

Unusual Origin of the Ascending Palatine Artery: a Case Report with Clinical Importance

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ABSTRACT

Introduction: the knowledge regarding vascular anatomical variants is important to understand and reduce possible accidents and complications on clinical and surgical procedures. The present study reports an unusual case of the ascending palatine artery originating from the lingual artery and discusses possible anatomical and clinical repercussions.

Case Report: during a routine dissection of a hemiface from an adult male individual it was observed that the facial and lingual arteries originated from a short thyrolingual trunk. Then, the lingual artery emitted the ascending palatine artery, with an uncommon route towards the soft palate, also emitting tonsillar branches, which were not identified, as usual, on the facial artery.

Conclusion: this variation may be important for otolaryngologists, vascular, head and neck, and maxillofacial surgeons, since it may cause accidents and complications on procedures such as tonsillectomies, Le Fort I osteotomies and palatoplasties.

Keywords: Anatomical variation; Arteries; Soft palate; Palate; Palatine tonsil.

Introduction

The ascending palatine artery (APA) often originates from the facial artery, in the vicinities of this vessels' origin from the external carotid artery. Then, it runs superiorly between the styloglossus and stylopharyngeus muscles, and, when it reaches the lateral aspect of the pharynx, it ascends between the superior pharyngeal constrictor muscle and the medial pterygoid muscle. Close to the levator veli palatine muscle the APA emits two branches¹. One of these branches follows this muscle and ends in an anastomosis with its contralateral homonym as well as with branches from the descending palatine artery, thus irrigating the soft palate. The other branch perforates the superior pharyngeal constrictor, irrigates the palatine tonsils and the auditory tube, anastomosing with the tonsillar and ascending pharyngeal arteries^{1,2}.

Authors have been naming the branches from the APA as "anterior" and "posterior" branches^{3-5t}. Cho *et al.*⁴ demonstrated that these branches were found simultaneously in 40% of dissected specimens. However, 25% presented the anterior branch, only, and 35% the posterior branch, only.

In addition, it has been described that the APA and the descending palatine artery represent the main sources of blood supply to the soft palate, palatine veil muscle, levator veli palatine muscle, palatine uvula, palatopharyngeal muscle and palatoglossus muscle, also contributing for irrigation of the palatine tonsils and auditory tube¹⁻⁹. Hence, the anatomical knowledge

regarding this blood vessel and possible variation on its branches, route or origin is essential for the success of surgical procedures performed between the body and angle of the mandible, the posterior region of the maxillae, the palate, and the pharynx, such as tonsillectomies, Le Fort I osteotomies and palatoplasties.

The present study reports an unusual case of the APA originating from the lingual artery, which, by its turn, originated from a short linguofacial trunk, found on a hemiface from an adult male individual. Moreover, we discussed possible anatomical and clinical repercussions.

Case Report

During a routine dissection performed by student monitors of the Head and Neck Anatomy discipline (Dental School, Federal University of Alagoas, Maceió, Alagoas, Brazil), a hemiface of an adult male individual from the Descriptive and Topographic Human Anatomy Laboratory of the Federal University of Alagoas, presented an uncommon origin of the APA. In addition, an anatomical variation on the anterior collateral branches of the external carotid artery was also observed.

The hemiface was photographed for registration purposes as well as for demonstration of vascular anatomical variations and for measurement of vessels lengths using a digital caliper (0-150 mm, error +/- 0,02 mm, MTX®, Tools World, Guarulhos, SP, Brazil - MTX-

316119). Three measures were performed by a single researcher, as follows:

- D1: length of the linguofacial trunk;
- D2: length of the trunk of the lingual artery (i.e. the portion with no branches, from its origin to the emission of the first branch);
- D3: distance between the origin of the APA from the lingual artery to the origin of the first tonsillar branch.

On the dissected hemiface, the lingual and facial arteries originated from a short linguofacial trunk, with 2.91mm of length (D1). After a route of 11.06mm (D2), the lingual artery emitted, unusually, the APA (Figures 1 and 2). This artery ran cranially close to the lateral aspect of the superior pharyngeal constrictor muscle and then divided into a medial branch to irrigate the soft palate and a branch with ascending trajectory to the skull base (Figure 1). The APA, before its division, emitted a few tonsillar branches which perforated the superior pharyngeal constrictor muscle to irrigate the palatine tonsil (Figure 1). The first tonsillar branch originated from the APA 12.79mm (D3) from its origin on the lingual artery (Figure 2).

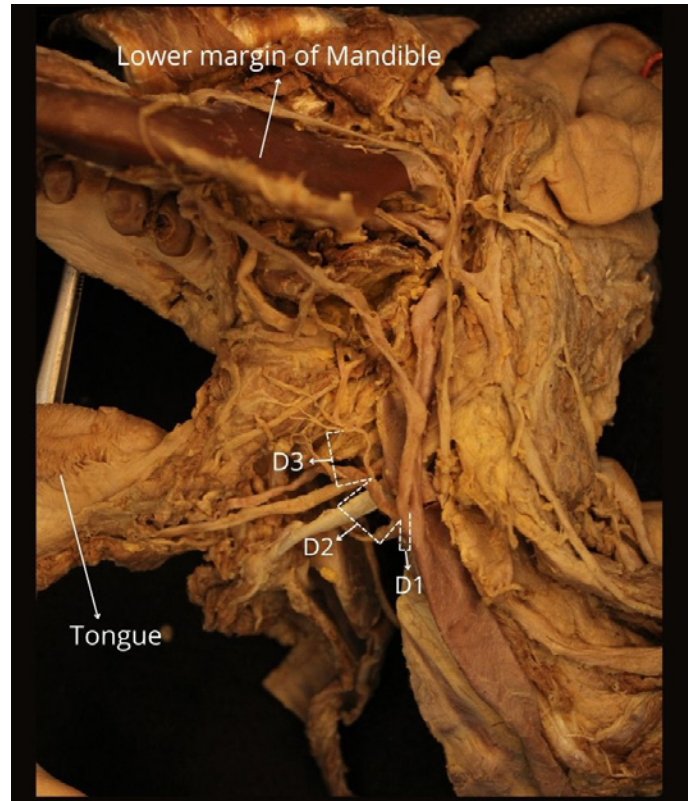


Figure 2. Lateral view of human hemiface. D1: 2.91mm; D2: 11.06 mm; D3: 12.79 mm.

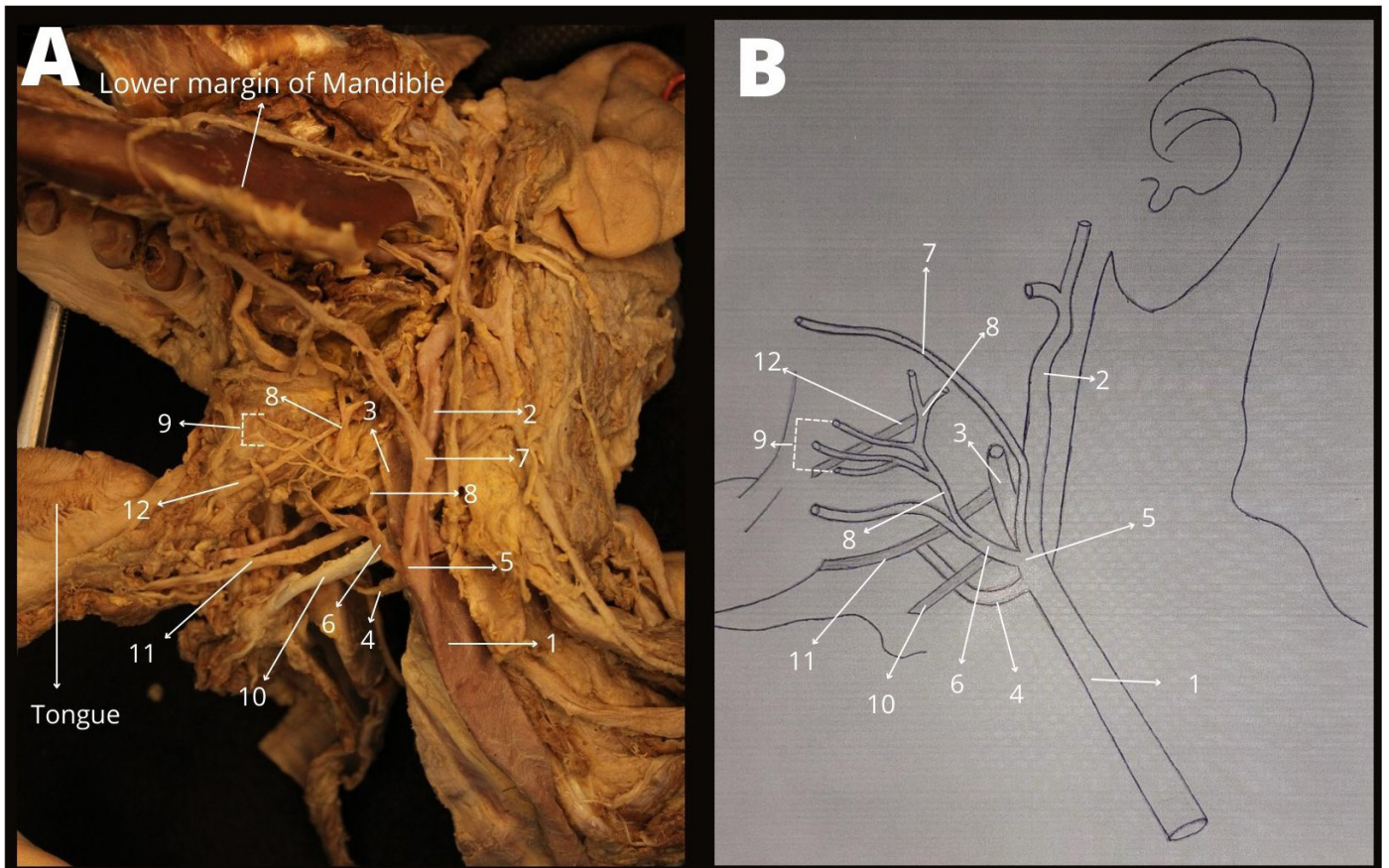


Figure 1. Human hemiface. (A) Lateral view showing: 1 – common carotid artery; 2 – external carotid artery; 3 – internal carotid artery; 4 – superior thyroid artery; 5 – thyrolingual trunk; 6 – lingual artery; 7 – facial artery; 8 – ascending palatine artery; 9 – tonsillar branches of the ascending palatine artery; 10 – tendon of the stylohyoid muscle; 11 – hypoglossal nerve; 12 – glossopharyngeal nerve. (B) Schematic drawing of the hemiface presented on Figure 1.A showing the unusual origin of the ascending palatine artery. Structures indicated with numbers 1-9 are the same on Figure 1.A.

Discussion

Anatomical variations on the collateral branches of the external carotid artery are well addressed on scientific literature¹⁰⁻¹³. A recent article studied 193 human cadavers and showed that most of the anterior collateral branches (i.e. superior thyroid, facial, and lingual arteries) originated independently from the external carotid artery in 80.83% of cases. Researchers also demonstrated that 17.62% of specimens presented a linguofacial trunk, 1.04% showed a thyrolingual trunk, and only one case (0.52%) showed a thyrolingualfacial arterial trunk¹¹.

In another study performed by Brazilian researchers, the linguofacial trunk occurred in 20% of studied cadavers on the right side and 24% on the left side; however, the existence of bilateral trunks was observed in two cadavers, only (4.9%)¹².

On the other hand, the origin of the APA from the lingual artery is little addressed on scientific literature. Maistry *et al.*¹⁴ studied the irrigation of the soft palate in cadavers of 30 human fetuses and 20 adult individuals, and showed that the APA presented different origins, including the facial artery (63%), external carotid artery (31%), lingual artery (4%), and occipital artery (2%). Nevertheless, on this article, researchers only presented images of the traditional origin of the APA from the facial artery. It is noteworthy that the non-presentation of images that demonstrate clearly and precisely the studied structures is considered, by the Evidence-Based Anatomy principles, a reporting bias, according to the Domain 4 of the Anatomical Quality Assessment (AQUA) tool, used to assess the quality of anatomical studies included in systematic reviews and meta-analyses^{15,16}.

Other study reported a case of the APA originating from the lingual artery⁵. On this case report study, researchers described that a common trunk originated from the lingual artery and soon divided into a submandibular branch and the APA. The tonsillar artery, on the other hand, originated from the facial artery, corroborating with traditional descriptions^{1,2,7,8,17}.

On the present study, the facial and lingual arteries originated from a short linguofacial trunk. Soon after, the lingual artery originated the APA, which sent a few tonsillar branches. Thus, the report here described is different from the ones on current scientific literature. Moreover, the facial artery did not emit the tonsillar artery. Hence, the APA was the main source of irrigation of the palatine tonsil, which could result in a higher risk of accidents and complications due to the obstruction of this vessel during surgical procedures on the region of the soft palate and tonsils.

Understating the anatomy of the APA has

considerable clinical importance, since this vessel represents one of the main sources of irrigation of the soft palate and participates on the irrigation of the palatine tonsil^{3-6,14}. Therefore, eventual variations of this vessel may lead to interurrences, such as hemorrhages and tissue necrosis in procedures such as tonsillectomies, Le Fort I osteotomies and palatoplasties^{5,18-22}.

Previous studies have been demonstrated that the Le Fort I osteotomy may cause rupture of the descending palatine artery or of its branches (greater and lesser palatine arteries)^{16,17,21}. On such a situation, the ascending palatine and pharyngeal arteries are the main blood vessels responsible for the maintenance of blood perfusion of the Le Fort I segment^{19,23}.

Bruneder *et al.*²¹ analyzed the irrigation of the palate after Le Fort I osteotomy in 30 cadavers from adult individuals, demonstrating that the pattern of vascularization was observed in 90% of specimens, in which the APA and the ascending pharyngeal artery irrigated the area/segment determined by the Le Fort I osteotomy. However, on 10% of specimens, the irrigation of the segment was carried out by the ascending pharyngeal artery. According to these researchers, this particular arterial anatomy may be at a higher risk of hypoperfusion and necrosis after surgery.

Other study reported a case of unilateral necrosis of the mucosa that covers the hard palate, which occurred after embolization of the APA. On this case, the patient was a victim of a car accident and presented a Le Fort I fracture pattern, as well as several nasal fractures. The patient underwent open reduction and presented recurrent epistaxis, even after ligation of the sphenopalatine artery. Angiography revealed a pseudoaneurysm of the APA on the left side. The embolization of this vessel was then performed, and the epistaxis was successfully controlled. However, two weeks after the embolization, a necrosis on the palatine mucosa on the left side was observed²⁰. As was previously described, the probable anatomical explanation for the reported case is that the Le Fort I fracture pattern may injured the branches of the descending palatine artery, and the irrigation of the fractured segment was maintained by the ascending palatine and pharyngeal arteries²¹. Consequently, the embolization of the APA restricted the irrigation of the palate, causing necrosis of the mucosa. In such a situation, one may also hypothesize that the ascending pharyngeal artery alone is not able to maintain the blood supply of the palate.

The anatomical knowledge regarding the blood vessels of the palate is also important for palatoplasties performed for corrections of palatine clefts. The occurrence of palatal necrosis, despite being rare, may occur after this surgical

procedure²⁴. Vascular anatomical variations, including hypoplasia or absence of the greater palatine vessels and injury to the greater palatine neurovascular bundle are considered as possible risk factors²². Since the APA establishes an anastomosis with branches from the descending palatine artery, including the greater palatine artery^{4,5,14}, it may contribute for the maintenance of blood supply of the surgical flap on the palatine region.

Conclusion

The ascending palatine artery is the main source of irrigation for the soft palate, establishing anastomosis with branches from the descending palatine artery, ascending pharyngeal artery, and tonsillar artery. The knowledge regarding variants of this blood vessel is important for the planning as well as for the understanding of possible accidents and complications on surgical procedures such as tonsillectomy, Le Fort I osteotomy, and palatoplasty.

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