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Authors: Angela Babuci, Silvia Stratulat, Zinovia Zorina, Ilia Catereniuc, Anastasia Bendelic, Sergiu Calancea, Sofia Lehtman, Gabriela Motelica, Andrei Mostovei

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Marginal mandibular branch of the facial nerve — anatomical peculiarities and clinical aspects

Angela Babuci[1], Silvia Stratulat[2], Zinovia Zorina[1], Ilia Catereniuc[1], Anastasia Bendelic[1], Sergiu Calancea[3], Sofia Lehtman[4], Gabriela Motelica[4], Andrei Mostovei[4]

[1]Department of Anatomy and Clinical Anatomy, Nicolae Testemitanu State University of Medicine and Pharmacy, Chisinau, Republic of Moldova
[2]Department of Biochemistry and Clinical Biochemistry, Nicolae Testemitanu State University of Medicine and Pharmacy, Chisinau, Republic of Moldova
[3]Light Dental Clinic, Bucharest, Romania
[4]Department of Oral and Maxillofacial Surgery and Oral Implantology „Arsenie Gutan", Nicolae Testemitanu State University of Medicine and Pharmacy, Chisinau, Republic of Moldova

Address for correspondence: Angela Babuci, Department of anatomy and clinical anatomy, Nicolae Testemitanu State University of Medicine and Pharmacy, Blvd Stefan cel Mare si Sfant, 192, MD-2004 Chisinau, Republic of Moldova; e-mail: angela.babuci@usmf.md

ABSTRACT

Background: The expanding number of parotid ablations, reconstructive and aesthetic surgeries of the head and neck, considerably increased the risk of the marginal mandibular branch (MMB) injury. The purpose of our study was to determine the anatomical peculiarities of the MMB depending on the facial nerve branching pattern (FNBP), gender and cephalometric type.

Materials and methods: The MMB was dissected on 75 hemiheads of adult embalmed cadavers. The origin, number of branches, topography and connections of the MMB were analyzed.

Results: Seven FNBP were identified: Type I (18.7%); Type II (14.7%); Type III (20%); Type IV (14.6%); Type V (5.3%); Type VI (18.7%); Type NI (8%, non-identified types). In males

1–3 MMB were determined and in females 1–4 MMB; p = 0.845. In males, bilaterally were identified 1–3 MMB. In females on the right side were found 1–2 MMB and on the left — 1–4 MMB; p = 0.204. A single MMB was revealed in 41 cases (54.7%), 2 MMB — in 29 cases (38.7%), 3 MMB — in 4 cases (5.3%) and in a single case 4 MMB (1.3%) were determined. Depending on the FNBP, the number of the MMB was: Type I — 1.2 ± 0.43; Type II — 1.5 ± 0.52; Type III — 1.6 ± 0.63; Type IV — 1.5 ± 0.52; Type V — 1.3 ± 0.50; Type VI — 1.9 ± 0.95; Type NI — 1.7 ± 0.82. IGFV = 1.403 (intergroup frequency variation); df = 6 (degree of freedom); p = 0.226. According to the cephalometric type the number of the MMB in mesocephalic type (MCT) was 1.5 ± 0.68; in brachycephalic type (BCT) — 1.6 ± 0.52; in dolichocephalic type (DCT) — 1.9 ± 0.60. IGFV = 1.698; df = 2; p = 0.190. A rare variant of the MMB origin from the temporofacial division of the facial nerve was highlighted in 5.3% of cases.

Conclusions: The MMB varies depending on the FNBP, gender and cephalometric type. The highest variation degree was characteristic of females, Type VI and DCT. The lowest variation degree was determined in Type I and in MCT, without gender differences. The risk of iatrogenic lesions of the MMB is conditioned by two important aspects: its anatomical variability and large number of surgical interventions at that level.

Keywords: marginal mandibular branch, facial nerve, branching pattern, variants

INTRODUCTION

The incidence of the facial nerve injuries in routine head and neck surgery is about 0.1–0.5% and, unfortunately, in some patients persistent impairments of the facial nerve are setup. The incidence of the facial nerve iatrogenic lesions in esthetic surgery varies between 1–20% [34]. The immediate postoperative deficiency of the MMB, even in cases of the nerve preservation, was reported up to 28.7% and the persistent palsy reached 16% [31].

One of the most feasible, modern and non-invasive imaging methods of the facial nerve intracranial segments previsualization is its tractography [47, 49], but it cannot be applicable for the parotid plexus branches. Only the facial nerve trunk and its primary divisions can be previsualized by three-dimensional constructive interference in steady state MRI [17]. The modernization of interventional techniques for the head and neck reconstructive surgery is one of the most stringent problems and development of new methods of previsualization of the extracranial branches of the facial nerve are required. Thus, in order to decrease the iatrogenic injures, data obtained from morphological and surgical dissections are indispensable for an individualized approach in facial nerve reconstruction, based on its anatomical model.

The facial nerve develops from the facio-acoustic primordium [43] and its development is controlled by *HOX* genes [19, 40]. According to Hunt et al. [19, 43] „each branchial arch expresses a different combination or code of HOX genes in a segment-restricted way", with a distinct position of the cranial nerves' roots in relation to individual rhombomeres [7, 8, 26]. Development of the motor nucleus of the facial nerve, along with the motor nuclei of the trigeminal and glossopharyngeal nerves has a two-segment periodicity [25, 27], that could be influenced by zinc finger gene *Krox-20* and retinoic acid, which are segment specific regulators of the *HOX* gene expression during hindbrain segmentation [29, 38, 45]. Under the action of the retinoic acid and zinc finger gene Krox-20 a duplication of r2/3 into r4/5, with subsequent transformation of the entire trigeminal area into the facial-vestibuloacoustic one, without changes of the normal r4/5, was reported [29, 45]. During embryogenesis the gene *Krox-20* is restricted to mature Schwann cells and in adults it is expressed in myelinating cells. An important gene encoding zinc finger transcription factors is the gene *Krox-24*, which during embryogenesis is restricted to Schwann cell precursors and in adults it is expressed in nonmyelinating cells [39]. Expression of a combination code of *HOX* genes in both neural crest and branchial arches, determines the normal development of the facial nerve [45]. On the other hand its high susceptibility to various harmful factors, could be an explanation of a wide range of branching patterns, including atypical origin, topographical, numerical and connecting variants.

Considering the fact that knowledge of anatomical variability, topography and connections of the marginal mandibular branch of the facial nerve is of high interest for head and neck surgeons, the named branch is studied on both patients and cadavers, thus, variants of its course, topography, number and connections were reported by many researchers [1, 2, 5, 11, 13, 16, 22, 30, 36, 48]. Often, the numerical variability of the MMB is associated with a series of specific topographical features, towards both bony and soft anatomical landmarks. Taking into consideration that the lower third of the face receives only heterolateral innervation, extreme caution is required in surgery of the marginal mandibular branch.

According to the latest updates of *Terminologia Anatomica* [14], muscles of the head are divided into nine groups as follows: extraocular muscles, superficial muscles of head, facial muscles, extrinsic auricular muscles, intrinsic auricular muscles, muscles of the auditory ossicles, masticatory muscles, muscles of the tongue and muscles of the soft palate, many of which are innervated by the facial nerve. The marginal mandibular branch is responsible for motor innervation of the labial and marginal parts of the orbicularis oris muscle, depressor anguli oris, transversus menti muscle, depressor labii inferioris and mentalis muscles.

The clinical significance of knowledge related to the individual variability of the extracranial branches of the facial nerve is imperative [21, 46]. Due to their superficial course the branches of the facial nerve are vulnerable to iatrogenic injures. In surgical interventions of the submandibular triangle, the postoperative paresis of the marginal mandibular branch was reported in 29.8% of cases, which preponderantly appeared after usage of retractors for the marginal mandibular branch fixation [21]. According to Nakamura et al. [32], due to excessive extension and microtraumas produced in parotid ablations, the postoperative transient paresis of the MMB occurred in 47.1% of cases. Wilhelmi et al. [44] described three areas of a major risk of intraoperative damage to the extracranial branches of the facial nerve, corresponding to the branching areas of the temporal, marginal mandibular and buccal branches. Ichimura et al. [21] recommended generous incision of the skin, considering surgical planes and avoiding the application of retractors.

A statistically significant quantitative difference ($p < 0.001$) of the nervous fibers within terminal branches of the facial nerve was established by Sargon et al. [35]. The highest amount of fibers was characteristic of the cervical branch, followed by the marginal mandibular branch. Taking into account that both branches in the majority of cases are solitary, the obtained data could be of practical interest in surgical repair of their injured terminal branches. In cases of nerve lesions, there is a strong induction of the gene *Krox-24* in Schwann cells, enhancing the nonmyelinating and proliferative processes [39]. Considering the effect of the neuropeptides on nerve regeneration, the galanin was identified by Kim et al. [23] as a marker of injured axons. The calcitonin gene-related peptide (CGRP) was pointed out as a marker of neuroglial and neuromuscular interaction. The pituitary adenylate cyclase-activating polypeptide (PACAP) was proposed as a marker of facial nerve regeneration, with a complex action on the damaged nerve. It controls the immune response after nerve injury, provides neurotrophic factors, improves the neuromuscular recovery by inducing the reappearance of compound muscle action potentials (CMAPs), contributes to microglial activation and stimulates the nerve growth factors and axon myelination.

Taking into consideration the increasing number of parotid tumors, reconstructive and aesthetic surgical interventions [4, 20], there is a high need for new solutions to ensure a better quality of the MMB surgical management. Contemplating on the functional role of the marginal mandibular branch and distribution of its ending twigs within the facial muscles, a meticulous research was carried out in order to review its morphological specific features. The purpose of our study was to identify the anatomical peculiarities of the marginal mandibular branch of the facial nerve depending on the gender, cephalometric type and facial nerve branching pattern.

MATERIALS AND METHODS

The current study was carried out at the Department of anatomy and clinical anatomy of *Nicolae Testemitanu* State University of Medicine and Pharmacy of the Republic of Moldova. For our purpose, 75 hemifaces of adult embalmed cadavers were used. A careful examination of each head was carried out before dissection and only cadavers with intact soft tissues were included in the study. Prior to dissection, in order to establish the cephalometric type, the longitudinal and transverse diameters of each head were taken. The transverse diameter of the head was equal to the distance between the two *eurions* and the longitudinal one was measured between the *glabella* and *opistocranion*. The cephalic index was calculated according to the following formula:

$$\text{Cephalic index} = \frac{Transverse\ diameter \times 100}{Longitudinal\ diameter}$$

The cephalometric classification of the heads was based on the method proposed by Franco et al. [15]. The heads with a cephalic index up to 74.9 were attributed to the dolichocephalic type (DCT), the heads with a cephalic index from 75.0 up to 79.9 were classified as mesocephalic type (MCT), and the heads with the cephalic index higher than 80.0 were classified as brachycephalic type (BCT).

For the statistical analysis of the quantitative and qualitative variables, the Microsoft Excel 2016 processing program was used, employing functions such as: STDEV, CONFIDENCE, one-way ANOVA to compare the means of three or more independent variables and χ^2 test. All the measurements and accounting of the marginal mandibular branches, were taken twice by the same observer.

Out of the total number of hemifaces, 78.7% were male and 21.3% were female samples. The right-side specimens had a ratio of 46.7% and those of the left side constituted 53.3%. In males, the right samples were represented by 49.2% and the left ones — by 50.8%. In females, the right samples had a ratio of 37.5% and the left ones had a ratio of 62.5%. The mesocephalic type was represented by 77.3% of samples, the dolichocephalic type by 12%, and the brachycephalic type by 10.7%. The male/female ratio in mesocephalic type was

81.3%/62.5%; in dolichocephalic type, it was 11.9%/12.5%; and in brachycephalic type, it was 6.8%/25%. In mesocephalic type, the ratio of the right/left hemifaces was 77.2%/77.5%, in dolichocephalic type, the ratio was 11.4%/12.5%, and in brachycephalic type, the ratio was — 11.4%/10%.

A total number of 14 branching patterns were determined in our study. The distribution of the branching patterns was done according to the Davis classification [10]. The types that entirely corresponded to the Davis classification were referred to as classical types, while the branching patterns with topographical and connection variants were classified as atypical types. It should be noted that all the uncommon (bizarre) patterns of branching were united by a common term “Type-NI” (non-identified). Considering that many atypical types were identified, with some found in only a few cases, each atypical type was attributed to its corresponding classical type. Finally seven branching types were statistically analyzed.

RESULTS

In males were identified 1–3 MMB, with an average of 1.5 MMB. In females 1–4 branches were observed, with a mean value of 1.6 MMB, $p = 0.845$. In males 1–3 MMB were marked out on the both sides of the head, while in females 1–2 MMB were revealed on the right hemifaces and 1–4 MMB on the left. On the right samples the mean value was 1.4 MMB, and on the left side it was 1.6 MMB, $p = 0.204$. The classical branching pattern had a mean of 1.5 MMB and the atypical branching pattern had a mean of 1.6 MMB, $p = 0.765$.

A single MMB was observed in 41 cases (54.7%), 2 MMB — in 29 cases (38.7%), 3 MMB — in 4 cases (5.3%) and 4 MMB in one case (1.3%).

Depending on the branching pattern a variable number of the marginal mandibular branch was determined (Tab. 1). IGFV = 1.403; df = 6; $p = 0.226$.

All the parameters of the head, including the cephalic index, were statistically significant $p < 0.05$ (Tab. 2).

The numerical variability of the marginal mandibular branch depending on the cephalometric type is given in Table 3. IGFV = 1.698; df = 2; $p = 0.190$.

A rare variant of the marginal mandibular branch origin from the temporofacial division of the facial nerve was found in four cases (5.3%) (Fig. 1). Three cases were identified in males (4%) — two of them on the left hemifaces (2.7%) and one case on a right hemiface (1.3%). The last variant was determined on a left female hemiface (1.3%). In three cases of atypical origin the marginal mandibular branch was solitary (Fig. 1A, B). In the fourth case the MMB was double and one of its branches derived from the temporofacial division, while another branch started from the cervicofacial division of the facial nerve, without terminal ramifications (Fig. 1C). The marginal mandibular branch with the origin from the temporofacial division formed a rhomboid connection with the inferior buccal branch, derived from the cervicofacial division (Fig. 1C). A communicating branch, which extended only within the limits of the rhomboid figure, divided it into a quadrangle and a triangle. On the woman's hemiface the MMB was joined to the inferior buccal branch by a triangular connection. A dual origin of the MMB by two roots from each primary division of the facial nerve was identified in (1.3%) of samples. Soon after their origin, both roots of the MMB joined to each other, formed a loop connection and continued distally as a single branch. Various connections between the extracranial branches of the facial nerve were marked out in samples with atypical origin of the MMB (Fig. 1).

Ramus marginalis mandibularis was connected to the *nervus mentalis (alveolaris inferior)* in all the dissected hemiheads. The majority of those connections were linear or fan-like, but also oval, round and elongated loop connections were highlighted (Figure 2A–G). In 2.7% of cases, ansiform-elongated connections around the facial artery and vein, formed by the MMB doubling, were identified (Fig. 2H). *Ramus marginalis mandibularis* in some dissected samples was connected to the *nervus buccalis* (Fig. 2E). The marginal mandibular branch varied topographically in relation to the facial artery and vein (Fig. 2A–H). In 76% of cases, the ramus marginalis mandibularis was located laterally to the facial vessels. The medial position of the MMB was determined in 10.7% of cases, and an intermediate position, between the superficial and deep vascular planes, was characteristic of 13.3% of hemiheads. The topographical peculiarities of the facial nerve in relation to the vascular landmarks was variable, even in bilateral dissections of the same individual.

It should be mentioned that in cases of a double, triple and quadruple MMB, only one of those branches had its course medially to the facial artery and vein, while the other branches were located laterally towards the facial vessels.

DISCUSSION

In Anatomy textbooks and even in *Terminologia Anatomica* [14], the marginal mandibular branch of the facial nerve is described as a solitary branch, nevertheless, its numerical variations were reported by many researchers [1, 2, 5, 11, 13, 16, 22, 30, 36, 37, 47]. The first large and multiaspectual research of the *ramus marginalis mandibularis nervi facialis*, was carried out by Dingman et al. [11], who reported the presence of 1 MMB in 21% of cases, 2 MMB in 67% of cases, 3 MMB in 9% and 4 MMB in 3% of cases. The highest rate of 95.2% of a solitary marginal mandibular branch was obtained by Farahvash et al. [13], followed by Gardetto et al. [16], who revealed a single MMB in 90% of cases and by Martínez Pascual et al. [30], who found out a single MMB in 84.21% of cases. According to Yang et al. [48], the MMB was solitary in 51.7% of cases, double — in 41.4% and triple branch was revealed in 6.9%. Al-Hayani [1], determined 1 MMB in 32% of samples, 2 MMB in 40% and 3 MMB in 28% of samples. Kim et al. [22], reported the following numerical variants: 1 MMB — 28%, 2 MMB — 52%, 3 MMB — 18% and 4 MMB — 2%. Anbusudar et al. [2], obtained a single MMB in 38% of cases, 2 MMB in 50% and each of the 3 MMB and 4 MMB were established in 6% of cases. Balagopal et al. [5] determined the presence of a single MMB in 79.7% of cases, 2 MMB in 12.9%, 3 MMB in 6.9%, 4 MMB in 0.5%. Different results were obtained by Savary et al. [36], who reported presence of 3 MMB in 72.7%, and a double MMB was found in 27.3% of cases. In the research conducted by Kim et al. [22] and by Anbusudar et al. [2], the highest rate was obtained for a double MMB, while Balagopal et al. [5] reported prevalence of a single marginal mandibular branch of the facial nerve. Saylam et al. [37], determined 2 MMB in 62% of cases, 3 MMB in 34% and in 4% of cases the marginal mandibular branch had a plexiform arrangement, of which in one case, it was initially divided into two branches and only the upper branch ended by a plexiform structure. Das et al. [9] reported a single MMB in 84% of cases, 2 MMB in 14% cases and 3 MMB in 2% of cases. In our study, *ramus marginalis mandibularis nervi facialis* in males varied numerically between 1–3 branches, and in females the maximum number was 4 MMB. A single MMB was revealed in 54.7%, 2 MMB in 38.7%, 3 MMB in 5.3% and 4 MMB in 1.3%. The obtained data showed a numerical prevalence of single and double MMB in 93.4% of cases.

A rare variant of the MMB origin from the temporofacial division of the facial nerve was revealed by us at a ratio of 5.3% and in a single case (1.3%) the marginal mandibular branch derived by two roots from each primary division of the facial nerve. Nevertheless, information about uncommon origin of the marginal mandibular branch from the temporofacial division of the facial nerve is scarcely reported in the specialized literature [24].

In order to decrease the iatrogenic impact in surgery of the marginal mandibular branch, Dingman et al. [11], highlighted certain specific features of its course in relation to the mandibular margin. The topographical peculiarities of the MMB towards adjacent blood vessels were elucidated by [33, 36, 41]. A supposition that variability of the facial nerve could depend on ethnic groups was made by Sargon et al. [35], but Wang et al. [41], stated that even variation of the *ramus marginalis mandibularis* could be related to ethnicity.

Among the important topographical aspects described by Dingman et al. [11], were interrelations between the MMB and facial vessels. The lateral position of the marginal mandibular branch towards the facial artery and vein was characteristic of 98% of cases. Batra et al. [6] determined the lateral position of the MMB towards the facial vessels in 100% of cases, Wang et al. [41] revealed it in 83% of samples, Kim et al. [22] observed it in 42% of cases and in our study the lateral position was identified in 76% of cases.

According to Kim et al. [22] the medial position of the MMB towards the facial vessels was determined in 4% of cases and only 2% were reported by [11, 41]. In the current study the medial course of the MMB was highlighted in 10.7% of samples.

The intermediate position of the MMB, between the superficial and deep vascular planes, was marked out by Wang et al. [41] in 15% of cases and by Kim et al. [22] in 54% of cases. In our study the intermediate position was characteristic of 13.3% of cases.

According to data reported by Wang et al. [41], in 60% of cases MMB formed one or two connections with the buccal branches (BB), in 12% of cases a single connection with the cervical branch (CB) was noted and in 4% of cases connections with both BB and CB were revealed. Anbusudar et al. [2] found out that in 72% of cases, *ramus marginalis mandibularis* did not form any connections. In 24% of cases connections between the MMB and buccal branches were observed and only in 4% of samples the MMB was connected to the cervical branch. Connections of the *ramus marginalis mandibularis* with the buccal branches were observed by Dingman et al. [11] in 1.5% of cases and by Elvan et al. [12] in 33%, while Marcuzzo et al. [28] reported those connections among the most common. Savary et al. [36], marked out connections between BB and MMB in 50% of cases, between MMB and CB in 27.3% and in 13.6% of cases plexiform connections were revealed. According to Wang et al. [41], a single connection of the *ramus marginalis mandibularis* was registered in 45% of cases, two connections were determined in 13% of cases, and only in 1% of those 120 dissected hemifaces three connections were marked out. Connections of the MMB with the CB were determined in 12% of cases and in 4% of cases MMB was connected to both buccal branches and cervical branch. In 40% of cases MMB did not form any connections. Kim et al. [22] reported absence of connections in 60% of cases. A loop shaped connection around the facial artery was reported by Das et al. [9]. In our study loop-shaped connections around the facial vessels were revealed in 2.7% of cases. Various intraplexual connections of the *ramus marginalis mandibularis* with the buccal branches and with the cervical branch of the facial nerve were marked out by us. Connections with the cervical branch were determined in 24% of cases, among which in 20% of cases there were single connections, in 1.3% connections were double and in 2.7%, triple connections were found [4]. Among extraplexual connections of the MMB were those with the buccal and mental nerves, derivatives of the trigeminal nerve.

Variability of the facial nerve trunk [3], could be the cause of its secondary branches variation, thus, a careful dissection of the MMB and other anatomical structures of the submandibular region is required [18]. The variability of the marginal mandibular branch, of its intraplexual and extraplexual connections [4, 11, 22, 28] along with impossibility of its previsualization [17], is a great impediment for development of a standard algorithm of the submandibular surgical access.

CONCLUSIONS

Despite the increased interest of researchers all over the world, regarding anatomical peculiarities of the *ramus marginalis mandibularis*, the risk of iatrogenic lesions is conditioned by two important aspects: anatomical variability and large number of surgical interventions at that level. The MMB varies depending on the facial nerve branching pattern, gender and cephalometric type. Considering the high range of the marginal mandibular branch variants of number, topographical relationship with the neighboring anatomical structures, connecting and origin variants, a quite careful dissection of the submandibular region is recommended. The risk of iatrogenic lesions of the marginal mandibular branch depends on its anatomical variability and on the number of surgical interventions at that level.

ARTICLE INFORMATION AND DECLARATIONS

Data availability statement

All the data reported in the manuscript are available, if required.

Ethics statement

The research project was approved by the Ethics Committee of *Nicolae Testemitanu* State University of Medicine and Pharmacy of the Republic of Moldova and it was conducted in line with the ethical principles for medical research of the Declaration of Helsinki.

Author contributions

Angela Babuci: conceptualization, resources, methodology, validation, formal analysis, investigation, writing and preparation of the original draft, editing, supervision, project administration. **Silvia Stratulat:** formal analysis, writing and editing the original draft. **Zinovia Zorina:** resources, formal analysis, writing and editing the original draft. **Ilia**

Catereniuc: resources, formal analysis, writing and editing the original draft. **Anastasia Bendelic:** resources, formal analysis, writing and editing the original draft. **Sergiu Calancea:** writing and editing the original draft. **Sofia Lehtman:** writing and editing the original draft. **Gabriela Motelica:** writing and editing the original draft. **Andrei Mostovei:** conceptualization, resources, methodology, validation, formal analysis, investigation, writing and editing the original draft, supervision, project administration.

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Conflict of interests

No competing interests were involved in this study.

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Table 1. Variation of the marginal mandibular branch depending on the branching pattern.

Branching pattern	Mean value ± SD	95% CI
Type I	1.2 ± 0.43	1.0–1.4
Type II	1.5 ± 0.52	1.1–1.8
Type III	1.6 ± 0.63	1.3–2.0
Type IV	1.5 ± 0.52	1.1–1.8
Type V	1.3 ± 0.50	0.8–1.7
Type VI	1.9 ± 0.95	1.4–2.4
Type NI	1.7 ± 0.82	1.0–2.3

CI— confidence interval; SD — standard deviation.

Table 2. The mean values of the head parameters.

	Length of the head	Width of the head	Cephalic index
Males	195.5 mm	150.3 mm	76.9
Females	188.0 mm	147.2 mm	78.3
Difference	7.5	3.1	–1.4
p-value	$p < 0.001$	$p = 0.001$	$p = 0.004$

Table 3. Variation of the marginal mandibular branch depending on the cephalometric type.

Cephalometric type	Mean value ± SD	95% CI
Mesocephalic type	1.5 ± 0.68	1.3–1.6
Brachycephalic type	1.6 ± 0.52	1.3–2.0
Dolichocephalic type	1.9 ± 0.60	1.5–2.3

CI — confidence interval; SD — standard deviation.

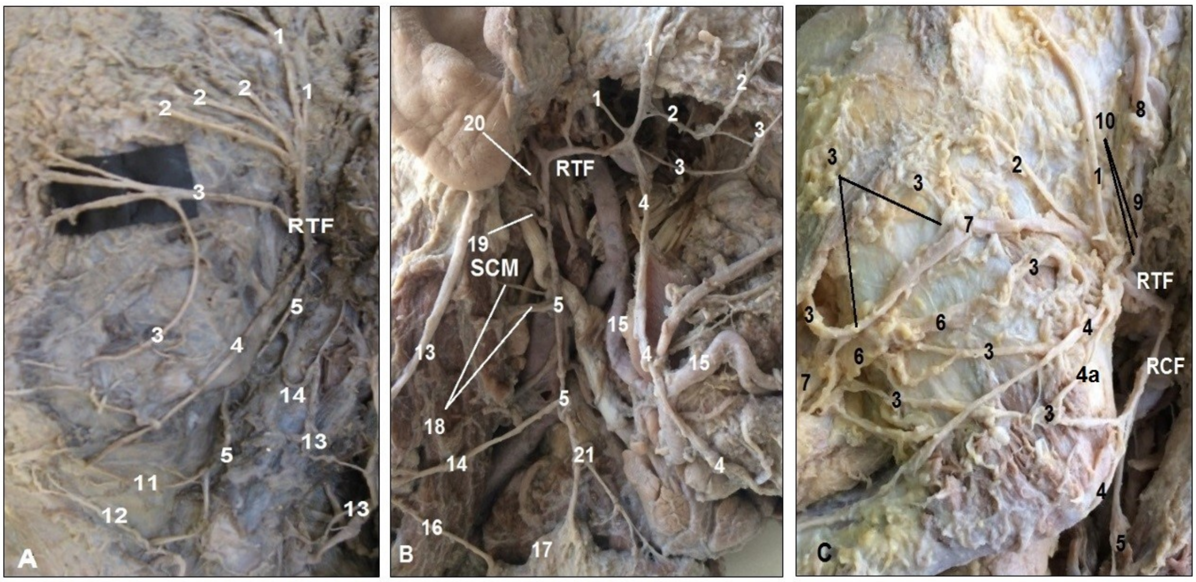

Figure 1. Atypical origin of the marginal mandibular branch from the temporofacial division of the facial nerve. RTF — *ramus temporofacialis*; RCF — *ramus cervicofacialis*; SCM — *musculus sternocleidomastoideus; 1 — rami temporales; 2 — rami zygomatici; 3 — rami buccales; 4 — ramus marginalis mandibularis; 4a —* connecting branch between the *ramus marginalis mandibularis et ramus buccalis inferior; 5 — ramus cervicalis; 6 — ductus parotideus; 7 — arteria transversa faciei; 8 — arteria temporalis superficialis; 9 — nervus auriculotemporalis; 10 —* connection between *nervus auriculotemporalis* and *ramus temporofacialis; 11 —* upper connection between *ramus cervicalis et ramus marginalis mandibularis; 12 —* lower connection between *ramus cervicalis et ramus marginalis mandibularis; 13 — nervus auricularis magnus; 14 —* connection between *ramus cervicalis et n. auricularis magnus; 15 — arteria facialis; 16 — nervus transversus colli; 17 —* connection between *ramus cervicalis* and *nervus transversus colli; 18 —* twigs from *ramus cervicalis* to the *musculus sternocleidomastoideus*; *19 — ramus digastricus; 20 — ramus auricularis posterior; 21 —* bifurcation of the *ramus cervicalis.*

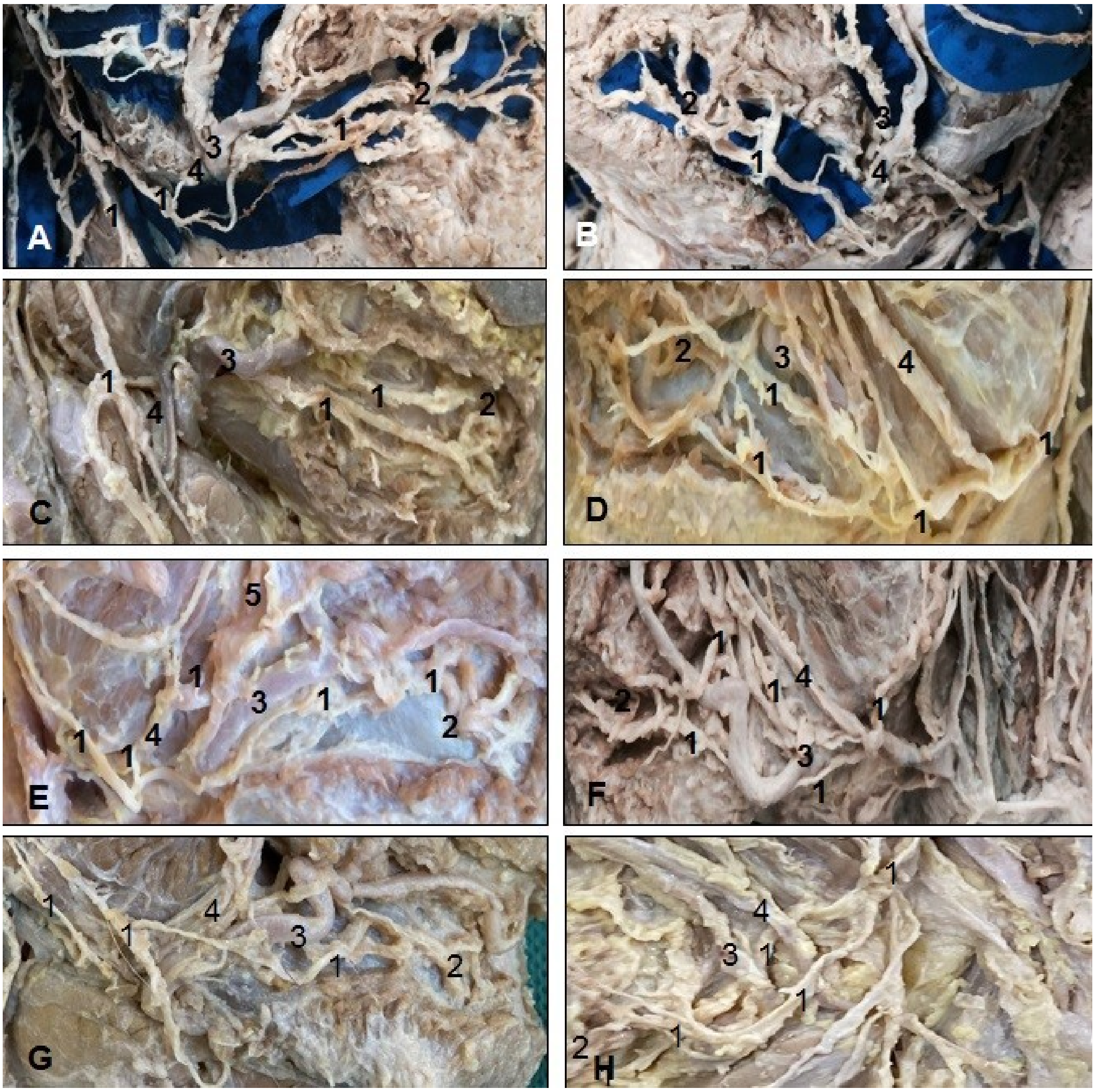

Figure 2. Topographical relationships of the *ramus marginalis mandibularis* with the facial vessels and *nervus mentalis*. 1 — *ramus marginalis mandibularis*; 2 — *n. mentalis (alveolaris inferior)*; 3 — *a. facialis*; 4 — *v. facialis*; 5 — *n. buccalis*.