

Therapeutic effects of sub-mucous diathermy of inferior turbinates, with special reference to ethnic groups in Malaya

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Introduction

THE COMPLAINT OF nasal obstruction, secondary to chronic rhinitis, is one of the commonest and sometimes the most perplexing problems faced by the rhinologists, specially in the tropics. This is not surprising when one considers the extent to which the nasal mucosa is exposed to the various types of insults in a person's everyday life. This is more so with modern industrialisation when there is extensive air pollution. Recurrent infection both acute and chronic, allergy, inhalation of dust, smoke and fumes, endocrine disturbances and indiscriminate use of nasal medication all tend to engorge and often enlarge the submucosa and the mucous membrane.

Anatomy and Physiology

In improving the air-way through the nose, several factors must be considered. They include:

- (a) The path the air current takes through the nasal cavity.
- (b) The anatomical structure of the nasal cavity.
- (c) The rich blood supply.
- (d) The various nervous control mechanisms.

Normally, the inspired air is directed to the roof, due to constriction 1 cm. from the anterior nares, "Constriction of Bell". It reaches to just below the superior turbinate. The air current is also deflected slightly inwards "20°" by the same constriction so that it ascends close to the septum. Deflected from the vault slightly back and down in a parabolic curve, the air current fans out as it approaches the choana. The expired air, which is "air-conditioned", follows a somewhat same course but due to the disproportion between the choana and anterior nares, a large eddy current is set up. This causes the expired air to enter the

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meatii and ostea. According to Proetz (1963) "The pathway of air current is determined by three structural elements:

- (a) Direction of the anterior nares.
- (b) The essential configuration of the nasal chambers; and
- (c) The relative sizes of the anterior and posterior nares"

In the average Caucasian nose, with a slit-like horizontal opening at the anterior nares, the inspired air arches high up into the nose in a parabolic curve before descending into the large opening in the nasopharynx. In Malaya, the Indians and the Malays have this nasal configuration to a greater or lesser degree while the Chinese have nostrils which are fairly dilated, circular, with a more flattened nasal-bridge. These are features not very unlike those of the Negroes in whom inspired air takes a more direct transverse course over the inferior turbinates (Tremble 1960).

The need for inspired air to be warmed and humidified calls for a very specialised vascular supply and, together with it, an intricate and sensitive nerve supply. The relative humidity of alveolar air is 90%, and 70% of this humidity is accounted for by the nasal cavity (Proetz 1963). Similarly, the temperature has to be raised to approximately 35°-37°C. That is, in one second "average time the inspired air takes to pass through the nasal cavity", the nose has to impart sufficient water vapour and heat to the inspired air to bring it to this physiological requirement (Ritter F. 1970). The blood vessels of the nose play an important role in this regulation. The nasal-angio architecture has been thoroughly studied by many since the classical study of Zuckerkandl nearly hundred years ago (Cuana and Hinder 1969; Ritter 1970; Cuana 1970; Dawes and Pritchard 1953).

Briefly, the sphenopalatine arteries supply the nasal septum and lateral wall of the nose below the middle turbinates with contributions from the ethmoidal, greater palatine and nasal branches of the facial arteries. The arrangements being arteriols-capillaries-sinusoids-venules. The sinusoids are surrounded by smooth muscle fibres giving it the power of vaso-constriction. Microscopically, there is a functional arrangement of the vessels of the nasal cavity, especially the turbinates. The minute arteriols course in parallel rows in a postero-anterior direction and lie in three distinct levels in relation to the mucosal surface (Ritter F. 1970):—

- (a) Superficial level lying under the mucosa supplying respiratory epithelium.
- (b) Second deeper level in association with mucous and serous glands among the loose connective tissue.
- (c) Third deeper level adjacent to the osseous supporting frame work.

The vessels are supplied in main by:—

- (a) Parasympathetic from the superior salivatory nucleus via the greater superficial petrosal nerve.
- (b) Sympathetic from the intermedio-lateral of grey column of the spinal cord via the superior cervical ganglion.

These two components eventually form the nerve of the Vidian canal.

Apart from these, there is anatomical evidence to indicate that the sensory fibres that travel along blood vessels may be involved in local axon reflex. Also there is strong evidence that the nasal blood vessels are regulated by agents carried by the blood. These agents reach the muscular layer of the blood vessels via the endothelial lining and its porous basement membrane (Cuana N. 1970).

Thus, the control mechanism of the nasal blood flow is a complex one and hence the great difficulty in managing satisfactorily those patients with an unstable nasal vasculature in chronic vasomotor rhinitis.

Various methods have been tried to shrink the mucous membrane of the inferior turbinate in an attempt to improve the air way. One of them used by us is to destroy some of the large cavernous spaces by using sub-mucous high frequency desiccation.

Material and Method

The selection of patients for this review consisted of all those subjected to this form of treatment between October '67-September '69. Their common symptom-complex was nasal obstruction of an alternating type, with episodes of sneezing and watery rhinorrhea. Definite allergic and infective cases were excluded. In all, 200 such cases were studied. They were followed up regularly at about 2-3 months intervals. At each of the visits, their progress was noted and recorded. At these visits, they were asked specifically whether the procedure gave any relief, and if so, was it complete or partial. In some patients, the procedure was repeated either because the patient requested for it or they felt partial relief of symptoms and that a repeat would have benefited them. The cases were followed up for an average of 12-18 months.

Birtcher Hyfrecator was used for the treatment of these patients. This is a simple device where, by use of a spark gap condenser circuit, a very high frequency damped current, of relative high voltage but of a low amperage is produced. This is suitable for electro-desiccation of tissue in surgical practice. Electro-desiccation by definition is a dehydration process rupturing the cell membrane and transforming it into a dry mass. For this purpose, a fine needle electrode insulated except for about an inch at the tip, is inserted submucosally into the nasal aspect of both inferior turbinates. A current of sufficient intensity judged by the amount of sparks emitted by the electrode tip when in contact with metal, which is usually between 25-50 as shown on the dial of the hyfrecator, is applied for about 20 seconds. This process is repeated at various points submucosally along the inferior turbinate (Fig. 1). The nasal cavities of these patients are previously anaesthetised with local application of 5% cocaine in 1:1000 adrenaline, or xylocane spray over nasal mucosa.

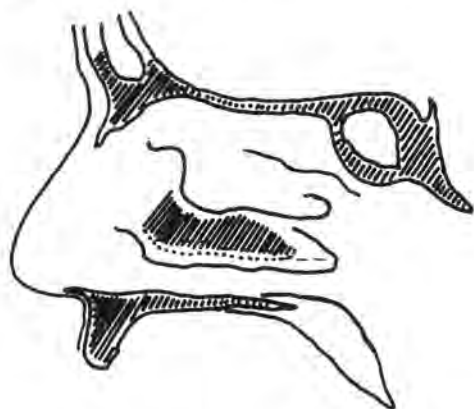


Fig. 1: Diagram shows sites of insertion of electrode along the Inferior Turbinates.

Results

The results were tabulated into three groups according to the duration of beneficial effect (partial or complete).

- (a) Immediate — when relief of symptoms were up to 3 months from time of procedure.
- (b) Temporary — when they were symptom free from 3-6 months.
- (c) Permanent — when relief was from 6 months and over.

However, the longest period of follow-up in

Race	Sex		Total Number	Percentage
	Male	Female		
Chinese	96	52	148	74.0%
Indian	21	19	40	20.0%
Malay	5	4	9	4.5%
Others	2	1	3	1.5%
		Total	200	

this series has been up to 20 months. The results were tabulated according to:

- Ethnic Group — Table 1
- Age Group — Table 2
- Duration of beneficial effect in each ethnic group according to relief of symptoms. — Tables 3, 4, 5 and 6.

Discussion

From a clinical viewpoint, air currents through the nose in humans assume great importance. Although in general inspired air is carried high up in the nose, as mentioned, air currents also traverse along the lower half of the nasal cavity. Every rhinologist has had the experience of improving the air-way temporarily, in patients with chronic nasal obstruction by the mere surface application of 5% cocaine in 1:1000 adrenaline on the inferior turbinate, provided there is no gross hypertrophy of nasal mucosa. Various other agents have also been used from time to time to shrink the mucous membrane of the inferior turbinate (Tremble 1960). In recent years, submucous electro-coagulation has been favoured. In this series, the milder form of electro-coagulation was used. This method has been found to be encouraging. About 85-88% showed improvement. Of those that showed this improvement:—

- 10.1% Chinese) Showed immediate relief (Tables 3, 4 and 5)
- 15.0% Indian)
- 54.0% Chinese) Showed temporary relief
- 47.5% Indian)
- 33.0% Malay)
- and
- 62.0% Chinese) Showed prolonged relief
- 22.5% Indian)
- 55.6% Malay)

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Race	0-10 Yrs	11-20 Yrs	21-30 Yrs	31-40 Yrs	41-50 Yrs	50+	Total
Chinese	1	45	72	22	6	2	148
Indian	4	11	16	9	0	0	40
Malay	0	2	8	0	0	0	9
Others	0	1	2	0	0	0	3

Chinese — 148 Patients						
Result of Submucous Dessication	Frequency of Submucous Dessication			Total Number Of Patients	Percentage	
	Once	Twice	Thrice			
0-3 Months	8	6	1	15	10.1%	
3-6 Months	41	11	2	54	36.5%	
6 Months And Over	55	7	0	62	41.9%	
No Improvement	13	3	1	12	11.5%	

Indians — 40 Patients						
Result of Submucous Dessication	Frequency of Submucous Dessication			Total Number Of Patients	Percentage	
	Once	Twice	Thrice			
0-3 Months	1	3	2	6	15.0%	
3-6 Months	17	1	1	19	47.5%	
6 Months And Over	8	1	0	9	22.5%	
No Improvement	6	0	0	6	15.0%	

Malays — 9 Patients						
Result of Submucous Dessication	Frequency of Submucous Dessication			Total Number Of Patients	Percentage	
	Once	Twice	Thrice			
0-3 Months	0	0	0	0	00.0%	
3-6 Months	1	2	0	3	33.3%	
6 Months And Over	5	0	0	5	55.6%	
No Improvement	1	0	0	1	11.1%	

Table 6
Result of Submucous Dessication In Other Races

Others — 3 Patients					
Result of Submucous Dessication Period of Improvement	Frequency of Submucous Dessication			Total Number Of Patients	Percentage
	Once	Twice	Thrice		
0-3 Months	0	0	0	0	00.0%
3-6 Months	0	1	0	1	33.3%
6 Months And Over	0	0	0	0	00.0%
No Improvement	1	1	0	2	66.7%

On the other hand, only 10-15% of the 197 patients studied in the above ethnic groups showed no improvement at all. In this failure group, the majority had only one attempt at dessication and repeat was not considered to be beneficial as they did not have any improvement at all following the first attempt.

Histo-pathological studies as to the effect of low grade electro-coagulation is conflicting. Uede T. (1962) found that low grade high frequency electrical current apparently caused vasoconstriction, and to some extent a complete occlusion of the vascular network and fibrosis of the submucous tissue. On the other hand, due to the low grade current, no injury was caused to the surface mucous membrane. However, H. Michishita (1965), using low grade electrocoagulation of the inferior turbinate found histologically, that the nasal mucous membrane showed a loss of cellular infiltration, degeneration of secretory glands, vascular occlusion and proliferation of fibrous tissue.

In this series, although no histological study was made, clinical observation, as evidenced by absence of dryness and crusting of inferior turbinate mucosa, or adhesion between septum and turbinates showed that there was no damage to the surface mucosa. In this procedure, the area and depth of tissue dessication with one application is directly proportional to:

- (a) The current intensity
- (b) Duration of current flow through the electrode
- (c) The density and moisture content of the tissue
- (d) The surface area of the electrode.

Factors (a), (b) and (d) were constant, the only variable being (c), that is, the individual variation of the patient's inferior turbinate mucosa.

From the ethnic point of view, the majority of patients seen at this clinic with nasal congestion and obstruction and who had this treatment were: Chinese 74%; Indians 20%; Malays 4.5% and the rest 1.5%. This, when compared with the population structure of Malaya where Malays form 50.5%, Chinese 36.4%, Indians 11% and the rest 2.1%, shows a high incidence among the Chinese, followed by the Indians. While several factors like population distribution, socio-economic conditions and other factors might account for their attendance at the clinic, nevertheless, anatomical and other elements do play a part. However, when the results of treatment of the various groups are compared, there is a striking similarity except for the "others" group. Here the number seen is too small (only 3) for any conclusion to be drawn.

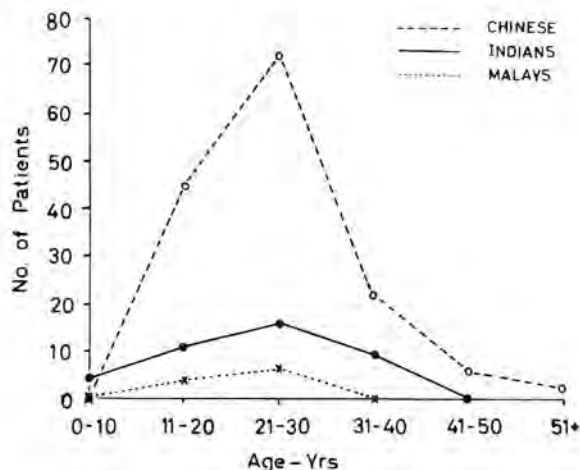


Fig. 2: Graphic representation of age distribution according to ethnic groups.

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The age incidence of this condition amongst the ethnic group is interesting. There is no striking difference between the various racial groups, all showing the same age distribution pattern, the highest incidence being in the 3rd decade (Fig. 2). There is a striking absence of this condition amongst the very young and old, i.e., beyond 50 years.

Conclusion

From the data so far obtained in this series, it seems that submucous high frequency dessication does benefit those patients who otherwise go

through life in great discomfort. The absence of post-dessication complication in the form of pain, crusting, adhesion, etc. is striking. The patient has no discomfort whatsoever and the whole procedure is simple and takes only a few minutes. However, the long-term effect is yet to be evaluated.

Acknowledgement

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