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Cone Beam Computed Tomography Assessment of Anatomical Risk Factors in Maxillary Sinus Floor Elevation: A Cross Sectional Study

Maksiller Sinüs Tabanı Yükseltilmesinde Anatomik Risk Faktörlerinin Konik Işınlı Bilgisayarlı Tomografi ile Değerlendirilmesi: Kesitsel Bir Çalışma

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ABSTRACT Objective: To evaluate both the incidence and characteristics of anatomical risk factors in patients requiring sinus lifting using cone beam computed tomography (CBCT). **Material and Methods:** A retrospective analysis was conducted, involving 142 CBCT scans obtained from edentulous and partially edentulous patients scheduled for sinus floor elevation. Residual bone height, position (extrasinusal, intraosseous, intrasinusal) and diameter of the vascular canal, palatonasal recess (PNR) localization, palatonasal recess angle (PNRA), presence and length of sinus septa and, symmetry of vascular canal and septa were evaluated. **Results:** Mean canal diameter of 1.28±0.4 mm and the canal diameter was higher in men (p=0.021). The mean PNRA was 127.09°±20.98°, with no significant difference in PNRA (p=0.488, p=0.162, respectively) and PNR location (p=0.419, p=0.746, respectively) based on edentulous status or gender. Septa were present in 34.5% of patients and were statistically higher in women (p=0.019). The mean septa length was 6.40±3.63 mm and significantly longer in edentulous patients (p=0.023). 82.4% canal symmetry and 51% septa symmetry were observed. **Conclusion:** Thorough assessment of patients by CBCT prior to sinus floor elevation enables the detection of anatomical structures that could affect the surgical design, with the aim of enhancing the success of the treatment and preventing potential complications.

Keywords: Cone beam computed tomography; dental implants; maxillary sinus; oral surgical procedures

ÖZET Amaç: Bu çalışmada, konik ışınlı bilgisayarlı tomografi (KIBT) kullanılarak sinüs tabanı yükseltilmesi gerektiren hastalarda anatomik risk faktörlerinin hem görülme sıklığı hem de özelliklerinin değerlendirilmesi amaçlandı. **Gereç ve Yöntemler:** Sinüs tabanı yükseltmesi planlanan dişsiz ve kısmen dişsiz hastalardan elde edilen 142 KIBT taramasını içeren retrospektif bir analiz yapıldı. Kalan kemik yüksekliği, vasküler kanalın konumu (ektrasinüzal, intraosseöz, intrasinüzal) ve çapı, palatonazal girinti (PNR) lokalizasyonu, palatonazal girinti açısı (PNRA), sinüs septasının varlığı ve uzunluğu, vasküler kanal ve septa simetrisi değerlendirildi. **Bulgular:** Ortalama kanal çapı 1,28±0,4 mm olup, kanal çapı erkeklerde daha yüksekti (p=0,021). Ortalama PNRA 127,09°±20,98° olup, dişsizlik durumuna veya cinsiyete bağlı olarak PNRA (sırasıyla; p=0,488, p=0,162) ve PNR lokalizasyonunda (sırasıyla; p=0,419, p=0,746) anlamlı bir fark yoktu. Septa hastaların %34,5'inde mevcuttu ve kadınlarda istatistiksel olarak daha yüksekti (p=0,019). Ortalama septa uzunluğu 6,40±3,63 mm idi ve dişsiz hastalarda anlamlı derecede daha uzundu (p=0,023). Yüzde 82,4 kanal simetrisi ve %51 septa simetrisi gözlendi. **Sonuç:** Sinüs tabanı elevasyonu öncesinde hastaların KIBT ile ayrıntılı olarak değerlendirilmesi, cerrahi tasarımı etkileyebilecek anatomik yapıların tespit edilmesini sağlayarak, tedavinin başarısının artırılması ve olası komplikasyonların önlenmesini sağlar.

Anahtar Kelimeler: Konik ışınlı bilgisayarlı tomografi; diş implantları; maksiller sinüs; oral cerrahi işlemleri

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Maxillary sinus floor elevation via lateral approach is a well-known technique that is recommended when there is less than 5 mm residual bone height. It entails lifting the Schneiderian membrane and inserting a bone graft into the created space after osteotomy on the maxillary lateral wall.[1,2] Membrane perforation is the primary complication, while bleeding is rare.[3]

Membrane perforation is linked to numerous anatomical and patient-related factors. Anatomical factors include the thickness of the sinus membrane, edentulous condition, the positioning of roots in relation to the sinus cavity, remaining bone height, the width of the sinus between the medial and lateral walls, the presence of sinus septa and their orientation, the alveolar antral artery (AAA), and the palatonasal recess angle (PNRA). Patient-related factors include smoking habits, the presence of preoperative chronic sinusitis, and the gingival biotype.[2]

AAA, known as one of the offshoots of the posterior superior alveolar artery, provides blood to the lateral sinus wall, the membrane of the maxillary sinus, and half of the posterior teeth.[4] The reported diameter of this artery ranges from 0.4 to 2.8 mm and is directly related to the severity of bleeding during sinus surgery. While bleeding from the artery is generally controllable, a diameter greater than 2 mm can obstruct the operative field, result in perforation of Schneiderian membrane, displace the graft material, inhibit neoangiogenesis in the grafted bone area, and potentially cause postoperative sinusitis and hematoma.[5-7]

The maxillary sinus may contain cortical bone walls known as maxillary septa. The septa have a shape resembling an inverted Gothic arch and originate from the inferior or lateral sinus walls, potentially dividing it into multiple compartments. Having bony septa at the base of the sinus is an anatomical characteristic that can raise the probability of perforation during sinus lifting procedure. Septum's position may change. Its length can vary between 2.5-6 mm and is reported to be longer in dentate cases compared to edentulous cases. Septa presents technical challenges, making surgical procedures in this area difficult and potentially causing perforation of the Schneiderhan membrane.[4,8]

Palatonasal recess (PNR) is characterized as the point where two virtual lines intersect, tracing the lower part of the lateral nasal wall and the palatal wall within the maxillary sinus. This could complicate the lifting the sinus membrane and increase the chances of membrane perforation. During sinus lift procedures, it is advisable to elevate the membrane towards the medial wall of the maxillary sinus. This reduces tension and the risk of membrane perforation. Elevating the membrane close to the medial wall helps secure implant placement and provides additional blood supply. The location and angle of the PNR can affect the difficulty of lifting the membrane on the medial wall. Higher-risk cases have a PNR distance less than 15 mm from the alveolar crest and an angle less than 90 degrees.[2,9]

Recent cadaver and radiographic investigations have aided in the identification of anatomical variations that may impact sinus lift procedures.[2,8-10] Cone-beam computed tomography (CBCT) delivers reliable and accurate three-dimensional measurements of maxillofacial structures at a lower radiation dosage than standard computed tomography (CT) scans. CBCT offers valuable diagnostic information for better evaluation of the sinus and related anatomical points. Preoperative CBCT is recommended to lower the risk of complications such membrane perforation and hemorrhage.[7,11]

The objective of this research is to assess anatomical risk factors using CBCT in patients with posterior atrophic edentulous crests who are indicated for sinus lift procedures in the maxilla, and to correlate the obtained data with age, gender, and edentulous status. The goal is to provide clarity regarding potential complications associated with these anatomical risk factors before surgery and aid in the assessment of potential risks in clinical practice. The null hypothesis was that the anatomical factors and their prevalence were not associated with age, gender, and edentulous status.

MATERIAL AND METHODS

The study was approved by the Giresun University Clinical Research Ethics Committee (date: February 7, 2023; no: 2023/18) in compliance with the Declaration of Helsinki. In this retrospective analysis, a total of 142 CBCT scans of patients who need sinus floor elevation in the posterior edentulous maxilla were assessed. The sample size was established utilizing the G*Power Software (v3.1; Franz Faul, University of Kiel, Germany). The calculation incorporated criteria such as α=0.05, 1-β (Power)= 0.90, and an effect size of Cohen's d=0.55.[12]

DATA COLLECTION

All the images were collected from patients who referred to implant treatment between the years 2018 and 2022. The database was obtained from 142 patients with edentulous/partially edentulous maxilla who met the inclusion criteria and was previously acquired CBCT images.

Included were CBCT images that met the specified criteria: (a) Good quality of the CBCT scan taken before the surgical procedure; (b) 18-90 age range (c); Edentulous/partially edentulous patients with absent teeth in the posterior maxilla (remaining bone height less than 5 mm); (d) The presence of vascular canal in the relevant region; (e) No motion artifacts during image acquisition; (f) No prior surgical procedures involving the sinus or bone grafting in the posterior maxilla (g) No history of jaw fracture and trauma; (h) No developmental anomaly affecting the maxillofacial region (i) No sinus pathology that prevents the measurement.

CBCT SCAN ANALYSIS

In this study, maxillary images from the Orthopantomograph OP300 (Instrumentarium Dental, Tuusula, Finland) tomography device were examined. Images were acquired in 6x8Ø cm FOV area, 200-300 micrometer voxel resolution and analyzed using OnDemand3D (CyberMed Inc., Seoul, South Korea) program. In order to optimize the image quality, the brightness and contrast of the images were adjusted when necessary, and all data were evaluated by two different observers.

First, the data of age, gender and edentulous status of the patients were recorded. Evaluation was performed on CBCT images in axial and coronal sections, and the following parameters were recorded:

In the coronal section;

- Inspected tooth region (premolar/molar),
- Localization of the vascular canal,[13]
- Diameter of the canal, >0.5 mm was taken into account (Figure 1A),[5,14]
- Distance between the lower edge of the canal and the alveolar crest (Figure 1B),
- Residual crest (distance between the floor of the maxillary sinus and the top of the alveolar crest) (Figure 1C),
- PNRA (between the upper surface of the hard palate to the side wall of the nasal cavity) (Figure 2A),
- Distance of PNR to the alveolar crest (PNR-crest distance) (Figure 2B).

In the coronal and sagittal sections, the presence and location of the septa in the maxillary sinus were determined and the septa length was measured (Figure 3). In addition, septa and vascular canal symmetry (visible/not visible) on the right and left sides were evaluated for each patient.

STATISTICAL ANALYSIS

Statistical analyzes were performed using SPSS software (ver. 23; SPSS, Inc., Chicago, IL, USA). In the preliminary analysis, the agreement of measurements

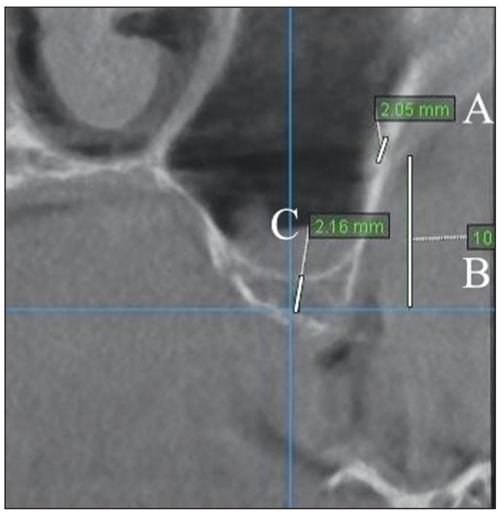

FIGURE 1: Measurement of the diameter of the artery (A), vertical distance from the lower border of the artery to the alveolar crest (B) and the bone height from the floor of the maxillary sinus to the alveolar crest (C).

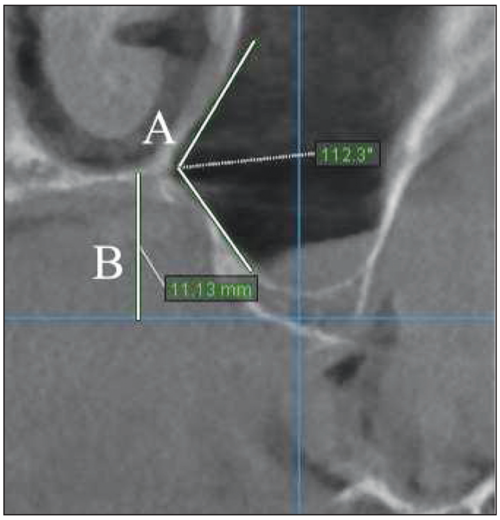

FIGURE 2: Measurement of the PNRA **(A)** and vertical distance from PNR to the alveolar crest **(B)**.
PNRA: Palatonasal recess angle; PNR: Palatonasal recess.

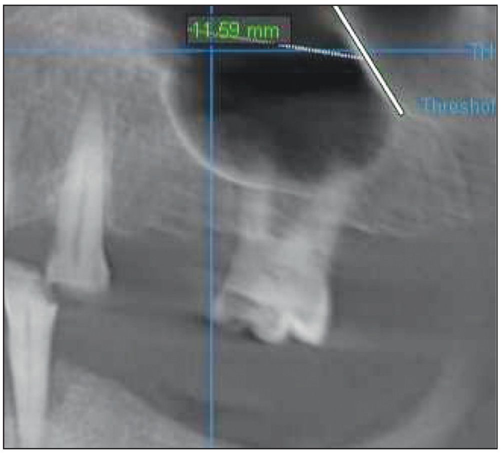

FIGURE 3: Measurement of the septa height.

between two observers was assessed using intra-class correlation coefficient (ICC) for continuous variables, and Cohen's kappa analysis for categorical variables. Skewness statistics and histogram graphs were used to assess the adherence of continuous variables to the normal distribution, and it was concluded that they aligned well with the distribution. Mean and standard deviation values were used for the descriptive statistics of continuous numerical variables, and the number of sample (n) and percentage (%) values were used for categorical variables. For data analysis, independent t-test was used to investigate the relationships among numerical variables while chi-square test was used to investigate the relationships between qualitative variables. Continuous numerical variables were assessed for correlations using the Pearson correlation test. It was considered statistically significant for p<0.05.

RESULTS

CBCT scans of 142 patients (80 males, 62 females) aged 31 to 84 years were evaluated. Inter-observer agreement was excellent. ICC for all measures and Cohens weighted kappa values for all categorical variables were >0.8.

The mean age was 56.09±1.55 (minimum 31, maximum 84). There were 35 edentulous and 107 partially edentulous patients. The mean amount of remaining bone was 2.91±1.20 mm (minimum 0.51, maximum 4.89). CBCT evaluations were mainly performed in the 1st molar region (79, 55.6%), the remainder in the 2nd molar (48, 33.8%) and 2nd premolar region (15, 10.6%).

The mean diameter of the vascular canal was 1.28±0.42 mm (minimum 0.56 mm, maximum 2.85 mm), and the mean distance of the vascular canal to the alveolar crest was 11.71±3.57 mm (minimum 1.49, maximum 20.81). There was a statistically significant difference between males and women in terms of canal diameter (p=0.021), however there was no significant difference in terms of edentulous status (p=0.783). There was no statistically significant difference when the canal-ridge distance was compared according to edentulous status and gender (p=0.917, p=0.739, respectively) (Table 1).

31% (n=44) of the canal diameters were <1 mm, 62.7% (n=89) were between 1-2 mm, and 6.3% (n=9) were >2 mm. There was no statistically significant difference in canal type between males and females (p=0.313), between edentulous and partially edentulous patients (p=0.773) (Table 2, Table 3).

Localization of the vascular canal was observed as intraosseous in 71 patients and extraosseous in 71 patients. All of the canals determined as extraosseous were under the membrane (intrasinusal), no canal observed on the outer part of the lateral sinus wall (extrasinusal). Double canals were seen in 4 patients. There was no statistically significant difference be-

TABLE 1: Comparison of mean radiographic measurements by edentulous status and gender.

Mean measures		Parameters	n	$\bar{X}$	SD	p value
Canal diameter (mm)	Dentition	Edentulous	35	1.29	0.40	0.783
		Partially edentulous	107	1.27	0.42	
	Gender	Male	80	1.35	0.44	**0.021***
		Female	62	1.18	0.37	
Canal-crest distance (mm)	Dentition	Edentulous	35	11.77	3.93	0.917
		Partially edentulous	107	11.69	3.46	
	Gender	Male	80	11.62	3.63	0.739
		Female	62	11.83	3.51	
PNRA(°)	Dentition	Edentulous	35	124.95	24.55	0.488
		Partially edentulous	107	127.79	19.76	
	Gender	Male	80	124.92	20.60	0.162
		Female	62	129.89	21.30	
PNR-crest distance (mm)	Dentition	Edentulous	35	11.65	3.66	0.419
		Partially edentulous	107	11.16	2.89	
	Gender	Male	80	11.21	3.26	0.746
		Female	62	11.38	2.90	
Septa length	Dentition	Edentulous	15	8.24	3.45	**0.023***
		Partially edentulous	35	5.61	3.46	
	Gender	Male	22	1.35	0.44	0.216
		Female	28	6.93	4.47	

*Significant at p<0.05 (independent t-test); SD: Standard deviation; PNRA: Palatonasal recess angle; PNR: Palatonasal recess.

TABLE 2: Distribution of risk factors by gender.

	Risk factors n (%)								
	Canal diameter			PNRA		PNR-crest distance		Septa presence	
Groups	<1	1-2	>2	<90	>90	<15	>15	Visible	Not visible
Male (n=80)	22 (27.5)	51 (63.7)	7 (8.8)	6 (7.5)	74 (92.5)	73 (91.3)	7 (8.8)	21 (26.3)	59 (73.8)
Female (n=62)	22 (35.5)	38 (61.3)	2 (3.2)	3 (4.8)	59 (95.2)	56 (90.3)	6 (9.7)	28 (45.2)	34 (54.8)
p value	0.313			0.731		0.849		**0.019***	

*Significant at p<0.05; chi-square test; PNRA: Palatonasal recess angle; PNR: Palatonasal recess.

TABLE 3: Distribution of risk factors according to edentulous status.

	Risk factors n (%)								
	Canal diameter			PNRA		PNR-crest distance		Septa presence	
Groups	<1	1-2	>2	<90	>90	<15	>15	Visible	Not visible
Edentulous (n=35)	9 (25.7)	24 (68.6)	2 (5.7)	3 (8.6)	32 (91.4)	31 (88.6)	4 (9.6)	15 (42.9)	20 (57.1)
Partially edentulous (n=107)	35 (32.7)	65 (60.7)	7 (6.5)	6 (5.6)	101 (94.4)	98 (11.4)	9 (8.4)	34 (31.8)	107 (68.2)
p value	0.773			0.689		0.736		0.231	

*Significant at p<0.05; chi-square test; PNRA: Palatonasal recess angle; PNR: Palatonasal recess.

tween men and women in terms of the location of the vascular canal (p=0.398) (Figure 4).

The mean PNRA was 127.09°±20.98° (minimum 61.50°, maximum 167.80°). The mean distance of PNR to the alveolar crest was 11.28±3.09 mm (minimum 1.24, maximum 22.53). Analysis of PNR location (p=0.419, p=0.746, respectively) and PNRA (p=0.488, p=0.162, respectivley) revealed that no significant difference existed between the groups when assessed based on edentulous status and gender (Table 1).

6.3% (n=9) of the PNR angles were less than 90 degrees, and 93.7% (n=133) were greater than 90 degrees. There was no statistically significant difference in terms of PNRA type between women and men (p=0.731), between edentulous and partially edentulous patients (p=0689) (Table 2, Table 3).

90.8% (n=129) of the distance of the PNR to the alveolar crest was less than 15 mm, and 9.2% (n=13) of it was over 15 mm. There was no statistically significant difference in PNR location in terms of gender and edentulous status (p=0.849, p=0.736, respectively) (Table 2, Table 3).

Septa was detected in 34.5% (n=49) of the patients. The presence of septa was statistically significant in women compared to men (p=0.019) (Table 2). There was no significant difference in the presence of septa between fully edentulous and partially edentulous patients (p=0.231) (Table 3). The mean septa length was 6.40±3.63 (minimum 2.40, maximum 16.08). While there was a statistically significant difference in septa length between fully edentulous and partially edentulous patients (p=0.023), no significant difference was found according to gender (p=0.216) (Table 1).

Canal symmetry was found in 82.4% (n=117) of all patients, and septa symmetry was detected in 51% (n=25) of patients (n=49) with septa. There was no difference between men and women in terms of canal and septa symmetry (p=0.630, p=0.458, respectively).

Upon analyzing the correlation between radiographic measurements and age, it was determined that there exists no statistically significant relationship between the variables (p=0.511, p=0.238, p=0.258, p=0.091, p=0.389, p=0.269, respectively) as presented in Table 4.

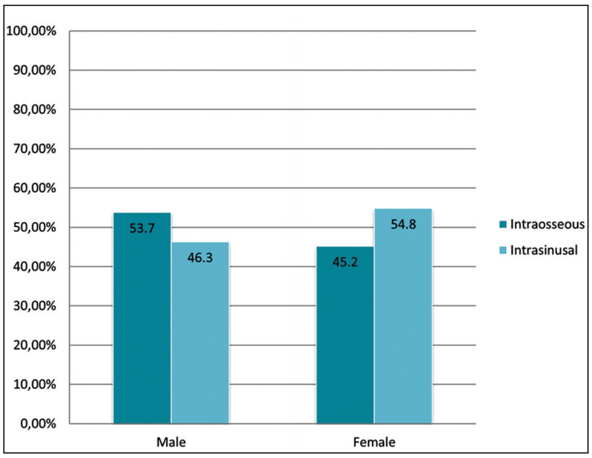

FIGURE 4: Position of vascular canal in relation to gender.

TABLE 4: Evaluation of the relationship between radiographic measurements and age

Parameters	Age r/p value
Residual crest	0.056/0.511
Canal diameter	0.1000/.238
Canal crest distance	0.096/0.258
PNRA	-0.142/0.091
PNR-crest distance	0.073/0.389
Septa length	0.161/0.269

r: Pearson correlation coefficient; p: significance; PNRA: Palatonasal recess angle; PNR: Palatonasal recess.

DISCUSSION

As per the outcomes of this study, the null hypothesis was rejected in terms of the diameter of the vascular canal, length of the septa, and prevalence of the septa.

The diameter of the artery during sinus lift surgery affects how bothersome bleeding can be. When the artery diameter exceeds 2 mm, rapid, pulsatile and prolonged bleeding may occur.[6] In the current study, prevalance of canal diameter exceeding 2 mm (6.3%) was consistent with the findings of Mardinger et al. (6.7%), but did not align with the results reported by Chitsazi et al. (10.5%).[5,11] In addition to most of the canal diameters being between 1-2 mm (62.75%), the mean canal diameter obtained in this study is consistent with the results of previous studies.[7,11,12,15,16] There are also studies in the literature that report mean diameters below 1 mm.[10,17] In contrast to Mardinger et al., the mean vascular canal diameter showed a significant difference between males and females, as in another studies.[5,12,18,19] It was found to be statistically higher in males than females. Consequently, it can be thought that minimum of 6.3% of patients are susceptible to bleeding complications from arterial injury during interventions in the maxillary sinus, and males are more prone to experiencing these complications when compared to females. According to Mardinger et al., older patients exhibit larger vessels when compared to younger individuals.[5] However, there was no significant correlation found between the diameter of the canal and patient age in our study.

The lateral positioning of the bony canals relative to the sinus wall was grouped into three classifications: (a) extrasinusal (the canal protruded outward from the wall); (b) intraosseous (the canal situated within the sinus wall); (c) intrasinusal (the canal protruded inward from the wall). While intraosseous localization is commonly reported, there are also studies in which the intrasinusal type is found to be the most frequently reported.[11,13,16,20,21] Our study found an equal occurrence of intraosseous and intra sinusal types, and also no extrasinusal type was observed as in the study of Ella et al. Tehranchi et al. found that the canal tended to be more intraosseous in males and more intrasinusal in females.[14,19] In our study, as in the previous studies, gender was not effective on canal localization.[16,18]

Although the distance from the canal to the alveolar crest was similar to a study involving patients with planned sinus floor elevation, it was shorter when compared to another study conducted using the same method.[15,22] The location and size of the lateral antrostomy can be affected by the position and dimension of the vascular canal. It is stated that the bone window for sinus floor augmentation should not extend more than 15 mm from the inferior border of the alveolar process in the literature.[5,23] In our study, we found that the mean distance between the canal and the alveol crest was less than 15 mm. This revealed the significance of not disregarding the vascular canal during bone osteotomy not exceeding 15 mm and the importance of conducting thorough examinations using radiographic methods before the surgery.

In the current research, the average PNR angle measured over 90°, while the average PNR height to the alveolar crest was below 15 mm, which aligns with findings from previous studies.[9,15,24] According to the literature, it has been noted that when the acute angled PNR (<90°) is less than 15 mm from the alveolar crest, raising the sinus membrane from the medial wall during sinus lift procedures may become challenging. Additionally, the amount of membrane elevation may reduce, and there might be a higher risk of membrane perforation. This acute angle is found more frequently in the premolar region, while it is wider in the molar region; however, the height of the PNR is less in the molar region.[9,24] In our study, the regions where sinus lift was planned were primarily molar regions where the occurrence of angles less than 90 degrees was 6.3%. As a consequence, it was determined that elevating the membrane would be easier, and the potential risk of perforation would be lower.

In various literature sources, the prevalence of septa ranges from 7.7% to 66.7%.[8,15,18,25,26] The authors hypothesized that this could be attributed to several factors, including a limited sample size, image resolution, and the interpretation of septa. In the present study, the presence of septa is similar to the previous study.[8] It has been reported that septa are more frequently found in edentulous patients, and our research was consistent with it.[27] In certain studies, men exhibited a higher prevalence of septa whereas in another study, no discernible between men and women was observed.[8,18,25] However, this study was found higher prevalence of septa among women.

Wen et al. have previously emphasized that when septa reach a height of 6 mm, clinicians should exercise caution in surgical planning, as it could potentially elevate the risk of membrane perforation.[28] In our research, the average length of septa was found to be over 6 mm. In addition, septa was found longer in edentulous patients than partially edentulous patients which is in line with studies by Iwanaga et al., whereas Kawakami et al. and Tassoker found no such difference.[4,15,18]

It is widely held that when there is diminished bone height, especially if it falls below 4 mm, the probability of membrane perforation during sinus floor elevation increases. Our study specifically focused on patients necessitating a lateral approach sinus lift procedure, wherein the average remaining bone amount was below 4 mm. This underscores the importance of conducting a three-dimensional assessment of anatomical risk factors that could potentially impact membrane perforation prior to surgical intervention. Due to the reported higher frequency of detecting the vascular canal in CBCT compared to conventional CT, and considering that conventional CT shows thicker arteries, we conducted our study on CBCT.[29]

The presented study is limited by uneven distribution across edentulous status, age, and gender. Hence, we propose future research with larger, more diverse samples, comparing edentulous status across various age groups. A comprehensive study incorporating patient-related factors alongside anatomical risk factors is also recommended.

CONCLUSION

The research provided valuable insights into the prevalence and characteristics of anatomical features that could potentially impact sinus lift surgeries in patients requiring dental implant placement in the posterior edentulous maxilla. It highlighted the importance of vascular canal diameter, septa presence, and PNR characteristics in assessing complications during sinus lifts. The findings revealed that the diameter of the vascular canal and the presence of septa were significant factors to consider when assessing the risk of complications during sinus lift procedures. Preoperative CBCT scans can aid in identifying these factors for safer implant surgery in the posterior maxilla. Further research could include patient-related factors for a more comprehensive understanding and improved clinical practice in sinus floor augmentation.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

***Idea/Concept:** Tuğçe Çevik Sönmez; **Design:** Tuğçe Çevik Sönmez, Emine Cansu Topçuoğlu; **Control/Supervision:** Tuğçe Çevik Sönmez, Emine Cansu Topçuoğlu; **Data Collection and/or Processing:** Tuğçe Çevik Sönmez, Emine Cansu Topçuoğlu; **Analysis and/or Interpretation:** Ömer Akbulut, Tuğçe Çevik Sönmez; **Literature Review:** Tuğçe Çevik Sönmez, Emine Cansu Topçuoğlu; **Writing the Article:** Tuğçe Çevik Sönmez, Emine Cansu Topçuoğlu; **Critical Review:** Tuğçe Çevik Sönmez, Ömer Akbulut.*

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