

CLINICAL STUDY

ENDOSCOPIC TREATMENT OF CHRONIC RHINOSINUSITIS – A CLINICAL STUDY

Vaibhav Kuchhal¹, Shahzad Ahmad²

HOW TO CITE THIS ARTICLE:

Vaibhav Kuchhal, Shahzad Ahmad. "Endoscopic treatment of chronic rhinosinusitis – a clinical study". Journal of Evolution of Medical and Dental Sciences 2013; Vol2, Issue 37, September 16; Page: 7187-7196.

ABSTRACT: OBJECTIVE: To assess the role of endoscopic treatment in patients of chronic rhinosinusitis. **DESIGN:** Prospective study; interventional type; randomised design. **METHOD:** 32 patients with chronic rhinosinusitis treated by Endoscopic Sinus Surgery (ESS) were analyzed. They were studied from July 2012 to May 2013. Surgery was performed under general anaesthesia and various procedures were performed depending upon the pathology detected in the clinical and radiological examinations. Patients were followed post operatively regularly with nasal endoscopy and their improvement of symptoms noted at 3 months and 6 months and complication if any taken care of in between. **RESULTS:** Facial pain was subsided in 14 out of 17 patients, showing improvement in 82% of patients. Nasal obstruction was relieved in 24/27 patients which is improvement in 88%. Nasal discharge was subsided in 16/18 patients. Hyposmia and Anosmia were improved in 81% (09/11) of the patients. 83% (15/18) improvement was seen in patients complaining of headache. Overall improvement of symptoms was observed in 27 out of 32 patients that is 84.4 % of patients at 6 months of follow up. **CONCLUSION:** Endoscopic sinus surgery succeeds in providing above 80% symptom relief to the patients. Complications in sinus surgery are minimal in experienced hand. Endoscopic surgery is the definitive treatment of chronic rhinosinusitis in patients not responding to medical therapy.

INTRODUCTION: Chronic rhinosinusitis is one of the most frequent otolaryngologic disease encountered. (Black well DL et al)¹ A general histopathological definition of sinusitis is inflammation of the nasal and the paranasal sinus mucosa. In addition osteitis of the underlying bone can occur. (Giacchi RT et al)² Previously a distinction was made between rhinitis (symptoms centered on nasal cavity) and sinusitis (symptoms centered on the paranasal sinus). Clinical experience has taught that the contiguous lining of the nose and the sinuses are affected. Therefore, the term sinusitis was expanded to rhinosinusitis. (Lanza DC et al, Lund VJ et al)^{3,4}

Children less than 15 years and adult between the age of 25 and 64 years are more frequently affected. (Annon J, Glikich R 1995, Kaliner M 1997)^{5,6}

The location and extent of different rhinosinusitis pathological condition implies a detailed knowledge of the anatomic organization of the paranasal sinuses and first and foremost of the ethmoid sinuses. The structures of the lateral nasal wall and paranasal sinuses fall into two anatomically and physiologically distinct categories: the anterior and the posterior ethmoid complex. The basal lamella of the middle turbinate is the clear and distinct separation between the two ethmoid complexes, according to definition, patterns of mucociliary transports and embryological development. The ostiomeatal complex is a functional entity of the anterior ethmoid complex that represent the final common pathway for drainage and ventilation of the frontal, maxillary and the anterior ethmoid cells. (Kennedy DW 1995)⁷

CLINICAL STUDY

The ostiomeatal complex is a region of anterior ethmoid sinus through which secretions drain from maxillary and frontal sinus. This complex is composed of narrow channels and openings that can become blocked by mucosal swelling, secretions, polyps and other such factors. Obstructed sinus drainage can result in inflammation and infection, producing facial pain and headaches associated with sinusitis. Although discomfort from sinusitis often presents in frontal or maxillary regions, the site of primary obstructing pathology is usually within ostiomeatal complex. The frontal and maxillary sinus becomes secondarily infected from blockage of their dependent drainage pathways through the ethmoid sinus.

The primary intent of endoscopic sinus surgery is to remove obstructing tissue in the region of ostiomeatal complex and to reestablish mucociliary flow. With improved sinus drainage, chronic infection can be cleared. Unlike conventional sinus surgery, inflamed mucosa is not routinely striped from the sinus, but left in place to heal with improved sinus drainage.

Mucus serves to cleanse debris including bacteria. The cilia propel a continuous flow of mucus along the sinus walls, through the ostia, and the nasal cavity, where it drains into the nasopharynx and is swallowed. Mucociliary flow within the maxillary sinus is directed from the sinus floor up the walls and out the ostium into infundibulum. The medial border of the infundibulum is the lamina papyracea of orbit. The lateral border is formed by uncinat process. The infundibulum communicates with the nasal cavity through hiatus semilunaris, which is a narrow slit between the posterior free edge of uncinat process and ethmoid bulla. Even if a new ostium is created surgically in the inferior meatus, the mucociliary pattern of flow will continue to be directed towards natural ostium. This factor explains many failures of traditional sinus surgeries for treatment of maxillary sinusitis when a nasal antral window is created in the inferior meatus or a Caldwell Luc's approach is used, while disease in anterior ethmoid sinus (which causes an obstructed natural ostium) is not taken care of. (Wilkerson W.W. 1949)⁸

The frontal sinus has a circulatory pattern of mucus flow in which cilia propel the debris in lateral direction along the floor and in medial direction along the roof. The narrow isthmus through which sinus drains is called frontal recess which opens into the most superior portion of middle meatus. The frontal sinus may drain directly into infundibulum. However its exact location depends on several factors, including site of attachment of uncinat process, pneumatization of several other cells that drain into frontal recess (e.g. agger nasi, supraorbital ethmoid, lacrimal, infundibular cells). Clearance of disease from anterior ethmoidal region re-establishes frontal sinus drainage and prevents reinfection.

Blockage of sinus ostia creates an increasing hypoxic environment within the sinus and the microbiologic flora may become increasingly anaerobic. Retention of secretions results in the inflammation and the bacterial invasion within the cavity. As drainage and air flow remains blocked, secretions stagnate, obstruction becomes more severe and ciliary and epithelial damage becomes more pronounced that creates a vicious cycle. By ensuring ostial patency and proper aeration and drainage this cycle can be interrupted.

Allergy, long believed to be an initiating factor is now known to be relatively less important as a cause of sinusitis, except in small number of highly atopic patients. (Kennedy 1992)⁹ The implications of the new understanding for medical therapy and that the ostiomeatal complex must be patent, antibiotics and decongestants are cornerstone of sinusitis therapy, anti histamines are less indicated and the arbitrary distinctions between acute and chronic sinusitis is now blurred.

CLINICAL STUDY

Functional Endoscopic Sinus Surgery (FESS) has now become a standard treatment for chronic rhinosinusitis. Although some of the ideas have been present since the turn of the century, yet the surgical technique per se was developed only about a decade and half back in Europe and later on popularized in United States. The technological advances made with the development of small fiberoptic endoscopes and computed tomography (CT) scanning of the paranasal sinuses have now allowed a more direct and accurate study of sinus diseases than in the past. Work by Messerklinger 1978¹⁰ and others (Wigand. E.M. 1990, Stammberger, H. 1986)^{11,12} led to the following concept of inflammatory sinus disease:

1. Most infection of the paranasal sinuses is rhinogenic in origin. Infection spreads from the ethmoid sinuses to infect the larger maxillary and frontal sinuses secondarily.
2. Obstruction of the major drainage pathways located in the ostiomeatal complex is the root cause for chronic sinusitis, non-resolving acute sinusitis or chronic recurrent sinusitis. The ostiomeatal complex consists of the drainage pathways for the frontal sinus, anterior ethmoid sinus and maxillary sinus. Since this area is very narrow and obstruction will interfere with the drainage and ventilation mechanism, and cause involvement of the larger sinuses.
3. Previously it was thought that chronic sinus disease produced irreversible changes in the paranasal sinus mucosa. But it is now demonstrated that by opening the stenotic ostia and re-establishing the ventilation of the sinuses, the so called irreversible mucosal changes revert back to normal without ever touching them. Based on these principles coupled with the technological development of endoscopes, functional endoscopic sinus surgery revolutionized the management of chronic inflammatory sinus diseases.

MATERIAL AND METHODS: The present study was conducted on 32 patients of chronic rhinosinusitis. Selection of cases was done from routine Otorhinolaryngology out patients department as well as cases admitted in Otorhinolaryngology ward in Govt. Medical College and Dr Susheela Tiwari hospital, Haldwani, Uttarakhand. They were studied from July 2012 to May 2013.

Selection of Cases was Based on the Following Criteria:

1. Patients fitting into diagnostic criteria with regard to symptoms and having more than 12 weeks of symptom duration.
2. History of all possible medical therapy without symptom relief.
3. Endoscopic evidence of sinonasal disease and/or anatomical obstruction of ostiomeatal complex.
4. Evidence of sinonasal disease and/or anatomical obstruction of ostiomeatal complex on non contrast computed tomography scanning of nose and paranasal sinuses.

Functional endoscopic sinus surgery was performed in all the cases under general anesthesia and various procedures like Uncinectomy, Anterior Ethmoidectomy, Middle Meatal Antrostomy, Inferior and Middle Turbinoplasty and Septoplasty was performed depending upon the pathology detected in the clinical and radiological examination. Patients were followed post operatively regularly with nasal endoscopy and their improvement of symptoms noted at 3 months and 6 months and complication if taken care of in between.

CLINICAL STUDY

Surgical Technique: The procedure was performed under general anesthesia using anteroposterior technique. The head end of the patient is elevated slightly to 10 to 15° to keep the skull base oriented and to prevent any bleeding from collecting in the surgical field. The nose is decongested and anesthetized with 4% xylocaine mixed with adrenaline soaked cotton pledgets placed in inferior meatus and middle meatus and left in place for 10 minutes. Alternatively, oxymetazoline was used for decongestion if the patient may not tolerate the cardiac side effects of adrenaline.

Uncinate Process: It is extremely important to remove the uncinate process completely, extending from the superior attachment to the inferior cover over the maxillary antrum. The key to successful functional endoscopic sinus surgery is atraumatic complete removal of the uncinate process with minimal bleeding. Injection of 2% lidocaine, with 1/100,000 epinephrine, was done 10 minutes before incision. The injection was given at four places: at the superior lateral attachment of the middle turbinate, at the inferior anterior aspect of the uncinate process, at the inferior aspect of the middle turbinate, and at the posterior lateral attachment of the middle turbinate (at the ground or basal lamellae). Next, the maxillary sinus probe was used to define and displace the uncinate process gently away from the hiatus semilunaris, setting it up for resection. The curved sharp end of the Cottle elevator or sickle knife was used to make multiple perforations through the mucosa and thin bone of the uncinate process; this procedure defines its anterior attachment to the thicker maxillary line. The multiple perforations were connected, and the superior attachment was disconnected using a small upbiting through-cutting forceps. The detached uncinate was grasped with a straight grasping Blakesly forceps and pulled down to its inferior attachment overlying the maxillary ostium. The inferior attachment was detached sharply using the Tru-cut forceps.

Maxillary Ostium: The ostium is probed first with the antrum probe. If there was a copious or thick secretion within the sinus, the ostium was gently dilated. If it was determined that a larger ostium is necessary, the straight endoscopic scissors is inserted and incised posteriorly. Alternatively curved 90 degree olive-tip suction was used to open carefully the maxillary sinus ostium posteriorly.

Bulla Ethmoidalis: Besides being the entry into the anterior ethmoids, the bulla is important for locating the lamina papyracea. The lateral attachment of the bulla is on the lamina, and its identification can reduce the risk of orbital injury.

The bulla was opened gently with an upturned small sinus curette, and the content was inspected. Once the bulla was removed, it was important to define clearly the lamina papyracea and the basal lamella.

Posterior Ethmoids: A small opening was made through the ground (basal) lamella into the posterior ethmoid cells. An adequate opening is made into the posterior ethmoids with an upturned curette, curved suction, or ball-tip probe. As dissection proceeds toward the skull base, an upturned suction Blakesly forceps, curved suction, or ball-tip probe was used to palpate the skull base. The dissection of the skull base was then performed in a posterior to anterior direction using the closed Blakesly forceps or ball-tip probe to dissect the inflammatory tissue and thin bony partitions. The removal of tissue was done with a Tru-cut forceps. This method preserves normal mucosa and avoids mucosal stripping.

CLINICAL STUDY

Septal Surgery: Those patients having deviated nasal septum a septoplasty operation was also performed.

Inferior Turbinoplasty: Patients having enlarged inferior turbinate and making it difficult to do an endoscopic examination was taken care of by doing an inferior turbinoplasty operation.

Important Principal of Functional Endoscopic Sinus Surgery: The preservation of sinus mucosa helps prevent scarring. Good hemostasis is achieved with careful preliminary decongestion and injection of a vasoconstrictive agent. In addition, patient's blood pressure is kept below 100 mm Hg systolic. Periodic irrigation with saline during surgery is done to improve visualization of vital anatomic structures. Careful handling of tissues is done intraoperatively to reduce postoperative problems such as obstructive synechiae.

Postoperative Follow-up: Intranasal packing was used in all cases a Postoperative medication was prescribed in the form of antibiotics for 2 to 3 weeks, depending on the severity of disease. A topical steroid was also employed, depending on severity and nature of disease. Patients were also given oral antihistamine therapy to reduce any allergic component of their disease, if applicable.

The first postoperative visit was usually between 5 and 10 days after surgery. An endoscopic examination with debridement was performed to remove any debris or loose tissue. The patient was followed regularly and their improvement in symptoms assessed at 3 months and 6 months. Complications like synechiae formation were opened if found at the time of endoscopic examination.

OBSERVATIONS: Among 32 patients studied 19 (59.4%) patients were males and 13 (40.6%) patients were females showing male preponderance over female cases. The maximum number of cases considering both sexes was seen in 31- 40 yrs age group together contributing about 13 cases (40.6 %). The duration of symptom ranged from 1 year to 5 years with maximum number of cases in 1 year group.

Nasal obstruction was present in 27 cases (84.4%), discolored post nasal discharge was present in 19 cases (59.4%), nasal discharge/ purulence was reported in 18 cases (56.4%), headache in 18 cases (56.4%), facial pain/ pressure in 17 cases (53.1%), hyposmia/ anosmia in 11 cases (34.4%), cough in 6 cases (18.8%), halitosis in 4 cases (12.5%), fatigue in 4 cases (12.5%), ear pain/ fullness in 3 cases (9.4%), fever in 3 cases (9.4%) and dental pain in 2 cases (6.3%).

S. No.	Presenting symptoms/signs	No. of cases n=32	Percent (%)
1.	Nasal obstruction	27	84.4
2.	Discoloured postnasal discharge	19	59.4
3.	Headache	18	56.3
4.	Facial pain/pressure	17	53.1
5.	Cough	06	18.8
6.	Halitosis	04	12.5

CLINICAL STUDY

7.	Nasal discharge / purulence	18	56.3
8.	Ear pain/fullness	03	9.4
9.	Hyposmia/ anosmia	11	34.4
10.	Fever	03	9.4
11.	Dental pain	02	6.3
12.	Fatigue	04	12.5
TABLE - 1			

Radiological Staging: Radiological staging of non contrast computed tomography nose and paranasal sinuses of all 32 patients were done and radiological score calculated as per radiological staging proposed by the international staging system (1993)

Maximum patients were in the radiological score ranging from 9-12 that is 16 patients (50%) followed closely in the 13-16 groups that is 13 patients (40.6%).

Radiological score range	No of cases n=32	Percent (%)
5-8	02	6.3
9-12	16	50.0
13-16	13	40.6
17-20	01	3.1
Total	32	100.0
TABLE - 2		

Anatomical Variations: The prevalence of lateral wall pathology associated with deviated nasal septum, the commonest was inferior turbinate hypertrophy in 30 cases (60%) followed by concha bullosa 12 cases (24%), paradoxical middle turbinate 12 cases (24%), uncinete process abnormality 10 cases (20%), Agar nasi cells 7 cases (14%), and Haller cells 5 cases (10%).

Post Operative Symptoms Assessment: post operative symptom assessment was done regarding the following symptoms at 3 months and six months. Initially about 17 patients complained of facial pain/pressure on presentation of which after functional endoscopic sinus surgery 12 had no complaints of facial pain at 3 months of follow up and on 6 months follow up only 3 complained of facial pain showing an improvement in 82% of patients.

Nasal obstruction was relieved in 24 patients showing an improvement in 88% of patients.

Nasal discharge was present in 18 of 32 patients with complaints remaining in 4 and 2 patients after 3 and 6 months of follow up respectively following surgery, showing an improvement in 88% of patients.

Hyposmia/ Anosmia was present in 11 of 32 patients of which 2 patients had remaining complaints after 6 months of surgery showing an improvement in 81% of patients.

Headache was improved in 13 patients out of 18, showing an improvement in 83%.

Maximum improvement following endoscopic surgery was observed in the symptom of nasal obstruction and nasal discharge as 88% while minimum was reported in Hyposmia as 81%. Overall

CLINICAL STUDY

improvement of symptoms was observed in 27 out of 32 patients that are 84.4% of patients at 6 months of follow up.

DISCUSSION: In the early 20th century, Mosher¹³ stated that the intranasal ethmoidectomy is "the blindest and most dangerous in all surgery" He went on to write that "it has proved to be one of the easiest operations with which to kill a patient. Complications associated with the procedure led many surgeons to avoid performing ethmoid surgery even into the middle and later portions of the 20th century. However the recent introduction of endoscopes, associated with enhanced illumination and visualization, has dramatically improved surgical dissection of the ethmoid sinus. In addition, the functional theory of sinusitis has directed our attention to the clefts and spaces of the middle meatal lateral nasal wall as the primary focus of obstruction sinusitis. The anatomic region is ideally approached with endoscopes and endoscopic surgical techniques. Different parts of our health care system daily receive a large number of patients with nasal/paranasal complaints. For most of these patients this means absence from work, school or social functions. By applying thorough diagnostic standards it may, however be possible to select the right treatment modality for this group of patient. This can be either a medical or surgical therapy alone or a combination of both. The principal mechanisms leading to the development of sinusitis are obstruction of the ostiomeatal complex. It's the principal site involved in almost all cases and vicious cycle of sinusitis starts thereof in anterior ethmoids (Messerklinger 1978)¹⁰. This obstruction produced secondary sinus cavity mucosal inflammation resulting in the clinical signs and symptoms of sinus disease. Surgical success is largely dependent on maintenance of a patent middle meatotomy. Mucosal closure of middle meatus, or extrinsic obstruction by recurrent polyp disease or synechiae are undesirable sequelae that require surgery if sinus disease and symptoms reoccur. Studies from past have shown that allergic rhinitis, nasal polyposis, recurrent acute sinusitis, seasonal rhinitis or perennial rhinitis are not independent but stages in a process of chronic sinus disease. Sinusitis is a multifactorial disorder with several factor acting at the same time to set up a vicious circle. Infection and allergy inter play with each other over the dynamically functioning mucosa of nose and paranasal sinuses each having a dominant effect one time or the other depending on immune status of person. Messerklinger remarked that when the two mucosal layers come into direct contact there is disruption of mucociliary function and cycle of events starts which keeps on continuing and the process usually starts in the region of ostiomeatal complex. This region as Wolsdrof¹⁴ remarked, bears the primary brunt of air flow and so is the site of particular impaction. Our study showed about 75% of patients having one or the other anatomical variation in the nose. All these studies carried out in past by Stammberger¹², Kennedy^{7,9} and Lund⁴ have targeted ostiomeatal complex as being the primary site, how it gets involved vary. The lateral nasal wall shows a large amount of variations among individuals and is never like in two individuals not even it is even symmetric or two sides of same person. Anterior ethmoid being the most blamed anatomic variant. The narrow clefts and passages are the part of anterior ethmoid, parts of which form covering of middle meatus, the middle turbinate, and the natural maxillary ostium. This narrowest place receives the most turbulent of airflow and so most liable to get involved in the inflammatory process when ever particular impaction occurs. Cilia propel overlying mucus but as two mucosal layers they come in contact as a result of inflammation or otherwise this function is also disrupted. Stasis of mucus sets up events leading to collection of secretions, infection of secretions, further mucosal edema, and

CLINICAL STUDY

more involvement of adjoining parts i.e. sinuses and these vicious cycles leads to symptoms of sinusitis. While the conventional wisdom has held that sinusitis becomes chronic after a defined time interval the new understanding considers acute (or recurrent acute) as long as infection resolves without mucosal damage. Early intensive treatment with decongestants and antibiotics is needed to maintain ostial patency. Regardless of duration of illness, damaged mucosa may regenerate after ostial patency and aeration is restored. Presentation and history allow differentiation between sinus infection and allergy. Infection is characterized by nasal obstruction, pressure pain, thick nasal discharge, toothache, fever, cough or irritability. In allergy the typical picture is itchy or running nose, paroxysmal sneezing, thin watery discharge, nasal obstruction, nasal congestion and a history of sinusitis in allergy season. Surgical experience with functional endoscopic sinus surgery; Surprisingly, a survey of the literature has revealed, that worldwide, the introduction of optical aids has not led to any significant change in the complication rate during endonasal sinus operations. In using a forehead lamp the risk is much the same as in operations where the optically assisted or transfacial operations are involved. However in survey carried out by Kennedy et al 1995⁷, fatal consequences are noted more frequently in surgery carried out without the use of optical instruments/aids. However, no principle difference can be detected when endoscopic, microscopic and video aided operative techniques are compared with one another. Nevertheless, the expert point of view supports the idea of using optical aids when carrying out endonasal sinus surgery. (Wayoff M. 1991)¹⁵. The idea is to perform the surgery in a more sophisticated, more mucosa preserving manner, with fewer side effects and better long term results. Each surgeon has a learning curve that goes along with complications rates as his experience with optical aids increases. In analysis carried by Stankiewicz (1999)¹⁶ the rate dropped from 29% to 31% with first 91 patients to 2.2% only later. To make a clearer distinction between various phases, Stankiewicz divided learning curve in the following manner. Stage I (Operations 0 to 30): Greatest danger, especially to dural lesions, with the possible risk of further potentially fatal intracranial complications. Stage II (Operations 31 to 180): Less risk to dural injury but a continuing risk of periorbital lesions with the potential risk of permanent visual defects. Stage III (Operations 181 and onwards): Period of safe surgery and only a very slight risk of dural and periorbital hemorrhage. To increase safety and success of endonasal surgery, it is recommended that medical training should be carried out according to stages outlined as follows:

1. The surgeon must be familiar with the anatomy, physiology, basic operations techniques, danger spots and strategies for dealing with complications. Literature study, cadaver dissection, operation courses, and the study of video recordings are all valuable aids but these alone will not provide the necessary safety levels. There is even danger that surgeons, on completing the appropriate training courses, will operate more extensively or with an inflated sense of self confidence. Contradictory experience has been gained with anatomic preparations though these represent safer learning aid aimed at helping to prevent complications.
2. The second step in reducing complications when doing the first personal operation is to have ample patience and supervision of experienced surgeons so that assistance can be given in form of practical or verbal advice whenever the situations becomes difficult.
3. Advanced techniques should be included in fellowship training programs. This increases the effectiveness and safety of surgery, while also making economic sense, since the tedious and

CLINICAL STUDY

time consuming training of all residents can thus be avoided and since study reveals that complications decrease slowly to a minimum only after 80-100 surgical procedures. However, standard training should include infundibulotomies and opening of the maxillary sinus via the middle meatus the key region of causation of chronic sinusitis.

SUMMARY AND CONCLUSION: In the treatment of chronic sinusitis functional endoscopic sinus surgery is being increasingly used. The principle of functional endoscopic sinus surgery is to remove pathology from the ostiomeatal complex and by enlarging the natural ostium promote the drainage of the sinus creating favorable healing conditions for the mucosa.

In this study 32 patients of chronic rhinosinusitis who were unresponsive to medical therapy were taken up for functional endoscopic sinus surgery. All the presenting symptoms of patients were recorded and they acted as their own controls, their post-operative symptoms were studied as to what extent they were relieved of their symptoms after functional endoscopic sinus surgery. Follow-up was done at 3 and 6 months postoperatively and symptom relief assessed. Based on the study following conclusions can be drawn.

1. Chronic rhinosinusitis affects both males and females with preponderance of males over females. It is less common over the age of 60 years.
2. Our study showed that about 75% of patients had one or the other anatomical variations predisposing them to the chronic rhinosinusitis.
3. The key area involved in pathology in our study was the region of the ostiomeatal complex followed closely by anterior ethmoids and maxillary sinus.
4. Infection and allergy act secondarily to obstructive factors.
5. Computed tomography of nose and paranasal sinuses is an essential prerequisite for functional endoscopic sinus surgery.
6. Functional endoscopic sinus surgery succeeds in providing above 80% symptom relief to the patients which in our study was 84.4%.
7. Complications in functional endoscopic sinus surgery are minimal and almost none in experienced hands.
8. Functional endoscopic sinus surgery is the definitive treatment of chronic rhinosinusitis in patients not responding to medical therapy.

BIBLIOGRAPHY:

1. Blackwell DL, Collins JG, Coles R. Summary health statistics for US Adults: National Health Interview Survey. *Vital Stat* 2002; 10:205.
2. Giacchi RJ, Lebowitz RA, Yee HT, Light JP, Jacob JB. Histopathological evaluation of the ethmoid bone in chronic sinusitis. *Am J Rhinol* 2001; 15(3): 193-7.
3. Lanza DC, Kennedy DW. Adult Rhinosinusitis defined. *Otolaryngol Head Neck Surgery* 1997; 117(3): S1-7
4. Lund VJ, Mackay IS. Staging in Rhinosinusitis. *Rhinology* 1993; 31:183-4.
5. Anon J. Report of the Rhinosinusitis task force committee meeting, *Otolaryngol Head Neck Surgery*; 117(Suppl), 1997.
6. Glikich R, Metson R. The health impact of chronic sinusitis in patients seeking otolaryngologic care. *Otolaryngol Head and Neck Surgery*. 113: 104-109, 1995.

CLINICAL STUDY

7. Kennedy DW, Ed International Conference on sinus disease: Terminology, Staging, Therapy. Ann Otol Rhinol Laryngol Supp 1995; 104 (Supp 167).
8. Wilkerson. W. W.: Antral window in middle meatus. Archives Otolaryngologica Vol 49; 463-489: 1949.
9. Kennedy DW. : Prognostic factors, outcomes and staging in the ethmoid sinus surgery, Laryngoscope Suppl, 57; 1-18:1992.
10. Messerklinger W. Endoscopy of the nose, Baltimore Urban and Schwatzenberg, 1978.
11. Wigand EM. Endoscopic surgery of the paranasal sinuses and anterior skull base. New York Thieme medical publishers Inc. 1990.
12. Stamberger H.: Endoscopic endonasal surgery Part-II Otolaryngol Head Neck Surgery 94: 157, 1986.
13. Mosher HP. The surgical anatomy of the ethmoid labyrinth. Ann Otol Rhinol Laryngol 1929; 38:896-901.
14. Wolsdorf J., Swiff DL., Avery ME.: MIST therapy reconsidered. An evaluation of the respiratory deposition of labeled water aerosols produced by JET and ultrasonic nebulizers. Pediatrics 79; 799-808: 1969.
15. Wayoff M., Jankowski R.: Medico legal aspects in sinus surgery. Rhinology; 29:257-261: 1991.

AUTHORS:

1. Vaibhav Kuchhal
2. Shahzad Ahmad

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor and Head, Department of ENT, Dr. Sushila Tiwari Hospital and Government Medical College, Haldwani.
2. Senior Resident, Department of ENT, Dr. Sushila Tiwari Hospital and Government Medical College, Haldwani.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Vaibhav Kuchhal,
Associate Professor and Head,
Department of ENT,
GMC, Haldwani – 263139.
Email- vaibhavgarima@gmail.com

Date of Submission: 02/09/2013.

Date of Peer Review: 04/09/2013.

Date of Acceptance: 10/09/2013.

Date of Publishing: 16/09/2013