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Endoscopic surgical treatment of sinonasal polyposis-medium term outcomes (mean follow-up of 5 years)*

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SUMMARY

Background: *Between 30 and 50% of patients with sinonasal polyposis (SNP) will require surgical treatment.*

Objective: *To determine the medium term risks and benefits of endonasal ethmoidectomy in SNP.*

Method: *132 cases of SNP have been retrospectively studied before and after endoscopic nasal surgery with a mean follow-up of 5 years. Functional symptoms and appearances on endoscopic examination were recorded on graded scales. Non-parametric statistical analyses for matched series were used in the assessment of data.*

Results: *Post-operative normalisation of nasal function was obtained in 62% of cases. Each of the four main nasal symptoms (nasal obstruction, rhinorrhoea, facial pain and anosmia) was improved ($p=0.001$). Patients with associated asthma or ASA triad had higher scores for nasal obstruction and rhinorrhoea (Fisher's exact test; $p<0.02$). The pre-operative clinical stage of SNP correlated neither with recurrence nor with functional outcomes (Fisher's exact test; $p>0.05$). The requirement for steroid treatment of concurrent asthma was also reduced post-operatively ($p=0.001$). The association with asthma and its level of treatment was not related to the frequency of recurrence of SNP (Chi^2; $p>0.6$).*

Conclusions: *Functional outcomes for patients with SNP and asthma were significantly improved by endoscopic surgical treatment, even if the appearance of the nasal mucosa did not always return to normal.*

Key words: sinonasal polyposis, endoscopic surgery, sinus surgery, asthma, functional outcomes

INTRODUCTION

Sinonasal polyposis (SNP) is part of the spectrum of chronic rhinosinusitis. Diagnosis is based on the observation of polyps extending from the sinonasal mucosa. This disease process has been described since antiquity (Lascaratos et al., 2000) but still raises questions about its aetiology, pathophysiology and treatment (Demoly et al., 2000). In the general population the prevalence of SNP is about 1 to 2% (Hosemann et al., 1994). The four main symptoms of SNP are nasal obstruction, rhinorrhoea, anosmia and facial pain. In many cases SNP is associated with asthma, with or without ASA triad, and at least 7% of asthmatic patients develop SNP (Settipane, 1996). The disability and long-term effects caused by SNP have been noted previously (Vento et al., 2000). Usually, nasal symptoms are improved by intranasal corticosteroids alone (Kanai et al., 1991), and sometimes with the addition of short courses of low dose oral corticosteroids. However, 30 to 50% of the cases of SNP are steroid resistant or steroid dependent and eventually require endonasal ethmoidectomy (Lamblin et al., 1997; Bonfils, 1998). The aim of surgical treatment is to totally remove pathological mucosa and to allow access for topical steroids. The surgical procedure of ethmoidectomy has evolved over the last three decades with the development of endonasal surgery under endoscopic control (Wigand, 1981;

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Stammberger, 1986; Schaefer et al., 1989). The advantages of this procedure have been recognised in the treatment of chronic rhinosinusitis (Friedman and Kantsantonis, 1990; Levine, 1990; Eloy et al., 1997; Senior et al., 1998). However, few data are available regarding the efficacy of endoscopic surgical treatment of SNP. In order to clarify the benefits and risks of endonasal ethmoidectomy in SNP, we have studied the recurrence rates, complications and functional outcomes in a group of 132 patients with a mean follow-up of 5 years.

MATERIALS AND METHODS

Patients and study design

A retrospective study was conducted over a period of ten years (January 1989 to January 1999). During this period 241 patients underwent bilateral endoscopic ethmoidectomy in the Department of Otolaryngology at the University Hospital of Montpellier, France. Complete case records for 132 of these patients were available for the present study.

The surgical indications were as follows:

- Symptoms of nasal dysfunction resistant to full medical treatment i.e. initial oral steroid therapy (1 mg/kg/day of prednisolone) followed by 3 months of topical nasal steroid (flunisolide) at a dosage of 1500 μg/side/day or;
- Symptoms of nasal dysfunction requiring more than 3 courses of 7 days oral corticosteroid per year.

Nasal dysfunction was evaluated subjectively by patients at the pre-operative visit and at the last follow-up visit. Data were collected using a two-point scale for nasal obstruction and facial pain and a three-point scale for dysosmia and rhinorrhoea (Table 1).

Table 1. Graded scales used to evaluate nasal function scores.

Nasal obstruction	absent	present	
Score	0	1	
Facial pain	absent	present	
Score	0	1	
Rhinorrhoea	absent	moderate	severe
Score	0	1	2
Sense of smell	normal	hyposmia	anosmia
Score	0	1	2

Polyp size was assessed by nasal endoscopy after decongestion and was classified into three stages (Table 2).

Asthma severity was assessed on a four-point scale by means of its level of treatment and symptoms (Table 3).

Table 3. Definition of the level of asthma treatment in patients with SNP.

level 1	Bronchial hyper-reactivity only	55.73 %
level 2	Occasional wheezing but no prophylactic therapy	16.79 %
level 3	Requiring regular inhaled corticosteroids	17.56 %
level 4	Requiring regular oral corticosteroids	9.92 %

Statistics

Statistical analysis was used to evaluate the differences between groups before and after surgical treatment. Non-parametric tests for matched series were used: the MacNemar test, the test of symmetry and Fisher's exact test.

Surgical procedure

The surgical procedure consisted of an endoscopically controlled intranasal ethmoidectomy using 25° and 70° angled optical endoscopes. All surgery was performed under general anaesthesia. After decongestion with naphazolyn, polyps were removed to give access to the middle meatus. Any significant deviation of the nasal septum was corrected endoscopically. The middle turbinate was displaced medially and the anterior third removed for access if necessary. The uncinate process was totally removed giving access to the maxillary sinus and allowing a clear view of the medial orbital wall. The bulla was then opened and the anterior and posterior ethmoids cleared completely, following the skull base. If disease was noted on the CT scan, a large sphenoidotomy and/or opening of the frontal recess was performed to allow maximum removal of diseased mucosa.

Post - operative treatment

Antibiotics (amoxicillin and clavulanic acid) and oral corticosteroids were prescribed for 7 days post-operatively along with saline douches. Following this, topical nasal steroids were recommenced.

Table 2. Staging of nasal polyps.

Stage	1	2	3
Clinical appearance	Polyps restricted to the middle meatus	Polyps outwith the middle meatus but not filling the nasal airway	Polyps filling the nasal airway down to the floor of the nose

RESULTS

Population

The sex ratio was 35.6% women to 64.4% men. The mean age was 46.7 years (SD: 13.7) and the median 45.5 years. Previous sinus surgery had been performed in 50%. Specific IgE levels and skin prick testing showed 34.5% of patients to be atopic. Simple asthma was found in 25% and ASA triad in 22%, such that 47 % of the total population was asthmatic (Table 3).

There was no association between the clinical stage of polyps and asthma severity (Chi^2; $p>0.5$).

The surgical procedures performed are summarised in Table 4.

Table 4. Procedures performed.

Anterior ethmoidectomy	99.2 %
Posterior ethmoidectomy	94.6 %
Middle meatal antrostomy	97 %
Opening of frontal recess	90.9 %
Sphenoidotomy	72 %
Septoplasty	23.5 %
Inferior turbinectomy	4.5 %

Complications

Postoperative complications were a breach of the medial orbital wall in three cases (2.3%) (asymptomatic in one case and with periorbital bruising in two cases). CSF leaks were noted per-operatively in two cases of posterior ethmoidectomy (1.5%). These were sealed during the procedure using a mucoperiosteal free flap taken from the middle turbinate which was applied to the defect with biological glue. After the procedure patients were given instructions to avoid straining. There were no post-operative complications such as meningitis noted in either of these patients and no evidence of persisting CSF leak at subsequent nasal endoscopy. Bleeding from the anterior ethmoidal artery occurred in two cases, one patient requiring diathermy treatment to the bleeding area. There were anaesthetic complications in two cases (1.5%) that suffered severe bronchospasm necessitating temporary suspension of the operation. Secondary complications were noted in two cases (1.5%) that developed frontoethmoidal mucocoeles, treated endoscopically in one case and requiring a combined approach in the other case (with ASA triad). A follow-up period of three years in each case has shown no sign of recurrence.

Post-operative treatment

83.5% of the patients had treatment with topical nasal corticosteroids during the entire post-operative follow-up period. 14.4% of the patients stopped topical steroid treatment during the follow-up period following medical advice, whereas 2.1% of the patients stopped topical steroid treatment against medical advice.

Results on nasal function

Normal nasal function was found in 62% of all post-operative cases i.e. patients did not complain of nasal obstruction, facial pain, anosmia or rhinorrhoea.

Analysis of each symptom showed a "normal" nasal airway in 6.82% of patients pre-operatively compared to 85.61% post-operatively (p=0.001) (Figure 1). Facial pain was noted in 36.36% pre-operatively and 4.55% post-operatively (p=0.001)

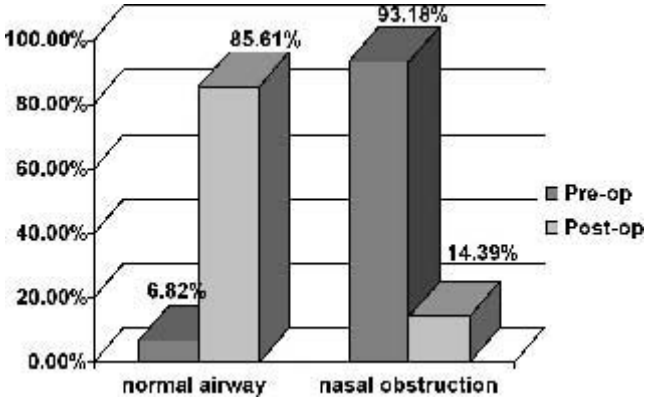

Figure 1. Nasal obstruction. MacNemar's test; p= 0.001.

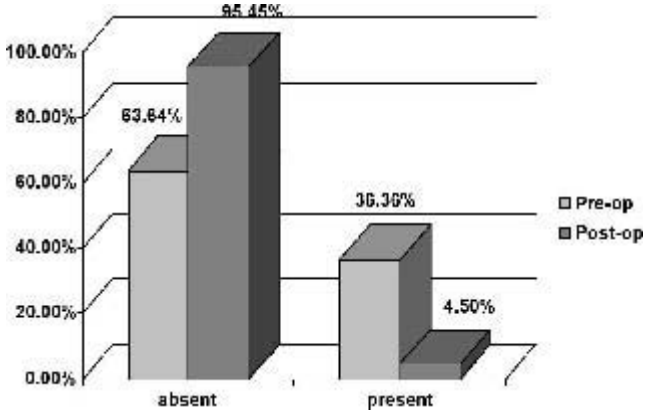

Figure 2. Facial pain: MacNemar's test; p = 0.001.

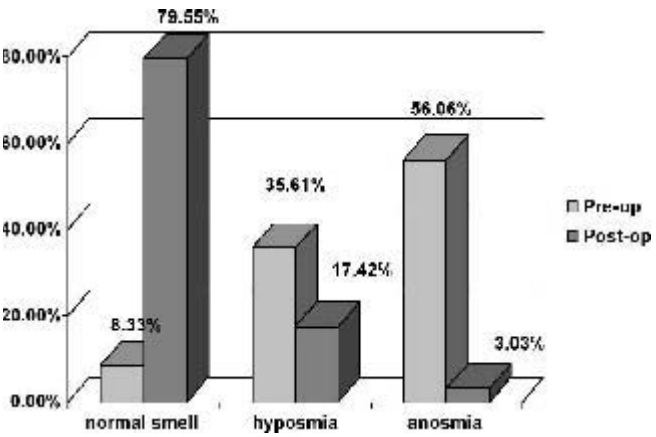

Figure 3. Smell: Test of symmetry; p=0.001.

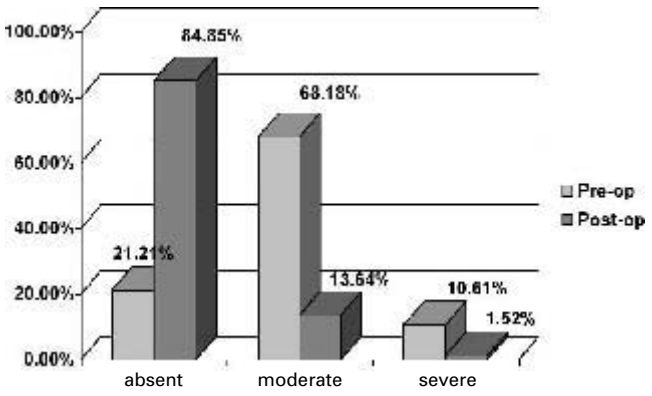

Figure 4. Rhinorrhoea: Test of symmetry; p = 0.001.

(Figure 2). The frequency of pre-operative anosmia was 56.06% versus 3.03% post-operatively (p=0.001) (Figure 3). The frequency of rhinorrhoea was 78% pre-operatively versus 15% post-operatively (p=0.001) (Figure 4).

Results on associated asthma

Among the asthmatic population, 44.27% of the pre-operative group had occasional wheezing or required regular prophylactic treatment for asthma compared to only 20.61% of the post-operative group (p=0.001) (Figure 5). The group of patients with level 1 disease increased by 24% in the post-operative group, with a consequent reduction in more intense treatment levels.

Endoscopic appearance and polyp recurrence

The findings on endoscopic examination following decongestion are summarised in Figure 6. Polyp recurrence was noted in 23 cases (17.4%). Minor recurrence (oedema of the mucosa or minor polyposis) was found in 15.6%. 26% of this group of patients with recurrence did not complain of any nasal symptoms. Three cases of major recurrence were noted, all in patients who had ceased nasal steroid therapy against medical advice.

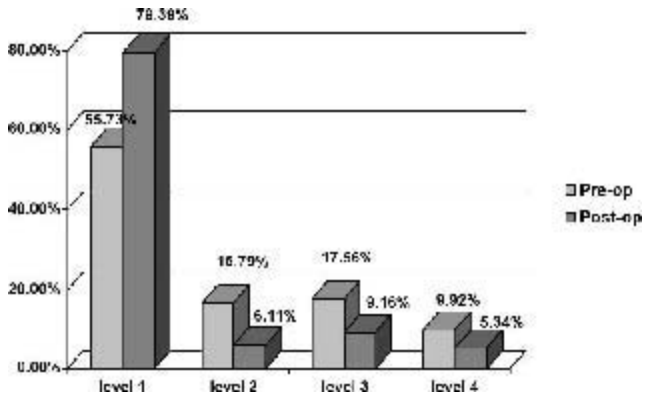

Figure 5. Level of asthma treatment: Test of symmetry; p = 0.001.

Study of correlation

The initial stage of SNP was neither correlated with recurrence rate nor with functional outcomes (Fisher's exact test; p>0.05).

The association with asthma and its level of treatment was not correlated with recurrence rate (Chi^2; p>0.6).

An association with asthma and its level of treatment was, however, correlated with post-operative nasal obstruction and rhinorrhoea (Fisher's exact test; p<0.02). There was no correlation between the anosmia rate and the facial pain rate (Fisher's exact test: p>0.1).

There was no correlation between recurrence rate and bronchial disease i.e. simple asthma or ASA triad (p>0.6).

In 30%, infection or inflammation of the sinonasal cavities occurred requiring a short course of antibiotic and oral corticosteroid. These events were significantly more frequent in cases with asthma or ASA triad (Figure 7).

One year post the operation, functional results remained constant and there was no variation between groups in length of follow-up (p>0.6).

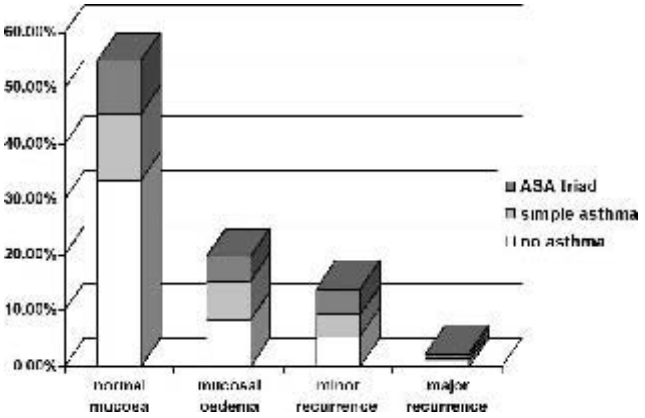

Figure 6. Recurrence of nasal polyps and the relation to the underlying respiratory disease: Chi^2 Test; p>0.6.

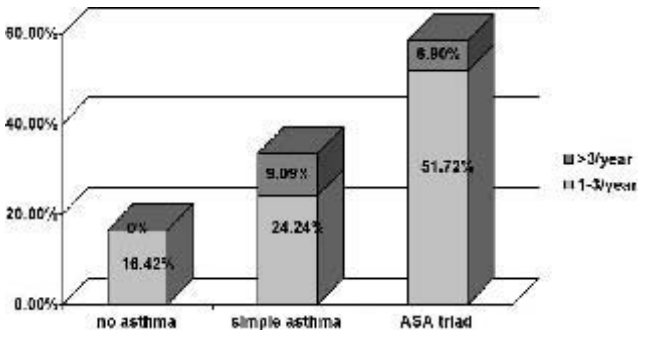

Figure 7. Relation between the respiratory disease and the number of nasal and sinus infections per year in each group during the post-operative period.

DISCUSSION

Overall results on nasal and asthmatic symptoms show that SNP resistant to medical therapy is greatly improved by surgical treatment followed by topical nasal steroid.

Jankowski et al. (1991) reported a study of 50 patients with a follow-up of 18 months and noted 72% improvement in functional nasal symptoms with normal olfaction in 50%. Klossek et al. (1997) reported a prospective study of 50 asthmatic patients with a follow-up of 3 years. Normal olfaction was obtained in 78%, normal nasal respiration in 94% and rhinorrhoea was abolished in 30%. In the present study, 62% of the patients recovered normal nasal function, despite minor polyp recurrence in 15.6%. The criterion for judging success, however, is the functional result, not the endoscopic appearance. The pre-operative clinical stage of polyposis was not correlated with nasal symptoms and was not a prognostic factor in determining post-operative functional outcomes. Conversely, bronchial disease is associated with poorer results for olfaction and facial pain, according to the literature (Simon et al., 1995; Amar et al., 2000). In the present study, bronchial disease was not associated with the rate of polyp recurrence. As reported by Hosemann (2000) however, the co-existence of asthma is associated with more frequent episodes of infection in the post-operative ethmoid cavities, suggesting that the whole respiratory tract mucosa is involved in the disease process (Dinis and Gomes, 1997; Rowe-Jones, 1997).

The effect of ethmoidectomy on the co-existent asthma is less clear. Most authors report a reduction in the severity of asthma and an improvement in respiratory function following surgery (Jankowski et al., 1991; Lawson, 1991; Ikeda et al., 1999), some authors suggesting a direct anti-inflammatory action of nasal steroids on the bronchi. Dunlop et al. (1999) reported a reduction in the requirement for oral steroids and the number of admissions to hospital in a year as well as improvements in peak flow. Conversely, others authors did not find any evidence of improvement in respiratory function after sinonasal surgery, despite an improvement of quality of life (Scadding, 1999; Uri et al., 2002).

Lamblin et al. (2000) divided a group of 46 patients with SNP into two groups: steroid responders and steroid non-responders. The trial showed that asthma severity did not vary significantly during a 4-year follow-up period in the two groups, but that steroid non-responders who underwent ethmoidectomy developed reduced pulmonary function that was not reversible with beta2-agonists. This change was not related to the presence of nonspecific bronchial hyper-reactivity nor to asthma, thus the effect of ethmoidectomy on the progression of bronchial disease is unclear.

Differentiating between steroid responders and non-responders is of importance in determining the longer-term prognosis in nasal polyposis and bronchial disease. Like some other authors (Klossek et al., 1997) our usual medical treatment involves a bolus of oral corticosteroid (prednisolone 1 mg/kg/day) for 7 days, sometimes repeated up to 4 times a year, and nasal steroids (flunisolide 1500 mg/nostril/day). Therefore, the cases reported in our series were selected by a high resistance to steroid therapy. This selection bias explains discrepancies with some other series in which ethmoidectomy was performed after only six weeks treatment with lower dose topical nasal steroids (600 μg/nostril/day) (Lamblin et al., 2000).

The surgical procedure of endoscopic ethmoidectomy is now well standardised. Complications such as cerebrospinal fluid leakage, retrobulbar haematoma or massive epistaxis are very rare, the incidence ranging from 0.5% (May et al., 1994) to 1.1% (Lawson, 1991). In this study two cases of CSF leak were treated endoscopically when noticed during the ethmoidectomy, an accepted method of dealing with small per-operative leaks (Daly et al., 1992; Wax et al., 1997). Other complications such as mucocoele formation, orbital cellulitis, ocular muscle paralysis or loss of vision seem more frequent in cases of ASA triad (8.6%) (MacFadden et al., 1996). In this study two cases of post-operative frontoethmoidal mucocoele (1.5%) were noted, associated with ASA triad in one case.

The incidence of major bronchospasm during anaesthesia was 1.8%. As stressed by Lamblin et al. (1997), the strong association between nasal and bronchial disease requires respiratory assessment and appropriate treatment for all cases of SNP.

Study limitations

Some limitations of functional evaluation must be stressed. First, most studies have included all types of chronic rhinosinusitis rather than SNP alone (Eloy et al., 1997). Second, the aim of treatment of SNP is restoration of nasal function. Therefore, we have recorded data on graded scales. Other groups have used global nasal scores or standardised questionnaires (Radenne et al., 1999; Birch et al., 2001). One way or another, however, data on functional symptoms are always subjective.

A prospective study of the long-term functional outcome after ethmoidectomy in cases of SNP would be of interest.

CONCLUSION

SNP is a chronic disease involving all the respiratory tract mucosa. It requires long-term treatment and follow-up. ENT surgeons and respiratory physicians must be able to inform patients about the benefits and risks of ethmoidectomy in cases of SNP. Symptoms of SNP and asthma are greatly improved after ethmoidectomy with only minor complications, even though a normalisation of the appearance of the mucosa is not always obtained. Topical nasal corticosteroid treatment must be continued for a considerable period post-operatively. Iatrogenic complications are usually minor and functional improvement appears stable after a mean follow-up of 5 years.

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