

Healing results of prolonged acute frontal sinusitis treated with endoscopic sinus surgery *

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SUMMARY

In a marked part of patients suffering from acute frontal sinusitis, the symptoms do not resolve after initial therapy (antibiotics and/or trephination). The prolongation of the healing or recurrences may be caused by persistent inflammation or by structural abnormalities at the nasofrontal connection. During the last decade endoscopic surgery (FES) has become a very useful method to restore the frontonasal drainage although long term results of this kind of population are rare.

We evaluated the results of endoscopic surgery in two patient groups (total number of 50) both operated after prolongation (persistent symptoms after 4 weeks) of the initial acute phase of the frontal sinusitis. The first group (A, 15 patients, first trephined) was followed-up 4 years, the number of recurrences after the first FES was 60 % and in the other group (B, no initial trephination) with over 6 months follow-up, 91 % of patients had recurrences. In group A pre-and postoperative CT-scanning was used to determine the possible anatomical variations that could be causing the failures. All but 3 patients showed some kind of abnormal anatomical variation. In group B only preoperative CT was done. In most cases the reasons for recurrences of frontal sinusitis were polyps and/or chronic inflammation at the ethmoidal region.

Key words: frontal sinusitis, endoscopic surgery, trephination, recurrence.

INTRODUCTION

Acute frontal sinusitis has been traditionally regarded as an empyema and therapy has been directed at the pathogenic bacteria, as well as at providing drainage (Perkins et al., 1993). The disease is more common in patients with septal deviations and nasal polyps (Paparella et al., 1991), which cause abnormalities of the nasofrontal region. According to Duvoisin et al. (1992), there is a correlation between these abnormalities detected by CT scan, and chronic frontal sinusitis. Pus may not be present in the nose because of a blockage of the ethmoids, which is caused by swelling of the mucosa, thus impairing drainage of the frontal sinus.

Classically, the acute phase has been treated with trephination, and the cases that have become prolonged or chronic have been treated more extensively. The alternatives have been from ablation of the sinus with obliteration to restoration of the nasofrontal or frontoethmoidal connection (Schaefer et al., 1990).

Since the invention of the endoscope, the intranasal type of restoration of these nasofrontal connections has become more

and more popular. Thawley et al. (1995) have described a combined endoscopic transfrontal trephination and intranasal endoscopic approach, which allows a more confident identification and removal of obstructions from the frontal sinus outflow tract. Both Becker et al. (1995) and Close et al. (1994) have described a modified transnasal endoscopic Lothrop procedure. Endonasal restoration of the ventilation and drainage with middle meatal antrostomy has produced good results. However, keeping the nasofrontal connection patent is more difficult (Loury et al., 1993). This seems to be one of the greatest problems in endoscopic manipulation of the paranasal sinus area. Visualisation of the frontal recess can also be very difficult even for an experienced surgeon (Metson et al., 1992).

In the present study, we report the healing results of 50 patients with acute prolonged frontal sinusitis who were treated with endoscopic sinus surgery after various treatment intentions at the immediate acute phase. The first 15 patients are a part of a larger series of 58 patients presented in our earlier study (Wide et al., 1996), who were trephined for acute frontal sinusitis. These 15 patients did not heal normally according to

the clinical and radiological findings. At the initial phase the ventilation measurements (rhinomanometry and saline-manometry) were recorded in this group. This period was the beginning of the endoscopic treatment of the frontal sinusitis patients in Turku. Another group of 35 endoscopically operated frontal sinusitis patients treated in 1995-1997 is also included in this report. These are patients who did not respond to conservative treatment. By conservative treatment, we refer to antibiotics, maxillary lavage when needed, and intranasal decongestants.

MATERIAL AND METHODS

The material consisted of two groups of patients. The first group consisted of 15 patients who had been treated in Turku University Central Hospital for frontal sinusitis in 1991-1993 (group A). These patients were a part of a bigger population of 58, described in our earlier work (Wide et al., 1996). The second group (group B) consisted of 35 endoscopically operated patients from 1995-1997 (different patients than in group A). Informed consent was obtained from all the patients. The material was collected retrospectively as two groups because we needed as many as possible endoscopically operated frontal sinusitis patients with as much data of the patient history as possible. Various studies concerning frontal sinusitis patients were performed during these two time periods and many data were collected. Therefore these periods were chosen. The material includes frontal sinusitis patients treated in Turku University Central Hospital with FESS. Only patients who were already under treatment, for example waiting for their operation, were excluded.

All 58 patients were first treated with antibiotics, nasal decongestants and maxillary lavage. A plain film X-ray examination of the sinuses with Water's, Caldwell's and lateral views were taken at the first consultation and again 3 days later. The new examination was performed so soon mainly to find out if the condition of the patients was getting worse and they would need immediate operative treatment. Complete recovery was not expected in such a short period of time. When no improvement in the symptoms or the radiological status was noted, or the situation was worse, trephination of the frontal sinus was performed. Ventilation measurements with rhinomanometry and salinemanometry began from the second or third postoperative day after trephination and were continued thereafter every other day. The patients who healed well according to all the available criteria had their drain removed before discharge, except for a few exceptions when it was removed later after successful ventilation measurements and negative symptom history. Patients were recalled for control after about one month. At that point, a plain film X-ray was taken and a thorough history of the possible symptoms was also taken.

The first 15 patients (group A) presented in this study are those who did not heal normally according to the ventilation

measurements of the frontal sinus (Wide et al., 1996) and according to the clinical and radiological criteria, but instead developed prolonged disease demanding further surgery in addition to the performed trephination. The decision to operate was based only on anterior rhinoscopy, the clinical state of the patient and CT.

Group B was treated very much like group A with the exception that they were not trephined first. Antibiotics, decongestants and lavage were used. No ventilation measurements were routinely performed. The decision to operate was based on clinical state and CT. These were patients who were first treated conservatively, i.e. with antibiotics, decongestants and maxillary lavage, and then when the disease became prolonged, meaning that the patients still had symptoms (fever, purulent rhinorrhea and/or pain over the frontal area) after 4 weeks, CT was performed and immediately thereafter FESS.

There were 9 men and 6 women in group A. The mean age of the men was 36 years (range 15-64 years) and the mean age of the women was 43 years (range 29-67 years). In group B there were 16 women and 19 men with a mean age of 52.8 years. Thus altogether there were 50 patients (28 men and 22 women). In group A, in 10 cases, the trephination was performed on both sides and in 5 cases on one side. The patients in group A who did not undergo directly endoscopic surgery were discharged from the hospital after about one week with the trephination drain in place. The ambulatory lavations were continued as were rhinomanometric and salinemanometric measurements, and the endoscopic surgery was performed as soon as possible. Those patients with exceptionally strong symptoms underwent endoscopic surgery during the same hospital stay. The exact date of the operation depended also partly on the resources of the hospital. As mentioned above, group B consisted of conservatively treated patients who developed prolonged disease and underwent endoscopic surgery.

CT scans were taken of all patients before endoscopic surgery. Functional endoscopic sinus surgery (FESS) was then performed on the first 15 patients of the larger population of 58 who had abnormalities in CT and whose ventilation of the nasofrontal ductus did not improve. Special attention was paid to the frontal recess. Three different surgeons took part, all of whom are experienced specialists in otorhinolaryngology. Patients were operated under local anesthesia (Stammberger, 1991). Rigid endoscopes with different angles (0, 30 and 70 degrees) and coldlight illumination were used. A middle meatal osteotomy was created, usually by enlarging the natural ostium. Possible cysts and polyps could then be removed through this anastomy. Infundibulotomy and both anterior and posterior ethmoidectomies were performed. The frontal recess and the floor of the frontal sinus were opened under endoscopic visual control. Although local anesthesia was used, no problems were met to perform the operation following all the known principles with full satisfaction.

The 15 endoscopically-operated patients were treated postoperatively with lavage through the trephination drain. In most cases, the trephination drain was removed when the patient was discharged from the hospital. Only in cases where the frontonasal duct felt obliterated during lavations, or where there were great amounts of pus as a result of the lavations, was the drain left in place for a short period of time for ambulatory lavations. The first postoperative control for the majority of patients who had had their drain removed was after 1-2 weeks. At that point possible blood coagulates were suctioned from the sinus system. The patients were called for a CT scan and check-up at the beginning of 1994.

Group B consisted of people who were treated in Turku University Central Hospital for frontal sinusitis in 1995-1997. These patients did not respond to conservative treatment with antibiotics, decongestants and maxillary lavations, but developed prolonged disease. The limit between acute and prolonged disease was set here at 4 weeks. When no normal healing was observed, CT was performed, and when abnormalities (obstruction of the osteomeatal unit etc.) were noted, patients were operated endoscopically. In this series, there were more surgeons operating, but the method used was the same as described above. All the surgeons were ENT specialists with experience and we feel certain that the post-operative results can still be compared with each other. The patients were monitored for 3 to 6 months by several ENT specialists in their private practice. No postoperative CT was automatically performed for these patients.

RESULTS

All the 15 patients in group A had symptoms lasting at least 0,5 months before the endoscopic operation was performed. The longest period was 7 months. The mean length of the symptom period was 1.8 months, which means a little less than 8 weeks. The symptoms consisted of various typical sinusitis symptoms like headache, feeling of pressure over the sinus area etc. Of the patients, 53 % had no previous history of pansinusitis before this period. The mean follow-up period after the endoscopic surgery was 2.8 months. Polyposis was observed in 7 and allergy in 5 patients.

Of the patients in group A, 53 % had no previous sinus or nasal surgery in their history. Trephination was the most common type of previously performed operations, the others being a Luc-Caldwell operation, septal reconstruction and intranasal ethmoidectomy. Polyposis was found in 7 and allergy in 5 of the patients in group A (Table 1). A number of re-operations were performed: 4 frontal sinus obliterations, 5 times re-FESS, 1 frontal sinus trephination and 1 septal reconstruction. One of these patients has had re-FESS twice and is now healthy, two patients required one re-FESS, one patient has undergone obliteration of the frontal sinuses since his re-FESS, and one patient has been endoscopically operated several times, the

Table 1. Patient profile and history in groups A and B.

	GROUP A	GROUP B
Women	6	16
Men	9	19
Mean age (years)	39.5	52.8
Mean symptom period (months)	1.8	4.1
Mean follow-up between FESS and healing (months)	3.2	8.2
Polyposis	7 (47 %)	15 (43 %)
Allergy	5 (33 %)	16 (46%)
Re-operations	9 (60 %)	3 (8.6 %)
Previous sinus surgery	9 (60 %)	13 (37 %)
Asthma	No information	11
Normal healing	6 (40 %)	7 (19 %)
Prolonged healing	7 (47 %)	22 (63 %)
Recurrence	6 (40 %)	4 (11 %)

problem evidently being the formation of synechia and scars which impair drainage.

Of group A, 10 (67%) patients healed with endoscopic sinus surgery alone, although 4 patients required more than one FESS. Re-operations other than FESS (osteoplastic obliteration, septoplasty etc.) were performed in 5 patients. The mean time interval between FESS operation and the visit when the patient was considered healthy, was in group A 3.2 months (Table 1). The criteria for those who needed re-operation were based mainly on symptoms and CT. Most of the re-operated patients had prolongation of the disease, one had both recurrence of the disease after a short period of well-being, followed by prolongation (Table 1). Poor CT results post-operatively alone were not enough for re-operation if the patient was clinically well.

CT scans were taken before and after the endoscopic operation in group A and were analysed by a radiologist. All but 3 patients showed some kind of anatomical variation in normal structures at the preoperative CT. The numbers of variations are shown in Table 2. Most patients had more than one variation. Table 3 shows the findings in group A at CT scan pre- and post-operatively. There were two patients who had undergone frontal sinus obliteration before the post-operative control, so they have no marking in the table concerning the frontal sinuses.

Table 2. Anatomical variations found at pre-operative CT-scan in group A.

	Absent	Present
Aplasia sinus frontalis	15	0
Concha bullosa	10	5
Paradoxal concha media	14	1
Hallers cells	6	9
Rotation of processus uncinatus	8	7
Agger nasi cells	10	5

Table 3. Pre- and post-operative results of the CT-scan in group A.

0=normal

1a=partially opacified, mucosal swelling

1b=partially opacified, pus

2=totally opacified

Pre-operative results

Area	Right			
	0	1a	1b	2
Maxillary sinus	2	11	4	1
Ethm. Anterior	1	9	0	5
Ethm. Posterior	2	9	0	4
Sphenoidal sinus	6	9	2	1
Frontal region	1	9	2	3
Osteomeatal area	2	0	0	13
Ductus nasofrontalis	2	0	0	13

Area	Left			
	0	1a	1b	2
Maxillary sinus	1	13	3	0
Ethm. Anterior	2	11	0	2
Etm. Posterior	2	11	0	2
Sphenoidal sinus	9	4	1	1
Frontal region	2	12	0	2
Osteomeatal area	3	0	0	11
Ductus nasofrontalis	2	0	0	13

Post-operative results

Area	Right			
	0	1a	1b	2
Maxillary sinus	1	13	1	0
Ethm. Anterior	5	6	0	3
Ethm. Posterior	5	7	0	2
Sphenoidal sinus	6	7	0	1
Frontal region	3	4	1	4
Osteomeatal area	9	0	0	5
Ductus nasofrontalis	3	0	0	11

Area	Left			
	0	1a	1b	2
Maxillary sinus	2	9	5	0
Ethm. Anterior	2	10	1	2
Ethm. Posterior	2	11	1	1
Sphenoidal sinus	10	4	0	0
Frontal region	2	4	1	5
Osteomeatal area	6	0	0	8
Ductus nasofrontalis	3	0		

There was practically no difference in opacification of the sphenoid sinus between the patients who healed well and those requiring re-operation. In both groups, there was opacification in the majority of the patients. Medially rotated processus uncinatus did not seem to play any significant role in the prognosis either. Post-operative opacification of the osteomeatal unit seemed to be somewhat more typical in the group of patients requiring re-operation. These results are shown in Table 4. Only one patient had a normal finding post-

operatively in the nasofrontal region, indicating that there was no mucosal oedema or pus. All the other patients had an either totally or partly opacified nasofrontal region (Table 3). This previously mentioned patient had only one partly opacified maxillary sinus, all the other sinuses being normal. All the other patients had clear opacification in two or more of their sinuses in the form of either swollen mucosa or pus. CT was not taken routinely of group B patients, so only radiological comparison could be made to the pre-operative CT.

In group B, 16 patients had an history of allergic rhinitis, 15 had polyps, 13 had had previous sinus operations, and 11 had asthma (Table 1). In this group, re-operations were performed in 3 patients. The mean length of time with symptoms in this group was 4.1 months (range 0.2-17.7 months). The mean time interval between the FESS operation and healing was 8.2 weeks. Of these 35 patients, 22 developed prolonged disease, 4 had recurrences during the study period and only 7 (19 %) healed normally (Table 1).

DISCUSSION

The use of the endoscope has become more popular in sinus operations and, thus, it is important to try to analyse the outcome of this type of surgery. Mathews et al. (1991) had 155 patients in their series, 15 % of whom required some sort of re-operation, with the mean follow-up period for the two groups of patients collected in two different series being 9.7 months and 12.8 months. Schaefer et al. (1990) had 36 patients in their series, 21 of whom reported improvement after the surgery, while two required re-operations. The rest either improved although still had episodes of sinusitis or remained unchanged, the mean follow-up period being 16.4 months.

In group A, 60 % required re-operations, although only 47 % had some sort of previous history of sinusitis. In this group, 6 patients healed normally (40 %), 7 had prolonged healing and 6 had recurrences. In group A, 10 patients healed with one or more FESS operations, the remaining 5 patients needing more extensive surgery. Our median follow-up period after the endoscopic operation was 3.2 months in group A, and 8.2 months in group B. In group B, only 19 % of the patients healed normally. One of the explanations for this can be the fact that these are patients with many complicating factors in their patient history; it could even be said that they constitute a selected material. In Finland, not every frontal sinusitis patient ends up in a hospital, even for an ambulatory visit. In our hospital, we see the worst cases, having been sent by another doctor: either by a general practitioner or an ENT specialist in their own practice. The great variations in outcome of the operated patients in different series of various authors emphasize the importance of finding more reliable methods to predict the outcome.

The severity of the sinusitis is shown by the fact that every patient had some sort of abnormality on the pre-operative CT scan as shown in Table 3. Surprisingly, little difference can be seen between the pre- and post-operative results of the CT

Table 4. Comparison of CT results between patients who healed well and those who needed reoperation in group A.

Patients who healed well						
Patient	preop.	bent proc.	ductus nasof.		osteomeatal region	
	sphenoids	uncinatus	preop.	postop.	preop.	postop.
TH	opacif.	absent	opacif./opacif.	opacif./opacif.	opacif./normal	normal/normal
LT	opacif.	absent	opacif./opacif.	opacif./opacif.	opacif./opacif.	normal/normal
VN	opacif.	absent	opacif./opacif.	exitus	opacif./opacif.	
JH	normal	present	opacif./opacif.	normal/opacif.	opacif./opacif.	opacif./normal
HS	opacif.	present	opacif./opacif.	opacif./opacif.	opacif./opacif.	normal/opacif.
RV	normal	absent	opacif./normal	normal/normal	Opacif./normal	normal/normal
Patients who needed reoperation						
TL	normal	absent	normal/normal	normal/opacif.	normal/normal	normal/normal
JT	opacif.	absent	opacif./opacif.	opacif./opacif.	opacif./opacif.	opacif./opacif.
MH	opacif.	absent	opacif./opacif.	opacif./opacif.	opacif./opacif.	opacif./opacif.
NH	opacif.	absent	opacif./opacif.	opacif./opacif.	opacif./opacif.	normal/opacif.
LW	opacif.	present	opacif./opacif.	opacif./opacif.	opacif./opacif.	normal/opacif.
JK	opacif.	present	opacif./opacif.	opacif./opacif.	opacif./opacif.	opacif./opacif.
VT	normal	present	norm./opacif.	norm./opacif.	norm./opacif.	normal/normal
JV	normal	absent	opacif./opacif.	opacif./opacif.	opacif./opacif.	norm./opacif.
TR	opacif.	present	opacif./opacif.	opacif./opacif.	opacif./opacif.	opacif./opacif.

scan. The most interesting fact was that only one patient had a normal nasofrontal area in the post-operative CT indicating that this patient had no opacification of the nasofrontal region. Whether or not this is of any significance for the number of reoperations needed should be taken into consideration. It is possible that our operations were not extensive enough in the beginning, especially concerning the nasofrontal region.

Our results show that the capability to predict the outcome of endoscopic sinus surgery is still uncertain. Metson et al. (1998) state that the effect of endoscopic sinus surgery on sinus-specific symptoms and general health remains largely unknown. According to King et al. (1994), literature reports of the failure rates for FESS vary from 2.5% to 24.0%. However there is still a need for standardisation of the criteria to analyse the results. For example the follow-up periods vary among different studies.

One of the main difficulties in endoscopic surgery is keeping the nasofrontal connection open. A vented tubular plastic stent to keep the nasofrontal communication open has been reported by Hoytt III (1993). Har-El et al. (1995) on the other hand reported their technique where the goals were to develop a wide and patent frontonasal communication, to prevent possible causes of recurrent obstruction, and to provide optimal conditions of reepithelization of the sinus itself and the frontonasal connection.

A factor also to be taken into consideration in predicting an outcome is the result of the CT scan, i.e. the state of the mucosa. Duvoisin and Schnyder noted in their series (1992)

that there was a strong correlation between abnormalities of the frontonasal duct shown by the CT scan and frontal sinusitis. In our series, 64% of the patients who showed abnormal opacification of the nasofrontal region after FESS were in need of further surgery. Mathews et al. (1991) again noted that the outcome for patients with opacified sphenoid sinus was significantly worse than for patients with normal sphenoid sinus. This could not be shown in our present study.

Altogether, the outcome of patients with prolonged frontal sinusitis is influenced by many factors and further research to find the ideal treatment for every patient is needed.

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