Surgical treatment of nasal polyposis in patients with aspirin intolerance

W Hosemann

It is not fully understood why humans possess paranasal sinuses and for many years there has been speculation as to their physiological significance.[1] Much the same uncertainty holds true for the pathophysiology of chronic paranasal sinusitis, a disease which represents a major therapeutic challenge despite recent medical and surgical progress.[2 3] There are probably several distinct subtypes of chronic paranasal sinusitis ranging from remote mucosal thickening to diffuse polyposis. All types of symptomatic chronic sinusitis call for surgical intervention if medical treatment fails.

Corresponding to the diversity of chronic sinusitis, different microsurgical operative techniques have been developed during the last 15 years, all of which share the endonasal access route. Transfacial or transoral surgery has therefore become obsolete for treatment of uncomplicated paranasal mucositis.

Many cases with circumscribed hyperplastic changes of the remote paranasal sinus mucosa need only limited surgery of the superordinate anatomical ostiomeatal unit. Removing defined microanatomical narrow passes around this functional key area of the middle nasal meatus ("isthmus surgery") facilitates drainage and ventilation of the dependent paranasal sinuses (fig 1). Even severe changes in the peripheral sinus mucosa may heal subsequently without being specifically treated.[4 5]

Other cases of diffuse polypoid sinusitis represent a unique disease which is less influenced pathogenetically by local microanatomy[6] and, as a result, does not respond adequately to mere "isthmus surgery". A more aggressive surgical approach is called for which, nevertheless, should take into account the maximum conservation of nasal physiology.[7] The most severe mucositis associated with analgesic intolerance falls into this category of sinusitis.

Department of Otorhinolaryngology, University of Regensburg, D-93042 Regensburg, Germany
W Hosemann

Correspondence to:
Professor W Hosemann
werner.hosemann@klinik.uni-regensburg.de

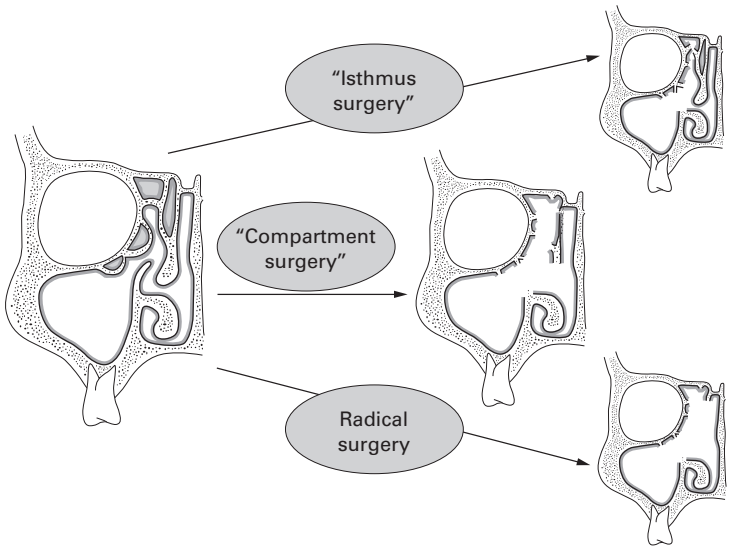

Figure 1 Scheme depicting the different surgical concepts: "isthmus surgery", "compartment surgery", and radical surgery. In isthmus surgery (functional endonasal sinus surgery, FESS) defined anatomical narrow passes are eliminated under optical control using microsurgical techniques. Areas of secondary and moderate tissue remodelling are left for spontaneous regeneration. Tissue ablation and tissue trauma are minimised and the postoperative healing period is reduced. On the other hand, small irregularities of the microanatomical operative field may become significant factors in delayed healing. Defined narrow passes or inflammatory foci may fail to be addressed during surgery. Chronic sinusitis caused by defined microanatomical aberrations is the main indication for this type of surgery.[4] Compartment surgery aims to create a distinct microanatomical compartment out of the individual ethmoidal cell system. The general rules of minimum tissue destruction and isthmus surgery are still applied using optical aids. However, tissue ablation is increased by removal of cell septa and the creation of larger neo-ostia. As a result, local postoperative care must be temporarily increased. Compartment surgery ranging from partial to complete ethmoidectomy and "pansinus surgery" are usually used in cases of chronic polypoid paranasal sinusitis.[5] Radical endonasal surgery is only justified today in cases of paranasal tumour growth. Substantial tissue destruction is needed. Increased scarring and the large operative cavity may lead to local stenosis or rhinitis sicca.

Epidemiology of chronic sinusitis and nasal polyposis

About 5% of the European population suffer from chronic sinusitis.[8] Nasal polyposis occurs in about 0.6% of adults, but this increases to 15% in patients suffering from bronchial asthma. However, up to 95% of patients with the bronchospastic type of analgesic intolerance will develop chronic polypoid sinusitis.[9 10] On the other hand, 15% of patients with nasal polyps have the bronchospastic type of analgesic intolerance, and this increases to 60% in patients who need revisional surgery for major regrowth of polyps following surgery.[11 12] Patients with the "aspirin (ASA) triad" (nasal polyposis, bronchial asthma, and aspirin intolerance) represent about 7% of cases with chronic sinusitis. More than 80% of these patients suffer from an advanced stage of polypoid sinusitis.

Concepts of surgery for chronic sinusitis

The basis of modern endonasal surgery has been laid in the last 100 years by anatomists, physiologists, and clinicians such as van Alyea, Grünwald, Hajek, Halle, Hilding, Ingal, Killian, Mosher, Mouret, Onodi, Zuckerkandl, and many others.[7 13 14] The endonasal access route, however, was initially discredited because of the increased risk of severe complications. Since the introduction of optical aids (endoscope, microscope) a substantial renaissance of endonasal surgical techniques has taken place during the last 15 years. The "fathers and trail blazers" of modern endonasal surgery are thus H Heermann, Messerklinger, Wigand, Draf, Stammberger, Terrier and Kennedy, among others.

During the last three decades different surgical concepts have evolved. The term "functional endoscopic sinus surgery" ("FESS" or "FES") was coined by Kennedy

and coworkers in 1985[15] to describe surgery relating to the systematic analysis of the microanatomy and physiology of the nose and sinuses. Functional endoscopic sinus surgery includes surgical techniques as well as the pathogenetic postulates mentioned above ("isthmus surgery"). Stammberger has presented a comprehensive review of detailed microsurgical techniques,[4] and Wigand[5] has presented a global and systematic endoscopic approach to the treatment of the paranasal sinuses ranging from minor interventions comparable to "FESS" up to complete sphenoethmoidectomy ("pansinus surgery").

In most aspirin intolerant patients the rhinosurgeon is faced with a diffuse polypoid growth in need of a more extensive procedure ("pansinus surgery").[16] Polypectomy alone should be avoided in aspirin intolerant patients as the effects are short lived (table 1). Generally, polypectomy causes irregular scars which mask the anatomical landmarks. Inevitable revisional procedures are rendered more difficult and the accompanying risks are increased. In the long term the prognosis of an impaired sense of smell is worsened.[17]

Preoperative evaluation, microsurgical techniques

Before every operation on the paranasal sinuses the patient undergoes a general examination by an otolaryngologist. The nasal cavity is examined with an endoscope (0°, 30° direction of view) before and after decongestion of the mucosa. It is a standard procedure to complete the preoperative examination with a computed tomographic (CT) or magnetic resonance imaging (MRI) scan. The CT scan demonstrates the extent and distribution of the disease and identifies anatomical landmarks, variants, and danger zones. There is no association between CT findings and severity of symptoms.[18] Preoperative olfactory testing is expedient for diagnostic reasons and is also advisable for medicolegal reasons.

Major operations such as complete sphenoethmoidectomy ("pansinus surgery") are usually performed under a general anaesthetic. The layout of instruments and optical aids (endoscope and/or microscope) and the positioning of the patient, surgeon, anaesthetist, and scrub nurse are handled in a wide variety of ways.[7]

Surgery for diffuse polypoid pansinusitis aims to clear the entire nose of disease, so adjunctive measures such as correction of septal deformities or turbinate reduction should be integrated into the treatment plan. Both central and peripheral areas of the sinus system are explored. Care is taken not to exclude areas of disease that are difficult to access or presumed to have no functional significance (fig 1). Incomplete removal of the inflammatory foci increases the potential for continued inflammation leading to disease recurrence.[19]

The first stage of surgery is polypectomy which might be facilitated by powered instrumentation.[20] The second step comprises a still limited anterior-to-posterior removal of the ethmoid cells with excision of the uncinate process. After resection of the posterior attachment of the middle turbinate, the anterior wall of the sphenoid sinus can be broadly exposed.[5 21] The sphenoid sinus is then opened via the sphenoethmoidal recess, with exposure of the ethmoid roof from posterior to anterior. Following removal of all major cell septa of the ethmoid, the access to the frontal sinus is exposed and widely opened under optical guidance. Draf has recently defined several types of extended endonasal interventions of the frontal sinuses which significantly increase the range of action in this area.[22] The maxillary sinus is broadly fenestrated in the middle meatus by removing the anterior and posterior fontanelle. Accurate endoscopically aided manipulations in the maxillary and frontal sinuses require special instruments such as slim and long handled upturned cupped forceps. Special effort is taken to preserve the stability and dimensions of the vertical lamella of the middle turbinate for maximum maintenance of nasal physiology.

"Functional compartment surgery" has the special merit of providing a certain degree of standardisation of the procedure and greater clarity of the postoperative endoscopic findings. The creation of a well defined anatomical cavity allows even major revisional surgery to be performed with the shaver as an outpatient procedure using local anaesthesia only.[23]

Following major sinus surgery, local wound healing takes about three months.[24] With this fact in mind, every patient should be subjected to a special and intensive therapeutic regimen (local debridement; local and systemic medication with, for example, corticosteroids; induction of aspirin tolerance). Patients with aspirin intolerance should undergo regular follow up visits for almost the rest of their lives in

Table 1 Rhinological outcome of surgical treatment of nasal polyps in patients suffering from analgesic intolerance (effects on accompanying asthma not given)

Author	*No of patients*	*Procedure*	*Follow up (months)*	*Objective results*	*Subjective results*
Patriarca *et al*[43]	130	Polypectomy	24	80% relapse	?
Brown *et al*[34]	101	Polypectomy ± ethmoidectomy	12	40% relapse	?
Hosemann *et al*[27]	21	Endonasal pansinus surgery	52	?	24% asymptomatic 38% improved
Schaitkin *et al*[44]	11	Endonasal pansinus surgery	36–52	36% revisional surgery needed	0% asymptomatic 82% improved
Kennedy[30]	11	Endonasal pansinus surgery	18	75% residual disease	?
McFadden *et al*[25]	25	Conservative/radical surgery	41	24% revisional surgery needed	100% improved
McFadden *et al*[35]	80	Conservative/radical surgery	36	"Significant number" of advanced stage disease needs subsequent surgery	85% improved
Rosen *et al*[37]	39	Conservative/radical surgery	27–62	51% revisional surgery needed, still 33% persistent disease	50% asymptomatic 30% improved

Radical surgery = mostly transmaxillary approach in addition to endonasal surgery.

order to detect and eradicate regrowing polyps at an early stage.

Results

Notwithstanding the multitude of recent reports on endonasal sinus surgery for chronic sinusitis, there are few papers which focus exclusively on patients with aspirin intolerance (table 1).

In general, the subjective success rate for pansinus surgery is about 80%. The specific preoperative symptoms respond to surgery in an individual manner. Nasal congestion, headache, and susceptibility to local infections may be expected to be relieved in up to 90% of cases. On the other hand, "postnasal drip" has a less favourable prognosis. Many patients continue with nasal symptoms, recurrent sinus infections, and the occasional need for vigorous medical treatment.[25] Comparatively more patients with aspirin intolerance suffer from preoperative anosmia and the impaired sense of smell is less likely to be relieved postoperatively in these patients.[26] The subjective results are not generally in agreement with postoperative endoscopic findings.[27] Depending on different criteria (definition of polyposis, patient subgroups, examination techniques), frank recurrence is observed in 10–40%.[7] Nevertheless, most patients with a recurrence of polyp growth experience improvement in symptoms.[28]

The accepted rate of revision surgery in chronic sinusitis is about 15% for all patients.[7 19 27] The main risk factor indicating a less favourable outcome is an advanced preoperative stage of disease which may be determined, for example, according to Lund and Kennedy.[19 28–32] Other risk factors include the polypoid type of chronic sinusitis, revisional surgery, coexisting analgesic intolerance, bronchial asthma, respiratory allergy, smoking, and possibly gastro-oesophageal reflux disease. Besides having an increased risk for postoperative healing problems, patients with aspirin intolerance have a higher incidence of mucoceles and of inflammatory orbital complications.[33]

Following restoration of the nasal physiology by surgery, improvement in the accompanying asthma may be expected in up to 80% of cases (range 32–84%).[7 34–37] Patients with severe disabling asthma do less well than those suffering from moderate asthma.[38] Aspirin sensitive asthmatic patients also have a less favourable prognosis.[39] On the other hand, selected cases with moderate pulmonary reactions to high doses of non-steroidal anti-inflammatory drugs (NSAIDs) may lose their aspirin intolerance postoperatively.[40]

There are many possible complications and side effects of endonasal sinus surgery ranging from simple nasal bleeding up to rare disasters such as intracerebral injury or laceration of the carotid artery.[7] The overall rate of major complications is less than 0.1%; 2% of patients may experience an asthma attack postoperatively.[27] Patients with aspirin intolerance are especially endangered by the erroneous prescription of NSAIDs for relief of postoperative pain.[41]

Conclusions

Rhinosurgery is indicated in all cases of symptomatic chronic sinusitis resistant to conservative treatment. This rule applies particularly to patients with the bronchospastic type of aspirin intolerance. Endonasal optically aided techniques represent the gold standard for surgery. Simple polypectomy inevitably leads to recurrence of polypoid growth within a short time period and should be avoided. Long term endoscopically guided aftercare of the operative field is mandatory for all patients. In spite of the use of sophisticated therapeutic methods, microsurgical techniques and intensive local aftercare, regrowth of polyps may occur in about 30% of patients. For this reason, aspirin intolerant patients should be given additional treatment—for example, topical/systemic steroids, induction of NSAID tolerance,[42] possibly leukotriene modulators, outpatient "touch up" procedures. Continued care for the aspirin intolerant patient with complementary surgical and medical treatment may offer long lasting relief.

1 Glück U. Die physiologische Bedeutung der Nasennebenhöhlen beim Menschen: Spekulationen seit 1800 Jahren. *Schweiz Med Wochenschr* 1991;**121**:925–31.
2 Vancil ME. A historical survey of treatments for nasal polyposis. *Laryngoscope* 1969;**79**:435–45.
3 Ray NF, Maraniuk JN, Thamer M, *et al.* Healthcare expenditures for sinusitis in 1996: contributions of asthma, rhinitis, and other airway disorders. *J Allergy Clin Immunol* 1999;**103**:408–14.
4 Stammberger H. *Functional endoscopic sinus surgery*. Philadelphia: BC Decker, 1991.
5 Wigand ME. *Endoscopic surgery of the paranasal sinuses and anterior skull base*. Stuttgart: Thieme, 1990.
6 Salman SD, Gonik L. Another look at functional endoscopic sinus surgery. *Curr Opin Otolaryngol Head Neck Surg* 1999; 7:2–6.
7 Hosemann W, Weber R, Keerl R, *et al. Minimally invasive endonasal sinus surgery*. New York: Thieme, 2000.
8 Gordts F, Clement PAR. Epidemiology and prevalence of aspecific chronic sinusitis. *Acta Oto-rhino-laryngologica Belg* 1997;**51**:205–8.
9 Larsen K. The clinical relationship of nasal polyps to asthma. *Allergy Asthma Proc* 1996;**17**:243–9.
10 Settipane GA. Epidemiology of nasal polyps. In: Settipane GA, Lund VJ, Bernstein JM, Tos M, eds. *Nasal polyps: epidemiology, pathogenesis and treatment*. Rhode Island: Ocean-Side Publication, 1997: 17–24.
11 Eichel BS. Revision sphenoethmoidectomy. *Laryngoscope* 1985;**95**:300–4.
12 Randerath W, Rühle KW. Analgetika-Asthma-Syndrom: von der Zyklo-Oxigenase-Theorie zu neuen therapeutischen Ansätzen. *Dtsch Med Wschr* 1998;**123**:123–7.
13 Draf W. Die chirurgische Behandlung entzündlicher Erkrankungen der Nasennebenhöhlen. *Arch Otolaryngol* 1982;**235**:133–305.
14 Jacobs JB. 100 years of frontal sinus surgery. *Laryngoscope* 1997;**107**:1–36 .
15 Kennedy DW, Zinreich SJ, Rosenbaum AE, *et al.* Functional endoscopic sinus surgery. Theory and diagnostic evaluation. *Arch Otolaryngol* 1985;**111**:576–82.
16 Jankowski J, Pigret D, Decroocq F. Comparison of functional results after ethmoidectomy and nasalization for diffuse and severe nasal polyposis. *Acta Otolaryngol (Stockh)* 1997;**117**:601–8.
17 Hosemann W, Goertzen W, Wohlleben R, *et al.* Olfaction after endoscopic endonasal ethmoidectomy. *Am J Rhinol* 1993;**7**:11–5.
18 Stewart MG, Sicard MW, Piccirillo JF, *et al.* Severity staging in chronic sinusitis: are CT scan findings related to patient symptoms? *Am J Rhinol* 1999;**13**:161–7.
19 Senior BA, Kennedy DW, Tanabodee J, *et al.* Long-term results of functional endoscopic sinus surgery. *Laryngoscope* 1998;**108**:151–7.
20 Christmas DA, Krouse JH. Powered instrumentation in functional endoscopic sinus surgery I: Surgical technique. *ENT J* 1996;**75**:33–40.
21 Hosemann W, Groβ R, Göde U, *et al.* The anterior sphenoid wall: relative anatomy for sphenoidotomy. *Am J Rhinol* 1995;**9**:137–44.
22 Draf W. Endonasal micro-endoscopic frontal sinus surgery: the Fulda concept. *Op Tech Otolaryngol Head Neck Surg* 1991;**2**:234–40.
23 Kühnel Th, Hosemann W, Rothammer R. Evaluation of powered instrumentation in outpatient revisional sinus surgery. *Rhinology* (submitted for publication)

24 Hosemann W, Wigand ME, Göde U, *et al.* Normal wound healing of the paranasal sinuses: clinical and experimental investigations. *Eur Arch Otorhinolaryngol* 1991;**248**:390–4.
25 McFadden EA, Kany RJ, Fink JN, *et al.* Surgery for sinusitis and aspirin triad. *Laryngoscope* 1990;**100**:1043–6.
26 Thomassin JM, Korchia D. Polypose naso-sinusienne - indications, résultats: a propos de 222 ethmoidectomies. *Ann Oto-Laryngol (Paris)* 1991;**108**:455–64.
27 Hosemann W, Wigand ME, Fehle R, *et al.* Ergebnisse endonasaler Siebbein-Operationen bei diffuser hyperplastischer Sinusitis paranasalis chronica. *HNO* 1988;**36**:54–9.
28 Chambers DW, Davis WE, Cook PR, *et al.* Long-term outcome analysis of functional endoscopic sinus surgery: correlation of symptoms with endoscopic examination findings and potential prognostic variables. *Laryngoscope* 1997; **107**:504–10.
29 Lund VJ, Kennedy DW, eds. Quantification for staging sinusitis. *Ann Otol Rhinol Laryngol Suppl* 1995;**167**:17–21.
30 Kennedy DW. Prognostic factors, outcomes and staging in ethmoid sinus surgery. *Laryngoscope* 1992;**102**(Suppl 57): 1–18.
31 Marks SC, Shamsa F. Evaluation of prognostic factors in endoscopic sinus surgery. *Am J Rhinol* 1997;**11**:187–91.
32 Osguthorpe JD. Surgical outcomes in rhinosinusitis: what we know. *Otolaryngol Head Neck Surg* 1999;**120**:451–3.
33 McFadden EA, Woodson BT, Massaro BM, *et al.* Orbital complications of sinusitis in the aspirin triad syndrome. *Laryngoscope* 1996;**106**:1103–7.
34 Brown BL, Harner SG, Van Dellen RG. Nasal polypectomy in patients with asthma and sensitivity to aspirin. *Arch Otolaryngol* 1979;**105**:413–6.
35 McFadden EA, Woodson BT, Fink JN, *et al.* Surgical treatment of aspirin triad sinusitis. *Am J Rhinol* 1997;**11**:263–70.
36 Mings R, Friedman WH, Linford PA, *et al.* Five-year follow-up of the effects of bilateral intranasal sphenoethmoidectomy in patients with sinusitis and asthma. *Am J Rhinol* 1988;**71**:13–6.
37 Rosen CA, Howell LL, Smith JD. Efficacy of different surgical approaches in patients with aspirin sensitivity, asthma, and nasal polyposis triad. *Am J Rhinol* 1996;**10**:207–10.
38 English GM. Nasal polypectomy and sinus surgery in patients with asthma and aspirin idiosyncrasy. *Laryngoscope* 1986;**96**:374–80.
39 Hosemann W, Michelson A, Weindler J, *et al.* Einfluß der endonasalen Nasennebenhöhlenchirurgie auf die Lungenfunktion des Patienten mit Asthma bronchiale. *Laryngo-Rhino-Otol* 1990;**69**:521–6.
40 Jankowski R, Moneret-Vautrin DA, Goetz R, Wayoff M, Incidence of medico-surgical treatment for nasal polyps on the development of associated asthma. *Rhinology* 1992;**30**: 249–258
41 Dias MA, Biedlingmaier JF, Ketorlac-induced status asthmaticus after endoscopic sinus surgery in a patient with Samter's triad. *Otolaryngol Head Neck Surg* 1997;**117**: S176–178
42 Stevenson DD, Pleskow WW, Simon RA, Mathison DA, Lumry WR, Schatz M, Zeiger RS, Aspirin-sensitive rhinosinusitis asthma: a double-blind crossover study of treatment with aspirin. *J Allergy Clin Immunol* 1984;**73**: 500–7.
43 Patriarca G, Bellioni P, Bucera E, *et al.* Intranasal treatment with lysine acetylsalicylate in patients with nasal polyposis. *Ann Allergy* 1991;**67**:588–92.
44 Schaitkin B, May M, Shapiro A, *et al.* Endoscopic sinus surgery: 4-years follow-up on the first 100 patients. *Laryngoscope* 1993;**103**:1117–20.