sciendo

DOI: 10.2478/rjr-2022-0012

Romanian Journal of Rhinology, Volume 12, No. 46, April - June 2022

ORIGINAL STUDY

Comparison between intranasal antrostomy and middle meatal antrostomy in the management of isolated maxillary sinusitis in the Rural Population: A prospective study

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ABSTRACT

OBJECTIVE. To compare the outcomes of Intranasal Antrostomy (INA) with Nasoantral Window-Plasty and endoscopic Middle Meatal Antrostomy (MMA) in patients with isolated chronic maxillary sinusitis using an elaborate and detailed set of parameters.

MATERIAL AND METHODS. All patients with clinically diagnosed chronic maxillary rhinosinusitis (unilateral/bilateral) were assessed based on radiological (Lund-Mackay Scoring System) and endoscopic evidence (Lund-Kennedy Scoring System). The Visual Analogue Scale was used to understand the severity of symptoms. Strict inclusion and exclusion criteria were used. One hundred patients were included in the study and divided into two equal groups of fifty each. Group 1 of patients underwent Intranasal Antrostomy with Nasoantral Window-Plasty and Group 2 underwent endoscopic Middle Meatal Antrostomy. All the surgeries were done in the same environment, under local anaesthesia and by the same surgeon. The parameters were noted before surgery and 8 weeks after surgery.

RESULTS. MMA did about 6.82% better than INA in relieving symptoms, had 1.08% better CT image and 4.58% better in regards of nasal endoscopy findings.

CONCLUSION. Although endoscopic Middle Meatal Antrostomy is a newer and more non-invasive procedure, the age-old Intranasal Antrostomy with Nasoantral Window-Plasty is still relevant in the management of chronic maxillary sinusitis in this modern age in our rural area.

KEYWORDS: middle meatal antrostomy, intranasal antrostomy, maxillary sinusitis, Lund-Kennedy score, Lund-Mackay score.

INTRODUCTION

Rhinosinusitis is among the most common diagnoses encountered in the day-to-day practice of an Otorhinolaryngologist. The drastic negative effect of rhinosinusitis on patients' quality of life has been often underappreciated and not clearly recognized[1]. In the past, many patients were told they would just have to "live with" their sinus problem. However, there have been enormous advances in the past few decades in the ability to diagnose and treat these symptoms related to sinusitis. Chronic rhinosinusitis is defined as a long-lasting sinus inflammation and infection, with an evolution of more than 12 weeks. Isolated maxillary rhinosinusitis without polyposis is not very common in daily practice, as the spread of the disease from one sinus to another cannot be controlled by precautions or treatment. The various symptoms with which a patient can present are divided into major and minor groups, with the most common being nasal discharge, nasal obstruction, post-nasal drip, facial pain and headache.

There are various modalities for the assessment of the severity of rhinosinusitis in our day-to-day practice. These include the Visual Analogue Symptom (VAS) Scale, the Lund-Mackay Radiological Scoring System, the Lund-Kennedy Endoscopic Scoring System, Rhinosinusitis Disability Index (RSDI) among others. The Lund-Mackay scoring

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Received for publication: December 28, 2021 / **Accepted:** February 15, 2022

system via a CT scan looks for opacity in the sinuses and gives a scoring based on the presence or absence of sinus cavities opacification[2]. The Lund-Kennedy scoring system looks for the presence of pathology at the natural ostium of the sinus[3]. The VAS scale is a subjective patient scoring system which helps in grading the discomfort the patient is experiencing at a particular moment.

The two most common methods of access to the maxillary sinus include intranasal antrostomy (the maxillary sinus is entered from the inferior meatus via an opening made in its medial wall) and middle meatal antrostomy (the maxillary sinus is entered from the middle meatus via an opening made in its medial wall). Both procedures help in clearing the contents of the sinus cavity and provide pathway for further drainage and in preventing recurrence of symptoms.

It is important to help the patient improve his/her quality of life (QoL)[4] after medical or surgical management. This has to be the aim of every surgeon who encounters such cases in clinical practice. With the advent of newer minimally invasive techniques and better diagnostic tools, the improvement in QoL is certainly better than before.

MATERIAL AND METHODS

This prospective study was conducted in the Department of Otorhinolaryngology and Head & Neck Surgery in a Rural Hospital in South India, between January 2019 and December 2020. One hundred patients with isolated chronic maxillary sinusitis diagnosed by clinical scoring, radiological evidence and endoscopic findings, were considered for the study after obtaining adequate written consent.

All patients were put through a detailed and complete clinical examination of Ear, Nose and Throat, underwent a CT scan of the paranasal sinuses and a diagnostic nasal endoscopy (DNE). Patients who showed findings suggestive of maxillary sinusitis were then included in the study.

Inclusion Criteria

1. Isolated chronic maxillary sinusitis.
2. Bilateral disease.
3. Age group 18-60.
4. Patients who gave a written consent to be part of study and surgery.
5. Evidence of opacification in the maxillary sinuses on CT.
6. Evidence of discharge in the nasal cavity on DNE.
7. Failure of medical management.
8. Septal deviation associated with chronic maxillary sinusitis.

Exclusion Criteria

1. Associated space occupying lesions in the nasal cavity, such as angiofibroma, haemangioma or carcinoma.
2. Extremes of age.
3. Complications of chronic sinusitis, such as mucoceles, retention cysts.
4. Pansinusitis.
5. Sinusitis of endodontic origin.
6. Sinonasal polyposis.

Parameters for assessment

1. Visual Analogue Symptoms Scale (VAS)

Each patient was asked to indicate on an unmarked line (origin labelled as 0 and terminus as 10) where symptom severity falls. The relative length from the origin was measured using the full length of the line and the value was rounded off to the nearest integer. Score of 0 was given when a symptom was not present and numbers up to 10 were given when a symptom was present, with 10 indicating greatest severity. This scale was given to the patient before surgery and again 8 weeks after surgery in the post-operative period. There were 5 symptoms assessed (Facial Pain, Headache, Nasal Obstruction, Nasal Discharge and Olfactory Disturbance) and thus, a maximum score of 50 and a minimum score of 0 could be obtained.

2. Lund-Mackay Radiological Scoring System

This scoring system takes into account the opacification of various sinuses as seen on a CT scan. Opacification of each sinus was seen and graded from 0 to 2 on each side. A score of 0 meant no opacification, 1 meant partial opacification and 2 meant total opacification. Each patient's CT was studied, and the observations were documented with respect to just the maxillary sinus. Cases where there was disease in the ethmoidal cells were excluded from the study, although endoscopic sinus surgery was performed in those patients. The reason this was done was to make the study unique as not a lot of such cases are reported in literature. Thus, a maximum score of 4 could be reached. This was done pre-operatively and 8 weeks post-operatively.

3. Lund-Kennedy Endoscopic Scoring System

It is based on the degree of scarring, crusting, oedema, polyps and discharge in each nasal cavity as seen during the diagnostic nasal endoscopy. Each of the 5 findings were scored from 0 to 2 on each side. A score of 0 meant no presence of the symptom, 1 meant mild and 2 meant severe. Thus, a maximum score of 20 could be reached. This was done pre-operatively and 8 weeks post-operatively.

4. Intra- and postoperative complications

Another aspect we took into consideration were

the intra- and postoperative complications in both studied groups. There were no intraoperative complications reported in neither of the two groups. As postoperative complications, we evaluated the following: epistaxis, adhesions after the nasal pack removal, pain. For the pain we used the subjective pain scale (0-no pain, 1-3 mild, 4-6 moderate, 7-9 severe, 10-worst possible pain).

Surgical procedures

All surgical interventions were performed under local anaesthesia by the same surgeon, to avoid bias. The lateral wall of the nose was infiltrated with 2% Lignocaine with 1 in 1,000,000 Adrenaline. The various points where the injection was given included the inferior meatus, the inferior turbinate, the anterior surface of the middle turbinate, the uncinate process and the nasal septum. The nasal cavity was then packed with cotton pledgets containing 4% Lignocaine with 0.1% w/v Xylometazoline in a ratio of 2:1.

The patient lied down in supine position in the Operation Theatre and was asked to breathe through the mouth during the procedure. This aided in reducing the time of surgery as there was lesser blood spillage on the endoscope. A simple randomization technique was followed, and all patients were divided into two groups: 50 patients in Group 1 underwent intranasal antrostomy (INA) with nasoantral window-plasty and 50 patients in Group 2 underwent endoscopic middle meatal antrostomy (MMA).

Surgical steps of intranasal antrostomy with nasoantral window-plasty

After adequate local anaesthetic and decongestant activity, the anterior nares were dilated and the inferior nasal meatus was exposed using a Killian's long bladed nasal speculum. The surgical field on the lateral wall of the nasal cavity at the level of the inferior meatus was widened by outfracturing the inferior turbinate with a Freer's elevator and compressing the same laterally.

An incision was made anteriorly in the lateral mucous membrane, along the dermo-mucosal line. Both the mucous membrane and the periosteum were then elevated so as to expose the bony medial wall of the maxillary sinus.

The Killian's speculum was then reinserted in such a way that it had the inferior meatus superiorly, the floor of the nasal cavity inferiorly and the end of the inferior turbinate posteriorly. The bony wall was then chiselled out and removed using a 11-size blade and a Lichtwitz trocar. Mucosa of the created antrum was then elevated, and the opening was then increased in size to 2cm*1.5cm. Care was taken to not damage the mucosa of the antrum. The edges were smoothened and the opening was shaped to be round. Anteroinferiorly, the bone was chiselled out neatly to increase the size of the antral opening. This ensured that the contents of the sinus cavity freely drained into the nasal cavity.

Using a 11-sized blade, two vertical incisions were made on the anterior and posterior ends of both the nasal and antral mucous membrane via the bony window. The upper part of the antral mucous membrane and the lower part of the nasal mucous membrane were then cut to make two separate mucosal flaps.

The antral flap was then reflected onto the basal floor of the nasal cavity. The nasal flap was used to cover the upper margins of the window created.

Finally, the maxillary antrum was examined through the newly created nasoantral window. All the contents of the sinus cavity were suctioned out and the cavity was washed adequately with normal saline and povidone-iodine liquid. The inferior turbinate was then repositioned to the normal anatomic position.

Surgical steps of endoscopic middle meatal antrostomy

After adequate local anaesthetic and decongestant activity, the zero-degree telescope was used to visualize the nasal cavity. All secretions in the nasal cavity were suctioned out. Using a Freer's septal elevator, the middle turbinate was medialised adequately so as to allow a good surgical field. In the presence of a concha bullosa, the same was crushed with a Luc's forceps.

A ball probe was taken and the posterior free end of the uncinate process was then identified, delineated and slowly pulled anteriorly to create an opening at the level of the natural ostium of the maxillary sinus. A curved suction cannula was then placed at the widened area and rotated to clear the mucosal tags at the ostium.

A backward cutting forceps was then taken and the vertical component of the uncinate process was crushed and the bony piece was removed. At this juncture, the horizontal component of the uncinate was clearly visualised and was slowly dissected out from its inferior attachment and removed with a straight Blakesley forceps by pulling it posteroinferiorly. The horizontal incision was given in the membranous area and extended into the anterior fontanelle and the posterior fontanelle. This manoeuvre provides adequate enlargement of the ostium.

Then, the remnant of the vertical component of the uncinate process was carefully removed with an angled Blakesley forceps. The mucosa of the maxillary sinus was elevated along the posterior wall and removed. All the contents of the sinus cavity were suctioned out and the cavity was washed adequately with normal saline and povidone-iodine liquid.

Table 1. Paired T-test sample results of VAS in both groups.

	Paired Differences					t	Sig.	Corr.
	Mean	S.D.	S.E. Mean	95% confidence interval				
				Lower	Upper			
Pre-operative vs Post-operative Group 1	16.72	4.12	0.58	15.55	17.89	28.69	0.02	0.73
Pre-operative vs Post-operative Group 2	17.64	5.60	0.79	16.05	19.23	22.28	0.01	0.43

Table 2. Comparison of VAS means for each evaluated parameter in both groups.

S. No.	Facial Pain (average)		Headache (average)		Nasal Obstruction (average)		Nasal Discharge (average)		Olfactory Disturbance (average)		Overall (average)	
	Pre-Op	Post-Op	Pre-Op	Post-Op	Pre-Op	Post-Op	Pre-Op	Post-Op	Pre-Op	Post-Op	Pre-Op	Post-Op
Group 1	5.12	2.26	4.86	2.36	7.66	3.12	7.1	2.74	4.78	2.32	29.52	12.8
Group 2	5.28	2.14	5.46	2.06	6.82	2.74	6.94	2.22	4.52	2.22	29.02	11.38

The antral opening was then widened to about 2cm*1.5cm. The middle turbinate was then repositioned to its original anatomic position.

Nasal packing post-surgery

In all patients, the nasal cavity was packed with a Framycetin soaked Merocel® pack in both sides after achieving haemostasis.

Statistical Study

Paired Student T-test was used in the analysis. Statistical analyses were performed using the SPSS Statistics 19 Software for Windows (by the IBM Corp., Armonk, United States of America). Paired T-test was used for the sampling process. A *p*-value of <0.05 was considered statistically significant and the confidence interval was set at 95%.

RESULTS

In the VAS score of Group 1, the average pre-operative score obtained in 50 patients was 29.52. The post-operative score after 8 weeks was 12.80. Thus, the improvement stood at 56.63%. In the VAS score of Group 2 (Table 1), the average pre-operative score obtained in 50 patients was 29.02. The post-operative score after 8 weeks was 11.38. Thus, the improvement stood at 60.78%. This proves that the MMA group performed 4% better than the INA group with respect to VAS.

The p-value by comparison between Group 2 and Group 1 was <0.05, which made it statistically significant (Table 2). The most important symptom seen in this study according to the VAS was found to be Nasal Obstruction, which was about 7/10 in the pre-operative period. This improved significantly in the post-operative period. Headache improved by 51% in Group 1 and by 62% in Group 2. This was the only symptom which improved by a large margin in comparison, while the others were almost the same in both groups.

In the Lund-Mackay Score of Group 1, the average pre-operative score obtained in 50 patients was 3.2 out of a possible 4 (including both the left and right sides), since only the maxillary sinus was considered for the study. The post-operative score after 8 weeks was 1.04 out of a possible 4. Thus, the improvement stood at 67.5%. In the Lund-Mackay Score of Group 2, the average pre-operative score obtained in 50 patients was 2.96 out of a possible 4 (including both the left and right sides), since only the maxillary sinus was considered for the study. The post-operative score after 8 weeks was 0.94 out of a possible 4. Thus, the improvement stood at 68.24%. The p-value by comparison between the

Table 3. Paired T-test sample results of Lund-Mackay Scoring in both groups.

	Paired Differences					t	Sig.	Corr.
	Mean	S.D.	S.E. Mean	95% confidence interval				
				Lower	Upper			
Pre-operative vs Post-operative in Group 1	2.16	1.04	0.15	1.87	2.45	14.72	0.003	-0.10
Pre-operative vs Post-operative in Group 2	2.02	0.94	0.13	1.75	2.29	15.25	0.001	0.22

Table 4. Paired T-test sample results of Lund-Kennedy Scoring in both groups.

	Paired Differences					t	Sig.	Corr.
	Mean	S.D.	S.E. Mean	95% confidence interval				
				Lower	Upper			
Pre-operative vs Post-operative in Group 1	6.60	2.20	0.31	5.97	7.23	21.18	0.001	0.35
Pre-operative vs Post-operative in Group 2	7.22	2.41	0.34	6.54	7.90	21.18	0.001	0.13

groups was 0.12, which did not make it statistically significant. Both Groups performed similarly in this scoring (Table 3).

In the Lund-Kennedy Score of Group 1, the average pre-operative score obtained in 50 patients was 10.04 out of a possible 20 (including both the left and right sides). The post-operative score after 8 weeks was 3.44 out of a possible 4. Thus, the improvement stood at 65.73%. In the Lund-Kennedy Score of Group 2, the average pre-operative score obtained in 50 patients was 10.48 out of a possible 20 (including both the left and right sides). The post-operative score after 8 weeks was 3.26 out of a possible 20. Thus, the improvement stood at 68.89%. Group 2 performed 3% better than Group 1. The p-value by comparison between Group 2 and Group 1 was <0.05, which made it statistically significant (Table 4).

The numbers of complications in Group 1 were more than the number of complications in Group 2. All complications were addressed, and patients did not have a long-standing disability. Group 2 was found to be safer as compared to Group 1 (Table 5).

Table 5. List of complications encountered in both groups.

S.No.	Name	Cases in Group 1	Cases in Group 2
1	Epistaxis 6 hours after the procedure	2/50	0/50
2	Adhesions after removal of the nasal pack over a period of 24 hours	1/50	1/50
3	Post-operative pain on the pain scale of >5/10 during the first 48 hours after surgery	4/50	2/50

DISCUSSIONS

Chronic rhinosinusitis is defined as a long-lasting sinus inflammation/infection lasting for more than 12 weeks. Isolated maxillary sinusitis is not very common in daily practice as the spread of disease from one sinus to another cannot be controlled by precautions or treatment. Thus, the diagnosis of the disease must be done early and treatment protocols must be started at the slightest symptom. Rhinosinusitis significantly impacts lifestyle measures with deterioration in general health perception, vitality and social functioning identifiable with that observed in patients who have angina or chronic obstructive pulmonary disease[5].

This study has been performed in a Rural Hospital in the interiors of South India, where cameras, endoscopes, ideal Operation Theatres and people with surgical and anaesthetic expertise are not always available on a daily basis. The CT scans also had to be performed elsewhere and not all patients could afford the financial burden. Since all patients cannot be sent to other centres, we usually perform INA, even though it has more complications than MMA. Thus, this study came into being and we wish to present our findings.

The goals of management for patients with bacterial rhinosinusitis are to minimize the spread of infection, diminish the tissue related oedema and reverse sinus ostial obstruction so that the mucopus can drain out into the nasal cavity[6,7]. Some experts prefer a short course of oral steroids to counter the oedema and inflammation[8]. Up-to-date guidelines, such as EPOS2020[9] (European Position Paper on Rhinosinusitis and Nasal Polyps), offer specific therapeutic indications for the management of chronic rhinosinusitis. The use of short- or long-term antibiotic in CRS is not certain to have or not have an impact on the outcome of patients. According to EPOS2020, the long-term use of intranasal corticosteroids is both effective and safe, improving the symptoms (such as, nasal obstruction, drainage, oedema), the nasal endoscopic score and reducing the risk of recurrence, while the association of a short course of oral steroids (7 to 21 days) results in a more significant reduction of both symptoms and nasal polyps scores[9]. Regarding the surgical indication time, the sinus surgery is supposed to be considered in those patients with CRS refractory to medical treatment. Considering that there is a lack of clarity regarding what a proper medical therapy implies, EPOS2020 stipulates that "the decision to operate should be made in patients with symptomatic disease, with the exception of patients with actual or impeding complications"[9].

Prior to the popularization of intranasal steroids, Del Borgo et al. investigated the impact of antibiotic therapy in patients with HIV. Their cohort included 15 patients with chronic rhinosinusitis (CRS) who received antibiotic therapy for a mean duration of 16 days, none of which had improvement in their clinical or radiologic outcomes[10].

Miglani et al. reported that overall revision endoscopic sinus surgery (ESS) rate was 4% in their study (3.5% in chronic rhinosinusitis with nasal polyps), which is lower compared to the reported rates in the literature. Thus, surgical management is effective in the management of CRS[11].

A study conducted by Ikeda et al.[12] found that the cooperation of patients was much better in the FESS group as compared to the Caldwell-Luc's surgery group. Results of a randomized controlled trial by Fairley[13] revealed no difference in outcome between ESS and INA.

J. Hajiioannou et al. stated that the advantage of intranasal antrostomy with canine fossa approach is its safety and simplicity, with no special instrumentation being necessary. They sustain that this technique can be widely performed in operating rooms all over without hassle[14].

In a study conducted by Shaefer et al.[15], eighty-three patients were judged as having significantly improved after MMA and uncinectomy, while ten were judged as improved, but had one episode of sinusitis postoperatively. The results of this series suggest that endoscopic paranasal sinus surgery is an efficacious advance in the treatment of chronic sinusitis[15].

One recent study has shown that INA is superior to MMA as it does not void the Ostiomeatal Complex[16].

In our study, MMA did about 6.82% better than INA in relieving symptoms in the patients. There was a negligible 1.08% improvement in Lund-Mackay Radiological Score in patients who underwent MMA as compared to INA. The improvement was 4.58% better in MMA as compared to INA in the Lund-Kennedy Score.

The inclusion and exclusion criteria stated in our study are unique, as not a lot of cases have been reported in previous literature. In the few studies[17] that have actually been done, this stands out uniquely as we state that, although MMA is safer than INA, it still not got a great advance as evidenced in our results.

CONCLUSIONS

The main inference in our study was that the age-old intranasal antrostomy procedure is still relevant in this age of endoscopic surgeries because

the results are almost as good as middle meatal antrostomy for isolated maxillary sinusitis.

The post-operative complications were also not very significant to warrant a complete discard of this procedure.

Symptomatically, patients who underwent middle meatal antrostomy had slightly more relief, but radiological proof of eradication of the disease was evident almost identically in both groups.

Thus, we infer that intranasal antrostomy can be taken up as a day-care procedure in the Outpatient Department, which can save time and reduce the financial burden on the patients in our Rural Society.

Contribution of authors: All authors have equally contributed to this work.

Conflict of interests: The authors declare no conflict of interests.

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