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Al Zahrawi University
College of Dentistry

Maxillary Sinus Septa: Prevalence and their Distribution

A Project Submitted to
The College of Dentistry, Al Zahrawi University, Department of Dental Radiology in Partial Fulfillment for the Bachelor of Dental Surgery

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بسم الله الرحمن الرحيم

وأن ليس للإنسان إلا ما سعى

وأن سعيه سوف يرى

Committee Certification

We, the members of the examining committee, certify that after reading this graduation project and examining the students (Hussain Haider, Fatima Raheem, Ruqaia Ali, Zahraa Jabar) and that in our opinion it meets the standards of the graduation project.

Signature
Lecture

Signature
Lecture

Declaration

We certify that this project entitled "**Maxillary Sinus Septa: Prevalence and their Distribution**" by the undergraduate students **Hussain Haider, Fatima Raheem. Ruqaia Ali, and Zahraa Jabar** under my supervision at the College of Dentistry / Al Zahrawi University in partial fulfilment of requirements for the degree of Bachelor in Dental Surgery (BDS)

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Dedication

To our beloved families, whose unwavering support carried us through; to our friends, who stood by us with laughter and encouragement; and to our professors, whose guidance and knowledge shaped our journey, we are deeply grateful. This achievement is as much yours as it is ours.

Acknowledgment

Primarily we would like to thank the Almighty God for being able to complete this project with success.

We would like to express grateful thanks to dean of Al Zahrawi University, **Dr. Nadhera H. Al Safar.**

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We would like to thank each and every one who supported us through out the project, from family to friends.

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.

Aim of the study:

The study was performed to assess the prevalence of maxillary sinus septa & their distribution according to the gender, side & location.

Materials &Methods:

The study is based on analysis of digital orthopantomogram images that are collected from archive of radiology department at College of Dentistry / Al Zahrawi University. A retrospective study consist of 200 maxillary sinuses (100 pairs) of Iraqi subjects with age ranged from (20-60) years old.
The study sample sub-divided into groups according to gender, side & location.

Results:

The prevalence of maxillary sinus septa was in a less number of cases (40 cases) than its absence (60 cases). The presence of maxillary sinus septa was in female (22 cases) more than males (18 cases). The prevalence of maxillary sinus septa was in right side (33 sinuses) more than left one (26 sinuses). The most common location was middle (41%) followed by posterior (39%) and least common location was anterior (20%).

Conclusion:

Panoramic Radiography is a good diagnostic tool for the detection of maxillary sinus septa and provide information about the location of this structure Therefore complications during surgery and post-operatively can be prevented by knowing the accurate information of maxillary sinus and its septa.

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Symbol	Abbreviation
MS	Maxillary sinus
MSS	Maxillary sinus septa
TMJ	Temporomandibular joint
CT	Computed Tomography
CPCT	Cone-Beam Computed Tomography
MRI	Magnetic Resonance Imaging
CCD	Charge-coupled device
OPG	orthopantomogram

Introduction

The maxillary sinus in the adult consists of a pyramid shaped cavity in the facial skull with its base at the lateral nasal wall and its apex extending into the zygomatic process of the maxilla **(McGowan et al, 1993).**

The proximity of maxillary sinus to the alveolar crest can be enhanced by sinus pneumatization, as well as resorption of the alveolar ridge due to tooth extraction, trauma or pathology. At the edentate stage of life, the size of maxillary sinus increases further, often filling a large part of the alveolar process, leaving sometimes only a paper-thin bone wall on the lateral and occlusal sides. This process of pneumatization of the sinus varies greatly from person to person and even from side to side **(Boyne and James, 1980).**

Various surgical operations involving the maxillary sinus in the posterior maxillary region demand adequate knowledge about the possible anatomical variations. Exact knowledge of the patient's morphological conditions allows accurate planning of invasive surgery and helps to prevent complications **(Velasquez-Plata et al, 2002; González-Santana et al, 2007).**

The presence of anatomical variations such as maxillary sinus septa, has been reported to hamper the preservation of the mucous membrane lining of maxillary sinus during the surgical sinus elevation procedure **(Chanavaz, 1990; Betts and Miloro, 1994; Krennmair et al, 1997; Van den Bergh, 2000).**

Underwood in 1910 first described and analyzed maxillary sinus septa as barriers of cortical bone or bony ridges that divide the maxillary sinus floor into multiple compartments, known as recesses.

Krennmair et al in 1999 further classified the septa into primary and secondary septa; primary septa arised from the development of the maxilla, whereas the secondary septa were said to arise from the irregular pneumatization of the sinus floor following tooth loss.

Evaluation of the anatomical structures inherent to the maxillary sinus is crucial for the success of sinus surgical procedures. Therefore, an exact and definitive radiological assessment is necessary **(Abrahams, 2001; Kim et al, 2006).**

Panoramic imaging (also called orthopantomography) is a technique for producing a single tomographic image of facial structures. **(White and Pharaoh, 2009).**

Panoramic radiography demonstrates a wide view of the maxilla and mandible as well as surrounding structures, including the neck, temporomandibular joint , zygomatic arches, maxillary sinuses and nasal cavity, and orbits although it does so with less sharpness and detail, comparison of right and left sides is easier with a panoramic projection, and this view provides an excellent initial view of the osseous structures of the temporomandibular joint and of the integrity of the sinus floor **(Greenberg and Glick, 2003).**

Aim of the study

This study was performed to assess the prevalence of maxillary sinus septa & their distribution according to the gender, side & location.

Chapter one

Review of Literature

Review of Literature

1.1 Anatomy of Maxilla

1.1.1 Definition

It is one of two identical bones that form the upper jaw. The maxillae meet in the midline of the face and often are considered as one bone. They have been described as the architectural key of the face because all bones of the face except the mandible touch them. Together the maxillae form the floor of the orbit for each eye, the sides and lower walls of the nasal cavities, and the hard palate and the lower border of the maxilla supports the upper teeth as shown in figure (1-1). Each maxilla contains an air space called the maxillary sinus **(Drake et al, 2009).**

1.1.2 Components of maxillae: (Grays, 2005)

Each half of the fused maxilla consists of:

- **The body of the maxilla**
- **Four processes:**
  - The zygomatic process
  - The frontal process of maxilla
  - The alveolar process
  - The palatine process
- **Infraorbital foramen**
- **The maxillary sinus**

1.1.2.1 The body of Maxilla:

The body of each maxilla lies below the corresponding orbit and lateral to the lower part of the nasal cavity, it contains the maxillary air sinus, and has the shape of a three-sided pyramid lying with its base medially, as shown in figure (1-2) **(Grays, 2005 & 2008; Romanes, 2008)**.

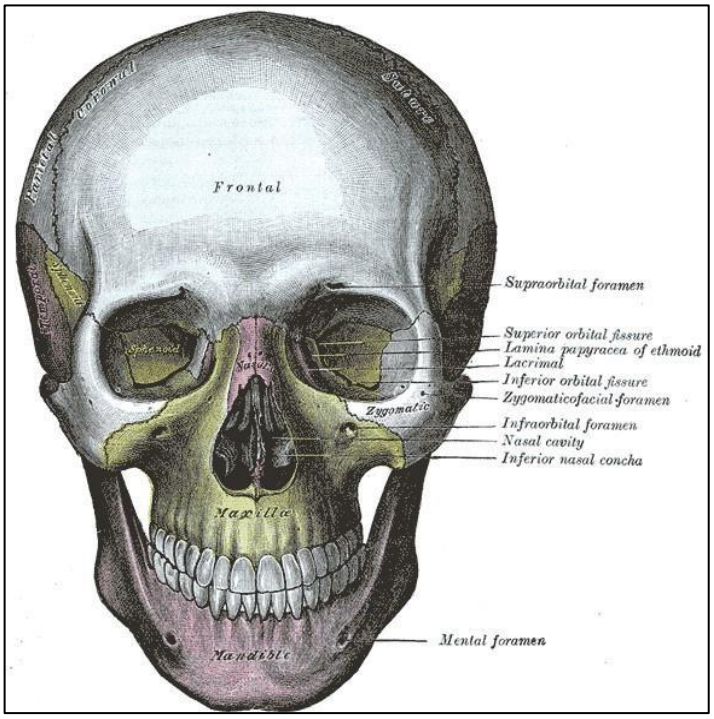

Figure (1-1): The skull from the front shows the maxillary bones. **(Grays, 2008)**

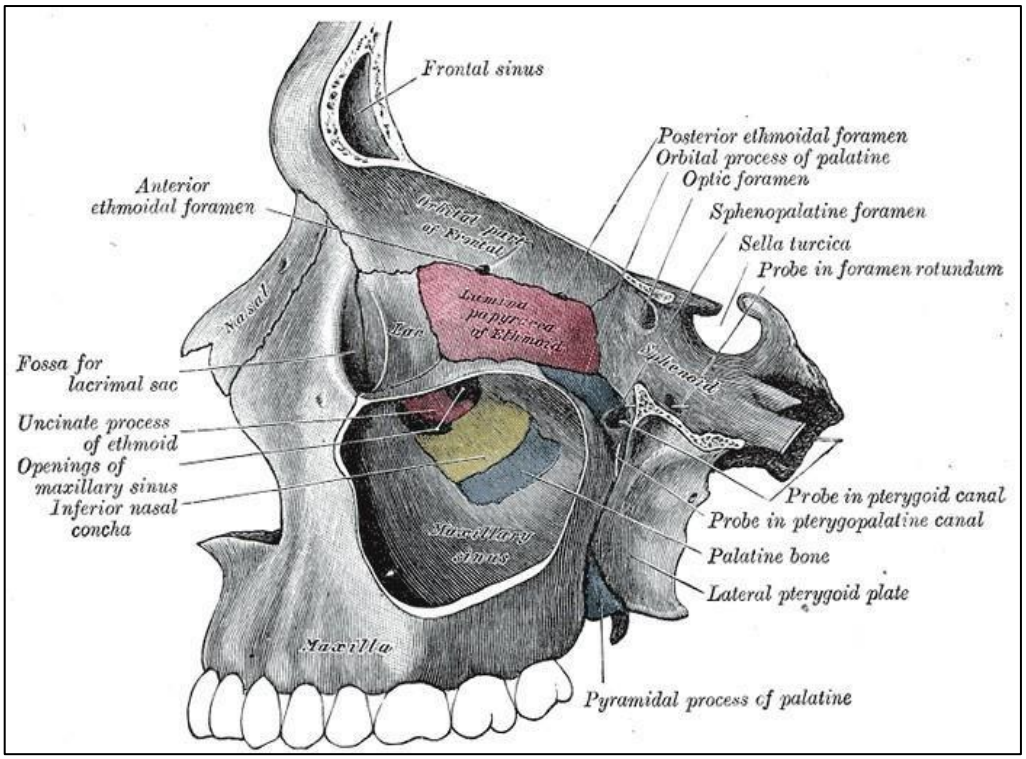

Figure (1-2): Left maxillary sinus opened from the exterior. **(Grays, 2008).**

1.1.3 The Importance of maxillary Bones (Grays, 2005).

The main functions of maxillae as bones are:

1. The alveolar process of the maxilla holds the upper teeth, and is referred to as the maxillary arch. The maxilla attaches laterally to the zygomatic bones (cheek bones).
2. The maxilla assists in forming the boundaries of three cavities:
   - The roof of the mouth
   - The floor and lateral wall of the nasal antrum
   - The floor of the orbit
3. The maxilla also enters into the formation of two fossae: the infratemporal and pterygopalatine, and two fissures, the inferior orbital and pterygomaxillary.

1.1.4 The alveolar process of maxilla:

It's the thickened ridge of bone that contains the tooth sockets on bones that bear teeth. It is also referred to as the alveolar bone. In humans, the tooth – bearing bones are the maxilla and the mandible .It makes up the thickest part of the maxilla **(Cate, 1998; Kyung, 2000).**

Each alveolus conforms closely to the shape of the root of the tooth it contains. Roots are supported within the alveoli by connective tissue called the periodontal membrane or the periodontal ligament. When teeth are lost, the alveolus gradually disappears. This happens partly through a filling in of their deeper parts and partly through resorption (loss) of the bone and a simultaneous shrinkage of their soft parts. This is an important consideration when these teeth are replaced with dentures, as shown in figure (1- 3)**(Grays, 2008).**

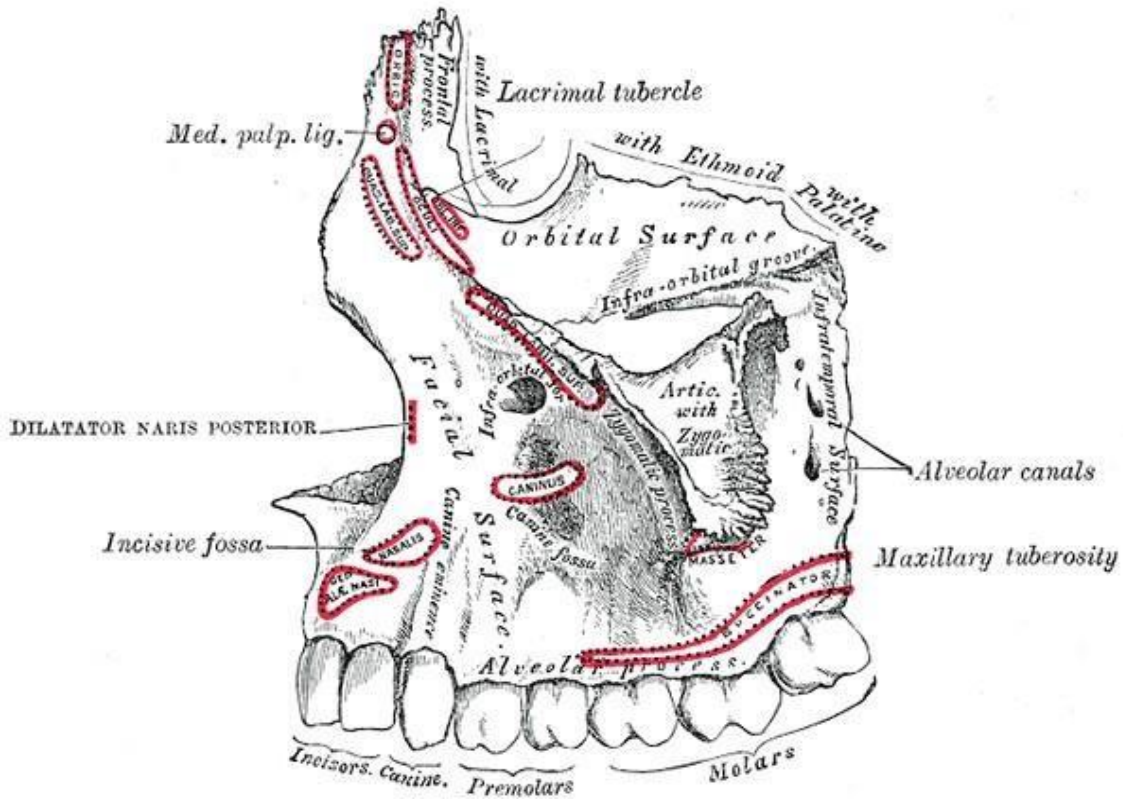

Figure (1-3): lateral aspect of maxilla shows the alveolar process **(Grays, 2008)**

1.2 Maxillary Sinus

1.2.1 Maxillary Sinus Anatomy

Maxillary sinuses are two spaces, which are filled with air, located in the maxillary bones and can be of various sizes and shapes; they occupy the maxillary bones bilaterally. Maxillary sinus MS is the largest of the paranasal sinuses, it is also known as the antrum or the antrum of Highmore. *Antrum* is derived from the Greek word meaning cave **(Plenk and Tschabitscher, 1986; Hupp et al, 2008).**

The paired maxillary sinuses, occupying most of the bodies of the maxillae and are the largest of the para nasal sinuses, pyramidal in shape, they have a base formed by the lateral wall of the nasal cavity. The roof forms the floor of the orbit, frequently ridged by the overlying infraorbital canal **(Williams et al, 1995).**

The lateral wall of the sinus contains canals or grooves for the nerves and blood vessels supplying the upper posterior teeth**,** as shown in figure (1-4) A and B **(Whaites, 2003)**.

The floor of the MS is formed by the alveolar process. The first, the second and the third molars and the roots of the premolars may elevate the sinuses or may perforate their floor **(Lerno, 1983).**

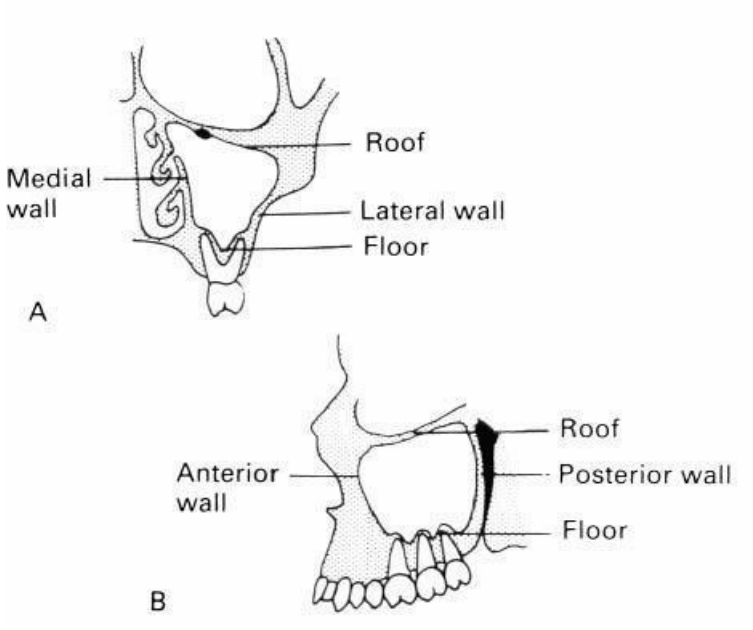

Figure (1-4) A &B: Diagrams of a left antrum showing the basic shape and various walls and margins. A- From the front. B- From the side **(Whaites, 2003).**

The medial wall of the MS is bounded by the nasal surface of the body of the maxilla and by parts of the palatine, lacrimal, ethmoid and inferior turbinate bones. The presence of these bones reduces considerably the size of the opening between the antrum and the nasal cavity during life **(Dixon, 1986).**

The posterior wall extends the length of the maxilla and dips into the maxillary tuberosity. Behind this wall is the pterygomaxillary fossa with the internal maxillary artery, sphenopalatine ganglion and the Vidian canal, the greater palatine nerve and the foramen rotundum **(Bailey et al, 2006; Hupp et al, 2008).**

The MS is lined with a pseudo stratified ciliary columnar epithelium the cilia being in constant movement and sweeping the mucous towards the sinusal ostia**.** The flow pattern is specific for each sinus and persists even in the presence of alternative openings **(Souza et al, 2006).**

Fluids drain into the nasal cavity by a narrow osteomeatal complex with the obstruction of the outflow causing sinusitis, mucosal thickening and polyps or retention cyst formation **(Rothman, 1998).**

1.2.2 Maxillary Sinus Recess:

The zygomatic recess, extending into the malar eminence or body of the zygoma; the palatine recess, which is usually small and variable, extending into the hard palate; the tuberosity recess, extending downward above and behind the

third upper molar; and the alveolar recess, extending into the alveolar process of the maxilla **(Mafee et al, 2006).**

The floor of the maxillary sinus is oriented inferiorly and laterally toward the alveolar process of the maxillary bone. At this level, it can form recesses between the dental roots. The alveolar recess in the alveolar process is in 52% of cases and consider the most frequent sinus extension, these facilitates the violation of the antrum through endodontic or surgical therapy, as shown in Figure (1-5) **(Nimigean et al, 2008),**.

Figure (1-5): Periapical radiograph showed the alveolar recess between the roots of the premolar **(Nijmegen et al, 2008).**

1.2.3 Shapes of Maxillary Sinus

Maxillary sinus is tubular at birth, ovoid in childhood and pyramidal shape in adults, its pyramidal shape is acquired as a result of eruption of permanent teeth from the first day of appearance, maxillary sinus expanded not only in posterior direction but also in anterior direction from 11 weeks onwards. It has been reported that triangular sinuses were the most common in both females and males **(Koppe et al, 1994; Gunay et al, 1997).**

Szilvassy in 1974 divided the maxillary sinuses into four bases according to their shapes: i.e. triangular, leaf, scapular and renal shaped and **Lerno in 1983** stated that the maxillary sinuses have also been classified it into triangular, oval, curved, and square shapes**.**

1.3 Functions of the Para nasal sinuses (as mentioned by Navarro, 2001):

1) Warming/humidification of air.
2) Assisting in regulation of intranasal pressure and serum gas pressures.
3) Contributing to immune defense.
4) Increasing mucosal surface area.
5) Lightening the skull.
6) Giving resonance to the voice.
7) Absorbing shock.
8) Contributing to facial growth.

1.4 Maxillary Sinus Septa

1.4.1 Definition

Maxillary sinus septa MSS were first described and analyzed regarding their prevalence and characteristics by Arthur S. Underwood, an anatomist at King's College London, and is thus also referred to as Underwood's septa **(Underwood, 1910).**

They are walls or barriers of cortical bone or bony ridges within the maxillary sinus, they are also named as sinus crests; their shape has been described as an inverted gothic arch arising from the inferior or lateral walls of the sinus, may be varied in number, thickness, and length and may even divide the sinus into two or more cavities, as shown in figure (1-6).
The presence of septa at or near the floor of the sinus are of interest to the dental clinician when proposing sinus floor elevation procedures because of an increased likelihood of surgical complications, such as tearing of the Schneiderian membrane **(Boyne, 1980).**

MSS divided the MS floor into three regions relating to zones of distinct tooth eruption activity:

- **Anterior** (corresponding to the premolars).
- **Middle** (corresponding to the first and second molar).
- **Posterior** (corresponding to the area distally to the second molar). **(Underwood, 1910).**

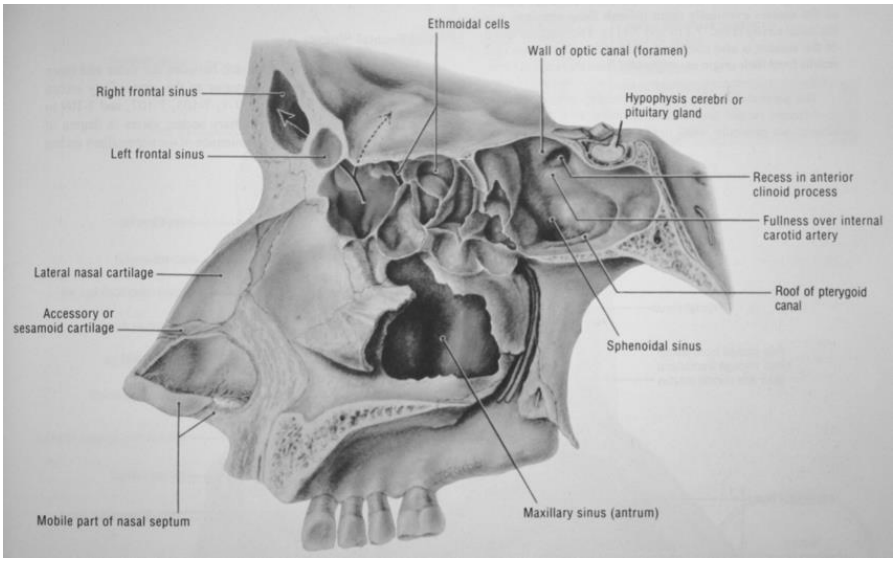

Figure (1-6): Lateral view of maxillary sinus showing sinus septa**. (Grays, 2008).**

1.4.2 Etiology and Classification of MSS

MSS constitute congenital and acquired normal anatomical variation. Congenital septa also referred to as "primary septa", can develop in all maxillary sinus regions and evolve during the growth of the middle part of the face **(Vinter et al, 1993)**.

Krennmair et al in 1999 categorized MSS into primary and secondary: primary septa corresponding to those first described by Underwood, arising during the development of the maxilla; and secondary septa arising from irregular pneumatization of the sinus floor following loss of teeth.

Kim et al in 2006 observed that atrophy of the maxillary alveolar process proceeded irregularly in different regions, leaving bony "crests" on the maxillary sinus floor; these are known as "secondary or acquired septa", which can be considered the result of tooth loss and atrophy.

1.4.3 Practical Implications of MSS

All the surgical interventions, such as endoscopic sinus surgery and sinus lift surgery, in the posterior maxillary region require detailed knowledge of maxillary sinus anatomy and possible anatomical variations. Detailed knowledge of the patient's morphological conditions allows exact planning of invasive surgery and helps to avoid complications such as the high risk of iatrogenic sinus membrane perforation during sinus floor augmentation surgery that may lead to postoperative sinusitis and graft infection, as shown in figure (1-7) **(Velásquez-Plata et al, 2002; González-Santana et al, 2007)**.

MSS have become increasingly important after the introduction of sinus floor augmentation surgery as their presence may complicate both creation and inversion of the access window in the lateral sinus wall, as well as elevation of the sinus membrane from the bony sinus floor **(Betts & Miloro, 1994)**.

There is also a great significance of MSS in endoscopic nasal surgery in which the otolaryngologist drain the sinus in case of sinusitis; so that the sinus cavity anterior to the coronal complete maxillary septa drainage into the middle meatus, whereas the antrum posterior drainage into the superior meatus **(Zhu et al, 2006)**.

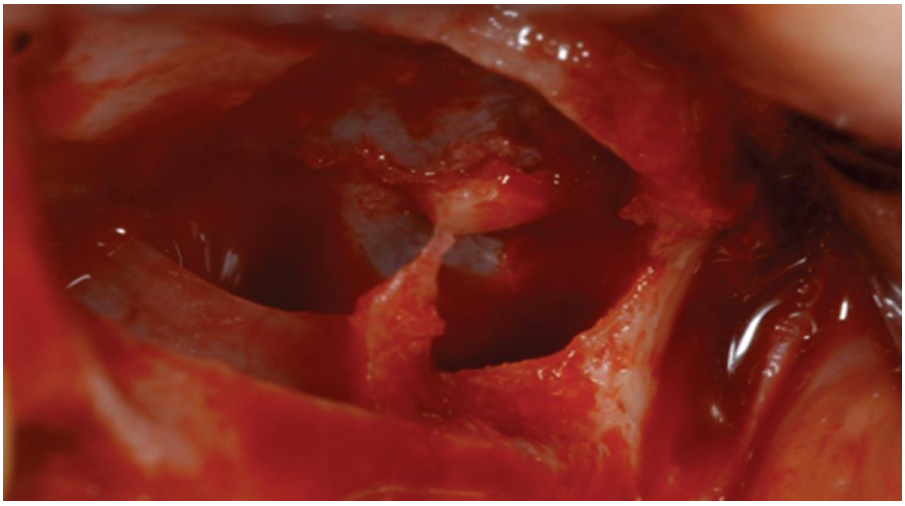

Figure (1-7): The presence of septa is well underlined after the sinus lift procedure performed. Two separate bone windows have been done. **(Mario et al, 2012).**

1.5 Dental Panoramic Tomography

Panoramic radiography, also known as pantomography or rotational radiography, is a radiographic procedure that produces a single tomographic image of facial structures **(Freny & Jaypee, 2009).**

The term Pantomography is derived from the word Panorama an unobstructed view of a region in every direction; Tomography the Greek word meaning "X-ray technique for making radiographs of layers of tissue in depth, without the interference of tissue above and below that level". Panoramic radiography demonstrates a wide view of the maxilla and mandible as well as surrounding structures, including the neck, TMJ, zygomatic arches, maxillary sinuses and nasal cavity, and orbits although it does so with less sharpness and detail, comparison of right and left sides is easier with a panoramic projection, and this view provides an excellent initial view of the osseous structures of the TMJ and of the integrity of the sinus floor **(Greenberg and Glick, 2003).**

The degree to which the blurring of extraneous details is dependent upon a number of factors .These factors include **(Farman, 2007):**

- The bulk of the content of the object.
- The atomic density of the contents of the object.
- The bulk and density of the patient soft tissue.
- The proximity of the object to the image layer.

Panoramic radiography is the most useful clinically for diagnostic problems requiring broad coverage of the jaw, common examples include evaluation of trauma, third, molar, extensive disease, and suspected large lesion and tooth development. These tasks don't require the high resolution and sharp detail available on intraoral radiograph **(White and pharaoh, 2009).**

Lesions affecting the floor of the maxillary sinus are better identified and localized with panoramic radiographs than with the Waters projection **(Duker and Fabinger, 1978).**

Maxillofacial radiography by means of orthpantomgram is used as a routine screening tool in diagnosis and treatment planning in various fields of dentistry and is found to be less expensive when compared to other advanced imaging modalities like CT, MRI & CPCT **(Mathew, 2011).**

It has become very popular in dentistry, the main reason for this include: the technique is simple and the radiation dose is relatively low. The resultant film is sectional radiograph produced by moving equipment and like all forms of radiography, only structure within the section (focal trough) will be evident and in focus on the final film **(White and pharaoh, 2009).**

Evaluation of the anatomical structures inherent to the maxillary sinus is crucial for the success of sinus surgical procedures. Therefore, an exact and definitive radiological assessment is necessary to avoid any clinical implications associated with presence of sinus septa. Dental panoramic radiography, computed tomography (CT) and cone beam computed tomography (CBCT) have all been used to identify the maxillary sinus septa **(Lugmayr et al, 1996; Koymen et al, 2009; Naitoh et al, 2009).**

Radiographic identification of these structures is important, since the design of the lateral window during sinus lift procedures is based on the presence of maxillary sinus septa **(Van den Bergh et al, 2000).**

Maxillary sinus septa are frequent anatomic variation. They can be found in any of the maxillary sinus regions independently of patient edentulism. The panoramic radiograph can lead to false-positive and false-negative findings in the visualization of septa in almost half of cases. Therefore, whenever a maxillary sinus lift is planned, a thorough study of the affected sinus should be made using CT **(Maestre-Ferrin et al, 2011).**

In some periapical radiographs, the septa appear as distinct radiopaque lines; in others, no septa are present. The presence and number of bony septa within a maxillary sinus vary depending on the anatomy of the individual **(Haring and Lind, 1993).**

1.5.1 Clinical Indications for Panoramic radiograph (Freny & Jaypee, 2009):

- Periodontal disease—as an overall view of the alveolar bone levels.
- To assist and assess the patient for and during orthodontic treatment.
- Prior to any surgical procedures such as extraction of impacted teeth, enucleation of a cyst, etc.
- Investigation of TMJ dysfunction.

- Evaluation of the vertical height of the alveolar bone before inserting osseointegrated implants.

1.5.2 Methods used in panoramic radiography (Bailoor& Nagesh, 2005):

1) Intraoral source of radiation is used to project on to the film positioned on the patient's face (Reverse-radiography based on Microfocus Principle).
2) The source of radiation and the film are positioned extraorally (Rotational Panoramic Radiography).
3) The latest CCD sensor technology makes it possible to have digital images recorded in the computer and displayed on the Visual Display Unit More and more tertiary level hospitals are going for the digital and filmless imaging systems.

1.5.3 Advantages and disadvantages of digital panoramic radiograph:

- **Advantages:**

As mentioned by ((Freny & Jaypee, 2009) :

1) Simple procedure requiring very little patient compliance.
2) Useful in patients with trismus and gagging problems.
3) Time required is minimal compared to a full mouth intraoral periapical radiographs.
4) The patient dose is relatively low.
5) A broad anatomic region is imaged.

- **Disadvantages :**

As mentioned by ((Freny & Jaypee, 2009) :

1) This radiograph is of a poor diagnostic quality, in terms of magnification, geometric distortion, poor definition and loss of detail.
2) Number of radiopaque and radiolucent areas may be present due to the superimposition of real/double or ghost images and because of soft tissue shadows and air spaces.
3) The cost of the machine is very high.
4) There is an overlapping of the teeth in the bicuspid area of the maxilla and the mandible.

5) Artifacts are easily misinterpreted and are more commonly seen, e.g. nose ring as a periapical radiopaque lesion, earring as a calcification in the maxillary sinus.

1.5.4 The Focal Trough or Image Layer

The Focal Trough or Image Layer Is defined as that zone which contains those object points which are depicted with optimum resolution in other words it is a three dimensional curved zone in which structures lying within are clearly demonstrated on a panoramic radiograph. In the OPG the arches should be placed within the image layer. The image layer thickness, depends upon the effective projection radius and the width of the beam. The size and shape of the focal trough varies according to the manufacturer. The closer the rotation center to the teeth, narrower the focal trough. In most machines the focal trough is narrow in the anterior region and wide in the posterior region. Since the jaws are not circular, a variety of movement patterns for the beam have been developed **(Allan, 1989).**

Chapter two

Subjects, Materials And Methods

Subjects, Materials and Methods

2.1 Sample Subject:

2.1.1 Sample selectin:

- A retrospective study consist of 100 Iraqi subjects with age ranged from (20-60) years old attended the teaching hospital of Dentistry College / Al Zahrawi University ,taking panoramic radiographs for different diagnostic purposes.
- The study was carried out during period (January- march) 2025.
- The study sample was subdivided into groups according to gender, side & location.

2.1.2 Criteria for patient's inclusion & exclusion:

Involve:

1. Patient who have obvious maxillary sinus without any pathological defects or anatomical abnormalities.
2. The panoramic radiographs should be without any artifact that cause difficulty in examining the target area.

Excluded criteria involve:

1. The radiographs that showed poor image quality or that have artifacts.
2. Any patients with middle third fractures or maxillofacial deformities.
3. Patients with extensive pathological lesions affecting the examined area.

2.2 Case sheet

For the entire subject sample, the information was recorded on a case sheet as shown in appendix1.

2.3 Materials

2.3.1 Digital panoramic machine

- The panoramic x-ray machine which was used in this study is Dimax 3 ceph Digital x-ray machine manufactured by Planmeca.
- The parameters setting were (68Kv, 8Ma, while the time of exposure was 10.3 seconds & the magnification factor was 1.7 (±10%).

- The digital panoramic machine was supplied with sensor which is responsible for transferring digital image to computer unite.

Figure (2-1): Digital panoramic machine

Figure (2-2): Computer system &HP printer

2.4 Method

- The panoramic image of each subject was viewed & manipulated on the computer monitor to be printed by hard copy printer.
- Then , the panoramic image was examined & analyzed carefully for both (Right & left) sides by single observer & marked using (paint 3D) program on computer to assess the Prevalence & Location of Maxillary sinus septa according to the following classification:

1. **Occurrence of MSS:**
   - **Left side**
   - **Right side**
   - **Both side**

2. **Location of MSS in relation to sinus floor:**
   - **Anterior** (Corresponding to the premolars).
   - **Middle** (Corresponding to the first and second molar).
   - **Posterior** (Corresponding to the area distally to the second molar).

Thus a total of 200 sides were evaluated & comparison was made between them in correlation to gender, side of jaw & location.

The data obtained were tabulated & subjected to statistical analysis.

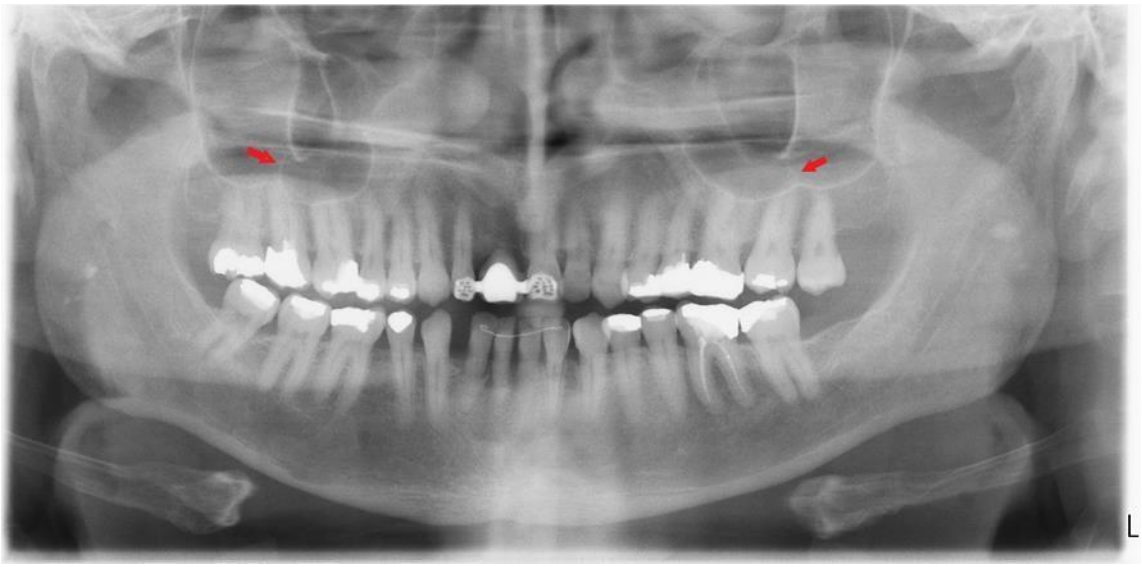

Figure (2-3) 51 years old male patient.
Bilateral MSS with posterior location on both sides.

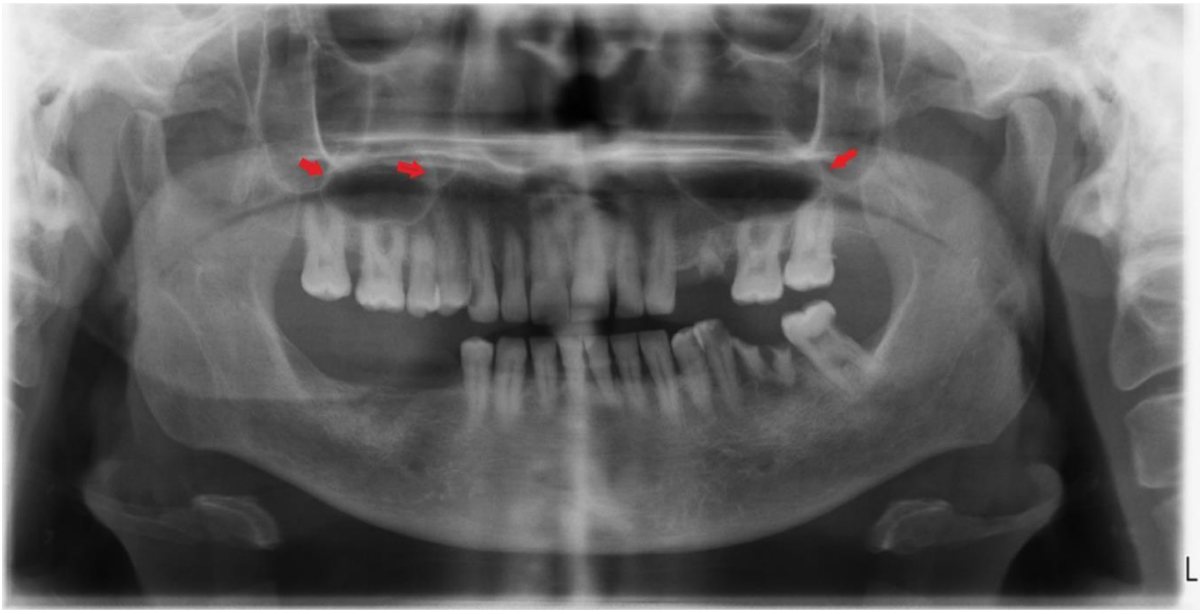

Figure (2-4) 48 years old female patient.
Bilateral MSS with anterior & posterior location in right side, posterior location in left side.

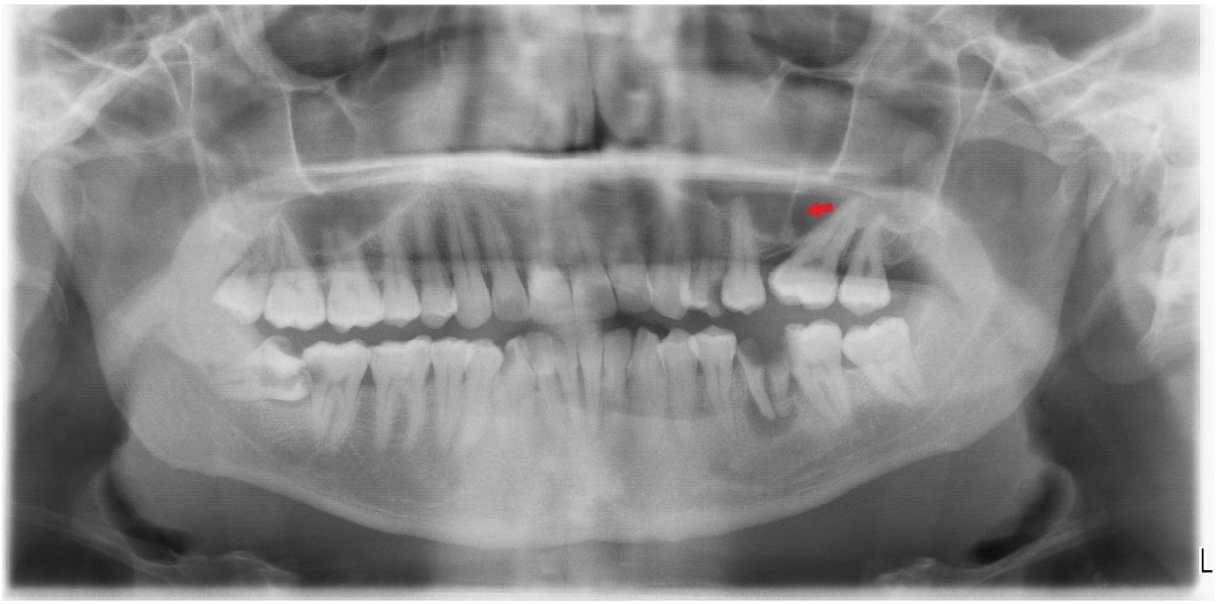

Figure (2-5) 35 years old female patient.
Unilateral MSS with middle location on left side.

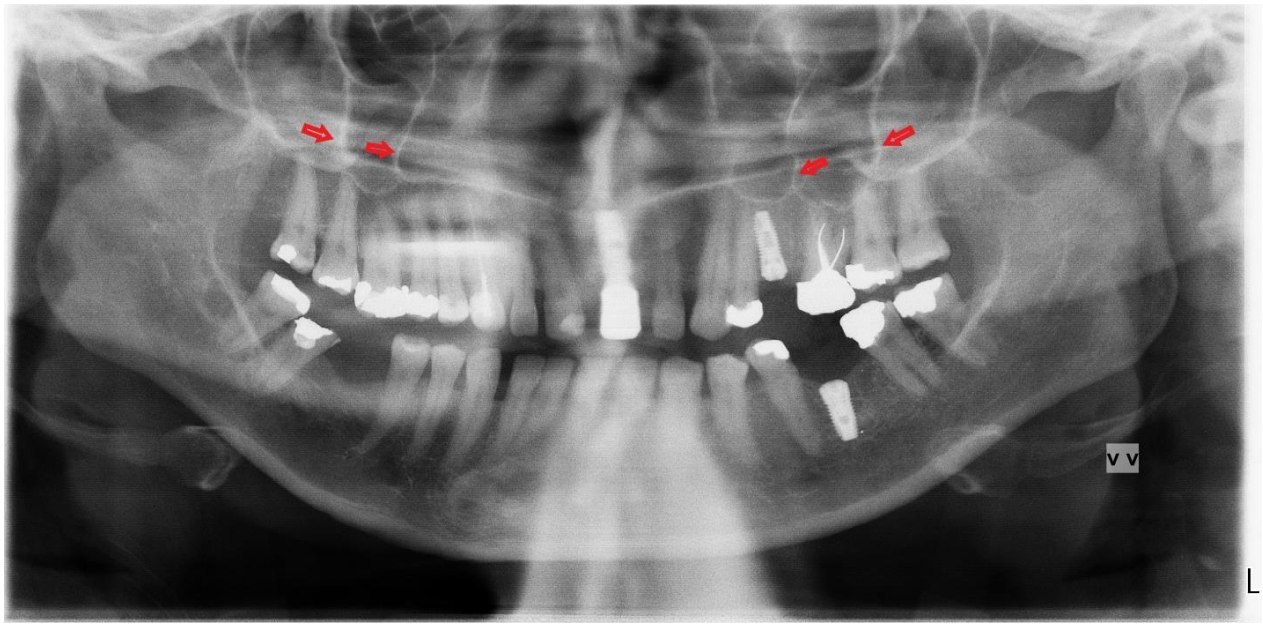

Figure (2-6) 37 years old female patient.
Bilateral MSS with middle & posterior location on both sides.

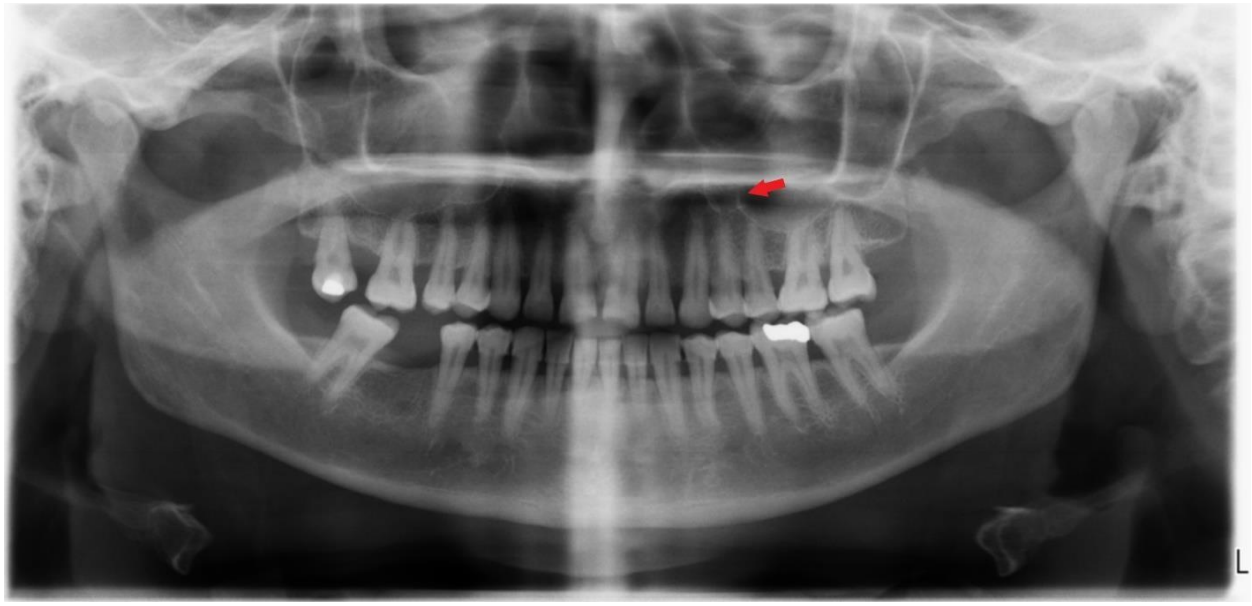

Figure (2-7) 29 years old male patient.
Unilateral MSS with anterior location on left side

Chapter three

Results

Results

3.1 Sample description

- The survey was a retrospective study made on 100 Iraqi subjects (200 Maxillary sinuses of both genders with age ranged from (20-60) years old.
- The study sample was subdivided into groups according to gender, side & location.

3.2 Distribution of maxillary sinus septa in total study subjects

Maxillary sinus septa was found to be present in 40 (40%) subjects and absent in 60 (60%) subjects as shown in table (3-1).

Table (3-1) Distribution of maxillary sinus septa in total study subjects.

MSS	Frequency	Percentage
Present	40	40%
Absent	60	60%

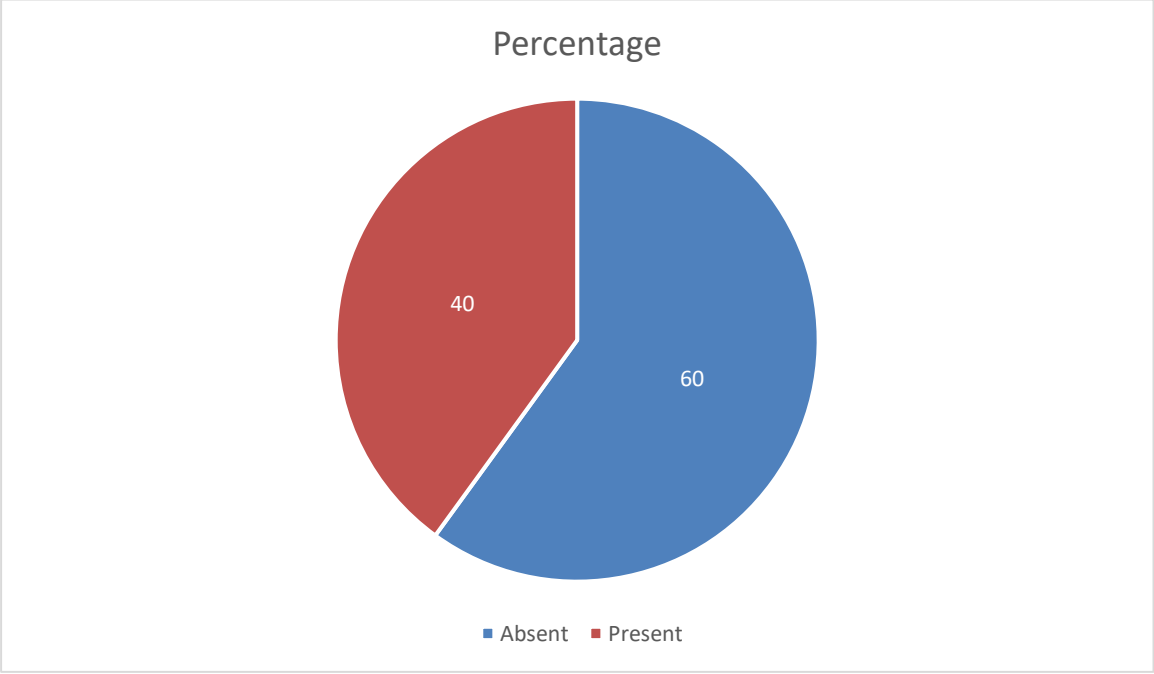

Figure (3-1) Distribution of maxillary sinus septa in total study subjects.

3.3 Distribution of MSS according to absence & presence in total viewed maxillary sinuses

In this study MSS was found to be present in 59 (30%) and absent in 141 (70%) out of 200 maxillary sinus (100 pairs) viewed in 100 subjects as shown in table (3-2).

Table (3-2) Distribution of maxillary sinus septa according to absence and presence in total viewed maxillary sinus.

MSS	Frequency	Percentage
Present	59	30%
Absent	141	70%

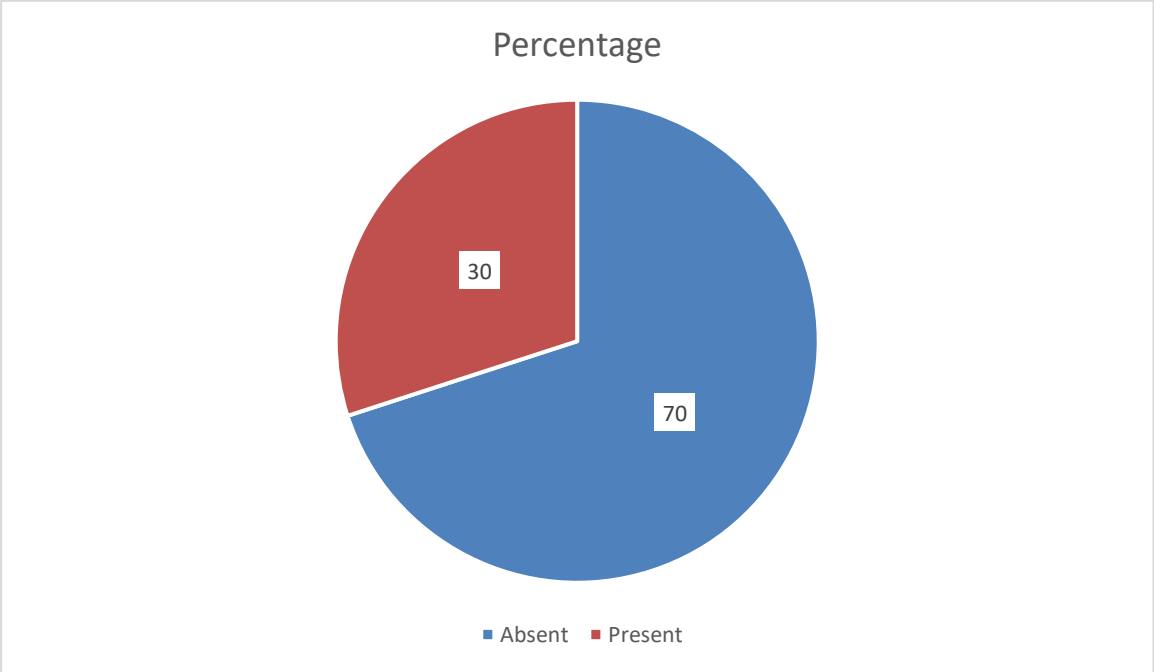

Figure (3-2) Distribution of maxillary sinus septa according to absence and presence in total viewed maxillary sinuses.

3.4 Distribution of maxillary sinus septa according to gender

The prevalence of MSS in females and males were 22 (55%) in females & 18 (45%) in males out of 40 subjects as shown in table (3-3).

Table (3-3) distribution of maxillary sinus septa according to gender.

Gender	Number	Percentage
Female	22	55%
Male	18	45%

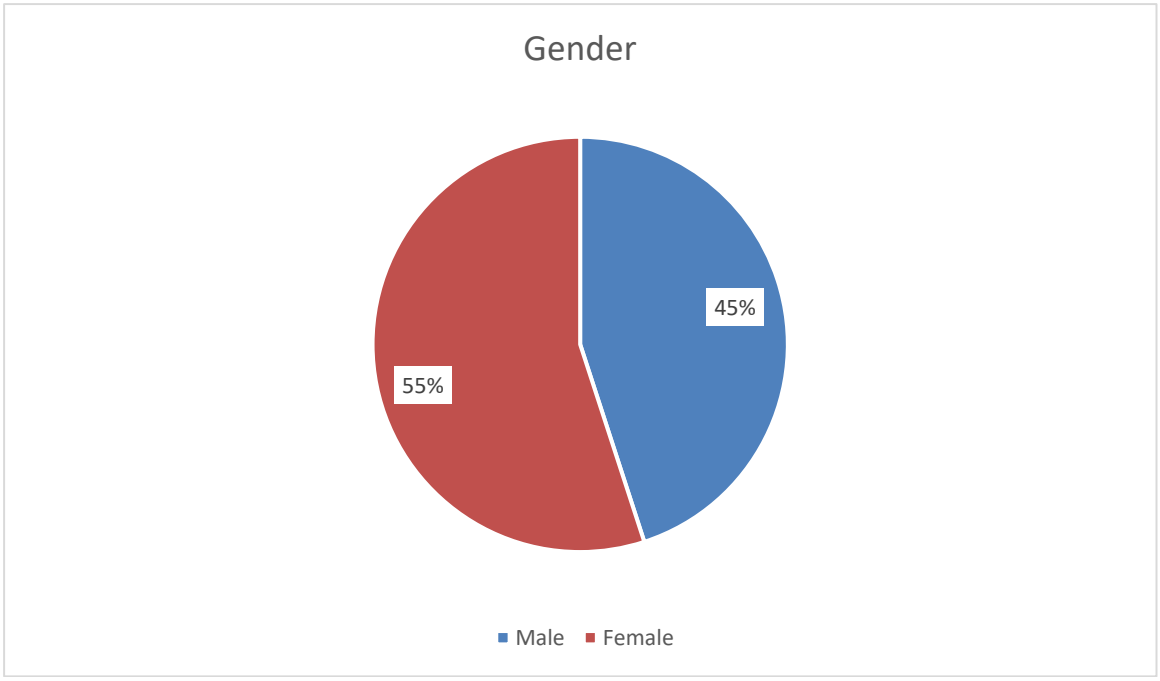

Figure (3-3) distribution of maxillary sinus septa according to gender.

3.5 Distribution of Maxillary sinus septa according to side (unilateral, Bilateral)

It was found that 14 subjects (35%) have MSS on right side only (unilateral),7 subjects (17%) have MSS on left side only (unilateral) & 19 subjects (48%) have MSS on both sides (bilateral) as shown in table (3-4).

Table (3-4) Distribution of Maxillary sinus septa according to side.

Side	Frequency	Percentage
Right side	14	35%
Left side	7	17%
bilateral	19	48%

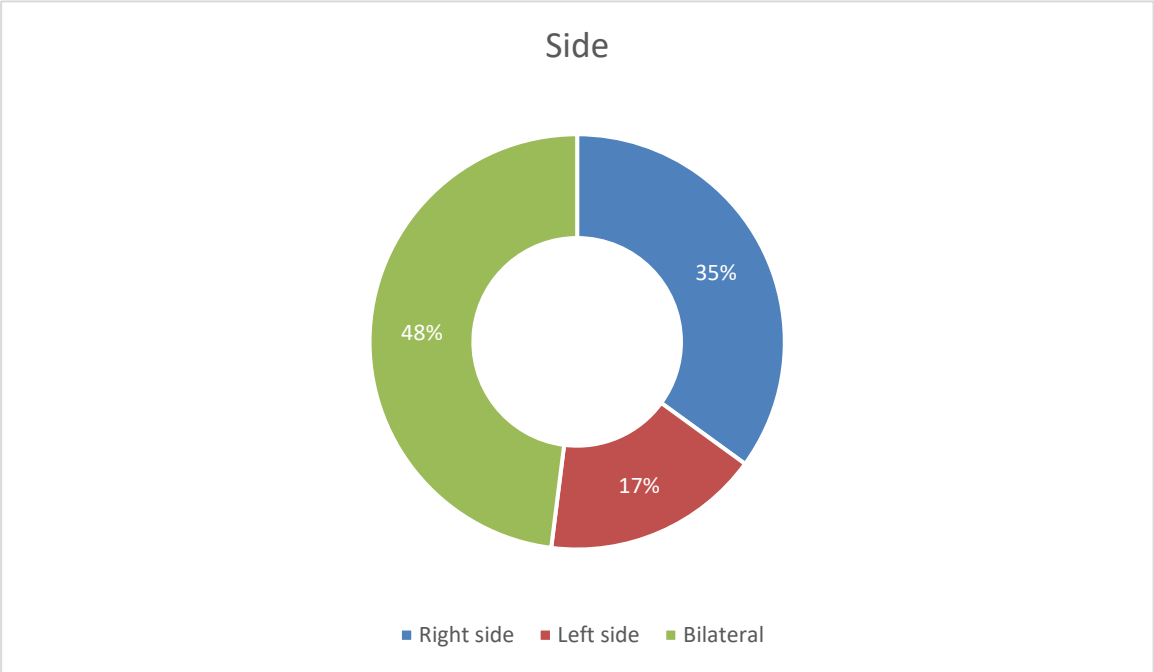

Figure (3-4) Distribution of Maxillary sinus septa according to side.

3.6 Distribution of Maxillary sinus septa according to location

The count of septa per sinus ranged between a minimum 1 to a maximum 6 per a single sinus. MSS have three location anterior, middle and posterior. In this survey the number of MSS located anteriorly was 14 (20%) while middle & posteriorly were in 28 (41%) and 26(39%) respectively as shown in table (3-5).

Table (3-5) Distribution of Maxillary sinus septa according to location.

location	Frequency	Percentage
Anterior	14	20%
Middle	28	41%
posterior	26	39%

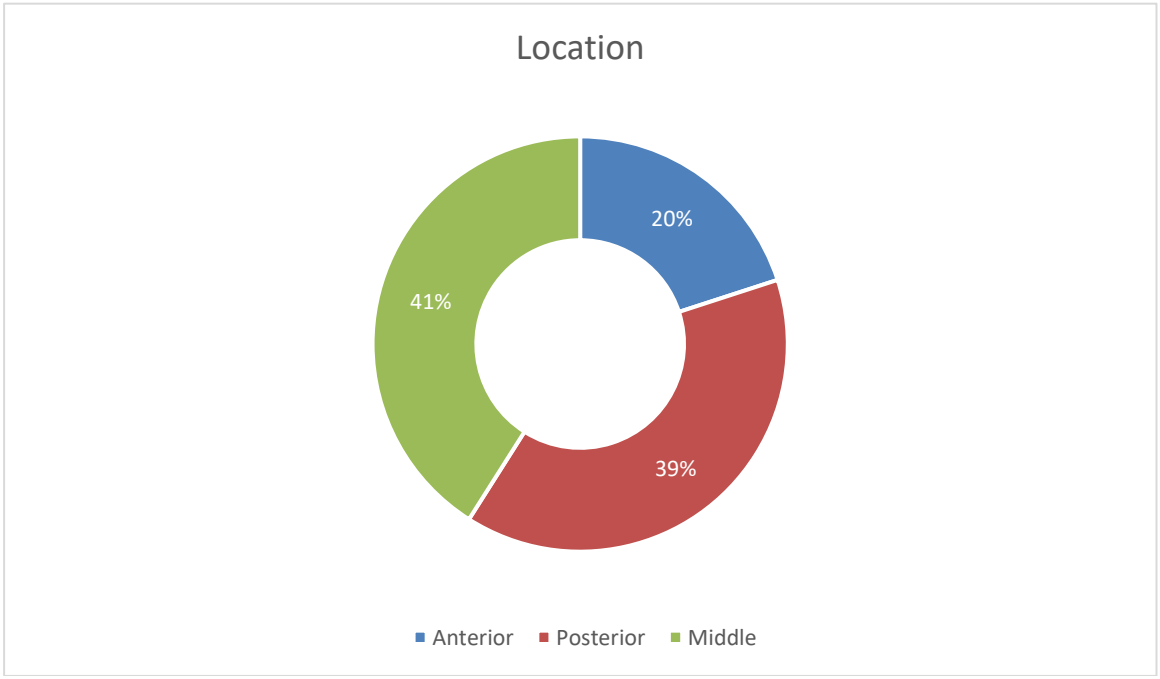

Figure (3-5) Distribution of Maxillary sinus septa according to location.

Chapter Four

Discussion

Discussion

In this study maxillary sinus septa was found to be present in 59 (30%) and absent in 141 (70%) out of 200 maxillary sinus (100 pairs) viewed in 100 subjects, present in 40(40%) subjects and absent in 60 (60%) subjects.

The prevalence of maxillary sinus septum according to gender, 22(55%) in female and 18(45%) in male out of 40 subjects.

Several authors have studied the prevalence of maxillary sinus septum.

Underwood in 1910 found 30 septa in 90 sinuses, demonstrating 33% prevalence.

Ulm et al in 1995 found 15 septa in 82 sinuses, demonstrating a prevalence of 18.3%.

Krenmmair et al in 1999 reported 32 septa in 200 sinuses, demonstrating 16% prevalence.

Kannaperuman et al in 2015 found 217 septa in 921 sinuses, demonstrating a prevalence of 23.6%. Out of 217 sinus septa, 125 male subjects had the maxillary sinus septum, 92 female subjects had the maxillary sinus septum.

Kaan et al in 2012 conducted a study in which 544 sides of 272 subjects, they found that the prevalence of MSS was 58%.

Shibli et al in 2007 made a retrospective study in the Brazilian population by means of panoramic radiography, the prevalence rate is (21.58%) which less than the prevalence rate in this study, this is may be due to influential effects like human variability and the type of radiography. Logistic regression failed to detect any correlation between the presence of maxillary septa and gender that agree with this study.

According to **Won-Jin Lee et al in 2010** found 58 septa in 236 sinuses, demonstrating a prevalence of 24.6%. Found 32 septum in the left sinus and 26 septum in right sinus out of 58 septa.

Velasquez Plata et al in 2002 reported 75 septa in 312 sinuses, demonstrating a prevalence of 24% found 39 septum in the left sinus and 36 septum in the right sinus out of 75 septa.

Kannaperuman et al in 2015 found 118 septa existed in right sinus and 99 septa existed in left sinus out of 217 septa.

In this study, 37 septa in right side and 31 septa in left side out of 68 septa.

In study of Won-Jin Lee et al in 2010, the location of septa regarding the floor position of MS was also divided for analysis into 3 regions: the anterior (1st and 2nd premolar), middle (1st and 2nd molar) and posterior (behind 2nd molar) regions. In terms of location, septa were found in 18 cases (27.3%) in the anterior, in 33 cases (50%) in the middle and in 15 cases (22.7%) in the posterior regions.

In this study, middle location was high prevalence rate (41%) followed by posterior (39%) and least common location was anterior (20%).

The variations that were found in our study as compared to other studies were due to fact that the studied population in each investigation was quite different from each other in sample size, race, and environment; and even in the methodology followed or imaging modality used.

Chapter Five

Conclusion & Suggestion

Conclusion& Suggestion

5.1. Conclusion

- OPG is a good diagnostic tool for the detection of MSS and provide information about the location of this structure Therefore complications during surgery and postoperatively can be prevented by knowing the accurate information of maxillary sinus and its septa.

- From this study it can be concluded that:

  - The prevalence of MSS was in a less number of cases (40 case) than its absence (60 case).
  - The presence of MSS was in female (22 cases) more than males (18 cases).
  - The presence of MSS was in right side (33 sinuses) more than left one (26 sinuses).
  - The MSS was unilateral (21 case) and bilateral (19 case).
  - In unilateral MSS was in right side (14 cases) more than left side (7 cases).
  - The most common location was middle (41%) followed by posterior (39%) and least common location was anterior (20%).

5.2. Suggestions

- The use of CBCT instead of OPG in the identification of MSS.
- Longitudinal study to investigate the effect of duration of extraction on alveolar bone atrophy, triggering of pneumatization of MS and occurrence of secondary septa.
- Enlarge the sample size to be more representative in the coming studies.
- Study the morphology of MSS by CBCT.

Appendix

Appendix1

Case sheet for study

Patient's name:

Age:

Gender:

Address:

Panoramic examination

Prevalence of MSS	Right side	Left side	
Position	Anterior	Middle	posterior

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