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An endoscopic study on the prevalence of the accessory maxillary ostium in chronic sinusitis patients

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ABSTRACT

Background: Chronic maxillary sinusitis is one of the common ENT problems. Accessory maxillary ostium (AMO) has been postulated in many publications to play a role in the development of chronic maxillary sinusitis. AMO is found in the medial wall of maxillary sinus and located in the lateral wall of the nose. It's been frequently identified in the routine nasal endoscopy. The variations in the location of AMO have been evaluated by nasal endoscopy in live subjects or through cadaver dissections by many authors. This live study is conducted to identify the prevalence of AMO during nasal endoscopic evaluation of chronic sinusitis patients.
Methods: 52 adult patients with symptoms of chronic sinusitis attending the ENT outpatient department were selected and subjected to X-ray of the paranasal sinuses and laboratory tests. Nasal endoscopy was done in all patients to identify the presence and location of the AMO and the results presented.
Results: In the 52 patients studied the X-ray of the paranasal sinuses showed positive signs of sinusitis in 32 patients (61.5%). During nasal endoscopy in those 32 patients AMO was identified in 20 patients (62.5%).
Conclusions: In patients presenting with symptoms of chronic sinusitis, apart from routine X-ray of the para nasal sinus, identification of the AMO during nasal endoscopy provides an additional evidence of obstruction of the natural ostia of the maxillary sinus. This will be valuable information to the surgeon who is contemplating on a surgical treatment to manage the chronic sinusitis.

Keywords: AMO, Chronic sinusitis, Nasal endoscopy

INTRODUCTION

The maxillary sinus is also known as the Antrum of the Highmore and is the largest of the paranasal sinuses and the most commonly affected in sinusitis. During evolution, the Homo sapiens changed to an upright posture and the maxillary sinus ostium also got rotated to a higher position and the sinus lost the advantage of a gravitational drainage. It has to depend upon the ciliary action and effective ventilation of the nasal cavity to clear the secretions.

Structures located on the lateral nasal wall especially the nasal septum, turbinates, bulla ethmoidalis and the uncinate process play an important role in directing the nasal airflow. During inspiration, due to the Bernoulli effect, the nasal airflow creates a negative pressure in the nasal cavity which helps in the sinus drainage. When there is a mucosal swelling, the cilia get paralysed, resulting in poor mucus clearance and mucus stasis in the sinus and secondary infection.[1]

Infection increases the mucosal swelling further and blocks the natural sinus ostium. A vicious cycle is formed

and the pressure inside the maxillary sinus builds up, which leads on to a rupture of the weaker membranous part of the medial wall, facilitating drainage and an accessory maxillary ostium (AMO) is thus created.[2] It has been compared to the perforation of the tympanic membrane in case of acute otitis media.[3] The AMO development has also been postulated as due to a congenital dehiscence of the fontanels.

The objective of the study was to identify the presence of an AMO during nasal endoscopy in patients with symptoms of chronic sinusitis and to correlate it with the findings of their X-ray para nasal sinus and analyse the incidence of the AMO in chronic maxillary sinusitis patients.

METHODS

This clinical study was conducted at the Department of Otorhinolaryngology and Head and Neck Surgery of Aarupadai Veedu Medical College and Hospital located at Puduchery South India, from August to October 2019. This study was approved by the Institutional research committee. 52 adult patients aged between 18-70 years attending the ENT outpatient department with symptoms of nasal obstruction, nasal discharge, sneezing, and headache and post nasal drip for more than 4 weeks were selected for the study.

Any patient below the age of 18 years and all patients with a previous history of nasal trauma, nasal surgery or co morbidities like diabetes, hypertension or bleeding disorders were excluded from the study.

Routine blood investigations such as Hb%, total and differential white blood cell count, absolute eosinophil count and X-ray of the paranasal sinuses were done to identify any anatomical abnormalities and other factors that contribute the development of sinusitis. After obtaining an informed consent they were subjected to nasal endoscopy under local anaesthesia to identify the presence of an AMO. Local anaesthesia and decongestion of the nasal cavity was achieved by packing both the nasal cavities with ribbon gauze strips soaked in a mixture of 10 ml of 4% xylocaine topical solution and 10 drops of 0.1% Otrivin nasal drops for 10 minutes prior to nasal endoscopy.

With the patients in sitting position, nasal endoscopy was done on both sides using a 0* and 30* rigid nasal endoscopes of 4 mm diameter which were attached to a camera and a monitor. Classical 3 pass endoscopy was done and various abnormal findings like septal deviations, concha bullosa, polyps and abnormalities of the uncinate, bulla or middle turbinate were recorded. The presence of AMO, its location, numbers, and presence of any discharge through the AMO were meticulously recorded. Appropriate medical or surgical treatments were advised and carried out for these patients.

Statistical analysis was done with simple interactive statistical analysis and the results are presented.[4]

RESULTS

In the study group of 52 patients there were 28 male (53.9%) and 24 female (46.1%) patients. Many of the patients had multiple symptoms and the common presenting symptoms were nasal obstruction (92%) headache or facial pain (88%) nasal discharge (84%) and sneezing (54%) and shown in Figure 1.

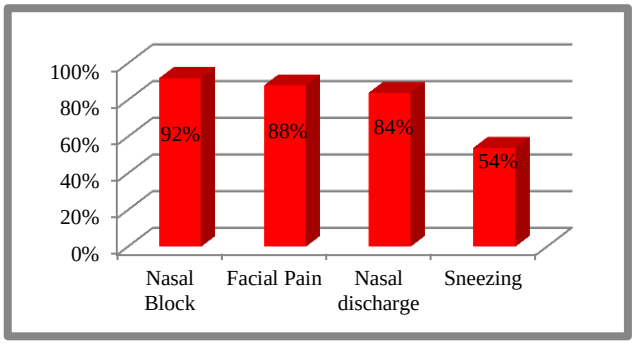

Figure 1: Patient symptomatology.

AMO was identified during endoscopy in a total of 20 patients (38.4%) of which there were 12 males and 8 females. The age wise prevalence is shown in Table 1.

Table 1: Age wise prevalence of AMO.

Age group (in years)	Male	Female	Total
18-30	5	2	7 (13.4)
31-40	2	3	5 (9.6)
41-50	2	3	5 (9.6)
51-70	3	0	3 (5.8)
Total	12	8	20 (38.4)

AMO was unilaterally identified in 14 patients (26.9%) and bilaterally seen in 6 patients (11.5%). The location wise prevalence is shown in Table 2.

Table 2: Location prevalence of the AMOs.

AMO	Male	Female	Total
Unilateral	10	4	14 (26.9)
Bilateral	2	4	6 (11.5)
Total	12	8	20 (38.4)

In our study we found the AMOs to be located mostly in the posterior fontanel in 13 cases (65%) and located in the anterior fontanel in 9 cases (45%). The various anatomical location of the AMOs is shown in Table 3. One patient had bilateral AMOs located in the anterior fontanel on one side and posterior fontanel on the other side. Another patient had bilateral AMOs and both were located on the anterior fontanel in either side.

Table 3: Anatomical location of the AMOs.

AMO	Male	Female	Total
Post. fontanel	6	7	13 (65%)
Antr. fontanel	7	2	9* (45%)
Total	13	9	22*

*: One patient had a bilateral AMOs, located in the anterior fontanel on one side and posterior fontanel on the other side. Another patient had a bilateral AMOs and both were located on the anterior fontanel on either side.

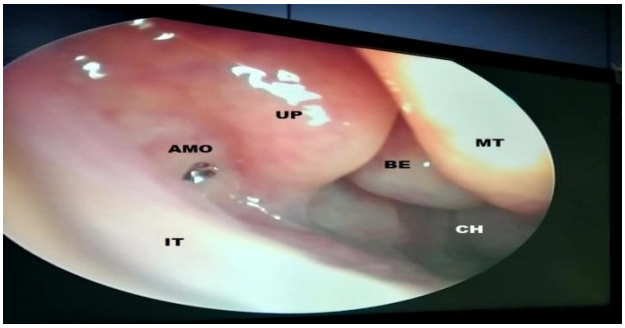

Figure 2: AMO identified in the anterior fontanel on the right side during nasal endoscopy with mucus draining.

IT- Inferior turbinate, AMO- Accessory maxillary ostium, UP- Uncinate process, BE- Bulla ethmoidalis, MT- Middle turbinate, CH- Choana.

The mean value for the prevalence of the AMO was 4.25 and shown in Table 4. Mucous discharge was seen draining through the AMO in two patients and shown in Figures 2 and 3.

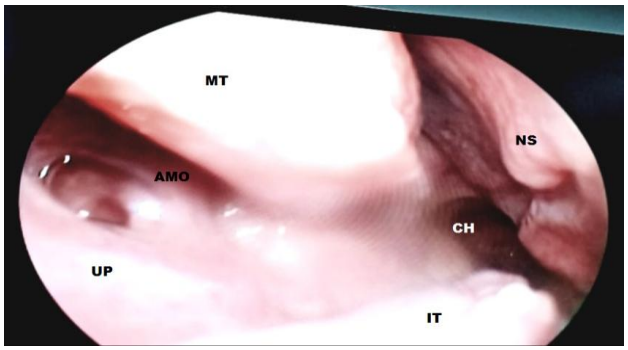

Figure 3: AMO identified in the posterior fontanel on the right side during nasal endoscopy with mucus draining.

UP- Uncinate process, AMO-Accessory maxillary ostium, MT-Middle turbinate, CH- choana, NS- Nasal septum, IT- Inferior turbinate.

Nasal septum deviation (NSD) was seen in 43 patients (82.7%) and among those with NSD 12 patients (27.9%) had an ipsilateral AMO. Concha bullosa was seen in 5 patients (10%) and polyps were seen in 5 patients (10%).

X-ray of the para nasal sinus showed abnormalities in the maxillary sinus 32 patients (61.5%) and we could identify an AMO in 20 of those patients (62.5%).

Table 4: Means value for the prevalence of the AMOs.

Means									
	Label	**Mean**	**SD**	**Std err**	**95% z-CI**		**Frequency**	**%**	**++%**
r1:	10	4	0	0	4	4	1	25	25
r2:	7	2	0	0	2	2	1	25	50
r3:	6	7	0	0	7	7	1	25	75
r4:	2	4	0	0	4	4	1	25	100
All		4.25	2.061553	1.030776	2.229712	6.270288	4	100	100

DISCUSSION

The maxillary sinus is located in the maxillary bone. The medial wall of the maxillary bone has a large opening known as the maxillary hiatus which is partly filled by bony structures such as the maxillary process of the inferior turbinate, perpendicular plate of the palatine bone, lacrimal bone, uncinate process and ethmoidal bulla. The remaining gap is filled by a membranous portion formed by the mucous membrane of the middle meatus and the maxillary sinus. This membranous portion lies anterior and posterior to the uncinate process and forms the anterior and posterior fontanels (Figure 4).

Sindel et al in their cadaveric study have identified that the posterior fontanel is closed by mucous membrane and periosteum and reported the AMO incidence to be 13.8%.[5] Yenigun et al in 2016 have reported a 19.10% incidence of AMO.[6]

The natural ostium of the maxillary sinus drains in to the posterior inferior part of the infundibulum in most of the cases.[7] The AMO is usually located in the posterior fontanel or in the anterior fontanel. In our study we found the AMO to be located mostly in the posterior fontanel in 13 patients (65%) and in 9 patients (45%) the AMO was located in the anterior fontanel.

The role of the AMO has not been clearly defined. The development of the AMO has been postulated as a congenital dehiscence found in the fontanels or an acquired dehiscence due to sinusitis.

In the acquired theory, due to infection and inflammation the natural ostium gets blocked and the pressure inside

the maxillary sinus builds up leading on to a rupture of the weaker membranous part of the medial wall and an AMO is created.

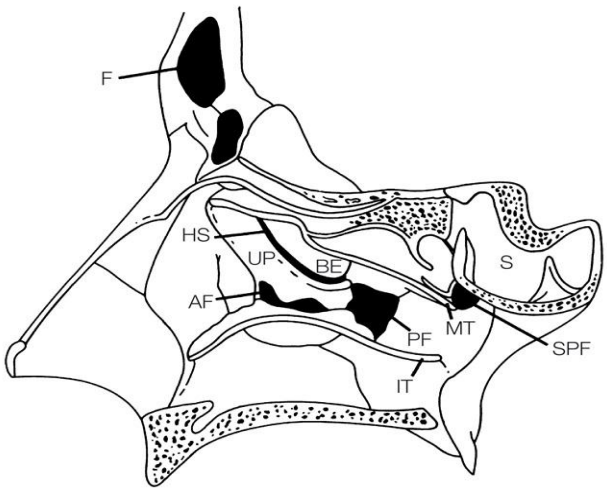

Figure 4: Anatomical location of anterior and posterior fontanels.

F- Frontal sinus, HS- Hiatus semilunaris, UP- Uncinate process, BE- Bulla ethmoidalis, MT-Middle turbinate, S- Sphenoid sinus, SPF- Sphenopalatine foramen, IT- Inferior turbinate, PF- Posterior fontanel, AF- Anterior fontanel.

Genc et al in their study blocked the natural maxillary ostium in rabbits and induced maxillary sinusitis which resulted in development of an AMO.[8] The effect of AMO on the ventilation of maxillary sinus has been beautifully studied using computational fluid dynamics by Jian et al.[9]

The incidence of AMO in normal subjects has been reported in the literature as between 4 to 9%. Sahin et al in their study have concluded that the formation of AMO is higher in cases of chronic rhino sinusitis and sinusitis may enhance the perforation of the fontanel and formation of AMO.[10] In our study, among the 32 patients who had positive signs in the X-ray of the para nasal sinus, we have identified the AMO in 20 patients (62.5%).

Anukaran et al in their endoscopic study have observed that the AMO interferes with the normal mucociliary clearance of the maxillary sinus and secretions are frequently seen moving through AMO into the maxillary sinus and leaving out through the natural ostium.[11] Kane has suggested that such recirculation of mucus between the natural ostium and AMO may be the reason for chronicity of the sinus infection.[12] In our study we found mucus draining through the AMO in two patients.

Ozel et al in their study have observed that the nasal septal devaiton (NSD) and AMO has a significant relationship and AMO is seen more on the side of the septal deviation.[13]

In our study also we identified that out of 43 patients who had NSD, 12 patients (27.9%) had an AMO on the same side of the septal deviation.

X-ray Water's view of the paranasal sinuses is a simple and valuable screening tool for diagnosing sinusitis. According to the study by Gujrathi et al the conventional X-ray para nasal sinus has a sensitivity of 97.6% and specificity of 47.6%. In case of sinusitis haziness is seen in 97.6% of the X-rays.[14] In our study the X-ray of the para nasal sinus showed maxillary sinus haziness or mucosal thickening in 32 patients (61.5%).

All these studies support the acquired theory that the AMO formation is secondary to sinus infection and blockage of the natural ostium.

CONCLUSION

The identification of an AMO through nasal endoscopy is a simple procedure. In patients presenting with symptoms of sinusitis, visualisation of an AMO during nasal endoscopy could be taken as an additional indicator of previous incidences of natural ostium obstruction. Coleman et al in their study have commented that mucus stasis due circular flow between the natural or surgical ostia and the accessory ostia could be a reason for chronic infections and have demonstrated an extended middle meatal antrostomy technique.[15] Presence of an AMO could be considered as an indication for a wider middle meatal antrostomy which can be achieved by joining the natural ostium and the AMO for better results

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