RESEARCH ARTICLE

ANATOMY OF ACCESSORY MAXILLARY SINUS OSTIUM WITH CLINICAL APPLICATION

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ABSTRACT

Background: The "osteomeatal complex" of the middle meatus is a group of anatomical structures that includes; principle maxillary sinus ostium and accessory maxillary sinus ostium. Its beauty lies in its complexity. This osteomeatal complex contributes to the final common drainage pathway of maxillary, anterior ethmoidal and frontal sinuses. Principle maxillary sinus ostium (PMO) is universally present in all population while if extra opening is present in addition to principle maxillary sinus ostium then this is called accessory maxillary sinus ostium. The principle maxillary sinus ostium is opened in the Hiatus semilunaris and it is located on the highest part of medial wall of maxillary sinus as compared to accessory maxillary sinus ostium. Accessory maxillary sinus ostium located in the anterior nasal fontanelle (ANF), posterior nasal fontanelle (PNF), and hiatus semilunaris.

Aims & Objective: The endoscopic sinus surgeons must have a detailed knowledge of inconsistent situation of principle maxillary sinus ostium (PMO) and accessory maxillary sinus ostium as there are important structures like orbit superiorly and nasolacrimal duct medially lying adjacent to medial wall of maxillary sinus where above said openings are situated.

Materials and Methods: This study was carried out in the department of Anatomy of government medical college, Surat and Surat municipal institute of medical education and research (SMIMER) where 54 cadaveric heads were cut in midsagital section into 108 half heads and then incidence, location and side of accessory maxillary ostium was studied.

Results: Among 108 half heads, accessory maxillary ostium was found in 20 (18.5%) half heads. Out of these 20 half heads, in 12 (60%) half heads accessory maxillary sinus ostium is present on right side while in remaining 8 (40%) half heads, it is on the left side. Similarly out of these 20 half heads, 16 (80%) half heads shows unilateral accessory maxillary sinus ostium either on right side or on left side while 4 (20%) half heads shows bilateral accessory maxillary sinus ostium. Out of these 20 half heads, 7 (35%) half heads shows double AMO (which includes 4 (20%) in ANF on the left side, 2(10%) in PNF on the right side and 1 (5%) in HS on the right side) while 13 (65%) were single in number (which includes 9 (45%) in ANF on both left and right side, 4 (20%) in PNF). All double accessory maxillary sinus ostia situated in the ANF and HS were placed in horizontal plane whereas accessory maxillary ostium which was situated in the PNF was placed vertically. Accessory maxillary sinus ostium was varies in size and shape. These accessory maxillary sinus ostia were 0.5 to 5 millimeters in size and round or oval in shape. Similarly out of these 20 (18.5%) half heads in which Accessory maxillary sinus ostia were present 70% Accessory maxillary sinus ostia were found in the anterior nasal fontanelle (ANF), 25% in posterior nasal fontanelle (PNF), and 5% in hiatus semilunaris (HS). Most of the accessory maxillary sinus ostia (65%) were single in number at the various places while double accessory maxillary sinus ostia were also found 20% in the ANF, 10% in the PNF 5% in the HS.

Conclusion: Clinically the presence of accessory maxillary sinus ostium is extremely beneficial for surgical intervention of the functional endoscopic sinus surgery which is designed to remove the blockage of maxillary sinus ostium and to restore normal sinus ventilation and mucociliary function.

Key Words: Accessory Maxillary Sinus Ostium (AMO); Anterior Nasal Fontanelle (ANF); Posterior Nasal Fontanelle (PNF); Hiatus Semiluneris (HS); Principle Maxillary Sinus Ostium (PMO)

Introduction

Evolution is gradual process by which man attained erect posture as a result, the principle or main maxillary ostium (PMO) come to situated at higher level consequently drainage was no longer duo to gravity.[1] Its higher location along with the improper mucociliary action of the lining mucosa in the maxillary sinus is the leading cause of the obstruction in the ostium which opens at the hiatus semiluneris. Zuckerkandle has observed that obstruction may however be due to anatomical variation or anomaly in the vicinity of PMO.[2] Maxillary sinusitis is therefore the demerit gift of erect posture.[1] The 'osteomeatal complex' of the middle meatus is a group of anatomical structures that includes principle and accessory maxillary sinus ostia. Its beauty lies in its complexity. This osteomeatal complex contributes to the final common drainage pathway of maxillary, anterior ethmoidal and frontal sinuses. PMO is universally present in all population while if extra opening is present in addition to principle maxillary sinus ostium then this is called accessory maxillary sinus ostium (AMO). Rice and Scheaffer (1993) termed all extra openings other than a single PMO as accessory maxillary sinus ostium.[3] Accessory maxillary sinus ostium is either congenital or secondary due to disease process as a result of obstruction of principle ostium by maxillary sinusitis or due to anatomical or pathological factors in the middle meatus resulting in the rupture of membranous area known as fontanelle.[4]

The location of principle ostium of the maxillary sinus is on the highest part of medial wall of maxillary sinus and is therefore responsible for poor free drainage. Its opening into the narrow ethmoidal infundibulum instead of direct opening into the nasal fossa is also responsible for poor drainage and the local inflammation of its surrounding area can further interfere with drainage.[5] This osteomeatal complex is a critical area for Functional Endoscopic Sinus Surgery. The surgical intervention of the functional endoscopic sinus surgery is designed to remove the blockage of maxillary sinus ostium and to restore normal sinus ventilation and mucociliary function.

Materials and Methods

Dissection of 54 cadavers was carried out in the department of Anatomy of government medical college, Surat and Surat Municipal Institute of Medical Education and Research (SMIMER). 54 cadaveric heads were cut in midsagital section into 108 half heads. The middle concha was cut and reflected along with its attached margins then middle meatus was opened so that its view became clear. In this study, we observed shape, site, size and number of accessory maxillary ostium in the middle meatus of lateral nasal wall. The diameter of AMO was measured along the long axis of the AMO with the help of divider and scale.

Results

Among 108 half heads which were studied, accessory maxillary ostium were found in 20 half heads. Out of these 20 half heads, in 12 half heads accessory maxillary ostium (AMO) is present on right side while in remaining 8 half heads accessory maxillary Ostium is on left side (table – 1). Similarly out of these 20 half heads, 16 half heads shows unilateral AMO i.e. either on right side or on left side while 4 half heads shows bilateral AMO. Out of these 20 half heads, 7 half heads shows double AMO which includes 4 in ANF on the left side, 2 in PNF on the right side and 1 in HS on the right side (Figure-1) while 13 were single in number which includes 9 in ANF on both left and right side, 4 in PNF as shown in table – 2.

Table-1: Location and side of AMO in 20 half heads

Side	ANF	PNF	HS
Right	7	4	1
Left	7	1	0

Table-2: Number of AMO in 20 half heads

Number	ANF	PNF	HS
Single	9 (on both left and right side)	4 (on both left and right side)	0
Double	4 (left)	2 (right)	1 (right)

All double AMO situated in the ANF and HS were placed in horizontal plane whereas accessory maxillary ostia situated in the PNF were placed vertically. AMO were varies in size and shape. These AMO were 0.5 to 5 mm in size and round or oval in shape.

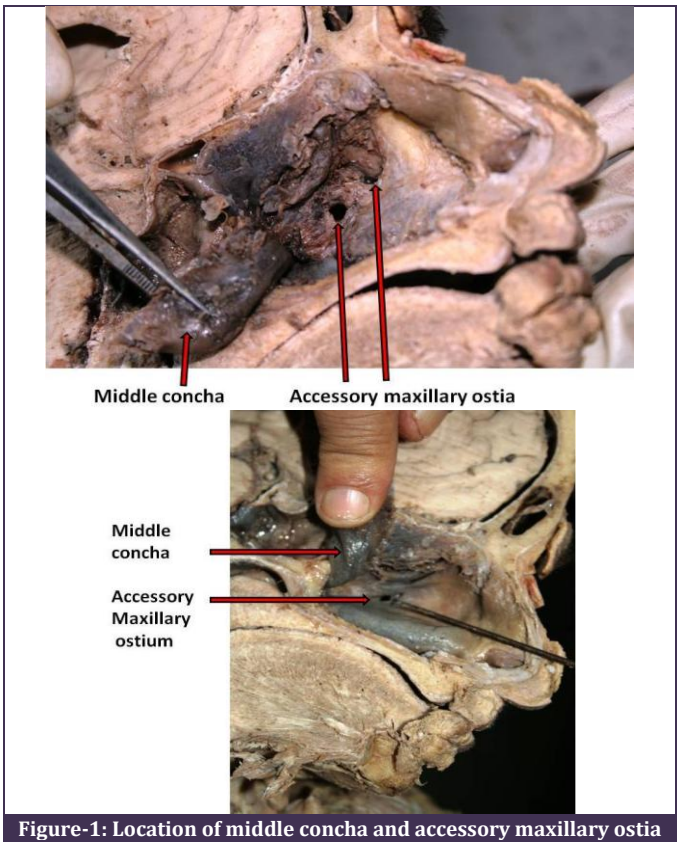

Figure-1: Location of middle concha and accessory maxillary ostia

Discussion

The accessory maxillary sinus ostium when present either as a congenital entity or as a consequence of chronic maxillary sinusitis, in both situations it is advantageous. These ostia do not have active mucociliary clearance still little drainage that occurs through them is due to gravitational effect and their lower anatomical position in the medial wall of maxillary sinus.[6] The incidence of accessory maxillary sinus ostium has been recorded in previous studies conducted on cadavers & endoscopically ranges from 0-43%. May et al (1990) observed 10%.[7] Kennedy et al (1991) found 15%.[6] Van Alyea (1936) observed 23%.[8] Schaeffer (1920) observed 43%.[9]

The natural (congenital) incidence of accessory maxillary ostium (AMO) was found to be 4-5% in normal healthy population. This incidence increases to 25% in the patients of chronic maxillary sinusitis and inflammation of nose.[10,11] In present study, among 108 half heads which were studied, accessory maxillary ostia were found in 20 (18.5%) half heads. Out of these 20 half heads, in 12 (60%) half heads AMO is present on right side while remaining 8 (40%) half heads accessory maxillary ostium is on left side (table – 1). Similarly out of these 20 half heads, 16 (80%) half heads shows unilateral AMO either on right side or on

left side while 4 (20%) half heads shows bilateral AMO. Out of these 20 half heads, 7 (35%) shows double AMO which includes 4 (20%) in ANF on the left side, 2(10%) in PNF on the right side and 1 (5%) in HS on the right side (Figure-1) while 13 (65%) accessory maxillary ostium were single in number which includes 9 (45%) in ANF on both left and right side, 4 (20%) in PNF as shown in table – 1 (Figure –2). All double accessory maxillary ostia situated in the ANF and HS were placed in horizontal plane whereas those in the PNF were placed vertically. Accessory maxillary ostia were varies in size and shape. These accessory maxillary ostia were 0.5 to 5 millimeters in size and round or oval in shape.

Accessory maxillary ostia were found in 20 (18.5%) half heads. Out of which most of accessory maxillary ostia 70% were found in the anterior nasal fontanelle (ANF), 25% were found in posterior nasal fontanelle (PNF), and remaining 5% observed in hiatus semilunaris (HS). Rice and Scheaffer (1993) termed all extra openings other than a single principle maxillary ostium (PMO) as accessory maxillary sinus ostium (AMO). Van Alyea (1936) published his observations from the anatomical study of surgical accessibility of the "Ostium maxillare" in 163 specimens. He found that natural ostia were easily accessible in 40% of specimens but that in 20% of specimens ostia could not be cannulated because of the anatomical configuration of uncinate process or the bulla ethmoidalis or the size of the ostia. In the remainder of specimens, cannulation was only possible because of skill, experience of the surgeon or because an accessory ostium was present.[8]

Clinically the accessory maxillary sinus ostium may be utilized in such cases by the endoscopic sinus surgeons to irrigate the maxillary sinus. Apart from the ostia, the fontanelle may be used to create alternate passage which re-establishes ventilation and drainage during therapy of maxillary sinusitis.[4]

Conclusion

Anatomy of maxillary ostia should be well understood by the endoscopic sinus surgeons in order to perform the middle meatus antrostomy. Once located, the natural ostium can be wined anteriorly or posteriorly so that it communicates with the fontanelles to the extent permitted by any disease or stenosis that may be present. Furthermore overzealous removal of the bone anterior to the natural ostium may result in injury nasolacrimal duct or more superior extension accounts for a high rate of orbital complications. However enlarging the accessory maxillary ostium or opening in the membranous fontanelle may provide maxillary sinus aeration, if the natural ostium is obstructed. That's why the presence of accessory maxillary sinus ostium is of great importance for surgical intervention of the functional endoscopic sinus surgery which is designed to remove the blockage of maxillary sinus ostium and to restore normal sinus ventilation and mucociliary function.

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