

The effect of sinonasal surgery on asthma

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Introduction

In the literature a number of authors have addressed the issue of whether asthma represents an adverse prognostic factor when performing surgery for sinus disease (1-5). The effect of sinonasal surgery on the upper respiratory tract has proved a more difficult issue to resolve, although the evidence would seem to be on the positive side of the equation. In considering the proposition, most authors have confined themselves to chronic rhinosinusitis and nasal polyposis, the latter representing an inflammatory manifestation of a number of pathological processes which affect both the upper and lower respiratory tract. The surgical procedures which have been considered have ranged from intranasal polypectomy to intranasal ethmoidectomy, Caldwell-Luc operations and endoscopic sinus surgery, although none have satisfied the six "gold standard" criteria of randomized, placebo-controlled, double-blinded trials more familiar to the physicians.

Does surgery make asthma worse?

In 1920 Van der Veet (6) published an article in the *New England Journal of Medicine* in which he stated that asthma was adversely affected by sinonasal surgery, although no specific clinical details were offered in support of this. In 1920, Francis (7) published a series of nine individuals of a series of 13 who had worsened their lower respiratory tract symptoms after sinonasal surgery.

Other authors have maintained that the first attack of asthma could be precipitated by surgery in the upper respiratory tract (8-12). Sainter and Lederer (8) described 17 patients who following intranasal polypectomy developed increased bronchial reactivity and Samter and Beers

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(10) looked at a series of 182 patients, 18 of whom developed their first asthma attack within 9 months of the nasal surgery. Clearly, it could be argued that this was simply part of the natural history of the disease and that the asthma would have developed irrespective of the surgery.

Is asthma unaffected by sinonasal surgery?

During the 1970s a number of authors considered this issue and felt that the evidence for a consistent impact on the lower respiratory tract was equivocal (13–15). Schenck (16) reported 18 patients with aspirin-sensitive asthma which, following intranasal polypectomy improved in five cases, worsened in six and remained unchanged in seven. In a series of 182 individuals also with aspirin-sensitive asthma undergoing nasal polypectomy, Brown et al. (15) reported 30% whose asthma improved, 14% who worsened and 56% who remained unchanged.

Asthma improved by sinonasal surgery?

In 1871 Voltolini (quoted by Slavin (17)) reported a patient whose asthma resolved after polypectomy. Thereafter, until the present day, argument has continued as to possible mechanisms with a sinobronchial reflex frequently cited. In 1933 Weille (18) looked at 40 asthmatics undergoing polypectomy 22% of whom improved and 18% of whom worsened. In a subsequent study with Richards (19), Weille considered a larger series of 197 patients, 52% of whom improved, 30% of whom were unchanged and 12% of whom worsened after surgery. One of the largest studies considering intranasal polypectomy was English's work (20) in 1986 (Table 1). He looked at 205 patients and considered both subjective and objective improvement over a follow-up period that extended between 6 months and 13 years. Eighty-five per cent of the patients demonstrated a subjective improvement and objectively there appeared to be a decreased need for anti-asthma medication. In common with other studies this did not include a control population, nor any tests of bronchial reactivity. However, with regard to the medication, 40% who had required periodic bursts of oral steroids preoperatively were able to do without steroids during the 6 months after the surgery. By contrast, the more severe cases who had required daily oral steroids preoperatively continued to require them after the surgery.

During the 1980s and early 1990s several studies looked at asthma following intranasal ethmoidectomy (Table 1).

Although the cohort of patients was not numerically large, most considered some form of objective measure in the form of reduction in medication and, in one case (22), respiratory function tests. Patients were followed for reasonable periods of follow-up although both Friedman et al.'s (21) study and Slavin (17) considered chronic rhinosinusitis as well as or rather than nasal polyposis. Mings et al. (22) interestingly showed not only sustained but increased improvement when the 2-year and 5-year follow-up figures were compared (65%, 85%).

In 1984 Juntunen et al. (24) looked at a cohort of 15 children aged between 3 and 12 years with chronic rhinosinusitis who had failed adenoidectomy and inferior meatal antrostomy. A significant improvement both in subjective and respiratory function test was demonstrated. McFadden et al. (25) looked at a cohort of 25 patients undergoing intranasal ethmoidectomy, of whom nine had also had a Caldwell-Luc procedure, who again showed a 68% subjective improvement, an increase in respiratory function test and a decrease in medication over a reasonable period of follow-up.

The 1990s showed a burgeoning of interest in the lower respiratory tract following endoscopic sinus surgery again for both nasal polyposis and chronic rhinosinusitis with most authors claiming subjective improvement in the asthma greater than that obtained by previous sinonasal surgery (78–91%) (Table 1). Most of these studies included some objective measures such as frequency of hospitalization, outpatient visits, use of medication and occasionally respiratory function tests. The study by Jankowski et al. (28) is notable for the additional inclusion of a carbomyl choline challenge to consider bronchial reactivity. This was reported as becoming negative in 30% of those who preoperatively had been positive.

While most studies have considered the adult population, Manning et al. (30) looked at 14 children with chronic rhinosinusitis with a 12-month period of follow-up and again reported reduction in hospitalization and use of medication.

A retrospective study of 50 patients attending a Rhinology Research Clinic assessed them by questionnaire preoperatively and at 1 year (32). This group was composed of both nasal polyposis and chronic rhinosinusitis and included 10 individuals with aspirin-sensitive asthma. The patients were asked to give an overall subjective assessment of their asthma and to look specifically at use of inhaled steroids and bronchodilators, hospitalization for asthma and frequency of severe exacerbations. Twenty-three of the individuals had kept regular peak flow measurements during this period. Although the overall

Table 1. Asthma improved by sinonasal surgery

			Improvement in asthma		
	No. of patients	Sinonasal pathology	Subjective	Objective	Follow-up
Polypectomy					
English 1986 (20)	205	NP	85%	↓ medication	0.5–13 years
Intranasal ethmoidectomy					
Friedman et al. 1982 (21)	30	NP (80%) CRS (20%)		↓ medication (93%)	0.5–4 years
Slavin 1982 (17)	29	CRS	65% significant 60%	↓ medication (60%)	2 years 5 year
Mings et al. 1988 (22)	31	NP	62%	↓ medication (88%) ↑ RFTs	2–5 years
Lawson 1991 (23)	36 (18-ASA)	NP	33% (66% U/C, 1% W)		2–14 years (mean 3.5 years)
Caldwell-Luc					
Juntunen et al. 1984 (24)	15 (children 3–12 years)	CRS	66%	↑ RFTs	3–12 years
McFadden et al. 1990 (25)	16 (INE) 9 (INE + C/L)	NP	68%	↑ RFTs ↓ medication	1–11 year (mean 3–4 years)
Endoscopic surgery					
Stammberger 1991 (26)	54	NP	83%	↑ RFTs	
Wigand and Hosemann 1991 (27)	51 (13 ASA)	NP	79% (70% ASA)		
Jankowski et al. 1992 (28)	30 (12 ASA)	NP	91%	↓ no. of attacks ↓ medication ↑ RFTs	1–3.3 years (mean 1.5 years)
Nishioka et al. 1994 (29)	20	CRS	80%	↓ hospitalization (75%) ↓ hospital visits (81%) ↓ medication (54%)	1 year
Manning et al. 1994 (30)	14	CRS	78%	↓ hospitalization (86%) ↓ medication (78%)	1 year
Senior and Kennedy 1996 (31)	42	NP	86%	↓ oral steroids (79%)	1 year
Dunlop et al. 1999 (32)	50	CRS (16) NP (34)	40%	↓ hospitalization (38%) ↓ medication (40%)	1 year

NP: nasal polyposis; RFT: respiratory function tests; CRS: chronic rhinosinusitis; U/C: unchanged; W: worse; ASA: aspirin-sensitive asthma.

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subjective improvement was somewhat less than that found in other studies (40%), 54% remained unchanged and only 6% regarded themselves as worse. In those using inhaled steroids 20% had been able to reduce the amount while 64% remained unchanged. In those using bronchodilators 28% had reduced the amount required, 46% had remained the same and 10% had increased bronchodilator usage. Eight patients had required hospitalization for asthma in the 12 months prior to endoscopic sinus surgery whereas only three had done so postoperatively and oral steroid therapy for acute exacerbations had fallen from 20 preoperatively to eight in the postoperative

period. In those patients taking regular peak flow measurements, seven of 23 reported higher levels and fewer dips and swings in the postoperative period.

The subgroups for chronic rhinosinusitis and polyposis were compared. While the effect of asthma on daily life appeared to be more severe in those with nasal polyposis, there was no difference between the two subgroups with respect to changes in asthma control, medication requirements, peak flow, hospitalization or use of oral steroids. Furthermore, the polypectomy group did not show significant worsening of asthma postoperatively compared to the chronic rhinosinusitis group.

Discussion

It would seem, on balance, based on the more recent studies and particularly in those including some attempted objective assessment that the effect of sinonasal surgery on the lower respiratory tract is a positive one. Variations in the results reported, however, may be due to the severity of the asthma including factors such as the need for oral steroids and the duration of this disease, the presence of atopy and aspirin sensitivity, the extent of the sinonasal disease and factors relating to the surgical approach and the surgeons themselves. Notwithstanding this, the vast majority of studies report at least two-thirds of the patients enjoying a subjective improvement during periods of reasonable follow-up and overall reductions in use of medication, hospitalization and respiratory function tests.

The reasons for such an improvement are many and will have been discussed at length in other articles in this Supplement but in summary may relate to the sinobronchial reflex, the reduction in postnasal discharge, reduction in

secondary bacterial infection, reduction in the burden of inflammatory mediators and improvement in mucociliary clearance. These effects may be at a local or systemic level although a cynical physician might simply argue that the surgery works by allowing medical therapy to be more effective. The real reason may be, as so much in medicine, a combination of these many factors.

Conclusions

Surgical interest in the effect of the upper on the lower respiratory tract has continued for over a century. The weight of evidence suggests that this effect is beneficial, be it surgery for chronic rhinosinusitis or nasal polyposis and that in general we can reassure our patients that, on a balance of probabilities, sinonasal surgery is unlikely to make their asthma worse.

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