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Localization of Mandibular Canal in Dentulous and Edentulous Regions

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ABSTRACT

Objective: Retrospective determination of the changes in the mandibular canal (MC) course in male and female in the second premolar, first molar and second molar regions of the dentulous and edentulous mandible.

Method: In CBCT images of 274 patients aged 18-88 years who were systemically healthy, the distances of the outer cortex of the MC to the mandible superior, lingual, inferior and buccal cortical bone border were measured in the right and left mandible 2nd premolar, 1st molar and 2nd molar regions. In these regions, the differences in MC course between left and right hemimandible, dentulous and edentulous, and males and females were examined by independent t-test and paired t-test (p<.05).

Results: As a result of the statistical analysis, statistical significance was observed in the linear measurements of the MC to the superior cortical bone border in dentulous and edentulous patients in the relevant regions. In female and male patients, the distance of the MC to the inferior cortical edge of the mandible in the dentulous and edentulous dentition was statistically lower in females. The superior distance of the mandible was found to be lower in the edentulous regions than in the dentulous regions.

Conclusion: The course of the MC in the posterior mandible is generally close to the inferior and lingual wall, but it changes direction towards the superior and buccal regions as it approaches the mental foramen. Furthermore, in women, the MC is located closer to the inferior border of the mandible compared to male.
Keywords: Cone-beam computed tomography; edentulous; mandibular canal; mandible

1. INTRODUCTION

The mandibular canal (MC) contains the inferior alveolar nerve, artery and vein vessel-nerve package. The MC starts from the lingual region of the ramus in the mandible and proceeds towards the mental foramen (MF) and performs the vital functions of the mandible. Complications may occur as a result of damage to the vessel and nerve package in the MC. Various complications may occur as a result of interventions performed in the posterior region of the mandible. MC surgery complications may occur at a rate of over 60% in dental implants and orthognathic surgeries (1). For this reason, it is of great importance to be able to accurately determine the course of MC.

Studies in the literature show that the course of MC in the bone changes in dentulous, edentulous, and partially dentate patients, different locations of the bone and osteotomies and the course of MC is affected by age and gender(1-3). Yet studies in the literature were conducted has lower number of subjets. It is important to learn how MC is affected by dentition and gender with a high number of subjects with higher accuracy, in order to prevent complications that may occur in surgical procedures.

Although computed tomography (CT) is the best technique for bone evaluation, the use of high-dose radiation and expensiveness makes this imaging method difficult to use in dental use. However, the use of cone beam computed tomography (CBCT), which is one of the advanced imaging techniques of the maxillofacial region, provides advantages due to its superior features such as the lack of magnification and superpositions compared to the panoramic imaging method, the use of low-dose radiation, and the lower price compared to CT and also it is sufficient for the necessary evaluation of the MC (3-5).

This study aimed to assess the changes in the trajectory of the MC by utilizing CBCT scans to measure the distance between the MC and the mandibular bone edges. The measurements were conducted in both dentulous and edentulous regions, specifically the 2nd premolar, 1st molar, 2nd molar regions, for both female and male. The null hypothesis tested is that the dentition and gender will not affect the trajectory of the MC.

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2. METHODS

This study was conducted retrospectively in full accordance with the applicable ethical principles, including the World Medical Association Declaration of Helsinki of 1964 and a later version. The Research Ethics Committee of the Recep Tayyip Erdogan University, Faculty of Medicine (date/number17/08/2021-2021/135) approved this study.

This study consisted of 548 hemimandible of 274 patients aged 18–88 years who had mandibular CBCT scans recorded in the archive of the Recep Tayyip Erdogan University, Dentomaxillofacial Radiology Department between 2017 and 2021. All CBCT images were acquired using a Planmeca ProMax 3D Classic (Planmeca Promax 3D; Planmeca Oy; Helsinki, Finland) with the following parameters: 90 kV, 4–10 mA, 200 µm voxel size. The acquisition process was performed according to the manufacturer's recommended protocol. The measurements were done with Planmeca Romexis 4.6.2.R software (PLANMECA Romexis, Helsinki, Finland). Each-intraexaminary patient gave informed consent to the use of examination in scientific research. The systemic anamnesis taken from the patients who applied to clinic before the x-ray is obtained during the examination is processed into the faculty system information. In this way, when retrospective scanning is required, the patient's information can be easily re-evaluated through the hospital system.

Patients under the age of 18, skeletal position anomalies and position disorders detected in the mandibular and maxilla, the presence of anatomical variations such as MC and accessory canal of the MF, any bone or soft tissue pathologies (cyst, tumour, etc.), periodontitis symptoms, previous osteotomies, fractures, unmeasurable image distortions or artefacts were excluded from the study. The third molar region was excluded from the study because it is the region that is not used for implant surgery (6). In addition, since the MF region is the region with the least change in the course of MC, the 1st premolar region was not included in the study and the cases where MF was seen in the 2nd premolar region were also not measured in the study(7).

Before the measurement, the three planes were oriented. Right and left mandible inferior margins are positioned parallel to each other and the occlusal plane. On the cross-sectional sections obtained, measurements were made in a total of 6 regions, from the regions of the 2nd premolar, 1st molar and 2nd molar teeth in each hemimandible.

For each region, the distance of the MC from the superior cortical border to the top of the crest (MC-SD), the distance of the MC from the inferior cortical border to the lower edge of the mandibular bone (MC-ID), the distance of the MC from the buccal cortical border to the buccal outer edge of the mandibular bone (MC-BD) and the distance of the MC from the lingual cortical border to the lingual outer edge of the mandibular bone (MC-LD), a total of 4 distance measurements were made. (Figure 1) Measurements were made by a dentomaxillofacial radiologist with more than ten years of experience. One month after the first measurements, the same measurements were repeated for the second time and the intraexeminary agreement coefficient (ICC) was calculated.

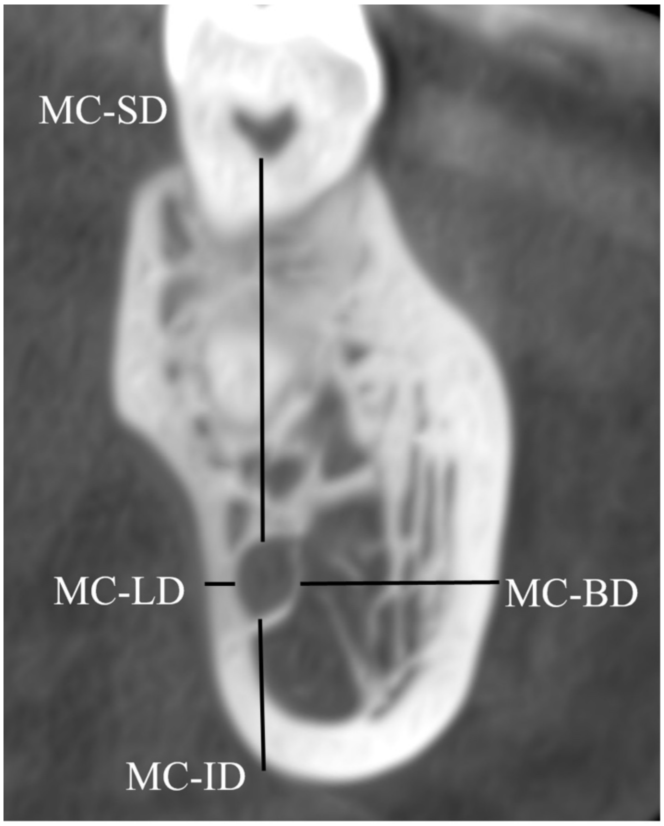

Figure 1. *Linear measurements of the Mandibular Canal to the superior (MC-SD), lingual (MC-LD), inferior (MC-ID), and buccal (MC-BD) cortical edges of the mandible on CBCT cross-section images (0.2 mm slice thickness)*

If there is no tooth in the relevant regions and adjacent regions, the tooth location that should be in occlusion concerning the opposing tooth in the upper jaw was determined and the measurement was made in that region. If there is no tooth in the opposing jaw, the region is determined according to the distance of the missing tooth from the adjacent tooth according to the average tooth crown diameter and measurements are carried out in the relevant region. Thus, the 2nd premolars mean value of the mesiodistal crown width was 7.1 mm, the 1st molars were 11.4 mm, and the 2nd molars were 10.8 mm. Additionally, we considered the mean widths of the identical mesiodistal crowns, which were 7.35 mm for the second premolar, 12.5 for the first molar, and 11.3 mm for the second molar(6).

Obtained measurements, descriptive analyses, paired t-tests and independent t-tests ($p<0.05$) were analysed using IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA). The power of the sample size was calculated using the G-Power 3.1 software (Heinrich-Heine University of Dusseldorf, Germany).

To establish the minimal sample size necessary to test the study hypothesis, a power analysis was carried out using

G Power version 3.1. For independent and paired t-tests, a significance level of .05 and a sample size of 80% moderate effect were calculated (8). The resulting sample size of N = 274 is sufficient to test the study's main claim.

3. RESULTS

ICC values lower than 0.5 are low reliability, values between 0.5 and 0.75 are moderate reliability, values between 0.75 and 0.9 are good reliability and values higher than 0.9 are excellent reliability. Our ICC has been calculated as 0.91, which is excellent reliability(9).

A total of 274 patients were analysed and of the patients, 140 (51.1%) were female and 134 (48.9%) were male. The mean age of females was 46.94±13.52, and the mean age of males was 48.32±14.89.

The relationship between MC-SD, MC-LD, MC-BD and MC-ID according to dentition and gender is calculated by independent t-test and given in table 1. When the results were examined, it was determined that MC-ID was significantly lower in females than males in all dentulous and edentulous regions.

The relationship between MC-SD, MC-LD, MC-BD and MC-ID according to dentition is calculated by independent t-test and given in table 2. The only value that showed a significant difference in each region was found as MC-SD. In the left mandible 2nd premolar, 1st molar and 2nd molar regions, MC-SD dentulous and edentulous region significance levels were found as $p < .01$, In the right mandible 2nd premolar, 1st molar and 2nd molar regions, MC-SD dentulous and edentulous region significance levels were found as $p < .001$.

The measurement results of the 2nd premolar, 1st molar and 2nd molar regions are given in Tables 3 and 4 in dentulous and edentulous patients, regardless of gender. According to the results obtained, it was determined that the mean values of MC-LD and MC-ID measurements increased from the 2nd molar region to the 2nd premolar region, from the posterior to the anterior, while the average of MC-BD values decreased.

Table 1. *Significance levels of the linear measurements of the mandibular canal to the mandible superior, lingual, inferior, and buccal cortical borders in the mandible 2nd premolar, 1st molar and 2nd molar regions, according to gender by independent t-test*

Tooth	Dentition	Gender	n	MC-SD		MC-LD		MC-ID		MC-BD	
				Mean/SD	p	Mean/SD	p	Mean/SD	p	Mean/SD	p
Mandibular Left 2nd premolar	Dentulous	Female	57	16.00/2.55	p=.03*	7.46/1.59	p=.46	3.59/1.08	p=.00*	3.24/1.35	p=.42
		Male	67	16.97/2.44		8.55/1.64		3.41/1.69		3.05/1.13	
	Edentulous	Female	29	11.56/3.92	p=.13	7.55/1.55	p=.43	3.60/1.16	p=.00*	2.96/0.94	p=.91
		Male	24	11.56/3.92		9.10/1.34		3.88/1.36		2.93/1.11	
Mandibular Right 2nd premolar	Dentulous	Female	59	16.13/2.41	p=.45	7.46/1.64	p=.14	3.63/1.23	p=.03*	3.33/1.19	p=.18
		Male	60	16.48/2.68		8.46/1.95		3.23/1.61		2.77/1.07	
	Edentulous	Female	35	11.05/4.33	p=.21	7.53/1.43	p=.98	3.42\1.21	p=.00*	2.76/1.09	p=.49
		Male	28	13.71/4.55		9.06/1.18		3.42/0.96		2.95/1.05	
Mandibular Left 1st Molar	Dentulous	Female	34	16.47/2.25	p=.08	5.84/1.35	p=.78	2.33\0.98	p=.00*	4.33/1.38	p=.56
		Male	43	17.44/2.47		7.94/1.78		2.39/1.07		4.16/1.26	
	Edentulous	Female	106	12.43/3.66	p=.01*	7.06/1.56	p=.91	2.80\1.11	0.00*	3.91/1.06	p=.21
		Male	91	13.63/3.25		7.99/1.73		2.78/1.18		4.13/1.40	
Mandibular Right 1st Molar	Dentulous	Female	32	16.56/1.91	p=.03*	6.23/1.49	p=.94	2.59/1.07	p=.00*	3.98/1.24	p=.71
		Male	41	17.61/2.19		8.22/1.78		2.57/1.50		4.10/1.39	
	Edentulous	Female	107	12.23/3.99	p=.00*	6.80/1.43	0.36	2.64/1.03	p=.00*	4.06/1.12	p=.87
		Male	89	13.85/3.56		7.82/1.57		2.50/1.12		4.03/1.27	
Mandibular Left 2nd Molar	Dentulous	Female	53	14.70/2.28	p=.02*	6.45/1.60	p=.03*	2.21/1.00	p=.03*	5.00/1.52	p=.23
		Male	68	15.74/2.57		7.09/1.68		1.82/0.97		5.32/1.52	
	Edentulous	Female	87	11.15/3.78	p=.06	6.43/1.48	p=.38	2.41\0.93	p=.00*	4.93/1.26	p=.74
		Male	66	12.29/3.72		7.42/1.90		2.27/1.04		5.00/1.37	
Mandibular Right 2nd Molar	Dentulous	Female	60	14.62/2.71	p=.00*	6.41/1.39	p=.03	2.04/0.87	p=.05*	5.29/1.18	p=.51
		Male	71	16.21/2.90		6.99/1.99		1.72/0.82		5.43/1.23	
	Edentulous	Female	79	10.46/3.88	p=.04*	6.52/1.40	p=.00*	2.45/0.98	p=.00*	5.03/0.89	p=.71
		Male	59	11.88/4.23		7.53/1.45		1.99/0.92		4.96/1.14	

** Significant results according to independent t-test (p<.05).SD: Standard Deviation, MC-SD: The distance of the Mandibular Canal (MC) from the superior cortical border to the top of the crest, MC-ID: The distance of the MC from the inferior cortical border to the lower edge of the mandibular bone, MC-BD: The distance of the MC from the buccal cortical border to the buccal outer edge of the mandibular bone, MC-LD: The distance of the MC from the lingual cortical border to the lingual outer edge of the mandibular bone.*

***Table 2.** Significance levels of linear measurements of the mandibular canal to the mandible superior, lingual, inferior, and buccal cortical borders in the mandible 2nd premolar, 1st molar and 2nd molar regions, according to the dentition status by independent t-test*

Tooth	Dentition	n	MC-SD		MC-LD		MC-ID		MC-BD	
			Mean/SD	p	Mean/SD	p	Mean/SD	p	Mean/SD	p
Mandibular Left 2nd premolar	Dentulous	124	16.52/2.52	p=.00*	3.49/1.44	p=.30	8.05/1.70	p=.46	3.14/1.24	p=.33
	Edentulous	53	12.29/3.92		3.73/1.25		8.25/1.64		2.95/1.01	
Mandibular Right 2nd premolar	Dentulous	119	16.30/4.59	p=.00*	3.43/1.44	p=.96	7.97/1.88	p=.38	3.06/1.16	p=.22
	Edentulous	63	12.23/4.59		3.42/1.09		8.21/1.52		2.84/1.06	
Mandibular Left 1st Molar	Dentulous	77	17.01/2.41	p=.00*	2.36/1.03	p=.00*	7.01/1.91	p=.04*	4.23/1.31	p=.18
	Edentulous	197	12.99/3.52		2.79/1.14		7.49/1.70		4.01/1.31	
Mandibular Right 1st Molar	Dentulous	79	17.15/2.12	p=.00*	2.58/1.32	p=.99	7.35/192	p=.71	4.05/1.32	p=.98
	Edentulous	196	12.97/3.88		2.58/1.07		7.26/1.58		4.05/1.19	
Mandibular Left 2nd Molar	Dentulous	121	15.28/2.50	p=.00*	1.99/1.00	p=.00*	6.81/1.67	p=.81	5.18/1.43	p=.19
	Edentulous	153	11.64/3.78		2.35/0.98		6.86/1.74		4.96/1.31	
Mandibular Right 2nd Molar	Dentulous	131	15.48/2.92	p=.00*	1.87/0.85	p=.00*	6.73/1.76	p=.26	5.36/1.21	p=.00*
	Edentulous	138	11.07/4.08		2.25/0.98		6.95/1.50		5.00/1.00	

**Significant results according to independent t-test (p<.05)SD: Standard Deviation, MC-SD: The distance of the Mandibular Canal (MC) from the superior cortical border to the top of the crest, MC-ID: The distance of the MC from the inferior cortical border to the lower edge of the mandibular bone, MC-BD: The distance of the MC from the buccal cortical border to the buccal outer edge of the mandibular bone, MC-LD: The distance of the MC from the lingual cortical border to the lingual outer edge of the mandibular bone.*

***Table 3.** Right and left hemimandible significance levels of linear measurements of the mandibular canal to the superior, lingual, inferior, and buccal cortical borders of the mandible in the mandible 2nd premolar, 1st molar and 2nd molar regions in dentulous patients by paired t-test*

Tooth	n	MC-SD		MC-LD		MC-ID		MC-BD	
		Mean/SD	p	Mean/SD	p	Mean/SD	p	Mean/SD	p
Mandibular Left 2nd premolar	37	16.71/2.15	p=.50	3.57/1.77	p=.78	7.99/1.50	p=.37**	2.90/1.10	p=.05*
Mandibular Right 2nd premolar	37	16.47/2.46		3.66/1.77		8.23/2.09		2.47/0.78	
Mandibular Left 1st Molar	45	16.97/2.37	p=.40	2.25/1.01	p=.04**	6.92/2.03	p=.01**	4.19/1.27	p=.12
Mandibular Right 1st Molar	45	17.21/1.95		2.48/1.43		7.26/2.06		3.92/1.28	
Mandibular Left 2nd Molar	45	15.79/2.26	p=.33	1.68/0.73	p=.61	6.44/1.91	p=.70	5.56/1.54	p=.64
Mandibular Right 2nd Molar	45	16.06/2.76		1.72/0.66		6.36/2.09		5.46/1.19	

** Significant results according to paired t-test (p<.05).SD: Standard Deviation, MC-SD: The distance of the Mandibular Canal (MC) from the superior cortical border to the top of the crest, MC-ID: The distance of the MC from the inferior cortical border to the lower edge of the mandibular bone, MC-BD: The distance of the MC from the buccal cortical border to the buccal outer edge of the mandibular bone, MC-LD: The distance of the MC from the lingual cortical border to the lingual outer edge of the mandibular bone.*

***Table 4.** Right and left meaning levels of linear measurements of the mandibular canal to the superior, lingual, inferior, and buccal cortical borders of the mandible in the mandible 2nd premolar, 1st molar and 2nd molar regions in edentulous patients by paired t-test*

Tooth	n	MC-SD		MC-LD		MC-ID		MC-BD	
		Mean/SD	p	Mean/SD	p	Mean/SD	p	Mean/SD	p
Mandibular Left 2nd premolar	30	11.71/4.11	p=.16	3.26/1.15	p=.45	7.78/1.57	p=.39	2.87/1.17	p=.01*
Mandibular Right 2nd premolar	30	11.06/4.32		3.38/1.17		8.00/1.79		2.47/1.07	
Mandibular Left 1st Molar	64	10.96/3.71	p=.01**	2.91/1.24	p=.00**	7.22/1.94	p=.48	3.77/1.33	p=.49
Mandibular Right 1st Molar	64	10.23/4.09		2.57/0.94		7.10/1.43		3.88/1.10	
Mandibular Left 2nd Molar	64	10.21/3.77	p=.06	2.41/1.01	p=.12	6.76/1.59	p=.90	4.56/1.17	p=.04**
Mandibular Right 2nd Molar	64	9.60/4.07		2.18/0.94		6.79/1.44		4.86/0.95	

** Significant results according to paired t-test (p<.05).SD: Standard Deviation, MC-SD: The distance of the Mandibular Canal (MC) from the superior cortical border to the top of the crest, MC-ID: The distance of the MC from the inferior cortical border to the lower edge of the mandibular bone, MC-BD: The distance of the MC from the buccal cortical border to the buccal outer edge of the mandibular bone, MC-LD: The distance of the MC from the lingual cortical border to the lingual outer edge of the mandibular bone.*

The difference between the right and left hemimandible was examined with the paired t-test. A statistically significant difference was found in the MC-LD in the 1st molar region, MC-ID in the 2nd premolar region, MC-ID in the 1st molar region, and MC-BD in the 2nd premolar region between the right and left hemimandible in dentulous patients. ($p<.05$, $p> .05$, $p< .05$, $p\leq .05$, respectively). In edentulous patients, a statistically significant difference was found in MC-SD and MC-LD in the 1st molar region and MC-BD in the 2nd premolar and 2nd molar regions. ($p< .05$) (Tables 3 and 4)

4. DISCUSSION

In this study, the distances between the MC and the mandibular cortical bone borders were measured in four directions: right and left premolar, molar, and edentulous regions. The findings revealed a significant decrease in the superior bone distance, particularly in edentulous regions compared to dentulous regions. Moreover, MC-ID was found to be lower in female than in male within the relevant regions. These findings suggest that both dentition and gender significantly influence the trajectory of the MC, leading to the rejection of the study's null hypothesis.

Due to magnification and distortions, accurate MC detection cannot be achieved using 2D techniques. CBCT is the most commonly used advanced imaging method in dentistry, providing sufficient information for MC detection (1, 10). Therefore, CBCT is considered an appropriate imaging modality for the detection of MC.

In contrast to study of Kalabalık and Aytugar (11), which included only dentulous patients and found no difference between measurements taken in the right and left jaws, this study revealed a statistically significant difference between the right and left hemimandibles in specific regions and measurements. In dentulous regions, significant differences were observed in the MC-LD measurement of the 1st molar region, MC-ID measurement of the 2nd premolar and 1st molar regions, and MC-BD measurement of the 2nd premolar region. In edentulous regions, significant differences were found in the MC-SD and MC-BD measurements of the 1st molar region, as well as the MC-BD measurements of the 2nd premolar and 2nd molar regions. These differences may be attributed to variations in the duration of edentulousness between the right and left sides of the same regions. This discrepancy in measurements between the right and left hemimandibles, which was observed in our study, can be considered as one of the limitations. The differing durations of edentulousness in the corresponding regions of the right and left sides may have contributed to the significant differences observed in certain measurements.

In the literature, it is commonly described that the MC is situated on the lingual and inferior sides in the posterior region of the mandible. However, as it approaches the MF, the course of the MC tends to shift towards the buccal cortical border and superior border of the mandible (1-3, 5, 10). Contrary to these findings, Kalabalık and Aytugar (11) observed that the course of the MC in the MF region was closer to the inferior and lingual borders. Nimigean et al. (6) reported a decrease in MC-BD from the second molar region to the second premolar region, while the MC-LD decreased from the second premolar region to the second molar region. Sekerci and Sahman (5) determined that the MC-BD was highest in the second molar region. In our study, we found that the MC-BD and MC-SD distances in the second premolar, first molar, and second molar regions decreased from the second molar region to the second premolar region, while the MC-LD and MC-ID increased in both the dentulous and edentulous regions (Tables 3 and 4).

In a study conducted by Kim et al. (12), they classified the course of the MC based on its localization within the mandibular bone. According to their classification, they identified three types: type 1 MC (70%) had a course close to the lingual side, type 2 MC (15%) followed a path in the middle of the bone, specifically in the ramus and distomolar region, and approached the lingual side in the first and second molar regions, and type 3 MC (15%) had a course in the middle or close to 1/3 part of the lingual cortex. Our study corroborated these findings as we also observed that the MC tended to have a close course to the lingual cortex, aligning with the previous study.

In this study, it was observed that the MC-ID measurement in the molar region is lower than in the premolar region, both in dentulous and edentulous regions. As the MC moves towards the MF, it changes its course towards the buccal and superior aspects before exiting the MF. Additionally, as the MC progresses towards the MF, it reaches its most inferior point within the bone. This particular region corresponds to the area with the highest thickness of the mandibular corpus (3, 13). Subsequently, the MC extends from the molar region to the premolar region while shifting superiorly.

According to the findings of Ylikontiola et al. (14), their study demonstrated that if the buccal bone thickness of the MC is less than 2 mm, therfore is a significant increase in the risk of damage to the inferior alveolar vascular-nerve bundle. Consequently, based on the results of this study, the second premolar tooth region, which has the lowest MC-BD, exhibits the lowest buccal bone thickness and poses the highest surgical risk within the region.

In similar studies in the literature, it has been concluded that the height of the superior alveolar bone significantly decreases in edentulous patients (15, 16). Consistent with these findings, our study also observed a reduction in the amount of superior bone in edentulous patients. This decrease in superior bone height is attributed to the atrophy of the edentulous jaws. It is crucial to consider this factor, particularly in surgical procedures especially implant surgeries involving edentulous areas.

Nimigean et al. (6) reported that there was no significant atrophy in the horizontal length measurements of the MC in edentulous mandibles compared to dentulous mandibles. Similarly, Asari and Lagravere (4) concluded that the differences in horizontal measurements (buccal and lingual bone changes) between dentulous and edentulous patients were less pronounced compared to vertical measurements. They suggested that vertical distance measurements were more affected by atrophy than horizontal measurements. Also, in the classification by Cawood and Howell (17), it was emphasized that vertical resorption is more severe in the mandibular posterior region with edentulism.

According to the statistical findings of this study, a significant and consistent difference in the course of the MC was observed only in the MC-SD measurements, both in dentulous and edentulous regions, when considering both horizontal and vertical directions. This result can be attributed to the high resorption pattern that occurs in the edentulous ridge, leading to changes in the superior-inferior dimension of the MC.

According to the findings of Kilic et al. (16) in their cadaver studies, the course of the MC varied depending on the dentition status and the region of the mandible. In the distal region of the mandibular 2nd molar, the MC was close to the lingual bone cortex in dentulous, edentulous, and partially dentulous groups. In the 1st molar region, edentulous patients showed a middle position of the MC in the horizontal direction within the bone, while dentulous and partially dentulous patients had the MC close to the lingual bone border. In the MF region, the MC was close to the buccal bone border in edentulous patients, while it was close to the lingual cortical border in dentulous and partially dentulous patients. Moreover, edentulous patients exhibited a superior extension of the MC in the posterior region compared to dentulous and partially dentulous patients. However, in the present study, the MC was found to be close to the lingual cortex in the second molar region in both dentulous and edentulous groups. In the first molar region and the second premolar region, the MC extended towards the MF with a course close to the buccal cortex in all groups, which contradicted the previous study. The differences in the duration of edentulism and the sample sizes may explain these discrepancies.

The literature presents varying results regarding the relationship between gender and the course of the MC. Some studies suggest that there is a difference between males and females in terms of bone measurements around the MC, with higher values found in males (1, 5). However, other studies indicate no significant gender-related differences in the course of the MC (10, 11, 15, 16). For example, Khorshidi et al. (1) found that the horizontal and vertical bone measurements around the MC were lower in women compared to men. Sekerci and Sahman (5) reported that except for the third molar region, there were no gender-based differences in the vertical bone measurements around the MC in the superior and inferior directions. Bhardwaj et al. (18) also noted that the distance between the MC and the inferior cortex was greater in males. Similarly, in our study, only MC-ID showed a statistically significant difference, with higher values observed in males in all regions. It is worth mentioning that differences between genders in the dimensions of the mandible have been identified in previous studies, with male generally exhibiting larger bone measurements than female (19, 20). In our study, significant differences between males and females were observed in MC-SD measurements in several regions, including the left dentulous 2nd premolar, edentulous left 1st molar, dentulous and edentulous right 1st molar, dentulous left 2nd molar, and right dentulous and edentulous 2nd molar regions. In MC-LD, significant differences were found between males and females in the dentulous left 2nd molar and dentulous and edentulous right 2nd molar regions.

The limitation of this study is the unknown duration of edentulism in edentulous areas. For this reason, the change in the course of MC and the difference between the genders and sides of this change could not be evaluated.

5. CONCLUSIONS

In dentulous and edentulous patients' posterior of the mandible, the MC course is close to the lingual and the inferior cortex, while it approaches the buccal cortex towards the MF and displaces superiorly. Alveolar crest resorption occurring in edentulous areas is greater in the superior direction. Also, MC being closer to the base of the mandible in female is a difference that should be considered in preoperative surgical evaluations.

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Research idea: MEN, TEK

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Acquisition of data for the study: MEN, TEK, DNG

Analysis of data for the study: MEN, TEK, DNG

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