
		Finished denture	-.10600	1.0
	Finished denture	Edentulous mandible	-.22900	1.0
		Master cast	.10600	1.0

Table 3: One-way ANOVA on buccolingual width in different denture making steps

	Steps of denture making	**n**	**Mean**	**Standard Deviation**	**p-value**
Buccolingual width	Edentulous mandible	20	9.9030 (7.04-14.00)	1.99958	0.04*
	Master cast	20	8.6050 (5.41-12.02)	1.95477	
	Finished denture	20	8.4540 (5.40-12.00	1.94904	

n = number of samples; Data in parenthesis indicate range

Table 4: Post Hoc Tests - Bonferroni multiple comparison of buccolingual width in different denture making steps

	Steps of denture making	**Comparisons with other group**	**Mean Difference**	**Significance**
Buccolingual width	Edentulous mandible	Master cast	1.29800	0.12
		Finished denture	1.44900	.07
	Master cast	Edentulous mandible	-1.29800	.12
		Finished denture	.15100	1.0
	Finished denture	Edentulous mandible	-1.44900	.07
		Master cast	-.15100	1.0

IV. Discussion

Dental development is multi-factorial process with interactions between genetic, epigenetic and environmental factors at multiple stages[13]. These factors are implicated in the aetiology of supernumerary teeth, hypodontia, megadontia and microdontia[14] and also affect the prenatal dental system resulting nominal change to the normal dental system[15,16,17]. These factors also affect the size of teeth might vary in different populations[18,19]. The size of teeth has been used as an inexpensive and simple tool for gender identification such as mandibular canine-index[20,21,22,23], but there are very few studies conducted to support the evidence of racial dimorphism. In particular, the group of North-East Indians showed higher racial dimorphism compared to the North Indian group[24]. In a study conducted in Udaipur population, buccolingual dimensions were found to be effective tool for gender determination[25] and maxillary canine has shown significant results for sexual dimorphism[25,26].

Our study indicated no significant change in mesiodistal width of buccal shelf area from intraoral to mast cast and in finished denture ($p=0.92$). However, the data on average value of buccolingual width of buccal shelf area in edentulous mandible, master cast and finished denture reflected significant change ($p<0.05$). To validate the results, further studies need to be carried out with larger sample size in different ethnic groups and races.

V. Conclusion

The findings indicate that the mesiodistal and buccolingual dimensions of buccal shelf area in changes from intraorally on mandible to finished denture and therefore, and the attempts should be made to preserve the width of buccal shelf area as much as possible as it is a primary stress bearing area.

Conflicts of Interest

The authors declare that they have no conflict of interest.

References

[1]. Shaweesh AI. Mesiodistal and faciolingual diameters of the permanent teeth in a Jordanian population. Arch Oral Biol 2017;73:253–258.

[2]. Yoo H-I, Yang D-W, Lee M-Y, Kim M-S, Kim S-H. Morphological analysis of the occlusal surface of maxillary molars in Koreans. Arch Oral Biol 2016;67:15–21.

[3]. Rakhshan V, Ghorbanyjavadpour F, Ashoori N. Buccolingual and Mesiodistal Dimensions of the Permanent Teeth, Their Diagnostic Value for Sex Identification, and Bolton Indices. Biomed Res Int 2022 Published online 2022 Feb 10. doi: 10.1155/2022/8381436

[4]. Babu SS, Nair SS, D. Gopakumar D, Kurian N, Parameswar A, Baby TK. Linear odontometric analysis of

permanent dentition as a forensic aid: a retrospective study. Jour Clin Diag Res 2016;10(5):ZC24-28.
[5]. Togoo RA, Alqahtani WA, Abdullah EK, Alqahtani ASA, AlShahrani I, Zakirulla M, Alhotellah KA, Mujam OH. Comparison of mesiodistal tooth width in individuals from three ethnic groups in southern Saudi Arabia. Niger Jour Clin Pract 2019; 22(4):553-557.
[6]. da Silva PR, Lopes MC, Martins-Filho IE, Biazevic MGH, and Michel-Crosato E. Tooth crown mesiodistal measurements for the determination of sexual dimorphism across a range of populations: a systematic review and meta-analysis. Jour Forensic Odonto-Stomato 2019;37(1):2-19.
[7]. Hattab FN, Al-Khateeb S, Sultan I. Mesiodistal crown diameters of permanent teeth in Jordanians. Arch Oral Biol 1996;41(7):641-645.
[8]. Kaushal S, Agnihotri VVG. Mandibular canines in sex determination. Jour Anat Soc India 2003;52(2):119-124.
[9]. Anderson DL, Thompson GW. Interrelationships and sex differences of dental and skeletal measurements. Jour Dent Res 1973;52(3):431-438.
[10]. Rakhshan V, Ghorbanyjavadpour F, Ashoori N. Buccolingual and mesiodistal dimensions of the permanent teeth, their diagnostic value for sex identification, and bolton indices. BioMed Res Inter 2022, Feb 10: Article ID 8381436. doi: 10.1155/2022/8381436
[11]. Ebeling CF, Ingervall B, Hedegård B, Lewin T. Secular changes in tooth size in Swedish men. Acta Odontol Scand 1973;31(3):141–147.
[12]. 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;19(6):721–731.
[13]. Khalaf K, Brook AH, Smith RN. Genetic, epigenetic and environmental factors influence the phenotype of tooth number, size and shape: Anterior maxillary supernumeraries and the morphology of mandibular incisors. Genes (Basel). 2022;13(12): 2232.
[14]. Brook A. A unifying aetiological explanation for anomalies of human tooth number and size. Arch Oral Biol 1984;29(5):373-378.
[15]. Brook A, Griffin RC, Townsend G, Levisianos Y, Russell J, Smith RN. Variability and patterning in permanent tooth size of four human ethnic groups. Arch Oral Biol 2009;54(1):S79–S85.
[16]. Bishara SE, Jakobsen JR, Abdallah EM, Garcia AF. Comparisons of mesiodistal and bnccolingnal crown dimensions of the permanent teeth in three populations from Egypt, Mexico, and the United States. Amer Jour Orthod Dentodacial Orthop. 1989;96:416–422.
[17]. Bailit HL. Dental variation among populations. An anthropologic view. Dent Clin North Amer. 1975;19:125-139.
[18]. Deepak V, Goryawala SN, Reddy Y, Chhabra RJ. Assessment of ethnicity in Indian population using tooth crown metric dental traits. Jour Inter Oral Hlth. 2015;7(9):83-87.
[19]. Hanihara T, Ishida H. Metric dental variation of major human populations. Amer Jour Phys Anthropol. 2005;128(2):287-298.
[20]. Rao NG, Rao NN, Pai ML, Kotian MS. Mandibular canine index - a clue for establishing sex identity. Forensic Sci Int. 1989;42(3):249–254.
[21]. Kondo S, Townsend GC, Yamada H. Sexual dimorphism of cusp dimensions in human maxillary molars. Amer Jour Phys Anthropol. 2005;128(4):870–877.
[22]. Acharya AB, Mainali S. Univariate sex dimorphism in the Nepalese dentition and the use of discriminant functions in gender assessment. Forensic Sci Int. 2007;173(1):47–56.
[23]. Suazo GI, Cantín M, Farias BL. Sexual dimorphism in mesiodistal and bucolingual tooth dimensions in Chilean People. Inter J Morphol. 2008;26(3):609–614.
[24]. Sekhon HK, Sharma P, Sharma J, Singh H, Singh S. Comparison of mesiodistal and bucco-lingual dimensions of permanent teeth in North-Indians and North-East Indians: Racial dimorphism as an identification parameter. Edorium Jour Dent 2018;5:100031D01HS2018
[25]. Metgud R, Surbhi, Naik S, Patel S. Odontometrics: A useful method for gender determination in Udaipur population. Jour Forensic Invest 2015;3(2):1-5.
[26]. Khangura RK, Sircar K, Singh S, Rastogi V. Sex determination using mesiodistal dimension of permanent maxillary incisors and canines. Jour Forensic Dent Sci. 2011; 3(2):81–85.