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ANATOMICAL DISTANCES OF THE FACIAL NERVE BRANCHES ASSOCIATED WITH THE TEMPOROMANDIBULAR JOINT IN ADULT NEGROES AND CAUCASIANS

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ABSTRACT

In this study, we examined the relationship between the distances of the temporal and cervicofacial branches of the facial nerve relative to the temporomandibular joint in 92 facial halves from 56 adult cadavers (37 Negroes, 19 Caucasians; 48 M, 8 F). Negro and Caucasian males frequently had a temporal branch more distant from the acustic meatus (1.59 cm) and the tragus (2.09 cm) when compared to the respective females (1.25 cm and 1.82 cm). In mesocephalic Negro and Caucasian males, the cervicofacial trunk frequently passed closer to the meatus (1.76 cm and 2.26 cm, respectively) than in brachycephalic Negro males (2.30 cm) and in dolicocephalic Caucasian males (2.95 cm). Mesocephalic Caucasian males and brachycephalic Negro males had larger distances for the cervicofacial branch (2.26 cm and 2.30 cm), respectively than the corresponding mesocephalic (1.4 cm) and brachycephalic (1.8 cm) females. The location of the temporal branches and cervicofacial trunk of the facial nerve increases the risk of lesions to these nerves during access to the temporamandibular joint. A knowledge of the measurements obtained here may help to decrease the number of such lesions.

Key words: Facial nerve, temporal nerve, cervicofacial trunk, preauricular approach, temporomandibular joint

INTRODUCTION

A detailed knowledge of the topography of the facial nerve and its temporal branches is fundamental for successful temporomandibular joint (TMJ) surgery since these branches are susceptible to damage during this procedure [3].

A preauricular incision is frequently used to access the TMJ, but can lead to a series of sequelae when incorrectly performed, the most serious of which is paralysis caused by injury to the facial nerve [6]. The risk of lesioning the facial nerve in this type of incision is approximately 5% [7]. As a result, the patient loses all facial expression on the affected side and is unable to close the corresponding eye [2].

Al Kayat and Bramley [1] were the first to study the facial nerve topography by measuring the course of its branches and then correlating the measurements with the site of the preauricular incision. There were no significant variations in topography with age and gender.

In this work, we examined whether the high level of genetic miscegenation in Brazilians could affect the distances of the temporal branches and cervicofacial trunk from the temporomandibular joint. These values were compared to those reported in the literature for more uniform populations. We also investigated whether factors such as ethnic group, sex and cephalic index could influence the distances obtained.

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MATERIAL AND METHODS

The study sample consisted of 56 adult cadavers, (37 Negroes, 19 Caucasians) with a total of 48 males and 8 females, which corresponded to 112 facial halves. Twenty facial halves were discarded because of their poor state of conservation. The remaining 92 facial halves were dissected.

The cephalic index was obtained using the relationship W x 100 / L , where W is the maximum cephalic width (cm), and L is the maximum cephalic length (cm) [8]. The brachycephalic, mesocephalic and dolicocephalic indexes were $\leqslant$ 74.9, 75 to 79.9 and $\geqslant$ 80, respectively.

The measurements were made with a special anthropometer which consisted of a base with a ruler and four extremities, one of which was immovable and had an active point fixed at 0 cm. The moveable extremity gave the results of the two lower extremities which measured the maximum cephalic width and length.

The facial nerve enters the parotid gland and usually divides into temporofacial and cervicofacial trunks. These trunks subsequently divide and emerge from the parotid gland to radiate anteriorly, and are commonly classified as temporal, zygomatic, buccal, marginal mandibular, and cervical branches [1].

The preauricular and/or retromandibular area was dissected to expose the temporal and cervicofacial branches of the facial nerve (Fig. 1A). The distances measured were: (1) from the acustic meatus to the first of the temporal branches when it crossed the central point of the superior and inferior margins of the zygomatic arch (dis-

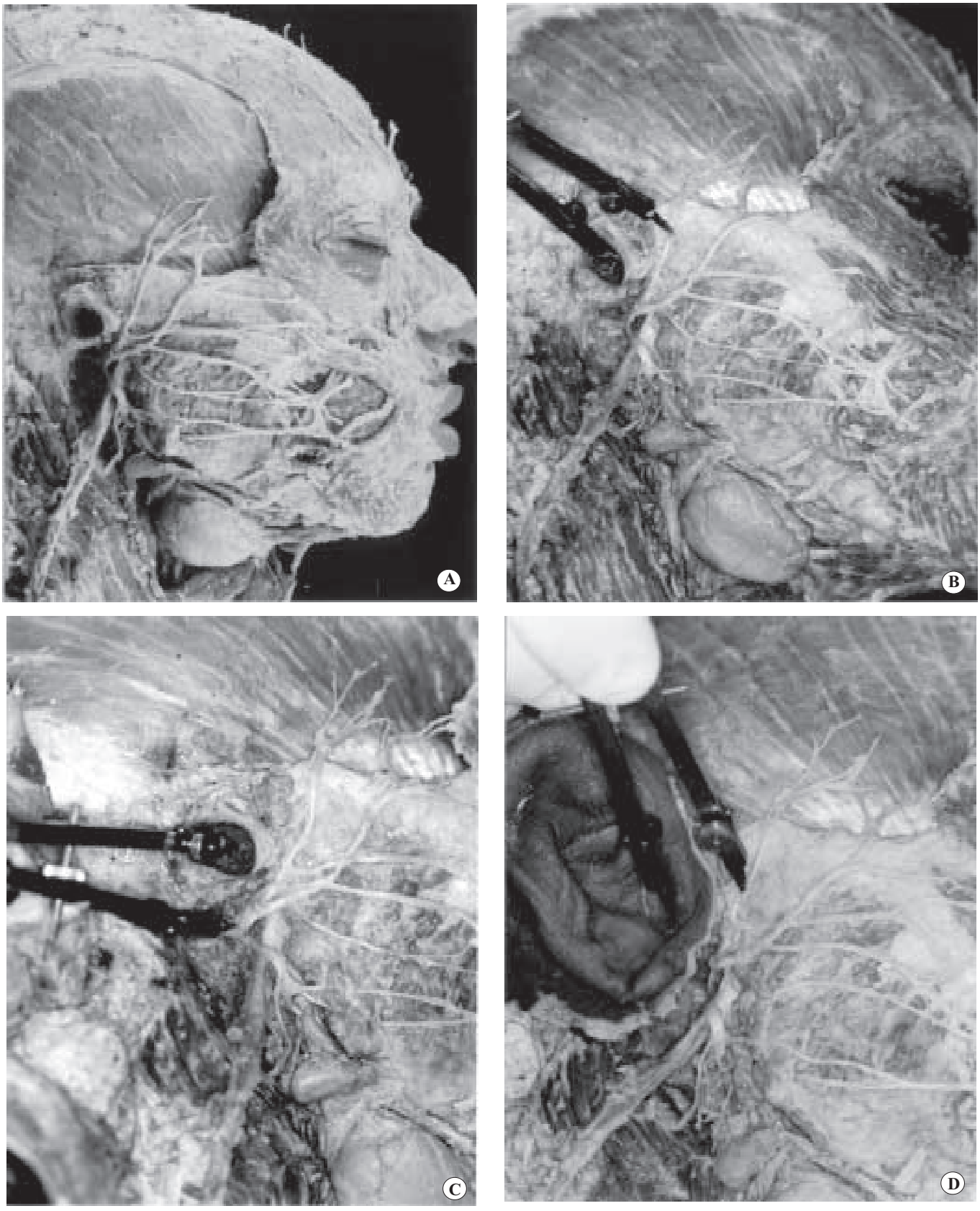

Figure 1 A. Exposure of the temporal and cervicofacial branches of the facial nerve.
B (Distance A) – distance from the acustic meatus to the first of the temporal branches when it crosses the central point of the superior and inferior margins of the zygomatic arch. **C** (Distance B) – distance from the acustic meatus to the cervicofacial branch at the level of its median initial portion. **D** (Distance C) – distance from the anterior margin of the tragus to the first temporal branch at the point were it crosses an imaginary line between the tragus and the condylium cranial point.

tance A in Fig. 1B), (2) from the acustic meatus to the cervicofacial branch at the level of its median initial portion (distance B in Fig. 1C), and (3) from the anterior margin of the tragus to the first temporal branch at the point where it crossed an imaginary line between the tragus and the condylium cranial point (distance C in Fig.1D). A further measurement included the number of divisions of the temporal branch when it crossed the basal portion of the zygomatic arch.

To compare the differences among the cephalic indexes, we used the Kruskal-Wallis test complemented by a multiple comparison test. When no significant differences were observed among the same indexes, these were grouped to form a single sample. The Mann-Whitney test was used to study the possible differences between the sexes and ethnic groups. In all cases, the rejection level for the null hypothesis was $P < 0.05$ (5%) [5].

RESULTS

For distance A (the distance from the acustic meatus to the first of the temporal branches when it crosses the central point of the superior and inferior margins of the zygomatic arch**)**, values between 0.7 cm and 3.2 cm were obtained, with a predominance of cases at 1.0 cm and 1.5 cm (10 each) and a mean distance of 1.54 ± 0.47 cm (Fig. 2A).

For distance B (the distance from the acustic meatus to the cervicofacial branch at the level of its median initial portion), values between 1.2 cm and 3.3 cm were obtained, with a predominance of cases at 2.1 cm (12 cases) and a mean distance of 2.19 ± 0.49 cm (Fig. 2B).

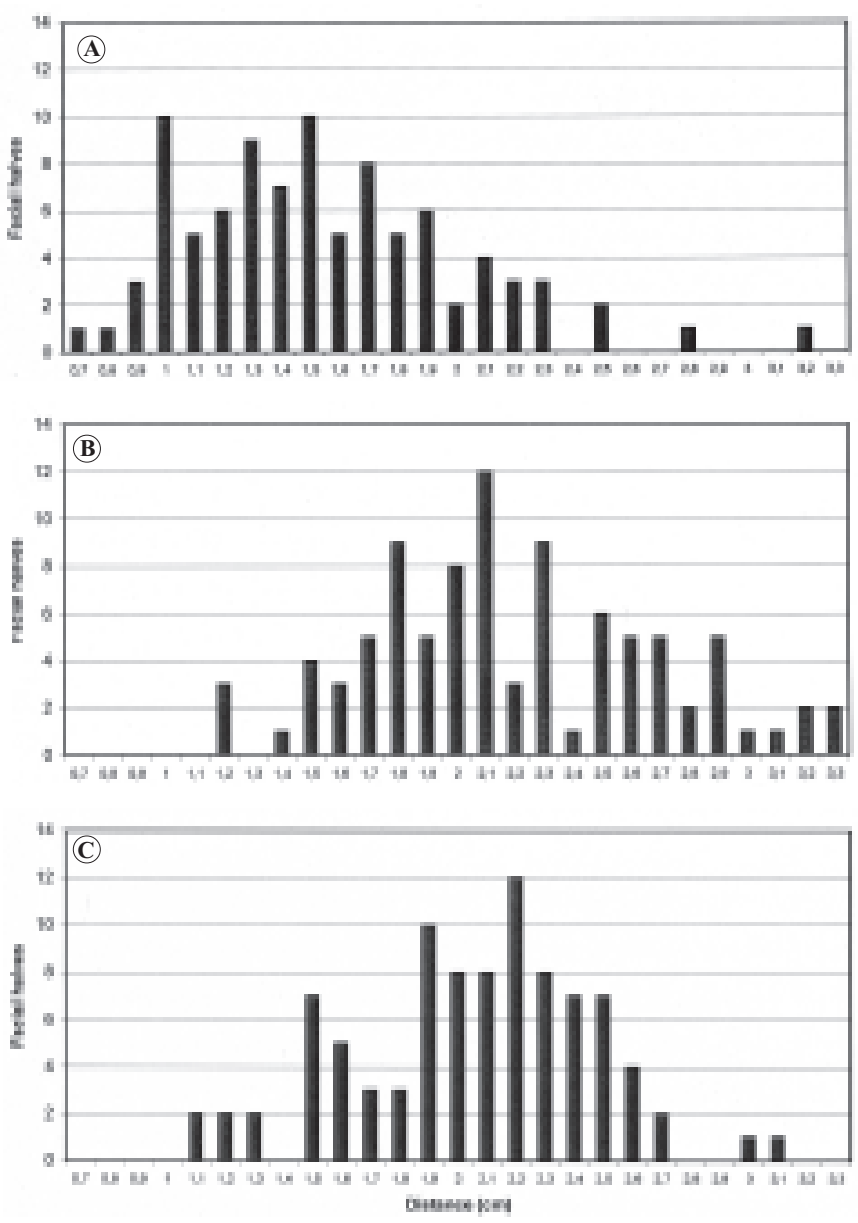

Figure 2. Frequency distributions of distances A (panel A), B (panel B) and C (panel C).

For distance C (the distance from the anterior margin of the tragus to the first temporal branch at the point where it crosses an imaginary line between the tragus and the condylium cranial point), values between 1.1 cm and 3.1 cm were obtained, with a predominance of cases at 2.1 cm (12 cases) and a mean distance of 2.05 ± 0.41 cm (Fig. 2C).

The number of temporal branches of the facial nerve at the point where they crossed the zygomatic arch varied from 1 to 4 [frequencies of 16%, 52%, 24% and 8% for one, two, three and four branches, respectively].

Significant differences were found for distance B, between mesocephalic and dolicocephalic Caucasian males (Table 1) and between mesocephalic and brachycephalic Negro males (Table 2). There were no significant differences between Caucasians and Negroes (Table 3). There were significant differences between males and females for distances A and C (Table 4). Significant differences for distance B were also observed between mesocephalic Caucasian males and females and between Negro males and brachycephalic females. Our sample contained no dolicocephalic female, so no comparison with the corresponding males was possible (Table 5).

DISCUSSION

The lowest value found for distance A was 0.7 cm, which was almost the same as the 0.8 cm obtained by Al-Kayat and

Table 1. Statistical comparisons of distances A, B and C among Caucasian male cadavers, according to cephalic type (distances in cm).

Distance	Comparison		P
A	Mesocephalic (1.47) – Brachycephalic	(1.68)	NS
	Mesocephalic (1.47) – Dolicocephalic	(1.87)	NS
	Brachycephalic (1.68) – Dolicocephalic	(1.87)	NS
B	Mesocephalic (2.26) – Brachycephalic	(2.44)	NS
	Mesocephalic (2.26) – Dolicocephalic	(2.95)	⩽0.05
	Brachycephalic (2.44) – Dolicocephalic	(2.95)	NS
C	Mesocephalic (2.08) – Brachycephalic	(2.18)	NS
	Mesocephalic (2.08) – Dolicocephalic	(2.32)	NS
	Brachycephalic (2.18) – Dolicocephalic	(2.32)	NS

Table 2. Statistical comparisons of distances A, B and C between Negro, male cadavers, according to cephalic type (distances in cm).

Distance	Comparison		P
A	Mesocephalic (1.55) – Brachycephalic	(1.62)	NS
	Mesocephalic (1.55) – Dolicocephalic	(1.57)	NS
	Brachycephalic (1.62) – Dolicocephalic	(1.57)	NS
B	Mesocephalic (1.76) – Brachycephalic	(2.3)	⩽0.05
	Mesocephalic (1.76) – Dolicocephalic	(2.1)	NS
	Brachycephalic (2.3) – Dolicocephalic	2.1)	NS
C	Mesocephalic (2.0) – Brachycephalic	(2.04)	NS
	Mesocephalic (2.0) – Dolicocephalic	(2.21)	NS
	Brachycephalic (2.04) – Dolicocephalic	(2.21)	NS

Table 3. Statistical comparisons of distances A, B and C between Caucasians and Negroes (distances in cm).

Distance	Comparison	P
A	Caucasian (1.55) - Negro (1.54)	NS
B	Caucasian (2.25) - Negro (2.12)	NS
C	Caucasian (2.10) - Negro (2.02)	NS

Table 4. Statistical comparisons of distances A and C according to gender (distances in cm).

Distance	Comparison	P
A	Male (1.59) - Female (1.25)	⩽0.05
C	Male (2.09) - Female (1.82)	⩽0.05

For Tables 1, 2 and 3: Distance A - distance from the acustic meatus to the first of the temporal branches when it crosses the central point of the superior and inferior margins of the zygomatic; **distance B -** distance from the acustic meatus to the cervicofacial branch at the level of its median initial portion; **distance C -** distance from the anterior margin of the tragus to the first temporal branch at the point where it crosses an imaginary line between the tragus and the condylium cranial point. NS, non-significant.
Statistical comparisons done with the Kruskal-Wallis test

Table 5. Statistical comparisons of distance B between males and females according to the cephalic index and race (distances in cm).

	Mesocephalic			Brachicephalic		
Race	Male	Female	P	Male	Female	P
Caucasian	(2.26)	(1.4)	<0.05	(2.44)	(2.15)	NS
Negro	(1.76)	(2.08)	NS	(2.30)	(1.8)	<0.05

P<0.05 (Mann-Whitney test), NS, non-significant
Distance B - distance from the acustic meatus to the cervicofacial branch at the level of its median initial portion.

Bramley [1]. On the other hand, the mean distances of 1.54 cm we obtained was lower than the 2.0 cm reported by the latter authors, and indicated that the cadavers examined here generally had lower values. Since the smallest distance was 0.7 cm, great care must be taken when performing the preauricular incision to approach the TMJ as this incision is generally done close to the temporal branch. An incorrect procedure may lead to motion paralysis, and compression during retraction can cause neuropraxia.

The lowest value found for distance B was 1.2 cm and the mean distance was 2.19 cm, both of which were similar to the 1.5 cm and 2.3 cm, respectively, obtained by Al-Kayat and Bramley [1]. These values suggest that during preauricular, endaural and postauricular approaches, the incision must not be extended below the ear lobe, otherwise motion paralysis due to neurotmesis or neuropraxia may develop.

For distance C, the smallest value obtained was 1.1 cm. Thus, when the surgeon uses the tragus as a reference for

the preauricular approach, the incision must be placed within a safety margin based on the smallest measurement, in order to avoid damage to the temporal branch.

In most cases (84%), there were two or more temporal branches. We presume that the greater the number of branches, the lower the risk of permanent paralysis, since other branches could partially compensate for the deficit in sensory input caused by the lesion. Indeed, Gosain *et al.* [4] state that, because of the high percentage of individuals with more than one branch and the numerous communications observed among the branches of the temporal nerve, neurotmesis of one or more branches does not mean permanent paralysis, and recovery may occur.

Ethnic origin, sex and cephalic index did not significantly affect the three distances measured when Caucasians and Negroes were compared. When the influence of sex was evaluated within each ethnic group, males had significantly greater values for distances A and C.

When the distances within ethnic groups were compared based on the cephalic index, dolicocephalic Caucasian males had a significantly greater distance B than mesocephalic males (Table 1), and brachycephalic Negro males had higher values than mesocephalics (Table 2). Thus, cephalic index apparently affects distance B. This observation indicates that surgical procedures involving the area covered by distance B require special consideration in males.

In conclusion, distances A and B were similar to those reported by Al Kayat and Bramley [1] for more homogeneous populations. This finding suggests that the genetic miscegenation of races in Brazil does not influence the distances of the facial nerve branches from the temporomandibular joint. However, these distances are influenced by the cephalic index and sex. These results thus provide additional data which may be useful for those performing preauricular incisions to access the temporomandibular joint.

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