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Research Article

MAXILLARY SINUS OSTIUM - MORPHOLOGY AND IT'S CLINICAL RELEVANCE

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ABSTRACT
The "osteomeatal complex" of the middle meatus, is a group of anatomical structures that contribute the final common drainage pathway of maxillary, anterior ethmoidal and frontal sinuses. Knowledge of inconsistent location of principle maxillary sinus ostium is essential for surgical intervention of the maxillary sinus as there are important structures like superiorly orbit and medially nasolacrimal duct lying adjacent to medial wall of maxillary sinus. The principle maxillary sinus ostium is opened in the Hiatus semiluneris and it is located on the highest part of medial wall of maxillary sinus. This study was carried out in the department of Anatomy, 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 and location of maxillary ostium was studied. In the present study, the ostium of the maxillary sinus was more commonly open into the posterior third of the infundibulum in 78 (84.24%) half head while it opened into the middle third in 26 (28.08%) half heads, anterior third in 4 (4.32%) half heads. Among 108 half heads, accessory maxillary ostium was found in 20 (18.5%) half heads.
The endoscopic sinus surgeons must have a detailed knowledge of inconsistent situation of principle maxillary sinus ostium (PMO) and accessory maxillary sinus ostium as it 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: *Principle Maxillary Sinus Ostium (PMO), Anterior Nasal Fontanelle (ANF), Posterior Nasal Fontanelle (PNF), Hiatus Semiluneris (HS), Accessory Maxillary Sinus Ostium (AMO)*

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 (Kumar *et al.,* 2001). 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. The obstruction may however be due to anatomical variation or anomaly in the vicinity of PMO, a fact recognized well over a century ago by Zuckerkandle (1870). Maxillary sinusitis is therefore the demerited gift of erect posture (Kumar *et al.,* 2001). The "osteomeatal complex" of the middle meatus is a group of anatomical structures that contribute the final common drainage pathway of maxillary, anterior ethmoidal and frontal sinuses. Its beauty lies in its complexity. Rice and Scheaffer (1993) termed all extra openings other than a single principle maxillary ostium (PMO) as accessory maxillary sinus ostium. Accessory maxillary sinus ostium may be 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 (Levin *et al.,* 1993).
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 (Holinshed, 1985). 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 incidence, location and side of maxillary ostium and relationship of structures in the middle meatus of lateral nasal wall. The specimens were washed with tape water. Then probe were used to locate the maxillary sinus ostium.

RESULTS AND DISCUSSION

Result

The primary maxillary ostium was found at the junction of the medial maxillary wall and the floor of the orbit, halfway between the anterior and posterior maxillary walls. The maxillary ostium was oval shaped or slit like and oriented horizontally or obliquely.

The position of the maxillary sinus ostium in 108 half heads (dissected specimens) was as follows:

- In 78 half heads, maxillary ostium was located in the posterior 1/3 of hiatus semiluneris.
- In 26 half heads, the maxillary ostium was located in the middle 1/3 of hiatus semiluneris.
- In 4 half heads, the maxillary ostium was located in the anterior 1/3 of hiatus semiluneris.
- Accessory maxillary ostia were found in 20 cases and absent in remaining 88 cases.
- The maxillary ostium was oval or slit like in shape and was oriented horizontally or obliquely.

Table 1: Incidence and Location of maxillary sinus ostium in 108 half heads

Location of maxillary sinus ostium	Number of cases	%
Posterior 1/3 of Hiatus Semiluneris	78	84.24%
Middle 1/3 of Hiatus Semiluneris	26	28.08%
Anterior 1/3 of Hiatus Semiluneris	04	4.32%

Discussion

The maxillary sinus form from outgrowths or diverticula of the walls of the nasal cavities and become pneumatic extensions of the nasal cavities in the maxillae. The original openings of the diverticula persist as the primary maxillary sinus ostium (Moore, 2003). Maxillary sinus begins as an out pouching of the nasal mucosa within the ethmoidal infundibulum at 60–70 days of embryonic development. The primary maxillary sinus ostium represents this point of evagination (Anon, 1996).

The primary maxillary ostium may be found at any point along the course of the ethmoidal infundibulum. In the present study, the ostium of the maxillary sinus was more commonly found to open into the posterior third of the infundibulum in 78(84.24%) half heads, while it was opened into the middle third in 26 (28.08%) half heads, anterior third in 4 (4.32%) half heads (table 1).

Van-Alyea reported similar observations and found the opening of maxillary ostium into the anterior third of the uncinate groove in 9 (5.53%), to the middle third in 18 (11.04%), to the posterior third in 117 (71.8%) and to the extreme posterior tip of the groove in 19 (11.65%) cases. Prasanna found the opening of maxillary ostium into the posterior third of the infundibulum in 21 (52.5%) specimens, to the middle third in 11 (27.5%), to the anterior third in 4 (10%) and was absent in 4 (10%) specimens. Rosenberger

has stated that maxillary ostium opens into the posterior third in 70% cases. Thus maxillary ostium commonly opens into the posterior third of the uncinate groove (Holinshed, 1985).

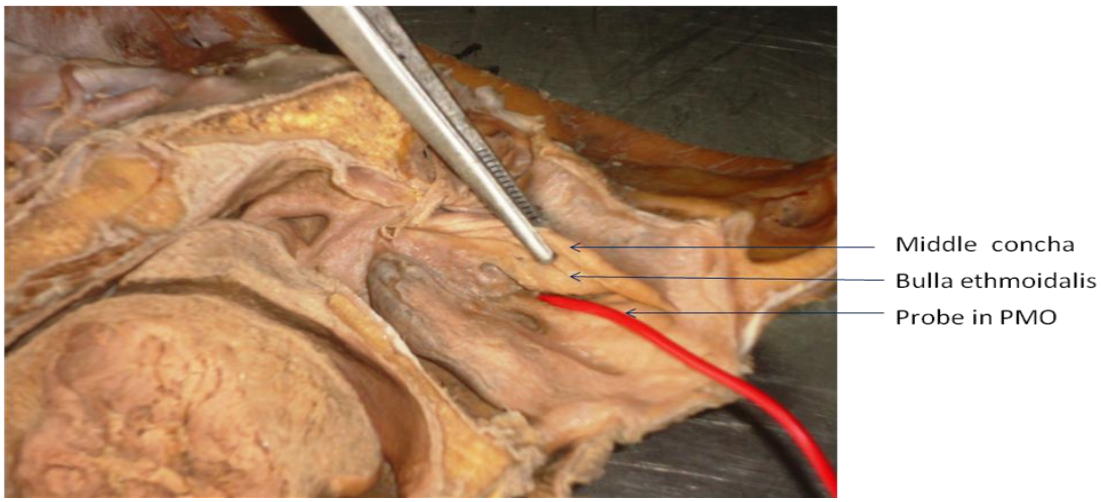

Figure 1: Shows lateral wall of nose, probe in PMO

Myerson (1932) recognized that the ostium of the maxillary sinus is located immediately below the orbital floor, and thus below the lamina papyracea in the posterior part of the infundibulum, and that perforating the lateral wall of the infundibulum superior to the ostium violates the orbit. Hence the sinus surgeon must have a thorough knowledge of the relevant anatomic relationship to avoid injury to the orbit. Blind probing or nibbling with the forceps may lead to higher incidence of orbital complications (May, 1990).

Rice and Scheaffer (1993) termed all extra openings other than a single principle maxillary ostium (PMO) as accessory maxillary sinus ostium (AMO). In the present study, accessory maxillary ostia were found in 20 (18.5%) half heads while the incidence of accessory maxillary sinus ostium has been recorded in previous studies conducted on cadavers and endoscopically ranges from 0 – 43%. May *et al.,* (1990) observed 10%, Kennedy *et al.,* (1991) found 15%, Van-Alyea (1936) observed 23% and Schaeffer (1920) observed 43%.

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.

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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