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CBCT Based Pre-Implant Assessment of Maxilla and Mandible - An Insight to Vital Anatomical Structures

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ABSTRACT

Background: Dental implants are a popular treatment option to replace the edentulous space. The relationship of the edentulous sites with adjacent anatomical structures should be clearly demarcated before initiating the implant treatment since the success rate of the implant depends on the factors like anatomical structures, dimensions of alveolar bone and bone density.
Aim and Objectives: The purpose of the study is to assess the location, occurrence, variations of anatomical structures of the edentulous site and to compare with age, gender, and the edentulous period.
Materials and method: We reviewed the CBCT images of 220 edentulous patients (110 males and 110 females) between 20-65 years of age requiring prosthetic rehabilitation through root-form endosseous implants. Using all the data and calculated rates of anatomical variations, comparisons based on age and gender were performed. The correlation between the edentulous period (EDP) with the distance between the alveolar crest and the anatomical structures was determined.
Results: Morphology of anatomical structures like the nasopalatine canal, course type of posterior superior alveolar artery, the incidence of maxillary sinus septa, visualization of the lingual foramen, presence of accessory lingual foramen, and accessory mandibular canal showed significant gender difference. Age-related results showed that as age increases the distance between the posterior superior alveolar artery and the alveolar crest decreases.
Conclusion: CBCT is one of the revolutionary 3D imaging that provides significant contributions in the pre-implant radiographic assessment.

Keywords: Cone beam computed tomography, maxilla, mandible, implant assessment, anatomical structures, variations.

INTRODUCTION

The tooth is an integral functional part of this system and the loss of which can impact on the other normal functions of other oro-facial structures. Hence, patients with missing teeth require obligatory dental treatment. Dental implants are unique in oral rehabilitation since it ideally replaces the tooth regardless of the atrophy, disease, or injury to the hard or soft tissues.[1] Morphological features of the bone, including height, width, volume, and relationship with the adjacent anatomical structures, are the factors that reflect the implant's success. The compromised state of these factors may lead to poor implant stability, bone perforation, paraesthesia, hematoma, and infection. Pre-implant diagnostic imaging helps in perceiving the details as mentioned earlier. The invention of Cone Beam Computed Tomography (CBCT) revolutionized the field of implant imaging since it has been labelled as the "reality of anatomy" or the patient's anatomic 3D presentation.[2] Various studies had been conducted to assess the anatomical variations in implant sites through CBCT so far.[3]–[8] This study is aimed to evaluate the morphological variations of important anatomical structures in the edentulous site using CBCT and compare with age, gender and edentulous period in a population, reporting to an institution in Chennai which has not been reported in the literature. Collectively, this information provides significant knowledge to oral and maxillofacial radiologists in preoperative implant assessment. It also helps other clinicians by providing data regarding implant site preparation and appropriate selection of implant size and type.

MATERIALS & METHODS

A total of 220 CBCT images (110 males and 110 females) of edentulous patients requiring prosthetic rehabilitation through root-form endosseous implants were acquired for this institution-based retrospective study. The images were obtained from the dental archives in the Department of Oral Medicine and Radiology of Meenakshi Ammal Dental College (Chennai, India). This study was reviewed and approved by the Institutional Review Board of the above-mentioned college with the protocol number MADC/IRB-XXXIII/2020/550. The scans were generated using the PLANMECA PROMAX 3D MID PROFACE CBCT machine. The Planmeca Romexis software version 5.2.0® was used to analyze the CBCT images. CBCT images of patients who have undergone extraction within six months and planned for immediate implants were excluded. Consecutive sampling was used, and we selected the scans between the ages of 20-65 years. The images were segregated for each segment corresponding to the edentulous site and divided in to three age groups. The groups are classified as maxillary anterior segment, maxillary posterior segment, mandibular anterior segment and mandibular posterior segment. (Table 1).

Table 1 Sample Size Distribution Between Males and Females for Each Segment

Segments	Age group	Male	Female
Maxillary anterior	20-35	10	10
	36-50	10	10
	51-65	10	10
Maxillary posterior	20-35	10	10
	36-50	10	10
	51-65	10	10
Mandibular anterior	20-35	6	6
	36-50	7	7
	51-65	7	7
Mandibular posterior	20-35	10	10
	36-50	10	10
	51-65	10	10
Total : 220		110	110

The information edentulous period of each patient was collected through phone call. The CBCT scans of the patients with edentulous period 1-5 yrs. were included in the study. The diagnosis was based entirely on radiographic appearance using well-established radiographic interpretation processes. Entire image data was assessed in all planes (orthoradial or orthogonal projections) in relation to individual segments to evaluate the presence of supernumerary tooth, presence of impacted tooth, and inclination of the adjacent tooth. The analysis was performed by two examiners, both properly trained maxillofacial radiologists. Standardization for the slice of interest is made for the analysis of each anatomical structure. After a period of 15 days, the same procedures were repeated for analysis of the intra and inter-rater agreement.

MAXILLARY ANTERIOR SEGMENT

The edentulous region of either right or left central incisor was selected to assess the relationship of nasopalatine canal.

Nasopalatine Canal (NPC) : The morphological measurements of nasopalatine canal were assessed in the serial transaxial reformatted image (Fig 1), based on the method employed by Thakur et al in 2013.[9] Length of the canal and the distance from the alveolar crest to the opening of the canal were measured. The diameter of the NPC at the crestal level, middle and nasal floor level (C, D, E) were measured and the mean of three measurements was taken as the diameter of NPC canal. The shapes of nasopalatine canal were assessed based on the classification given by Mardinger O et al in 2008.[10]

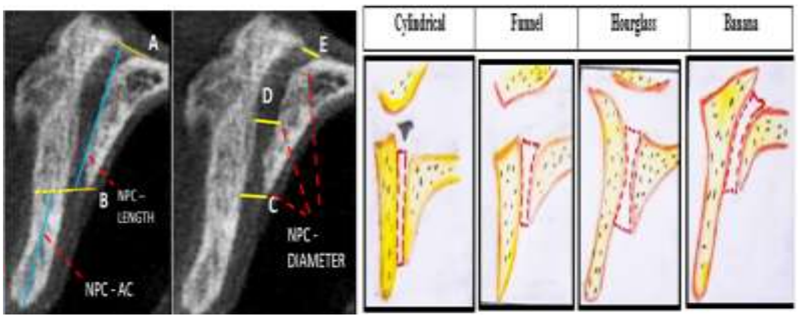


Figure 1 Nasopalatine canal (NPC) length, diameter and distance between NPC and alveolar crest (AC) measurements. shapes of nasopalatine canal

MAXILLARY POSTERIOR SEGMENT

Edentulous region of first or second molar was selected to assess the relationship of the alveolar crest and the adjacent anatomical structures like maxillary sinus and the posterior superior alveolar artery.

Maxillary sinus

Based on the criteria given by white and pharoh, thickening of maxillary sinus (ST) measuring more than 3mm is considered as abnormal and was included in the study.[11] (2) presence of sinus septa (SS) and (3) the sinus recess (SR) was evaluated in the curved oblique reformatted image view. Distance between the alveolar crest to the closest part of the sinus floor (D/B AC-SINF) was measured. (4) (Fig 2)

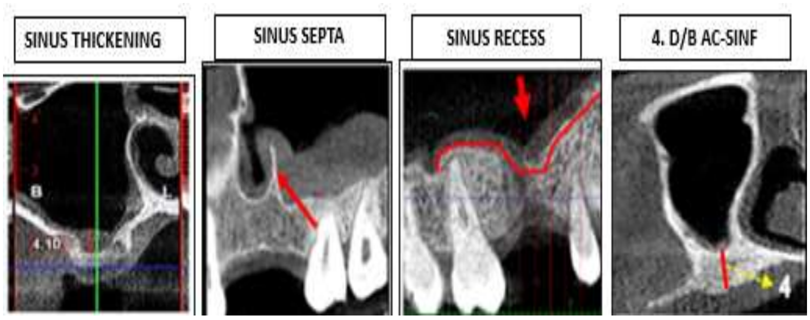


Figure 2 Evaluation of Sinus thickening, sinus septa, sinus recess and distance between Alveolar crest and sinus floor

Posterior Superior Alveolar Artery (PSAA)

This was assessed based on the possibility to identify the artery as the difference in density with the adjacent bone marrow in the lateral bony wall of the sinus. The distance between the inferior border of the artery to the alveolar crest and the floor of the sinus was measured in millimeters based on the method proposed by Panjnoush et. al 2017, where a perpendicular line was drawn along the inferior border of the artery.[12] Distance between alveolar crest to inferior border of the artery (D/B AC- PSAA) (1). Distance between inferior border of the artery to the closest part of sinus floor (D/B PSAA- SINF) (2). The presence or absence was noted down. The position of the artery was identified and categorized as types: intrasinusal, intraosseous, and extraosseous based on the classification given by Guncu et al 2011. [13](Fig 3).

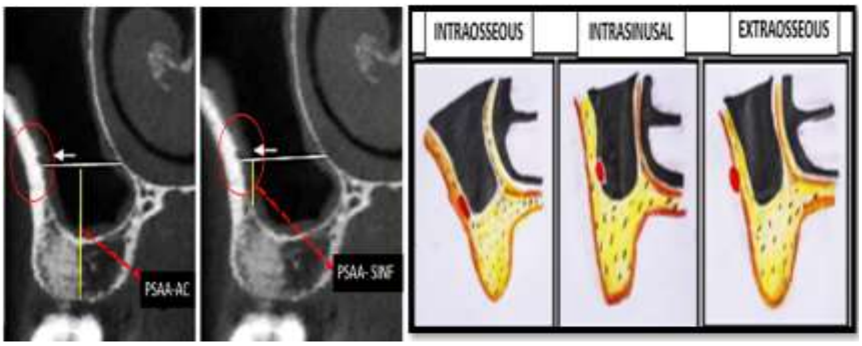


Figure 3 Relation of Posterior superior alveolar artery (PSAA) with alveolar crest and Sinus floor and Types of Posterior superior alveolar artery

MANDIBULAR ANTERIOR SEGMENT

The edentulous region of mandibular right or left central incisor was known to be most associated with the vital anatomical structure mandibular lingual foramen in this segment.

Mandibular lingual foramen: The presence or absence of the mandibular lingual foramen was assessed and the morphometric relationship of the foramen, alveolar crest and the mandible were assessed based on the method given by Sanchez-Perez A. et al in 2018. [4] (1) Distance between alveolar crest to foramen (D/B AC- LF) and (2) Distance between foramen to the inferior border of mandible (D/B LF- MAND) (Fig.4)

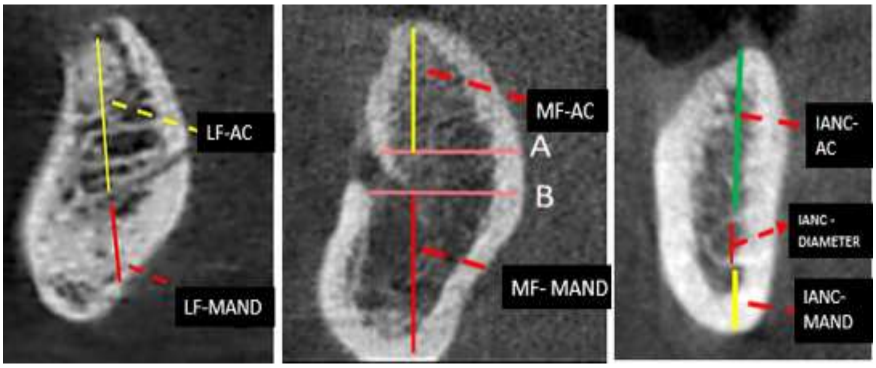


Figure 4 Lingual foramen, mental foramen and Inferior alveolar nerve canal measurement from alveolar crest and the lower border of mandible

MANDIBULAR POSTERIOR SEGMENT

The edentulous area of missing mandibular both premolars and molars are selected to assess this segment. The structures analyzed in the molar region are mandibular canal and submandibular fossa. The edentulous region of mandibular premolar was assessed corresponding to the mental foramen.

Mental foramen: In serial transaxial reformatted image, the presence or absence of the foramen was best identified as an opening in the vestibular margin and the distance was measured based on the method given by Oliveira et al 2018. [14] (1) Distance between alveolar crest to foramen (D/B AC- MF), (2) Distance between the foramen to the inferior border of mandible (D/ B MF- MAND). (Fig IV)

Mandibular canal: Mandibular canal tracing was done after locating in panoramic imaging and the status of the canal was assessed in all orthogonal planes. The presence or absence of the canal was noted down. The canal corticalization was assessed based on the possibility of identifying the canal by the difference in density with the adjacent bone marrow with a hyperdense cortical border surrounding the mandibular nerve canal and noted as present or absent.

The course of the mandibular canal was assessed in the 3 D reconstructed image and classified as caternary, progressive descending, and straight type based on the study of Worthington et Al in 2004. [15] (Fig I). The following parameters of the mandibular canal were measured in the serial transaxial reformation based on the measurement method proposed by Lilian et al in 2015. [6] (1) Diameter of the canal, (2) Distance between alveolar crest to the superior border of the canal (D/B AC- MC) and (3) (D/B MC – MAND) Distance between the inferior border of the canal to the inferior border of mandible. (Fig IV and V)

Submandibular Gland Fossa depth: Based on the method given by Parnia et al. in 2010, A line drawn connecting the uppermost (A) and lowermost (B) prominent point of the gland fossa. [16] Now a line was drawn perpendicular to the line from the deepest region of the gland fossa using the length measurement tool. This gives the deepest region of the gland fossa and was noted down (SMFD). (Fig 5)

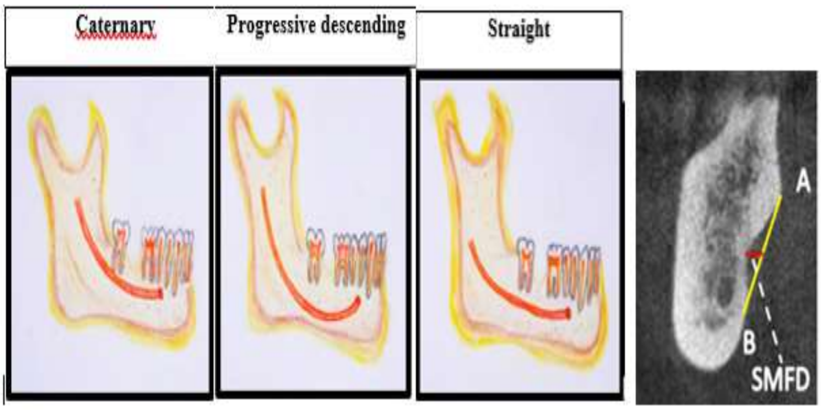


Figure 5 Types of course of mandibular canal and measurement of submandibular fossa depth (SMFD)

RESULTS

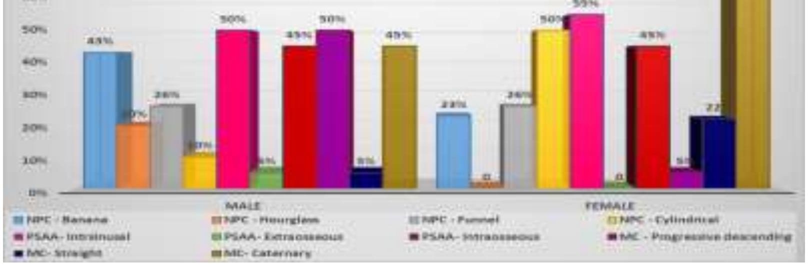
The data were processed using SPSS version 22 for windows (IBM, Chicago, USA. Descriptive statistics, expressed as Mean ± SD and Inferential statistics was analyzed using independent sample t test. Categorical variables were shown as the number of events and percentage. (Table 2) Pearson's correlation test was used to measure the association between the edentulous period (EDP) with the distance between the alveolar crest to the adjacent anatomical structure. (GRAPH 1) The mean age of total population was 41.81 ±1.6 years. However, for males, the mean age was 41.14 ±2.30 years and for females, it was 42.48 ±2.22 years.

Table 2 Analysis for differences in means of different parameters among males and females in each segment

VARIABLES	MALE	FEMALE	P VALUE
MAXILLARY ANTERIOR SEGMENT			
Supernumerary tooth	1.10 ± 0.54	1.00 ± 0.00	0.04*
Impacted tooth	1.03 ± 0.18	1.03 ± 0.18	1.00
Inclination of adjacent tooth	1.13 ± 0.34	1.20 ± 0.40	0.17
Diameter of NPC	2.05 ± 0.59	2.25 ± 0.62	0.94
Length Of NPC	12.50 ± 2.07	9.45 ± 2.21	0.74
Distance between NPC- AC	4.77 ± 2.71	5.06 ± 1.35	<0.001***
MAXILLARY POSTERIOR SEGMENT			
Supernumerary tooth	1.00 ± 0.00	1.00 ± 0.00	0.55
Impacted tooth	1.03 ± 0.18	1.03 ± 0.18	1.00
Inclination of adjacent tooth	1.40 ± 0.49	1.50 ± 0.50	0.27
Sinus thickening	1.43 ± 0.50	1.43 ± 0.50	1
Sinus septa	1.13 ± 0.34	1.30 ± 0.46	0.002**
Sinus recess	1.56 ± 0.50	1.56 ± 0.50	1
Distance between AC- SIN	6.73 ± 3.58	8.33 ± 4.15	0.35
PSSA Visualization	1.66 ± 0.47	1.70 ± 0.46	0.588
Distance between PSAA-SINF	4.80 ± 3.51	4.43 ± 2.70	0.21
Distance between PSAA-AC	10.48 ± 4.58	12.61 ±4.37	0.93
MANDIBULAR ANTERIOR SEGMENT			
Supernumerary tooth	1.02 ± 0.28	1.03 ± 0.18	0.72
Impacted tooth	1.20 ± 0.41	1.05 ± 0.22	0.84
Inclination of adjacent tooth	12.90 ± 3.92	8.20 ± 2.89	0.003**
Lingual foramen visualization	11.90 ± 6.09	10.81 ± 3.09	<0.001***
Distance between LF-AC	4.83 ± 3.17	6.11 ± 2.01	0.09
Distance between LF-MAN	1.10 ± 0.30	1.30 ± 0.47	0.34
Accessory lingual foramen	44.30 ± 12.01	43.30 ± 12.16	<0.001***
MANDIBULAR POSTERIOR SEGMENT			
Supernumerary tooth	1.00 ± 0.00	1.00 ± 0.00	0.95
Impacted tooth	1.02 ± 0.28	1.03 ± 0.18	0.72
Inclination of adjacent tooth	1.46 ± 0.50	1.46 ± 0.50	1
Mandibular Canal visualization	3.21 ± 1.98	2.19 ± 0.76	0.32
Canal corticalization	1.80 ± 0.40	1.76 ± 0.43	0.53
Diameter of IANC	2.61 ± 0.74	1.91 ± 0.50	0.07
Distance between AC- MC	13.00 ± 2.89	12.93 ± 3.03	0.994
Distance between MC-MAN	6.05 ± 2.37	5.39 ± 1.22	0.003**
Bifid canal	1.03 ± 0.18	1.06 ± 0.25	0.242
Mental foramen visualization	1.24 ± 0.89	2.18 ± 1.12	0.29
Distance between AC-MF	5.15 ± 5.92	2.78 ± 4.55	0.005**
Distance between MF-MAND	4.44 ± 5.13	2.38 ± 3.74	0.002**
Accessory mental foramen	1.21 ±0.72	1.06 ± 0.25	<0.001***
Submandibular fossa depth	1.21 ± 0.77	1.17 ± 0.69	0.740

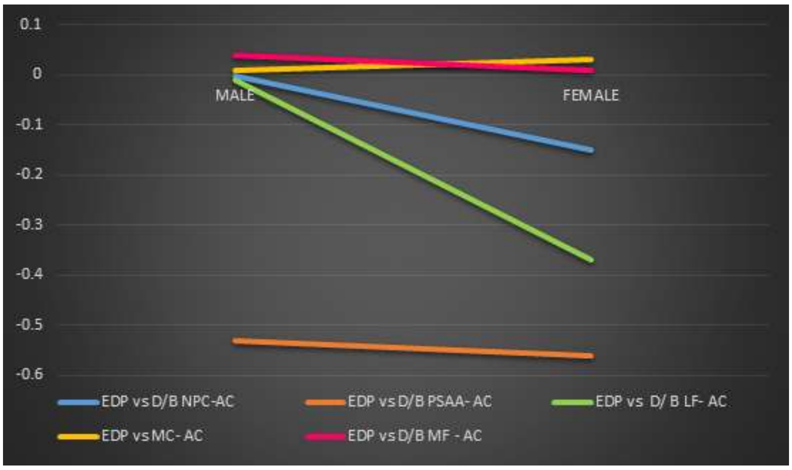
MAXILLA

The presence of supernumerary tooth differs statistically significant among gender (p=0.04). on evaluating the distance between the alveolar crest and the nasopalatine canal, it revealed that there existed a gender difference with high significant values. All other parameters like length, morphology, and diameter of the NPC, residual alveolar ridge height and width, presence of impacted tooth, adjacent tooth inclination were proved to be statistically insignificant between men and women. Pearson's correlation done between the edentulous period and the distance between the alveolar crest and the nasopalatine canal exhibited negative correlation. The most commonly observed NPC shape in this study was banana shape in males (43%) and cylindrical shape in females (50%). (GRAPH 1)



Graph 1 Frequency of shapes of Nasopalatine canal, types of posterior superior alveolar artery, course of mandibular canal among gender

While comparing the three age groups, the incidence of sinus recess and sinus thickening decreases as the age increases only in females. The visualization of PSAA was more observed in the age group I compared to other age groups. The mean distance between the alveolar crest and sinus floor and the mean distance between the posterior superior alveolar artery and the sinus floor was observed least in the age group of III. The mean D/B PSAA-AC was found to be least in the age group III. All other parameters showed an insignificant age difference. Statistically, significant gender difference was detected for the presence of sinus septa with a p value of p=0.0002. A significant gender difference was observed between the types of occurrences of PSAA with a p value of p<0.001. All other parameters exhibited no gender variations. In both the gender, Intrasinusal was the most common type observed (males 50%, females 55%) followed by intraosseous (males 45%, females 45%). The extraosseous type was present in 5 % and found only in males. (GRAPH 2) Correlation between EDP and distance between posterior superior alveolar artery and the alveolar crest depicted negative correlation in both the genders.



Graph 2 Correlation of edentulous period (EDP) and distance between alveolar crest and the adjacent anatomical structure.

MANDIBLE

No age difference was observed for the visualization of the lingual foramen. The mean LF- AC dimension decreases from the age group of I – III in females. The least LF- MAND mean value was observed in the age group of I. The least mean distance between the alveolar crest to the lingual foramen was observed in the age group of II & III with male predominance. The presence of accessory lingual foramen differed significantly between males and females with a p value of < 0. 001. Correlation between edentulous period and distance between alveolar crest to the lingual foramen showed negative correlation. A very high statistical gender difference was exhibited between the course types of mandibular canal p<0.001. Caternary type was the most commonly observed type in females (73%) and the progressive descending type was the least observed (5%). However, in males, the most common type was progressive descending (50%) and the least was the straight type (5%) (GRAPH 2). The distance between alveolar crest to the mandibular canal negatively correlates with the edentulous period in males, however in females it was found to be positively correlated indicating that, as the edentulous period increases the distance between alveolar crest and mandibular canal decreases in males and increases in females.

DISCUSSION

Anatomical variations in maxilla and mandible are reported to be common in normal individuals. However, bone and structural alterations in the jaws are more insidious following a tooth loss resulting in both dimensional and morphological changes in edentate individuals. Several studies compared the occurrence of anatomical variations between the edentate and dentate groups revealed that changes are more insidious in the edentate groups. These variations in edentulous patients should be highly considered and evaluated before any surgical intervention like implant placement and bone augmentation. Thus, this study aimed to evaluate the anatomical variations with the efficacy of CBCT as an imaging modality in the pre-implant assessment. The results of the study showed that morphology of anatomical structure like nasopalatine canal or course type of posterior superior artery or mandibular canal were different among gender. Other gender variations found in this study were incidence of maxillary sinus septa; visualization of lingual foramen and presence of accessory lingual foramen; the distance relationship between the mandibular canal, alveolar crest and the inferior border of mandible.

Pertaining to the age difference, results showed that as the age increases, the distance between the vital anatomical structure in each segment and the alveolar crest decreases except in the lower anterior segment. This illustrates that while performing an implant procedure in any individual, all the factors like age, gender, and edentulous period should be considered in the pre-implant radiological assessment thereby to appraise the possible anatomical variations.

MAXILLA

The most commonly observed NPC shape in this study was banana shape in males (43%) and cylindrical shape in females (50%). However, Gunc et al in 2013 observed cylindrical shape more in both edentate males 35% and females 39%. [17] Gender based comparison of length and diameter of NPC, our results showed that length was higher in males and diameter was higher in females. Similar studies on edentate individuals done by Tolga et al and Bornstein et al showed that gender influences the length and diameter of NPC.[3, 18] This is in accordance with our study. No significant age difference was found in our study relevant to the diameter and length of the canal. Tolga et al in 2018 studied the presence of sinus septa in edentate subjects and he found no gender relation in the occurrence of sinus septa. [3] But in our study, significant gender difference was found where in a total of 60 equally distributed samples, females presented 9 sinus septa whereas males had only 4. In our study, the visualization of PSAA was elucidated in 68.3% of the subjects. Whereas previous studies done by Tolga et al and Tehranchi et al showed PSAA was found in 87.4% and 92% respectively in their study population. [3, 19]

In our study, the intrasinusal type of PSAA was the most commonly occurred type in both males (50%) and females (55%) followed by the intraosseous type. In a total of 60 patients, the extraosseous type of PSAA was found in only one male patient (5%) this is in accordance with the study done by Tehranchi et al, in which he reported the common types of PSAA in edentate population were in the order of intrasinusal (47%), intraosseous type (47%) and extraosseous (6%).[19] In our study, the mean distance between the PSAA and the alveolar crest (D/B PSAA-AC) was found to be 12.61 ±4.37mm and it has also seen to be decreased with increase in age. Ilguy et al calculated this dimension in the edentulous patients and reported a mean value of 16.9 ±3.6mm and he also found a negative correlation between the age and the D/B PSAA-AC, which is in accordance with the results of our study.[20] In our study the mean distance between the sinus floor and the PSAA in the edentulous maxilla in molar site was 8.80 ± 3.51mm. However, a greater value of 9.15 ±3.82mm compared to our result was observed in a study done by Temmerman et al in 2001.[21]

MANDIBLE

In the present study, the lingual foramen was visualized in 92.5% cases and it showed female predominance. However, literature reports a higher frequency range between 93-98%. [22] The present study reported mean distance of (LF-AC) was found to be 10.94 ± 3.17. Sanchez-perez et al in 2018 measured this distance in the edentulous scans of 28 patients and their result was found to be 12.19 ± 6 3.25mm. [4] Moreover, an additional data of age-based variation of (LF-AC) was observed in our study in which, this dimension tends to be decreased with the increase in age.

In our study, the mean values of the distance between mental foramen and the alveolar crest (MF-AC), and the mean value of the distance between mental foramen and the inferior border of the mandible showed significant gender difference. Kalendar et al. and Tolga et al. reported that gender influences the distance between the mental foramen and inferior border of mandible, which is in line with the results of this study. [3, 23] In our study, the presence of accessory mental foramen was observed in 5 % (2 males and 1 female) in a total of 60 posterior edentulous mandibles and so far in the literature, the occurrence rate was found to be between 1.2%-13%. [3] In the present study, the mean value of the diameter of the mandibular canal observed was 2.61 ± 0.74 mm and 1.91 ± 0.50 mm in males and females respectively and represented a significant gender difference. A significant age difference was also observed where the mean diameter was found to be 1.42 mm, 2.67 mm, 2.69 mm in the age group of 20-35 years, 36-50 years, and 51-65 years respectively. This reveals that as the age increases the diameter of the canal was also increased. This in accordance with a study done by Tolga et al in edentate subjects, in which the author reported, age and gender difference for mandibular canal diameter. [3]

In this study, from a total of 60 CBCT scans of mandible, the canal corticalization was found in 63% when assessed in the molar region. Correlations with the age and gender were not significant. Lilian et al. in 2015, reported 76 % and he also reported no significant age and gender difference. [13] According to the literature, the visualization of cortical border of mandibular canal greatly differs in the posterior regions of the mandible. Angeloupoulos et al. (2008) observed greater ease of identification of the canals in the more posterior regions. [24] The calculated mean distance between the mandibular canal and the inferior border of the mandible in this study was found to be 6.05 ± 2.37 mm and showed a significant gender difference where the males got higher values than females. Moreover, this was also found to have a significant age difference, which depicted that, as the age increases the distance decreases. This is in accordance with the studies done in the edentate individuals by Kili et al. and Tolga et al. [3, 25] The mandibular canal course type is an important anatomical feature to be considered during implant placement. In our study, the type of course most often observed in males was progressive descending type and caternary type in females. However, in the study done by Khalid et al., observed caternary type as the most common type in both the gender.[26] According to the literature the caternary course lies in close proximity to the mandibular molars which may have more tendency for nerve injury during implant placement. So, patients with caternary type should be properly evaluated for adequate implant length without violating the nerve.

The mean submandibular fossa depth observed in this study was found to be 1.21 ± 0.77 mm in males and 1.17 ± 0.69 mm in females. No gender and age differences were observed. Lingual concavity is another term used to mention the submandibular fossa in relation to implant site. According to the literature, a depth of more than 3 mm hinders in the easy placement of implants.[27]

To evaluate the morphology of anatomical structures we used the most commonly used criteria in the literature. While comparing the morphological presentations obtained in this study with the previous studies, site specific variations were found to be present. This might be due to the ethnicity of the population included. However, factors such as morphometrics of edentulous sites, dimensional relationship of alveolar crest with adjacent anatomical structure showed difference when compared to other studies. These variations might be explained by different methodology and different reference points used. This infers that the methodologies mentioned in the literature are not currently validated. So, there is a need for universal guidelines in measurement protocol for the edentulous sites in the CBCT assisted pre-implant assessment. The anatomical structures in maxilla and mandible are diverse. In this study, few anatomical structures were skipped due to the insufficient sample size for age and gender comparison. Those were canalis sinosus and nasal floor in the maxillary canine region; and incisive canal in the mandibular premolar region. Moreover, bone resorption rates are inadvertently affected by certain systemic conditions like diabetes mellitus, osteoporosis and corticosteroid therapy. So anatomical structures can be indirectly affected if these conditions are present. In this study, the patient's medical history was not included and not analysed due to the unavailability of the data. These excluded data are also found to be the vital factors in evaluating the anatomical variations in the edentate patients. Bone density is another important criterion in pre-implant assessment which relies on the Hounsfield unit. Since this study is based on CBCT, the estimation of Hounsfield unit cannot be possible for the determination of bone density. However, the determination of bone density based on the Misch's classification can be performed with CBCT scans.[28]

CONCLUSION

This present study was carried out to assess, relate and compare the possible anatomical variations. The result concluded that gender related variations were seen for the morphology of a canal, foramen and course of an artery. The age-related changes were mostly found in relation to the dimensions of the residual alveolar ridge width and height; dimensional relationship of the alveolar crest and the adjacent anatomical structure. The correlation between the edentulous period and the above-mentioned dimensions were found to be negatively correlated. Radiographic investigation in implant planning for any edentulous segment of the jaw is highly indispensable. CBCT imaging is a valuable tool to determine the anatomical structures in pre-implant assessment. Since anatomical variations are more incidental in the edentulous areas, clinical specialists like maxillofacial radiologists, oral surgeons, Periodontists and dental implantologists should properly interpret these variations. In general, age and gender affect these variations and dimensions significantly. Moreover, the edentulous period also has a tendency to cause these variations. Hence it is crucial to understand these factors during implant assessment of an edentate individual.

Declaration by Authors

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