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Research Article

MANAGEMENT OF CHRONIC SINUSITIS BY FUNCTIONAL ENDOSCOPIC SINUS SURGERY

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ABSTRACT
Surgical treatment of Chronic Sinusitis has been based on the concept that the diseased mucosa should be radically removed to enable new, healthy mucosa to grow in its place. Now it been clearly stated through Messerklinger technique that there is no need to remove all the diseased mucosa from the sinuses as formerly believed. Therefore the present study suggests that with endoscopic endonasal surgery, it is possible to do this by directly visualizing the middle meatus area. Disease in the sphenoid sinus and sphenoethmoidal recess can be similarly treated. Further, the study demonstrates that the Messerklinger technique of endoscopic sinus surgery is a safe and efficient method for treatment of chronic sinus disease.

***Key Words*:** *Messerklinger Technique, Endoscopic Surgery, Mucosa, Sinus*

INTRODUCTION
From the earliest days of medicine, numerous attempts have been made to illuminate the inside of various hollow cavities located within the body. The interior of the nose and paranasal sinuses with their narrow passages, fissures and bony walls places heavy demands on the design of instruments to be used for this purpose.

David Kennedy (1985) has taken on and popularized Messerklinger technique in the United States and made significant contributions to the further development of this technique by developing and refining some of the modern imaging techniques.A more radical extirpation of the disease has been made Wigand (1982). Lund (1990) proposed a staging for quantification of sinusitis. It has gained acceptance by international committee and relies primarily on CT scan. The anterior ethmoid, posterior ethmoid, sphenoid, maxillary and frontal sinuses on each side are all scored on a ternary scale based on: The presence of no disease, Partial opacification (Kennedy, 1985), or total opacification (Wigand, 1982). The ostiomeatal complex is scored on a binary scale as diseased or not. The system is simple requiring no special training for CT scans, and provides a means for quantification of endoscopic appearance.

In a study by Dale H. Rice (1989) of 100 consecutive patients, the most common nasal finding was nasal mucosal congestion (erythema) (100%). Polyp (mass) (25%) muco purulent rhinorrhoea (42%) and edema (100%). These findings and previously reported lack of reliability of plain radiographs argue for a complete evaluation in these patients.

In a study by Danielsen and Jan Olofsson (1996) on 230 patients, 11.3% of them showed Concha Bullosa, 15.22% showed paradoxically bent middle turbinate, 8.7% showed laterally bent uncinate process, 6.5% showed the presence of Agger Nasi cells and 4.35% of cases had Hallers cells.

MATERIALS AND METHODS
Fifty patients attending Basaveshwar Teaching & General Hospital, Gulbarga and Government General Hospital, Gulbarga and also from P.D. Hinduja Hospital, Mumbai with sinus disease are included in this study whose ages ranged from 12 to 62 years.

A uniform history was documented for each patient, including the location of facial pain and pressure (maxillary, medial canthal, retro-orbital or temporal); whether nasal discharge was thick or thin, or clear, milky or purulent; the presence of allergic symptoms such as itchy eyes, watery eyes, itchy nose, seasonal variation, presence or absence of nasal obstruction, congestion and anosmia. Previous medical

management with antihistamines, decongestants (topical and/ or systemic), antibiotics, or steroids (topical and / or systemic) was asked. The details of previous surgical treatment like septoplasty, antral wash, polypectomy, Caldwell-Luc, FESS are also taken.

All the patients are subjected for diagnostic endoscopy. The evaluation was performed under topical anaesthesia after insertion of cotton pledgets soaked with a combination of 4% xylocaine and 1:30,000 adrenalines. Examination was performed with 30^{o}-4mm endoscope. An initial pass was made along the floor of the nose to examine the area of inferior meatus and the nasopharynx. A second pass was then made to examine sphenoethmoidal recess, superior meatus, anterior middle meatus (uncinate process, fontanelles etc.) Inflammation, abnormal discharge, presence of polyps, anatomical variations and presence of accessory ostia are noted. A third pass was performed by passing into the middle meatus. The ethmoidal bulla, sinus of the turbinate, hiatus semilunaris inferioris and openings in the frontal recess area are examined, whenever possible.

Initially patients are medically managed according to their symptoms and prior management. Patients who had received previous adequate medical management are evaluated immediately with computed topography (CT). Patients who had not received adequate medical management are started on appropriate regimes.

Prior to beginning of surgery, CT scans are reviewed with particular attention to the surgical anatomy and the extent of disease. The roof of ethmoid was again evaluated for slope and thickness in each of the areas. The position of uncinate and width of infundibulum are re-evaluated along with shape of medial orbital wall and degree of pneumatisation of ethmoidal cells. The relative position of cells within frontal recess and their relationship with frontal sinus are identified. In the posterior ethmoid, it was important to identify the vertical distance from the maxillary sinus to the ethmoidal roof. The relationship of optic nerve to the posterior ethmoidal cells was checked. The degree of indentation by internal carotid artery and optic nerve, relative positions of the inter sinus septae in sphenoid sinus are evaluated.

When there was a significant septal deformity a septoplasty was performed at the time of surgery. In this situation, endoscopic surgery was performed on the wide side at the beginning of the operation. Septoplasty be then performed ethmoidectomy on narrower side was preceded afterwards.

The general anaesthesia was used in 21 patients whereas local anaesthesia whereas local anaesthesia was used in 29 patients. The local anaesthesia began with 4% xylocaine with 1:30,000 adrenaline soaked cotton pledgets kept in the nasal cavities for 10 minutes. We used premedication of intravenous sedation with injection pentazocin and diazepam with or without atropine. Infiltration anaesthesia was with 2% xylocaine with 1:200000 injected into uncinate process (3 to 4 injections), anterior part of the middle turbinate etc. The eyes of the patients are never covered and patient was instructed not to blow the nose and inform immediately wherever slightest orbital pain occurs.

The first step in endoscopic ethmoidectomy was typically infundibulotomy. An uncinectomy was performed with sickle knife. Under endoscopic visualization, all the disease was exenterated until normal mucosa appeared maxillary ostium was identified and widened. After removing ethmoidal bulla, the ground lamella of the middle turbinate was infractured in its inferomedial segment.

After entering the posterior ethmoid, the roof was slowly skeletonised by removing the inter-cellular partitions working from posterior to anterior, staying close to medial orbital wall.

When sphenoid sinus was needed to be opened, the inferior and medial aspect of posterior ethmoid showing sphenoid bulge was infractured. The opening was enlarged inferiorly and medially.

With the ethmoid roof carefully identified, the dissection was continued from posterior to anterior following the slope of ethmoid roof into frontal recess. Any frontal cell if noted was cleared. Usually 30^{o} scope was used. The anterior ethmoid artery was identified. The frontal sinus opening was usually found medially in close proximity to middle turbinate. If its ostium was stenosed, it was enlarged taking care not to disturb the mucosa.

The addressing of posterior ethmoid cells, sphenoidal cells or frontal sinus cells was done only when there was evidence of disease in either CT or diagnostic endoscopy. If the disease was limited, only

uncinectomy and / or anterior ethmoidectomy are done. The maxillary sinus ostium was widened if it was narrowed or when there was significant maxillary sinus disease. When the disease was mild, the opening was usually extended to posterior fontanelle, and the size of opening thus created was around 6mm. When the maxillary sinus was severely involved, much of medial was to be removed, taking care not to extend too anteriorly to injure the nasolacrimal duct. When diffuse disease was evident, total endoscopic ethmoidectomy, sphenoidectomy, middle meatal antrostomy and meticulous dissection of the frontal sinus was performed. Whenever bleeding occurred, cotton pledgets soaked in 4% xylocaine with 1:30,000 adrenalines are used to achieve haemostasis. Ribbon gauze soaked with soframycin ointment was put into the nasal cavity for one day.

Post Operative Care

Each patient was prescribed a 5-day course of antibiotics, decongestants and painkillers. The patients are instructed not to blow the nose forcefully. They are ambulant on the evening of the same day. Endoscopic post-surgical examinations and cleaning of ethmoid cavity are performed in every case. Typically, blood, mucus, debris etc. are aspirated by suctioning on the first, second and third post operative days. Usually the patients are discharged on the evening of the first post operative day after cleaning. They are asked for follow up on second, third and seventh post operative days. Each time nasal cavities are inspected under headlight and suctioning was done to remove crusts, secretions and debris. Patients are subjected to endoscopy on seventh day. The character of the nasal mucosa polypoid changes any abnormal secretions, patency of antrostomy are noted. The patients are asked to report in the sixty week for post surgical endoscopic evaluation. The cavities are inspected to note down the healing, presence or absence of mucosal hypertrophy, abnormal secretions, residual polyp, patency of the ostia etc. At each follow up on the second, third and sixth month and after one year, patients are questioned about subjective relief from headache, nasal discharge, nasal obstruction and postnasal drip. If any recurrence of the symptoms was present, the patient was subjected again to nasal endoscopy and evaluation.

RESULTS AND DISCUSSION

Out of 50 patients 27 (54%) are males, 23 (46%) are females. Their ages ranged from 12 to 62 years. The mean age was 28.42 years. This is illustrated in Table 1.

Table 1: Patient information

Total patients Population	50
Males	27 (54%)
Females	23 (46%)
Range of the age of patients	12-62 years
Mean age	28.42 years

The patients who did not respond to the regular medical line of management, which included antibiotics, antihistamines and decongestants, steroid spray are subjected to functional endoscopic sinus surgery after investigations. 15 (30%) had undergone one or more surgical procedures before they presented. Out of them 12 (24%) had undergone antral wash, 2 (4%) had undergone Caldwell-Luc, 1 (2%) patient had undergone septoplasty. Details of the previous sinus surgery are given in Table 2.

Table 2: n=50 patients

S.No.	Name of the previous surgery	No. of patients	Percentage
1.	Antral wash	12	24
2.	Caldwell-Luc	2	4
3.	Septoplasty	1	2
	Total	15	30

When these patients are questioned about symptoms, the most common symptom was nasal obstruction (congestion or block), found in 34 (68%) of them. Headache was present in 27 (54%). Next common

symptoms are nasal discharge 20 (40%), allergic symptoms 16 (32%) and altered smell, mainly hyposmia 6 (12%). The details of symptomatology are given in Table 3.

Table 3: n=50 patients

S.No.	Symptoms	No. of patients	Percentage
1.	Nasal obstruction	34	68
2.	Headache / facial pain	27	54
3.	Nasal discharge or postnasal drip	20	40
4.	Allergic symptoms	16	32
5.	Hyposmia	6	12

On clinical examination, 28 (56%) patients had middle meatal discharge, 19 (38%) had nasal discharge (anterior / post nasal). Nasal mucosal congestion was present in 30 (60%) patients, maxillary sinus tenderness in 8 (16%) patients and frontal sinus tenderness in 12 (24%). The details of signs are given in Table 4.

Table 4: n=50 patients

S.No.	Clinical signs	No. of patients	Percentage
1.	Nasal mucosal congestion	30	60
2.	Middle meatal discharge	28	56
3.	Nasal discharge (anterior or postnasal)	19	38
4.	Frontal sinus tenderness	12	24
5.	Maxillary sinus tenderness	8	16

All these patients are advised to get total CT scan of the paranasal sinuses which are analyzed.
All the patients are subjected to functional endoscopic sinus surgery (FESS). General anaesthesia was used in 21 (52.5%) patients, 29 (47.5%) are operated under local anaesthesia. The details of the types of anaesthesia used are given in Table – 5.

Table 5: n=50 patients

Sl.No.	Type of anaesthesia	No. of patients	Percentage
1.	General anaesthesia	21	42
2.	Local anaesthesia	29	58
	Total	50	100

A total of twenty anatomical variations are encountered during the study of the 50 patients subjected to diagnostic FESS.

Table 6: n=50 patients

S.No.	Anatomical variant	No. of patients	Percentage
1.	Concha bullosa	4	8
2.	Paradoxical middle turbinate	6	12
3.	Agger nasi	3	6
4.	Laterally bent uncinate process	4	8
5.	Haller's cell	3	6

As can be observed from Table-7, intraoperative difficulties are encountered in 15 (30%) patients, among these, 11 (22%) of them had narrowing of nasal cavity due to gross deviated nasal septum. In 4 (8%)

cases there was profuse bleeding which was overcome by repeated packing with small cotton pledges soaked in 4% xylocaine with 1:30000 adrenalines.

Table 7: n=50 patients

S.No.	Intraoperative difficulties	No.of patients	Percentage
1.	Narrow space available due to DNS or spur	11	22%
2.	Intraoperative bleeding	4	8%
	Total	15	30%

In the present series, all 50 patients underwent infundibulotomy. Anterior ethmoidectomy was done in 33 (66%) patients, posterior ethmoidectomy in 3 (6%), frontal sinusotomy in 2 (4%) and sphenoidotomy in 1 (2%) patient, and maxillary ostia widening in all (100%) cases. Septoplasty was done in 11 (22%) cases. The details of these procedures in the patients are summarized below in Table 8.

Table 8: n=50 patients

S.No.	Name of the operative procedure	No. of patients	Percentage
1.	Infundibulotomy	50	100
2.	Anterior ethmoidectomy	33	66
3.	Posterior ethmoidectomy	3	6
4.	Frontal sinusotomy	2	4
5.	Sphenoidotomy	1	2
6.	Maxillary ostia widening	50	100
7.	Septoplasty	11	22

Total of 202 individual procedures are performed. When percentage was calculated depending on the number of individual operative procedures, 70 (34.65%) are infundibulotomies, 48 (23.76%) are anterior ethmoidectomies, 4 (1.98%) are posterior ethmoidectomies, 3 (1.48%) are frontal sinusotomies, 1 (0.49%) sphenoidotomy, 65 (32.17%) involved widening of maxillary ostia, 11 (5.48%) are setoplasties details of these are given in Table – 9.

Table 9: n=202 individual operative procedures

S.No.	Name of the procedure	Unilateral	Bilateral	Total sides	Percentage
1.	Infundibulotomy	30	20	70	34.65
2.	Anterior ethmoidectomy	18	15	48	23.76
3.	Posterior ethmoidectomy	2	1	4	1.98
4.	Frontal sinusotomy	1	1	3	1.48
5.	Sphenoidotomy	1	-	1	0.49
6.	Maxillary ostia widening	35	15	41	32.17
7.	Septoplasty	-	-	11	5.45
	Total			**202**	

Accurate estimation of blood loss was not available but it was insignificant. Length of hospital stay ranged from one day to six days with a mean of 2.675 days. Majority of the patients are discharged on second postoperative day.

Complications

No major complications occurred in the patients. There are no cases of orbital haematoma, CSF leak, diplopia or visual loss. No patient had to be repacked post operatively nor was any procedure abandoned

because of bleeding. No patient required blood transfusion. Out of 50 patients, 10 minor complications occurred, which included six cases of synechiae and four of hemorrhage. Synechiae are effectively treated by resection and hemorrhage stopped with adrenaline packing as can be seen from Table – 10.

Table 10: n=50

Complications		Number	Percentage
Major	Haemorhage	4	8
	CSF leak	-	-
	Orbital haematoma	-	-
	Visual loss	-	-
	Synechiae	6	12
Minor	Periorbital emphysema	-	-
	Minor bleeding	-	-
	Total	10	20

Post Operative Results

The patients are followed regularly. The mean period of follow up was 6 months. All the patients reported on the sixth week and underwent endoscopic examination. Before endoscopy, they are questioned about the relief of their symptoms.

Subjective Assessment of Results

Depending on the patient's symptom satisfaction, the overall improvement was present in 45 (90%) cases, mild improvement in 2 (4%) and no improvement in 3 (6%).

Table 11: n=50

S.No.	Subjective improvement	No. of cases	Percent
1.	Marked	45	90
2.	Mild	02	4
3.	No	03	6

Objective Assessment

This was done by endoscopy at 6 weeks post operatively. Operated cavities are recorded as abnormal if there was any evidence of pathological secretions, mucosal hypertrophy, and / or closed ostia. Using these criteria 9 (18%) patients had some evidence of disease in their operated cavities 41 (82%) had no evidence of any abnormality at all. Evidence of mucosal hypertrophy was found in 4 patients, abnormal secretions in 2 cases, and stenosed ostia are found in 3 cases. The details are given below in Table – 12.

Table 12: Details of objective Assessment
n=9

Sl.No.	Abnormality	No. of patients	percentage
1.	Mucosal hypertrophy	4	44.44
2.	Abnormal secretions	2	22.22
3.	Closed ostia	3	33.33

The present study series demonstrates that the Messerklinger technique of endoscopic sinus surgery is a safe and efficient method for treating chronic sinus disease.

The preoperative CT scans most often showed anterior ethmoid and infundibular disease consistent with rhinogenic origin of paranasal sinus infection.

The correlation between patient's symptomatology and CT scan need not be significant but good correlation is present between CT and diagnostic endoscopy as well as intraoperative findings.

Paradoxical middle turbinate and concha bullosa are the most common anatomical variations encountered in our series.

In most instances, infundibulotomies with maxillary ostia widening and anterior ethmoidectomies are performed. Other procedures are done on the basis of extent of disease on CT and diagnostic endoscopy.

The complications of FESS are minimal when performed carefully by an experienced surgeon, and in the present study, there was a good subjective outcome. (94% cases showed improvement) following functional endoscopic sinus surgery.

Chronic sinusitis has become one of the most common diseases surpassing arthritis. The pathogenesis of chronic hypertrophic inflammatory sinusitis remains an enigma. Ostiomeatal obstruction was ignored for many years as a factor in the pathogenesis of chronic disease. However, the large number of publications currently drawing attention to the importance of this area could lead to other potential underlying factors being forgotten. Sinusitis can be controlled to some extent by medical therapy. Majority of those which are not controlled by it can be successfully managed by Functional Endoscopic Sinus Surgery.

The most frequent presenting complaints in the present series are nasal obstruction or congestion 34 (68%) and headache 27 (54%), Nasal discharge was resent in 20 (40%). Other uncommon complaints are decreased smell perception 6 (12%) and allergy 16 (32%).

Regarding the clinical findings, the study had nasal mucosal congestion 30 (60%) as the most common sign. Middle meatal discharge was present in 28 (56%) post nasal discharge in 19 (38%).

Out of 202 individual procedures in 50 patients, infundibulotomies and maxillary ostia widening was performed in all patients. Anterior ethmoidectomies are performed in 33 (66%) patients. These are the procedures most closely associated with ostiomeatal complex and are relatively safe to perform. The anterior ethmoid as the source of re-infection of maxillary sinus has been a subject of great interest.

In the present study, patients are followed upto a mean of 6 months. Their subjective improvement showed 94% overall result. Out of them 90% markedly improved, 4% mildly improved and 6% had no improvement at all.

Studies of objective outcome, however, have reported more mixed results. Postoperative endoscopy at 6 weeks was used as an objective assessment 9 (18%) showed abnormalities, musosal hypertrophy (Danielsen and Olofsson, 1996) stenosis of maxillary ostia (Dale, 1989) and abnormal secretions in 2 cases. But overall 94% patients showed good subjective improvement. This shows that even with residual disease in the post operative period after FESS there can be good subjective improvement.

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