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Case Report

A case report of the abnormal branching pattern of the facial nerve and its relationship to the posterior auricular artery

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ABSTRACT

Variation of the facial nerve accompanying with vascular variation was encountered on the left side of a male cadaver during the routine dissection. Facial nerve gave off five main branches instead of typically bifurcated pattern. On the other hand its trunk was pierced by the posterior auricular artery. In the present case, a unique branching pattern of the facial nerve and its variative relationship with posterior auricular artery were discussed regarding clinical aspects and embryological development. We suggest that the artery piercing the nerve trunk significantly increases the risk of iatrogenic injury of facial nerve. Different branching patterns and anastomoses may result in unexpected functional consequences of mimetic muscles after damage of nerve branches. Therefore, awareness of the variations of the facial nerve and its branches are clinically important to decrease relevant complications.

1. Introduction

Facial nerve (FN) is the 7th cranial nerve that carries motor, sensory and parasympathetic fibers. It is responsible for the motor innervation of mimic muscles in addition to muscles which develop from second branchial arch. It carries the taste sense of the front 2/3rd of the tongue and general sensory input in certain parts of the ear. It is responsible for parasympathetic innervation of lacrimal, nasal, submandibular, sublingual and minor salivary glands. It also carries proprioceptive sensory input of the innervated muscles.[3,9]

Facial nerve exits the skull base from stylomastoid foramen. After a short run, it branches into two main branches between superficial and deep lobes of parotid gland as temporofacial and cervicofacial divisions. Those divisions also split to five terminal branches as temporal, zygomatic, buccal, marginal mandibular and cervical; forming the parotid plexus. Those branches innervate the facial mimic muscles.[3,9]

Posterior auricular artery (PAA) emerges from external carotid artery, courses between parotid gland and stylomastoid foramen and continues between mastoid process and auricula. It supplies digastric, stylohyoid and sternocleidomastoid muscles, and parotid gland in the neck region. It also nourishes the relevant parts of auricula and scalp in addition to facial nerve, tympanic cavity, mastoid antrum air-cells and semicircular canals via stylomastoid artery which arises from PAA in 1/3rd of the cases.[3,9]

In this study, a variative branching pattern of the FN that directly gave off five main branches was presented. That FN trunk was also pierced by PAA.

2. Case Report

During the facial dissection of a formalin-fixed 45-year old male cadaver in anatomy department, variation in branching pattern of FN and its relationship to PAA were detected on the left side.

Exiting from stylomastoid foramen, FN ran 13.61 mm and then splitted to five main branches in the parotid gland and lateral to the retromandibular vein. The first superior branch splitted to the temporal, zygomatic and buccal terminal branches. The second main branch joined the buccal branch which separated from the first branch with a couple of anastomoses. The third branch divided into two parts. One of them lay on the surface of buccal fat pad as buccal branch, and the other continued as the marginal mandibular branch. The fourth main branch joined the marginal mandibular branch after a short run. The fifth main branch divided into two parts. First part joined the marginal mandibular branch

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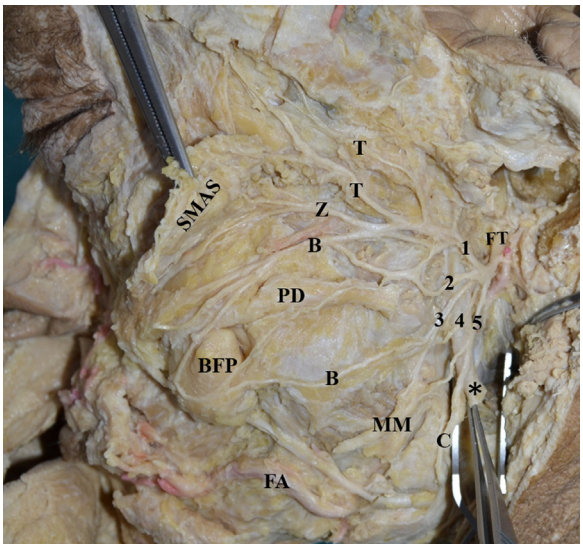

Fig. 1. Variative branching pattern of facial nerve. It divides into five main divisions instead of two in the parotid gland. FT: Facial nerve trunk, *: Retromandibular vein, T: Temporal branch, Z: Zygomatic branch, B: Buccal branch, M: Marginal mandibular branch, C: Cervical branch, 1-5: indicates the branches of facial nerve from temporal to cervical branches, SMAS: Superficial muscular aponeurotic system, PD: Parotid duct, BFD: Buccal fat pad, FA: Facial artery.

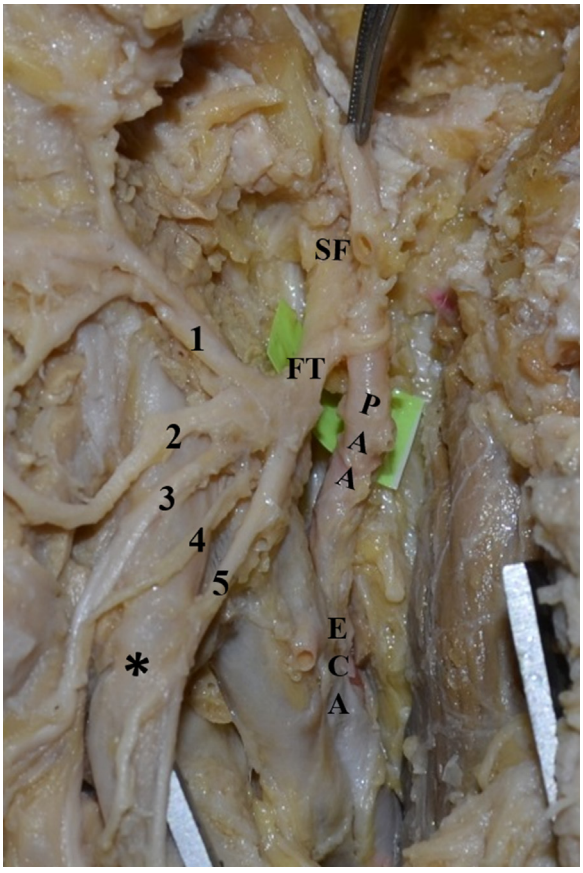

Fig. 2. Photo showing especially the branching point of the facial nerve and the posterior auricular artery piercing the facial nerve trunk in its half length. SF: Stylomastoid foramen, FT: Facial nerve trunk, PAA: Posterior auricular artery, ECA: External carotid artery, *: Retromandibular vein.

whereas the other continued as the cervical branch inferiorly, anterior to the retromandibular vein (Fig. 1).

Posterior auricular artery, emerged from external carotid artery, pierced the FN trunk and continued upwards on its normal course. The distance between stylomastoid foramen and the point pierced by the PAA on the FN trunk was measured as 7.71 mm (Fig. 2).

Right side of the cadaver's face was not dissected because of the trauma and previous dissections on the region.

3. Discussion

During the 4th and 5th weeks of embryological development; FN develops from 2nd pharyngeal arch and innervates the structures developed from the same arch. The second aortic arch pair is seen on the middle of the 4th week. They cross the second branchial arch and form stapedial and hyoid arteries. In addition, the origin of external carotid artery is found to be sprout from 2nd aortic arch. PAA is a branch that reaches to the ear that emerges from external carotid artery [4,6]. The structures developed from 2nd brachial arch and the arteries differentiated from 2nd aortic arch reach to the relevant region around the 4th week together. During this process, some erroneous developmental differentiations of FN and PAA might be responsible for the variations presented in this case report.

Facial nerve is one of the most important structure during surgeries in face, neck and especially in parotid gland. FN paralysis is the most dangerous complication of the parotid surgery and reported to be between 1–20%.[8] Radiological imaging procedures during preoperative period supply insufficient information about the anatomical course of FN.[1] In textbooks; the FN is generally accepted to bifurcate into two main branches.[3,9] Trifurcation pattern is also defined in the literature.[10] However, no data was encountered in the literature regarding the FN which splitted to five main branches as presented in this case. Therefore, branching pattern of FN and classification of its branches does not fit into the Katz-Catalona and Davis et al.'s classifications which are commonly used.[10]

The branching pattern of FN and its variations are important while choosing the right surgical technique. Branches of FN and facial vascular structures are crucial in all kinds of facial surgical operations, especially in parotid surgery and face-lifting operations. Moreover, arteries of parotid region can be used as landmark during surgical approach. Also, accidental hemorrhage of these structures during cauterization might increase the iatrogenic injuries of FN.[1,2,5,7]Variative relationship between the FN and the vascular structures at its vicinity increases such kind of complications

Consequently, the FN pierced by PAA is very important as it significantly increases the risk of nerve injury. Awareness of anatomic variations of FN and its branches are clinically important. Different branching patterns and anastomoses of FN may result in unexpected functional consequences of mimetic muscles after damage to nerve branches.

Conflict of interest

None.

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