Septal surgery and improvement of respiratory function

L. Podoshin, G. Alroy and D. Sussmann, Haifa, Israël

SUMMARY

Sixty-five patients with septal deviation were assessed spirometrically before and 3 months after Cottle's operation. It was found that 31 of them improved 10% or more with regard to F.E.V.$_{1\cdot0}$ (forced respiratory volume). This group proved to be younger, with an increased incidence of nasal trauma and decreased incidence of allergic rhinitis. It is concluded that early operation on the young patient with possible trauma is indicated. Further work on a group of patients with respiratory insufficiency is planned.

THE primary indication for surgical repair of nasal septal deviation is the subjective complaints of the patient. Ogura et al. (1966) demonstrated that these patients have objective disturbance of respiratory function. The question arises as to whether a successful operation can be shown to improve respiratory function. If so, are there any clinical or laboratory parameters which indicate reversibility of respiratory malfunction and in particular, is not an early operation (prior to emergence of subjective complaints) indicated.
The purpose of this study is to answer these questions.

MATERIAL AND METHODS

A study was made of 65 patients who had undergone surgical repair of nasal septal deviation by Cottle's method (1960). Indications for surgery were subjective complaints of dyspnoea and anatomical or pulmonary diseases were not included in this study. They were eliminated on the basis of past history, physical examination, chest X-ray and E.C.G.
Prior to surgery all patients underwent E.N.T. examination, general physical examination, routine blood tests (including blood count, sedimentation rate, electrolytes, sugar, urea).
Vital capacity values and F.E.V.$_{1\cdot0}$ (forced expiratory volume in the first second) were measured in all patients with a Vitalograph (Vitalograph Ltd., Macols Marten House, Buckingham, England). Each patient was given a detailed explanation before undergoing consecutive tests and an informed consent was obtained. Volumes were corrected to B.T.P.S. Three months after surgery (designated

Table 1

No.	Initial	F.V.C.		F.E.V.$_{1.0}$	
		Pre	Post	Pre	Post
1	M.Z.	4700	5400	3600	4000
2	S.A.	6150	6150	4950	4950
3	H.G.	4100	4200	3100	2900
4	H.N.	4000	4400	3050	3550
5	M.A.	5000	4800	3050	4050
6	N.M.	2650	2950	2300	2450
7	M.M.	5300	6000	3400	3650
8	B.M.	3350	3350	3000	3000
9	A.J.	4050	4350	3450	3550
10	G.T.	2050	1800	1800	1550
11	E.P.	4800	4700	3100	3850
12	R.M.	3700	3700	3150	3150
13	B.K.	4700	4350	4100	3650
14	B.L.	2450	2600	1500	2100
15	G.R.	5200	5800	4200	4700
16	E.H.	4700	5400	3750	4250
17	Z.M.	5000	4300	4300	4800
18	S.D.	4350	4400	3200	3600
19	H.H.	3950	4100	2800	3350
20	A.B.	4500	5200	4000	4500
21	S.W.	3850	3800	3500	3300
22	G.A.	2000	4500	3450	3700
23	S.I.	3300	3300	1900	1800
24	M.N.	4250	5000	3500	4400
25	S.J.	3750	3900	2700	2650
26	G.Z.	2700	2700	2300	2300
27	D.Z.	2600	3200	1700	2000
28	B.J.	4650	4800	3650	4050
29	H.S.	3700	3500	3400	3550
30	B.M.	4600	5000	3850	4050
31	H.M.	5350	5650	3000	4100
32	S.J.	3800	4650	2700	3800
33	E.M.	2750	3000	2500	2700
34	J.A.	3400	3400	2400	2400
35	C.M.	4300	4400	3500	3400
36	J.A.	4600	4700	4050	4100
37	H.T.	3500	3300	1750	1650
38	S.T.	4250	4100	3800	3600
39	M.A.	3550	3950	2500	2700
40	D.Z.	3900	4000	3400	3800
41	S.A.	5350	4350	4650	5400
42	O.A.	4200	4050	4100	4650
43	R.T.	3300	4000	1500	2000
44	H.M.	3400	3700	1500	1800
45	D.B.	4200	4300	3650	4100
46	B.S.	4250	4650	2100	3250
47	B.R.	4600	4250	3700	3300
48	R.M.	2800	2550	2200	1700
49	G.G.	3400	4100	3000	3800

50	C.D.	4350	4550	2750	3850
51	A.R.	4300	4650	3950	4450
52	B.M.	3200	3600	2500	3100
53	E.T.	4300	4700	3050	2800
54	W.N.	3600	3700	3550	3300
55	F.A.	4800	4800	4100	3400
56	A.E.	4050	4500	3200	3750
57	R.S.	2600	2700	1800	2200
58	H.A.	4350	4000	3650	3700
59	A.D.	4200	4000	3450	3500
60	R.T.	4250	4600	4000	4500
61	K.A.	4000	4100	3200	3300
62	A.R.	3650	4150	2400	2900
63	H.M.	4400	4200	3550	3400
64	N.H.	3000	2200	2550	1800
65	E.A.	2950	3030	2400	2200
Total △		3954	4110	3105	3279

convalescent period) the patients underwent the same respiratory function tests under similar conditions. (Table 1).

The group of 65 patients was made up of 55 males and 10 females. The average age was 31 years, then youngest being 16 years old and the oldest 65 years old. None of the patients had previously undergone surgery for nasal septal deviation. The criteria examined were previous nasal trauma, allergic or vasomotor rhinitis, asthma and continual sore throat (Table 2).

There was an improvement in the anatomical condition of the septum in all the patients, but in 15 patients there was no subjective improvement of nasal breathing

RESULTS

The criterion or improved spirometric function was an increase of at least 10% in the F.E.V.$_{1.0}$ values after surgery. Comparison of the "improved" group (31 patients) and the "no improvement" group (34 patients) was made as to the follow parameters: (Figure 1).

Age: The average age of the "no improvement" group was 33.9 years (S.D. 9.3). In the improvement group the average age was 27.4 years (S.D. 7.0). This difference in age is statistically significant ($p < 0.01$). (Table 3).

Sex: In the "no improvement" groups there were 28 men and 6 women, as opposed to 27 men and 4 women in the group which showed improvement. This difference in sex ratio is of no statistical significance (Table 4).

Trauma of the nose: Six of the patients in the "no improvement" group had nasal trauma in the past (17%), whereas in the improved group this was true of 18 patients (58%). Tris difference is highly significant $p < 0.001$). (Table 4).

Allergic and vasomotor rhinitis: In the "no improvement" group 13 patients

Table 2

No.	Initial	Age	Sex	Trauma to the	Allergic rhinitis	Asthma	Sore throat	Subjective improvement
1	M.Z.	23	M		Yes		Yes	No
2	S.A.	26	M				Yes	Yes
3	H.G.	38	M					Yes
4	H.N.	30	F					Yes
5	M.A.	30	M	Yes				Yes
6	N.M.	26	F		Yes		Yes	No
7	M.M.	35	M			Yes		Yes
8	B.M.	17	F					No
9	A.J.	36	M		Yes			Yes
10	G.T.	21	F					No
11	E.P.	19	M					Yes
12	R.M.	31	M		Yes		Yes	Yes
13	B.K.	49	M	Yes	Yes		Yes	No
14	B.L.	38	F					Yes
15	G.R.	26	M	Yes				Yes
16	E.H.	32	M	Yes				Yes
17	Z.M.	40	M	Yes				Yes
18	S.D.	37	M	Yes			Yes	Yes
19	H.H.	30	M	Yes			Yes	Yes
20	A.B.	29	M	Yes				Yes
21	S.W.	16	M				Yes	Yes
22	G.A.	57	M		Yes		Yes	Yes
23	S.I.	24	F	Yes			Yes	Yes
24	M.N.	41	M	Yes				Yes
25	S.J.	48	M		Yes			No
26	G.Z.	49	F		Yes			Yes
27	D.Z.	21	F		Yes			Yes
28	B.J.	23	M	Yes			Yes	Yes
29	H.S.	24	M				Yes	Yes
30	B.M.	27	M					Yes
31	H.M.	35	M	Yes				Yes
32	S.J.	17	M	Yes				Yes
33	E.M.	25	M		Yes			Yes
34	J.A.	38	M					Yes
35	C.M.	25	M		Yes		Yes	Yes
36	J.A.	28	M				Yes	Yes
37	H.T.	43	M			Yes		Yes
38	S.T.	26	M					Yes
39	M.A.	38	M		Yes			Yes
40	D.Z.	37	M	Yes				Yes
41	S.A.	23	M	Yes				Yes
42	O.A.	18	M					Yes
43	R.T.	31	M	Yes			Yes	Yes
44	H.M.	16	M			Yes	Yes	No
45	D.B.	18	M	Yes				Yes
46	B.S.	22	M	Yes				Yes
47	B.R.	28	M	Yes	Yes		Yes	No
48	R.M.	53	M		Yes		Yes	No

Table 2

No.	Initial	Age	Sex	Trauma to the	Allergic rhinitis	Asthma	Sore throat	Subjective improvement
49	G.G.	24	M	Yes				Yes
50	C.D.	42	M					Yes
51	A.R.	22	M	Yes				Yes
52	B.M.	46	M		Yes			No
53	E.T.	40	M					Yes
54	W.N.	42	M					Yes
55	F.A.	35	M	Yes				No
56	A.E.	19	M				Yes	Yes
57	R.S.	26	F					Yes
58	H.A.	40	M		Yes		Yes	Yes
59	A.D.	35	M					Yes
60	R.T.	16	M		Yes			Yes
61	K.A.	40	M	Yes			Yes	Yes
62	A.R.	18	M					Yes
63	H.M.	18	M	Yes				No
64	N.H.	22	F			Yes		No
65	E.A.	52	M				Yes	Yes

(42%) suffered from allergic or vasomotor rhinitis (according to past history and clinical examination), as opposed to 4 patients (13%) in the group which showed improvement. Although this difference is not statistically significant ($0.05 < p < 0.1$) it still might have a clinical importance.

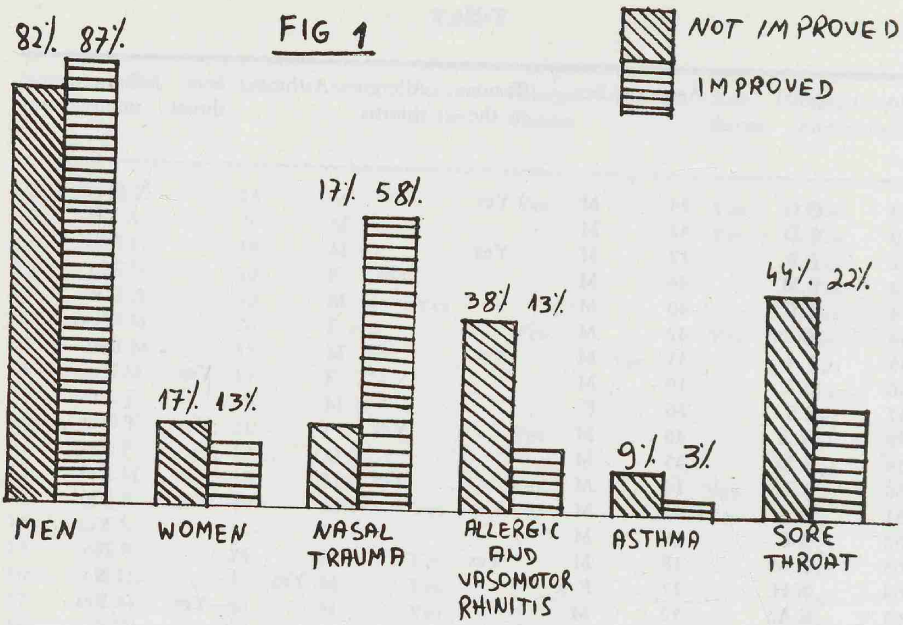
Asthma: Three of the patient in the "no improvement" group suffered from asthma, as did one patient in the group which showed improvement (Table 4). This difference is of no statistical significance, perhaps due to small numbers of asthmatic patients in this series.

Sore throat: In the "no improvement" group 15 patients (43%) suffered from this subjective complaint, there being 7 such patients (22%) in the improved group (Table 4).

DISCUSSION

Nasal septal deviation is a common manifestation, frequently discovered on routine examination. The etiology is not uniform and can result from trauma of the nose during birth, with worsening of the deviation at a later stage. Trauma of the nose can also occur at a more advanced age. Another conception, unassociated with trauma, is that the septum continues to grow after fixation of the upper and lower margins, causing the septum to bend to one side or the other (Brown, 1971).

Surgery is usually indicated when dyspnoea manifests even during rest. It is particularly surprising that some patients have difficulty in breathing, even during



mouth breathing, despite having no cardiac or pulmonary complaint. This symptom was ascribed by Ogura (1966) to the nasal obstruction affecting the preathing mechanism. He found that patients with nasal obstruction showed a decrease in pulmonary compliance and increase in pulmonary resistance (Ogura, 1966). In another study on 95 patients with nasal obstruction due to septal deviation, Ogura found that 85% showed increased respiratory resistance even during mouth breathing (Ogura et al., 1968).

The question arises as to the importance of the nose to the mechanism of breathing. Proetz (1951) in his basic work on air flow through the upper respiratory tracts, showed the great importance of the correct flow of air through the nose. In fact, as far back as 1870 Kratschmer described the influence of irritation of the nasal mucosa on breathing. He proved that irritation by noxious gases or smoke on the nasal mucosa of rabbits caused apnoea.

Table 3

	Average age	Standard deviation
No improvemet group	27.4	7.0
Improved group	33.9	9.3

Table 4

	Men	Women	Trauma the nose in the past	Allergic and vaso-motor rhinitis	Asthma	Sore throat
34 with no improvement	28	6	6 / 17%	13 / 43%	3	15 / 43%
31 with improvement	27	4	18 / 58%	4 /13 %	1	7 / 22%

Sercer (1952) maintained that air flow through the nose acts as a physiological stimulus in regulating breathing. In addition, nasal breathing as it is associated with greater pressure differences between exhalation and inhalation, affects pulmonary circulation more than mouth breathing. The chest movements during mouth breathing are decreased due to lack of this reflex, causing changes in pulmonary circulation, reduction in vital capacity and decrease in PO_2.

Lüscher (1930) is also of the opinion that mouth breathing causes acid base imbalance and decrease in the alkali reserve in the blood as a result of disturbance of pulmonary ventilation.

It is therefore clear that the importance of the nose lies beyond that of a mere air passage to the lungs. According to Ferris (1964) the resistance of the regular air flow through the nose is 47% on exhalation and 54% on inhalation, of the total respiratory resistance.

It is not clear what affect nosal obstruction has on the mechanism of breathing. Is it a direct nervous reflex, or is the cause humoral? Ohnishi (1972) obstructed the noses of dogs and found a resulting disturbance in respiratory function. This he thought to be the result of the increase in bronchial smooth muscle tone following nasopulmonary reflex.

Ogura (1964) in another study, raises the conjecture that the cause is either the classical nasopumonary reflex or perhaps changes in surfactant substance. Are the changes in respiratory function secondary to nasal obstruction reversible? Ogura gives a positive answer to this question in a work published in 1968.

The objective of our study was to evalute whether simple, non invasive, pulmonary function tests could serve as criteria for pulmonary malfunction on the one hand and as some indication for operation on the other. Our criterion for improved respiratory function was an increase of at least 10% of the $F.E.V._{1.0}$ value measured post operatively. This increase occurred in 31 of the 65 patients.

These findings confirm the findings of Ogura on reversibility and improvement in respiratory function once the nasal obstruction is removed. It is also possible to conclude from our study that young patients with nasal trauma, particularly those with no history of allergy, have a good prognosis with regard to the chances of improved respiratory function post operatively. Moreover, it might be argued that patients with some form of respiratory insufficiency and septal deviation

might benefit even from small possible improvement in respiratory function following the operation.

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L. Podoshin, G. Alroy and D. Sussmann,
E.N.T. Department, Rotschild University Hospital
Medical Department "B",
Rambam University Hospital,
and the Aba Khoushy School of Medicine,
Haifa, Israel.