

Cross Sectional Study Estimating Prevalence and Location of Maxillary Sinus Septum using Orthopantomogram

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ABSTRACT

Background: Maxillary sinus septum is an anatomical variation in the maxillary sinus. It is a crucial structure that needs to be evaluated during sinus elevation procedure. As the risk of membrane perforation increases when anatomical variation such as antral septa are present. The study was conducted with the objective to evaluate prevalence and location of maxillary sinus septum.

Methods: The study is based on analysis of digital orthopantomogram images that are obtained from patients who visited Farooqia Dental College and Hospital, Mysuru. A retrospective analysis of 400 maxillary sinuses (200 pairs) is done. The orthopantomogram images which exhibited any sinus pathology/fracture are excluded from study. Orthopantomogram was analyzed by examiners to confirm the presence/ absence of sinus septum. Patients not having maxillary sinus septum on both sides are considered absence of sinus septum.

Results: Prevalence of maxillary sinus septum was found to be 21%. Maxillary sinus septum was found in 49 patients on left side and 35 patients on right side.

Conclusion: Study infers significant prevalence of septum with maxillary sinus that would aid to prevent complications during sinus lifting procedure.

Keywords: Maxillary Sinus, Sinus Septum, Antrum Of Highmore, Digital Orthopantomogram.

Introduction

Maxillary sinus septa (Figure 1) were first described by Underwood in 1910.^{1, 2} The etiology of antral septa has been the subject of several hypotheses by various authors. Neivert proposed that the septa were derived from the fingerlike projections produced by the embryologic out-pouching of the ethmoid infundibulum, where the contiguous walls did not resorb.3 Maxillary sinus septa are walls of cortical bone present within the maxillary sinus; their shape has been described as an inverted gothic arch arising from the inferior or lateral walls of the sinus, and may even divide the sinus into two or more cavities.^{1, 4,} ⁵Many sinuses are partially divided into compartments by bony partitions or septa that vary greatly in length and thickness.6Often one or several radiopaque lines traverse the image of the maxillary sinus. These opaque lines are called septa.7

The presence of anatomic variations within the maxillary sinus, such as septa, has been reported to increase the risk of sinus membrane perforation during the sinus elevation procedure.⁸Detailed knowledge of maxillary sinus anatomy is becoming increasingly important during sinus augmentation surgery. Such augmentation allows anchorage of dental implants even when the posterior maxillary region has undergone severe bone resorption. In this surgical technique, a hinge door is made in the facial antral wall and inverted to create space for the grafting material. Surgical interventions in the posterior maxillary region require detailed knowledge of maxillary sinus anatomy and the possible anatomic variations.^{9, 10} For example; the presence of septa can limit the creation of a window in the lateral antral wall and elevation of a hinged door.⁹

Therefore, it is important for septa to be accurately diagnosed on preoperative imaging. The occurrence and location of maxillary sinus septa have been evaluated using panoramic radiography and computed tomography (CT). Even though Underwood published a detailed description of maxillary sinus anatomy in 1910, for decades these septa were considered clinically-insignificant anatomical variations. Now, however, we must understand the maxillary sinus and anatomical variations because the lateral hinge door formation is a complicated procedure and the membrane is susceptible to perforation during elevation in the presence of a maxillary sinus with septa.^{1, 4} Therefore, only when the prevalence, location and morphology of the sinus septa are understood, a precise surgical plan can be made and complications from sinus surgery can be prevented.^{1, 3}

The purpose of the study was to evaluate prevalence, location and also to compare gender (male and female) and side (right or left) of occurrence of maxillary sinus septum using orthopantomogram.

Materials and Methods

The study is based on the analysis of digital orthopantomogram images that were obtained from patients who visited Farooqia Dental College and Hospital, Mysuru. A retrospective analysis of 400 maxillary sinuses (200 pairs) was done. The images included in the study were not having pathological findings or fracture. Each orthopantomogram were analyzed by examiners to confirm the presence or absence of sinus septum. Patients not having maxillary sinus septum on both sides are considered absence of sinus septum. All radiographs were taken with a digital machine, SIRONA Orthophos XG with the following parameters:

- Kilovoltage of 62-73 kVp
- Tube current 8-15 mA
- Time for 14.9 s

Results

In present study maxillary sinus septum was found to be present in 84(21%) and it is absent in 316(79%) out of 400 maxillary sinuses (200 pairs) viewed in 200 patient through orthopantomogram. The prevalence of maxillary sinus septum was found to be 21 % (Table 1 and Graph 1). In present study, out of 84(21%) maxillary sinus septum, 35 septum were found in males and 49 septum were found in females. Hence the prevalence of maxillary sinus septum was 8.75% for males and 12.25% for females respectively (Table 2 and Graph 2). There was no statistically significant

difference in proportion of maxillary sinus septum between males and females (p=0.127). In present study location and association of maxillary sinus septum on right and left side was assessed using chi square test for association. In 133(88.1%) patients maxillary sinus septum was absent in both right and left side. In 18 (11.9%) patients it was present in right side and absent in left side. In 32 (65.3%) patients it was present in left side and absent in right side and in 17(34.7%) patients it was present in both sides. There was statistically significant association of maxillary sinus septum with sides of maxillary sinus (p<0.001) (Table 3 and Graph 3). Strength of association was assessed using phi test where it showed moderately strong association between maxillary sinus septum and sides of sinus (i.e., phi 0.258) and the association was found to be statistically significant (p<0.001). In total out of 200 patients, maxillary sinus septum was found in 49 patients on left side and 35 patients on right side and it was found to be more in left side compared to right side of maxillary sinus.

The prevalence of maxillary sinus septum was found to be 21 %. Out of 84(21%) maxillary sinus septum, 35 septum were found in males and 49 septum were found in females. Hence the prevalence of maxillary sinus septum was 8.75% for males and 12.25% for females respectively. In total out of 200 patients, maxillary sinus septum was found in 49 patients on left side and 35 patients on right side and it was found to be more in left side compared to right side of maxillary sinus.

Table 1; and Graph 1: Presence and absence of maxillary sinus septum.

PRESENCE AND ABSENCE OF MAXILLARY SINUS SEPTUM								
		Frequency	%	Р				
SEPTUM ON BOTH SIDE	ABSENT	316	79%					
	PRESENT	84	21%	<0.001				
	Total	400	100%					



GENDER WISE PREVALENCE OF MAXILLARY SINUS SEPTUM								
			SEPTUM	Р				
GENDER	MALE	Count	35					
		%	8.75%	0.407				
	FEMALE	Count	49	0.127				
		%	12.25%					

Table 2: and Graph 2: Gender wise prevalence of maxillary sinus septum.



Table 3: and Graph 3: Maxillary sinus septum right side versus left side.

Chi-Square Tests									
SEPTUM RIGHT * SEPTUM LEFT ABSENT PRESENT			SEPTUM LEFT		Р				
SEPTUM RIGHT	ABSENT	Count	133	32					
		% within SEPTUMLFT	88.1%	65.3%	<0.001				
	PRESENT	Count	18	17					
		% within SEPTUMLFT	11.9%	34.7%					



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Fig. 1: Digital orthopantomogram showing maxillary sinus septum.

Discussion

Several authors have studied the prevalence of maxillary sinus septum.² Underwood found 30 septa in 90 sinuses, demonstrating 33% prevalence, Ulm et al. found 15 septa in 82 sinuses, demonstrating a prevalence of 18.3%.¹¹ Krenmmair et al. reported 32 septa in 200 sinuses, demonstrating 16% prevalence. Kannaperuman et al found 217 septa in 921 sinuses, demonstrating a prevalence of 23.6%.¹Velasquez-Plata et al.¹² reported 75 septa in 312 sinuses, demonstrating a prevalence of 24%. Won-Jin Lee et.al found 58 septa in 236 sinuses, demonstrating a prevalence of 24.6%.¹³Present study revealed 84 septa (21%) and absent in 316(79%) out of 400(200 pairs) sinuses viewed in 200 subjects using orthopantomogram. The prevalence of maxillary sinus septum is found to be 21%. The prevalence of the present study agrees with the results of the previous studies.

Kannaperuman et al, out of 217 sinus septa, 125 male patients had the maxillary sinus septum, 92 female patients had the maxillary sinus septum.¹In present study out of 84 maxillary sinus septae, 35 male patients had the maxillary sinus septum and 49 female patients had the maxillary sinus septum.

Velasquez Plata et al. found 39 septum in the left sinus and 36 septum in the right sinus out of 75 septa.¹² Kannaperuman et al found 118 septum existed in right sinus and 99 septa existed in left sinus out of 217 septa. According to Won-Jin Lee et.al found 32 septum in the left sinus and 26 septum in right sinus out of 58 septa.¹³ In present study out of 84 maxillary sinus septa, 49 were found in left sinus and 35 were found in right sinus. Maxillary sinus septum was more in left side compared to right side of maxillary sinus.Sinus septa can be divided into primary septa and secondary septa; the primary septa arise from the development of the

maxilla, whereas the secondary septa are said to arise from the irregular pneumatization of the sinus floor following tooth loss. In other words, primary septa are congenital and secondary septa are acquired. The septa above the apical area of an edentulous ridge cannot be distinguished into primary or secondary septa without previous radiographic records. Therefore, it can be said that septa above teeth are primary, and septa above an edentulous ridge are primary or secondary.¹

Conclusion

There is a wide anatomical variation in the prevalence, location of maxillary sinus septa. Presence of septa will increase the risk of sinus membrane perforation during the sinus elevation procedure. Among possible complications of perforation of the sinus membrane is development of maxillary sinusitis. In sinusitis, dysfunction of mucociliary clearance, the stagnation of secretions, obstruction of excretion and ventilation in the maxillary sinus is seen. During sinus augmentation surgery, the presence of septa can restrict the creation of a window in the sinus wall and elevation of a hinged door. Therefore complications during surgery and post operative can be prevented by knowing the accurate information of maxillary sinus and its septa.

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