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Nasal resistance values in the adult Negroid Nigerian

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SUMMARY

Nasal resistance values have been documented quantitatively in adult Caucasians and Asians and have been found to be similar. The possibility of there being a difference in these values in the African due to anthropological and climatic differences has been examined and found to be untenable. The values thus obtained for the Negroid African was found to be similar to that obtained for the Caucasian and Asian.

INTRODUCTION

Nasal resistance values in the Caucasian and in the Asian have been recorded (Eccles, 1977) and the values obtained have been used as the standard values for man (Cole, 1982).

There are no available data on nasal resistance parameters in the African and in spite of this, nasal surgical procedures are carried out to relieve nasal obstruction. When pilot studies were carried out in Cardiff (U.K.) among Nigerian and British students (Babatola and Eccles, unpublished) the results obtained suggested that normal nasal resistance value for adult Nigerian residents in Cardiff may differ significantly from that of the normal adult Caucasian domiciled in the same environment.

In view of the above-mentioned, and coupled with the phenotypical differences in the nasal structure between the Negroid African and the Caucasian, it has become essential that the nasal resistance values of normal adult Negroid Nigerians domiciled in their normal tropical environment be investigated and documented. There is the need also to establish basal nasal resistance parameters as the lack of this may have adverse implications in nasal surgical procedures.

METHOD

Unilateral nasal resistance values were measured using the modified technique of active anterior rhinomanometry (Babatola, 1985; Babatola and Eccles, 1987). The NR3 Mercury Rhinomanometer was used. This equipment incorporated the

BBC model B microcomputer in which the NR3D microchip was installed (Mercury Electronics, Glasgow, U.K.).
Nasal resistance graph patterns were displayed on a monitor screen and a print-out obtained using an Epson FX-80 dot matrix printer.
In view of the normal resting asymmetry in the resistance between the two nasal passages which alternates on a cyclic basis with a period of 4–6 hours (Eccles, 1977) it became necessary to identify the nasal passages with reference to their state of congestion at the onset of the experiment. Thus the nasal passage with the higher resistance at the onset of the experiment was identified and labelled as HC (high resistance under control conditions) while the nasal passage with the lower resistance at the onset of the experiment was identified and labelled as LC (low resistance under control conditions).
Unilateral nasal resistance values in nasal passages HC and LC were thus measured and total nasal resistance calculated from the relationship:

$1/R_{TNR} = 1/R_{HC} + 1/R_{LC}$ (Hamilton, 1979)

where R_{TNR} = Total nasal resistance
R_{HC} = Resistance in nasal passage HC
R_{LC} = Resistance in nasal passage LC

The ratio HC/LC was also calculated for each set of readings.
Temperature and humidity was maintained at 22°C and 60% respectively, by means of an air conditioning system.
None of the subjects had a previous history of nasal allergy and none had had a nasal infection or "cold" in the preceeding fortnight.
Statistical significance of changes observed was assessed using a t-test (Bahn, 1972).

RESULTS

46 adults subjects of either sex (21 males and 25 females) volunteered for these experiments. The mean age was 24.08 yrs. $\pm$ 1.12 (mean $\pm$ S.E.M., n=46). The mean body weight was 57.18 kg $\pm$ 0.95 kg (mean $\pm$ S.E.M., n = 46).
Total nasal resistance values in the combined nasal passage in the 46 subjects was a mean value of 0.26 $\pm$ 0.02 Pa s cm^{-3} (mean $\pm$ S.E.M., n = 46).
Unilateral nasal resistance values in the high resistance nasal passage was a mean value of 0.83 $\pm$ 0.07 Pa s cm^{-3} (mean $\pm$ S.E.M., n=46) whereas the unilateral nasal resistance value in the low resistance nasal passage was a mean value of 0.43 $\pm$ 0.03 Pa s cm^{-3} (mean $\pm$ S.E.M., n = 46).
The ratio of the resistance between HC and LC in the 46 subjects was found to be a mean value of 2.25 $\pm$ 0.20 (n = 46).

Nasal resistance parameters in the adult female

When considered in the relation to the sex of the subjects involved, mean total nasal resistance value in the combined nasal passage in the 25 female subjects was 0.29 ± 0.02 Pa s cm^{-3} (mean ± S.E.M., n = 25).

Unilateral nasal resistance value in HC was found in these 25 females subjects to be a mean value of 0.96 ± 0.11 Pa s cm^{-3} (mean ± S.E.M., n = 25) while in LC mean resistance values was 0.45 ± 0.03 Pa s cm^{-3} (mean ± S.E.M., n = 25).

The ratio of the resistance between the two nasal passages (i.e. HC/LC) in the females was a mean value of 2.28 ± 0.22 (mean ± S.E.M., n = 25) (Table 1).

Table 1. Comparison of ratio of asymmetry between the two nasal passages.

	males (n = 21)	females (n = 25)	combined (n = 46)
HC/LC	2.22 ± 0.34	2.28 ± 0.22	2.25 ± 0.20

Nasal resistance parameters in the adult male

In the male subjects, total nasal resistance in the combined nasal passages was a mean value of 0.24 ± 0.22 Pa s cm^{-3} (mean ± S.E.M., n = 21).

Unilateral nasal resistance value was found to be a mean value of 0.69 ± 0.07 Pa s cm^{-3} (mean ± S.E.M., n = 21) in HC while the mean value in LC was 0.40 ± 0.04 Pa s cm^{-3} (mean ± S.E.M., n = 21) in the 21 male subjects.

The ratio HC/LC in the 21 male subjects was a mean value of 2.22 ± 0.34 (mean ± S.E.M., n = 21).

DISCUSSION

The asymmetric pattern of flow between the two nasal passages have been confirmed in both Caucasian and Asian subjects (Kayser, 1895; Eccles, 1977). This observation has also been confirmed in the subjects we have sampled. The ratio HC/LC was a mean value of 2.25 ± 0.20. This ratio is a quantitative assessment of the asymmetry between the two passages.

Cole (1982) and Cole and Haight (1984) gave total nasal resistance value of 2–3 cm H_2O/L/sec (0.2–0.3 Pa s cm^{-3}) in healthy Caucasian adults whether they were in the upright or recumbent positions. In the series of 46 subjects that have been compiled in this report, a similar value of 0.26 ± 0.02 Pa s cm^{-3} has been obtained. These results suggest that there is no difference in the level of physiological resistance offered to the passage of air through the nose in either the Caucasian, the Asian or the Negroid Nigerian.

One of the considerations at the onset of the study was the possibility that the anatomical (or anthropological) differences in the shape of the nose itself may influence the internal anatomical passage way to such an extent as to cause a difference in the basal nasal resistance parameters between the Caucasian, the Asian and the Negroid African.

When eight Nigerian students were examined in a pilot study in Cardiff (U.K.), (Babatola and Eccles, unpublished), the total nasal resistance values and especially the unilateral nasal resistance values were so varied and it suggested that a significant difference may exist when the Nigerian values were compared to that of the Caucasian.

The results obtained in these series have not in any way supported or confirmed this suggestion, rather it has been shown that there are no racial or geographical differences in the resistances offered to the passage of air through the nasal passages.

Statistical analysis also showed that the difference in total nasal resistance values between the two sexes was not significant, $p > 0.05$.

The unilateral nasal resistance values were higher in females when compared with males. This was more prominent in the nasal passage HC where the difference was statistically significant with $p < 0.05$ (Table 2). In the nasal passage LC, the difference was not statistically significant with $p > 0.05$.

Table 2. Comparison of nasal resistance values obtained from males and females.

	male (n = 21) (Pa s cm^{-3})	female (n = 25) (Pa s cm^{-3})	P value
high resistance passage HC	0.69 ± 0.07	0.96 ± 0.11	< 0.05
low resistance passage LC	0.40 ± 0.04	0.45 ± 0.03	> 0.05
total nasal resistance (TNR)	0.24 ± 0.02	0.29 ± 0.02	> 0.05

It is thought that the observed difference especially in nasal passage HC could be due to fluid retention in nasal tissues as occurs in other tissues under the influence of sex hormones in response to cyclic menstrual activity. This has been suggested by Mortimer et al. (1936), Mohum (1943); Sorri et al. (1980). The degree of intensity of fluid retention vary with different women. The retention of fluid and/or increased blood flow under hormonal influence may be responsible for increased congestion in the mucosa thus leading to increased nasal resistance to airflow.

CONCLUSION

The total nasal resistance values in the adult Negroid Nigerian is not different from that of the adult Caucasian or adult Asian. The physiological parameters were similar irrespective of physical, geographical or racial differences. These values would be of significance in objective assessment of nasal congestion or decongestion where nasal surgery is indicated.

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