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Original Article

The study of functional endoscopic sinus surgery in patients of sinus headache

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FESS-Functional Endoscopic Sinus Surgery
OMC-Osteo Meatal Complex
PNS-PARA Nasal Sinus
MTH-Middle Turbinate Hypertrophy
ITH-Inferior Turbinate Hypertrophy
CB-Concha Bullosa
UP-Uncinate Process

ABSTRACT

ABSTRACT Functional endoscopic sinus surgery has opened up a new horizon in the management of Headache secondary to chronic sinusitis and other paranasal disorder. In this study, we have selected 92 patients of chronic sinonasal disease (allergic/inflammatory/miscellaneous) attending the Department of Otorhinolaryngology, Jhalawar medical college, Jhalawar (Rajasthan) from July '08 to Oct. '11. All the patients were pre-operatively evaluated clinically, radiologically as well as endoscopically in order to maintain normal physio-anatomy as much as possible. All 92 patients underwent for endoscopic sinus surgery. Endoscopy in all 92 patients revealed various pathological abnormalities at the middle meatus and anterior ethmoid region. The important findings were mucopurulent discharge in 63.04% of cases, polyps in nose in 71.73% of cases, concha bullosa were noted in 36.96% cases, Enlarged Bulla ethmoidalis were found in 36.96% cases. Radiological evaluation done by coronal section C.T. Scanning, revealed the anterior ethmoid as the most common site of mucosal involvement 45.65%, followed by maxillary 44.56% frontal 19.56% and posterior ethmoid 14.13% and sphenoid region 14.13%. After complete preoperative evaluation patients were considered to have chronic rhinosinusitis when they had nasal obstruction, recurrent episodes of mucopurulent secretion and headache, facial pain and pressure. Initially patients were managed medically according to their symptoms and were observed for 6 months. The patients who were symptomatic even after medical management were operated upon using the Messerklinger's approach (1978). All the patients were operated under local anaesthesia except who were uncooperative and age less than 12 years. In this series all 92 patients followed up carefully over a minimum of 6 months. This same group of patients were also assessed with reference to their dominating symptoms. Each patient was asked to assess his or her preoperative symptoms in order of severity which demonstrated that headache was leading symptom in 100% cases and 93.47% responded favorably to surgery, nasal obstruction was complained by 84.78% cases and 92.30% responded favorably to surgery, nasal discharge was complained by 78.26% patients and 91.67% responded to surgery; while patients with post-nasal discharge responded well after surgery in 81.82% patients. The overall results reveal that 89.81% patients considered themselves asymptomatic or improved following surgery. No major complication directly related to FESS occurred in this series. Hence, over the conventional method, FESS has a number of advantages, besides being more accurate in diagnosis namely access to inaccessible areas of nose and sinuses restoring normal physiology and avoidance of radical surgery. The success depends upon a thorough pre-operative endoscopic and CT coronal screening, evaluation and of course upon the efficiency and the skill of the surgeon. In spite of certain serious complications, of which no surgery is exempt, FESS is undoubtedly the beginning of a new era in cases of sinus headache.

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1. Introduction

Headache is the 9th most common symptom that brings a patient to a physician and agonizes both the sufferer and physician equally;

over 300 causes of headache are established. Headache is itself not a disease it is merely a symptom of disease. The medical term for headache, cephalalgia, is from the Greek meaning a condition of head pain. Since the cause of headache are multifactorial, it requires a multidisciplinary approach to diagnose the causative factors. The quality, location, duration and time course of headache and the condition that produce, exacerbate or relieve, it should be carefully reviewed – may provide close to the underlying cause.

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2. Materials and Methods

This study has been carried out in the Department of Otorhinolaryngology in Jhalawar medical college, jhalawar (rajasthan) from July 2008 to October 2011. A total of 92 patients having age group of 10-70 years with clinical evidence of chronic sinus headache with or without nasal polyposis who were unresponsive to appropriate medical therapy. The patients underwent complete clinical evaluation and routine screening by X-ray PNS (Water's view) followed by nasal endoscopy, CT scan PNS (Coronal Section), as part of preoperative evaluation for FESS. Postoperatively the patients were followed-up at fortnightly intervals for the first 3 months followed by monthly check-ups up to 6 months and every half yearly thereafter.

2.1. CRITERIA FOR PATIENTS SELECTION

All the patients included in the present study were refractory to appropriate medical line of management for more than 6 months duration. The patients were observed by following methods as-

(1) history

A good clinical history is important since sinus headache refers to episodes of pain over the sinus area of face around the eyes and often related to change in weather is associated with nasal obstruction, nasal discharge, post nasal discharge, nasal polyps, throat irritation.

(2) Clinical Evaluation

A detailed clinical examination was undertaken in all the patients with emphasis on anterior and posterior rhinoscopy, elicit sinus tenderness.

(3) Endoscopic Evaluation

Patients were further evaluated clinically by subjecting them to diagnostic office nasal endoscopy using 4 mm Hopkins rigid nasal endoscope with 30° and 0° angulation, to view the anatomical variation and polypoid changes at osteo meatal complex(OMC) area.

(4) Radiological Evaluation and CT scan PNS -

CT scan PNS(Coronal & axial section)provides the surgeon with a "Road Map" and acts as a guide to the surgeon in planning the operative procedure and in assessing the prognosis and success of surgery. After nasal endoscopy and CT scan evaluation 92 subjects of the study group underwent FESS.

2.2.Preoperative Patient Counseling

All the patients included in the present study were explained about the nature of the surgery, the possible benefits and the outcome of the surgery including the rare complications.A written informed consent was obtained from each patient before being subjected to FESS.

2.3.Equipments

Following equipment were used for functional endoscopic sinus surgery:

1. Optical instruments:

Storz cold light source with 150 watt lamp was used for illumination, Fibre optic lightcable, Fibre optic rigid telescopes 0, 30 and 70 degrees with 2.7 mm and 4 mm diameter were used.

2. Instruments specific for FESS

Sickle knife, Blakesley straight and upturned forceps, reverse cutting Ostrum's forceps, Straight and curved sinus surgery scissor, Straight and curved suction tip, packing forcep etc.

2.4.Operative Technique-

FESS done in supine position with head elevated to 30 degree under local anaesthesia (submucosal infiltration of 2% xylocaine with 1:100000 adrenaline).The "Messerklinger's Technique" of FESS was followed in all the patients, This is an anterior to posterior approach.

2.5.Post Operative Care

Regular follow-up and meticulous postoperative care is essential for good results of FESS. So it was aimed to keep the operative site clean as to promote optimal healing and free drainage of sinuses by avoiding adhesion and ostiomeatal obstruction.

2.6.Follow-up

Minimum period of 6 months follow up is taken in this study to access the relief of principal symptoms.The patients were called for follow-up fortnightly for first 3 months to the out patient department until the cavity healed completely.

3.Results

This study comprised of 92 cases of headache associated with nasal and sinus diseases for whom functional endoscopic sinus surgery was performed. The age ranged from 10 years to 70 years in this study group of 92 patients. the maximum percentage of patients i.e. 43.47% were found in the age group of 10-20 years. Male and female ratio was found to be 2.3:1.

Preoperative Clinical Evaluation (symptoms)

Table :1 - Showing Incidence Of Headache (n=92)

Headache	No. of cases	% age
Frontal	40	43.47
Frontal and facial	20	21.73
Diffuse	32	34.78
Total	92	100

In 92 patients under study experienced headache of varying degrees & site. 40(43.47%) patients had frontal headache, 20(21.73%) patients had facial and frontal headache and 32(34.78%) patients presented with diffuse (frontal/facial/retro orbital, occipital) headache (Table-1). nasal obstruction was leading symptoms in 78(84.78%) of the patient under observation, out of which 58(63.04%) cases presented with bilateral obstruction and 20(21.73%) cases presented with unilateral nasal obstruction. Nasal discharge was complained by 72(78.26%) of the cases. The quality of discharge ranged from watery to frank mucopurulent.

3.1.PREOPERATIVE CLINICAL EVALUATION (CLINICAL EXAMINATION)

Anterior Rhinoscopic Findings and Examination of Paranasal Sinus

Apart from DNS which was present in 86(93.47%) cases. The other most obvious abnormalities detected at examination of nose and paranasal sinuses were mucoid and mucopurulent discharge seen in 46(50.00%) patients. Out of total 92 cases, 22(23.91%) patients presented nasal polyps on anterior rhinoscopic examination.

3.2.Pre-operative Endoscopic Evaluation

The important findings were mucopurulent discharge in middle meatus seen in 58(63.04%) of cases, out of which, 34(36.95%) were unilateral and 24(26.08%) were bilateral. The other important finding was mucosal oedema/ polypoidal changes in middle meatus area and in infundibulum seen in 66(71.73%) cases, out of whom 40(43.47%) showing unilateral and 26(28.26%) cases showing bilateral changes. Obvious ethmoidal polyps were seen in 12(13.04%) patients, of whom 2(2.17%) patient had unilateral, 10(10.86%) patients had bilateral ethmoidal polyps, 10(10.86%) cases were having unilateral antrochoanal polyps. 34(36.95) patients were having MTH or concha bullosa out of which 26(28.26%) patients were unilaterally only and 8(8.69%) patients bilateral.septal deviation was found in 88(95.65) cases. (Table-2)

Table-2 Showing Nasal Endoscopic Finding (n=92)

Finding	Total no. of case	%	Unilateral case	%	Bilateral case	%
MPD in MM	58	63.04	34	36.95	24	26.08
Septal deviation	88	95.65	82	89.13	6	6.52
ITH	38	41.30	28	30.43	10	10.86
MTH or CB	34	36.95	26	28.26	8	8.69
Oedematous and Polypoidal infundibular mucosa	66	71.73	40	43.47	26	28.26
Concha bullasa	34	36.95	26	28.26	8	8.69
Enlarged bulla enthmoidalis	34	36.95	8	8.69	26	28.26
Enlarged UP	32	34.78	20	21.73	12	13.04
Paradoxical MT	2	2.17	2	2.17		

Anatomical variation detected in this study by nasal endoscopy were - concha bullosa in 34(36.95%) patients. Paradoxical middle turbinate was found in 2(2.17%) cases. Enlarged ethmoidal bulla were seen in 34(36.95%) patients. Out of which 8(8.69%) were unilateral and 26(28.26%) showed bilaterally enlarged bulla. Enlarge/pneumatized uncinate process in 32(34.78%) patients medially bent uncinate processes were seen in 8(8.69%) patients. (Table-2)

3.3.PRE-OPERA FIVE RADIOLOGICAL EVALUATIONS

3.3.1.Mucosal Abnormalities Detected in C. T. Paranasal Sinuses

All 92 patients were radiologically evaluated. The most frequently involved sinus area was anterior ethmoid region In 42(45.65%). Mucosal abnormality detected in maxillary sinuses was 41(44.56%) and in frontal sinus was 18(19.56%). Sphenoid sinus was involved in 13(14.13%) and in 13(14.13%) there was posterior ethmoid involvement. CT revealed anatomical variation of concha bullosa detected in 34(36.95%) patients out of whom 14(30.43%) were unilateral and 3(6.52%) were bilateral. The next most frequent variation of bulla ethmoidalis 30(32.60%) patients out of whom 12(26.08%) were unilateral and 3(6.52%) were bilateral. Agger nasal found in 13(14.13%) patients and medially rotated uncinat process in 24(26.08%) patients.

3.4.SURGICAL TECHNIQUE

After complete pre-operative evaluation functional endoscopic sinus surgery was performed using Messerklinger technique. Polypectomies were done in 33(35.87%) patients out of whom 20 (21.74%) underwent unilateral polypectomy and 13(14.11%) patients underwent bilateral polypectomy. Anterior ethmoidectomies were performed in 50(54.35%) patients of whom 16(17.39%) patients underwent unilateral and 34(36.96%) patients underwent bilateral ethmoidectomy. 60(65.22%) patient underwent infundibulotomy of whom 36(39.13%) underwent unilateral and 24(26.09%) bilateral. 52(58.70%) patients underwent for middle meatus antrotomy. Posterior ethmoidectomy and sphenoidotomy was carried out in 6(6.52%) patients. Concha bullosa exteriorised in 28(30.43%) patients of whom 22(23.91%) underwent unilateral and 6(6.52%) bilateral. Septoplasty were perform in 42(45.65%) patients. (Table-3)

TABLE- 3. SURGICAL TECHNIQUE USED IN PRESENT STUDY (N=92)

Surgery	Unilateral	%	Bilateral	%
Polypectomy	20	21.74	13	14.13
Anterior ethmoidectomy	16	17.39	34	36.96
Infundibulotomy	36	39.13	24	26.09
Middle meatus antrotomy	34	36.96	20	21.74
Post-ethmoidectomy/ Sphenoidectomy	6	6.52	-	-
Concha bullosa exteriorization	22	23.91	6	6.52
Septoplasty & spurectomy	42	45.65	-	-
Cauterization of ITH	8	8.70	4	4.35

3.5.POST-OPERATIVE EVALUATION (SUBJECTIVE IMPROVEMENT)

The results of endoscopic sinus surgery in the patients of Headache secondary to chronic sinonasal diseases; allergic or non-allergic, with or without nasal polyposis were evaluated in 92 patients who responded to the different questions asked regarding their subjective improvement in their follow up-

Nasal Obstruction -Nasal obstruction was present in 78(84.78%) patients out of which, the nasal obstruction disappeared completely in 46(58.94%) cases, Nasal obstruction improved in 26(33.33%) cases & Nasal obstruction remained unchanged in 6(7.69%)

Nasal Discharge - Nasal discharge was present in 72(78.26%) patients out of which nasal discharge had completely disappeared in 48(52.17%) patients and decreased in 18(19.56%) patients, no improvement was noted in 6(6.52%) patient.

Headache - Headache was complained by 92(100%) patients. Post-operatively headache disappeared in 58(63.04%) patients, improvement was noted in 28(30.43%) patients and there was no improvement in 6(6.52%) patients

Post-Nasal discharge - On pre-operative evaluation post-nasal discharge was complained by 66(71.74%) patients. Post-nasal discharge was found to have disappeared in 42(63.64%) patients, in 12(18.18%) patients it had decreased, while in 12(18.18%) patients there was no improvement.

4. Discussion

In cases of headache secondary to sinusitis, patients invariably have coexisting symptoms of nasal obstruction, nasal discharge, post nasal drip, nasal mass. STUMBERGER & WOLF postulated that variations in the anatomy of the nasal cavity result in mucous stasis, infection and ultimately headache and facial pain. With the help of CT scanning and fiberoptic nasal endoscopy it may be possible to have an access and visualization of the niches and narrow spaces in this region (Osteo meatal complex is the key area). Once the atypical offending anatomical/pathological area in the lateral nasal wall is delineated a minimal conservative resection of the areas is done as per standard messenger Klinger technique. MESSERKLINGER [8] through his extensive work on mucociliary pattern of sinuses, declared functional endoscopic sinus surgery is a prime treatment entails for proper drainage and ventilation of the paranasal sinuses. D. W. KENNEDY, ZINREICH SJ [9] found that C. T. Coronal Scanning of paranasal sinuses significantly improves surgeon's ability to diagnose disease. The use of endoscope during surgery on the paranasal sinuses Improves visualization and reduce the necessity for wide exposure.

In present study All 92 patients were evaluated clinically, radiologically and endoscopically preoperatively. After preoperative evaluation, FESS was performed. All 92 patients were first studied with regard to age incidence and we found 86.95% of cases to be in the age group between 10 to 40 years of which 43.47% of patients were in the age group between 10 to 20 years. The Male Female ratio was noted to be 2.3:1. In the present study we observed nasal obstruction in 84.78%. Nasal discharge was complained of by 78.26% patients. Headache, differing in site and nature were noted in 100% patients (43.47% presented with headache in the frontal region, 21.73% patients had facial and frontal headache and 34.78% patients presented with diffuse headache). In present study, 23.39% of cases presented with main complaint of mass in the nasal.

Apart from septal deviation, the most obvious abnormalities detected on anterior rhinoscopy were discharge in 50.00% cases, inferior turbinate hypertrophy in 41.30% cases, middle turbinate hypertrophy in 34.78% cases, polyp or nasal mass in 23.91% cases, sinus tenderness 34.78% cases and swelling over cheek 15.21% cases.

In this series of 92 cases, nasal endoscopy revealed that mucopurulent discharge in middle meatus seen in 63.04% of cases. Oedematous and polypoid infundibular mucosa in 71.73% cases. 47.83% cases of early polyp formation were detected in near anterior ethmoidal and middle meatal areas which were missed in anterior rhinoscopic examination.

S.K. KALUSKAR [10] noted lit concha bullosa in 13% of patients with chronic maxillary sinusitis. JOE ET AL. [11], noted concha bullosa in 37% cases of sinus headache. ZINREICH and D.W. KENNEDY [12] et al encountered concha bullosa in 34% of cases on CT imaging. In this series enlarged concha bullosa was found in 34 (36.95%) cases (26 i.e. 28.26% unilateral and 8 i.e. 8.69% bilateral). Endoscopic penetration into the middle meatus can

reveal disease of the ethmoidal bulla, thus occluding the ethmoidal infundibulum by overlapping the hiatus semilunaris. In this series an enlarged bulla ethmoidalis was found in 34 (36.95%) cases (8 i.e. 8.69% unilateral and 26 i.e. 28.26% bilateral). Preoperative CT scan (coronal view) was done in almost all cases which revealed mucosal hypertrophy in anterior ethmoid region 45.65% cases, maxillary region 44.56% cases, frontal region 19.56% cases posterior ethmoidal region 14.13% cases sphenoid region 14.13% cases.

After complete preoperative evaluation and conformation by endoscopy and CT scan PNS (coronal section), FESS was performed in all 92 cases using MESSERKLINGER'S technique according to need and minimal surgery was done in order to preserve the normal physiology and anatomy of sinuses as much as possible. Septoplasty when necessary is an important addition in our study was done in 45.65% cases. Anterior ethmoidectomy was performed in 36.96% cases bilaterally and in 17.39% cases unilaterally. Infundibulotomy was performed in 39.13% cases unilateral and 26.09% cases bilateral. Middle meatus antrostomy was performed in 36.96% cases unilaterally and in 21.74% cases bilaterally. Posterior ethmoidectomy with sphenoidotomy was performed in only 6.52% cases. Concha bullosa was exteriorized in 23.91% cases unilaterally and 6.52% cases bilaterally.

Excellent results have been reported by many authors following endoscopic sinus surgery.

WIGAND [13] reported the subjective assessment of patients symptoms of sinusitis following endoscopic ethmoidectomy based on 220 answers returned from 310 questionnaires. Facial pain and headache were assessed as being better in as much as 93.4%.

J.S. MACKAY [14] reported results in 343 patients carefully followed up over a period of 3.5 years with a minimal follow-up interval of 6 months. Patients were assessed within reference to symptoms in order of their severity and consequently it was demonstrated that nasal obstruction responded best in 92% of cases, headache and rhinorrhoea following with 84% and 80% respectively.

JONAS NS [15] and ACQUADRO MA [16] had reported that in the group that has genuine sinusitis, endoscopic sinus surgery has been shown to alleviate the facial pain and headache in 75% to 83% of cases.

BOONCHOO [17] performed endoscopic sinus surgery on 16 patients who had headache but who had negative sinus CT scans. He reported total resolution of pain in 10 patients and partial resolution in the other 6.

PARSONS and COLLEAGUES [18] retrospectively described 34 patients who had headache and who had contact points removed and found that there was 91% decrease in intensity and 84% decrease in frequency.

TERRIS MH and COLLEAGUES [19] reported an analysis of 10 series reporting endoscopic sinus surgery in 1713 patients showed a mean improvement rate of headache was 91%.

4. Discussion

In this study of 92 patients after endoscopic sinus surgery improvement of headache were observed in 93.47% cases, improvement of nasal obstruction were observed in 92.30% cases, improvement of nasal discharge were observed in 91.67% and improvement of PND were observed in 81.82% cases.

No major intraoperative and postoperative complication occurred in this series

The advantages of endoscopic technique include improved diagnostic accuracy and visualization during surgery and the ability to minimise trauma to normal structure. Since conservative removal of disease is a hallmark of this technique, in each case detailed pre operative evaluation and understanding of the underlying pathology are required for a successful outcome, FESS has undoubtedly given a new horizon in the field of paranasal sinus surgery.

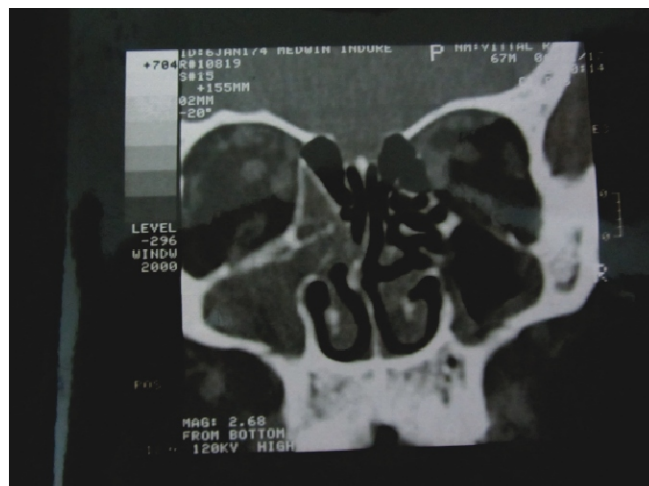
5. Conclusion

The results of this study show that FESS is a safe and effective method of treatment in cases of Headache secondary to chronic allergic or non-allergic sinonasal disease with or without polyposis in all age group of patients. The following conclusions are drawn from the present study Chronic rhinosinusitis usually affects mostly the people of age group ranging from 10-20 years with the common mode of presentation being nasal obstruction, nasal discharge, headache and post nasal drip. Endoscopy helps in diagnosis of sinonasal pathology by revealing structural details and anatomical variations in the nasal cavity to a greater extent. Coronal CT Scan accurately defines microanatomical locales in and around the Ostiomeatal Unit, it seems to be a valuable guide to the surgeon in the planning operative procedure, avoiding intraoperative complications and assessing surgical programmes and the success thereof. Functional endoscopic sinus surgery provides an efficient and safe method for treating sinonasal disease. Functional endoscopic sinus surgery has proven to be a better therapeutic means over the conventional methods and has opened a new horizon for possibilities of positive results in further studies and research work to be performed in the hands of future inquisitive workers.

Figure -1. Showing Removed Trifoliated Polypoidal Nasal Mass



FIGURE- 2 SHOWING SINUS MUCOSAL THICKENING & OMC DISEASE



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6. References

- [1] Naumann H. Pathologische Anatomie der chronischen Rhinitis und sinusitis. Proceedings VIII international congress of Otorhinolaryngology. Amsterdam. Excerpta Medica. 1965. p.80.
- [2] Stammberger H: History of Nasal Endoscopy in functional endoscopic sinus surgery. H. Stammberger, B.C. Decker - Philadelphia. 1991.
- [3] Stammberger H, Wolf G. Headaches and Sinus Disease: The endoscopic approach. Ann Otol Rhinol Laryngol 1988;134 (suppl) 3-23.
- [4] Stammberger H, Wolf G: Headaches and sinus disease: The endoscopic approach. Ann Otol Rhinol Laryngol 97 (Suppl134):3,1988.
- [5] Stammberger H: Endoscopic endonasal surgery concepts in treatment of recurring rhinosinusitis. Part I. Anatomic and path physiologic considerations; Part II. Surgical technique. Otolaryngol Head Neck Surg 94: 143, 1986.
- [6] Messerklinger W: Endoskopische diagnose und chirurgie der rezidivierenden sinusitis. In Krajina Z (ed): Advances in Nose and Sinus Surgery. Zagreb, Yugoslavia, Zagreb University Press, 1985
- [7] Kennedy DW, Zinreich SJ, Rosenbaum AE, et al: Functional endoscopic sinus surgery: Theory and diagnostic evaluation. Arch Otolaryngol 111:576, 1985.
- [8] Kaluskar SK, Patil NP (1992). The Role of Outpatient Endoscopy in Evolution of Chronic Sinus Diseases. Clinical Otorhinol Laryngol. (Editorial). 17(3):193-194.
- [9] Joe JK, Steven YH, Yanagisawa E. Documentation of variation in sinonasal anatomy by intraoperative nasal endoscopy. Laryngoscope 2000; 110:229-35.

- [10] Kennedy DW, Stammberger H, Zinreich SJ: Diagnostic evaluation for endoscopic-2 sinus surgery. Course 3238. Presented to American Academy of Otolaryngology Head and Neck Surgery, 1987.
- [11] Wigand ME: Transnasal ethmoidectomy under endoscopic control. *Rhinology* 19:7, 1981.
- [12] Mackay IS : Functional endoscopic sinus surgery. Recent advances in otolaryngology, London, Churchill Livingstone, 1995; 225-241.
- [13] Jones NS, Cooney TR. Facial pain and sinonasal surgery. *Rhinology* 2003;41:193-200.
- [14] Jones NS. Sinogenic facial pain ; diagnosis and pain management .*Otolaryngol clin. North am.*2005;38: 1311-1325.
- [15] Jones NS. Midfacial segment pain ; implications for rhinitis and sinusitis , *curr. Allergy , asthma respiratory.*2004: 4; 187-192.
- [16] Acquadro MA, Salman SO, Joseph MP. Analysis of pain and endoscopic sinus surgery for sinusitis. *Ann Otol Rhinol Laryngol*1997;106:305-9.
- [17] Boonchoo R. Functional endoscopic sinus surgery in patients with sinogenic headache. *J Med Assoc Thai* 1997;80:521-6..
- [18] Parsons DS. Batra PS. Reported functional endoscopic sinus surgical outcomes for contact point headaches. *Laryngoscope* 1998;108:696-702.
- [19] Terris MH, Davidson TM, Review of published results for endoscopic sinus surgery, ear, nose throat]. 1994;73(8):574-80.