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POSTERIOR SUPERIOR ALVEOLAR ARTERY – AN ANATOMICAL AND CLINICAL CASE REPORT

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Abstract
During a routine dissection of infratemporal fossa on educational purposes abnormality of posterior superior alveolar artery was found. This abnormality stays in relation to atypical anatomy of the facial artery in this cadaver. Such an unusual course of branches may have a profound meaning during surgery in the infratemporal and facial area and might have educational value. A case report was conducted using routine dissection techniques, and the material was accessed through a local informed donation program.

Running title: Posterior superior alveolar artery

Keywords: posterior superior alveolar artery, maxillary artery, cadaver, dissection, facial arterial supply

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Introduction

Posterior superior alveolar artery (PSAA) is one of the maxillary artery branches from pterygopalatine part of this vessel. PSAA have extraosseous and intraosseous branches [1], which may anastomosis at anterior wall of maxilla, in most cases supply molar teeth and gingiva around them, intraosseous branch may supply maxillary sinus and molar teeth and extraosseous supplies mucosa and gingiva in this region [1].

Anatomical abnormalities of PSAA might be crucial in facial surgery to prevent accidental hemorrhage during operation [2].

Case report

Dissection was performed on male patient 71 years of age with unknown cause of death. The body of the deceased had been obtained through the university's conscious donation program. During her life, the donor had given notarized consent to participate in the university's conscious donation program and had given fully informed consent to donate his body after death to the Division of Anatomy of our University.

The anatomical access to infratemporal fossa was made in an almost traditional manner but the parotid gland, parotid duct and branches of facial

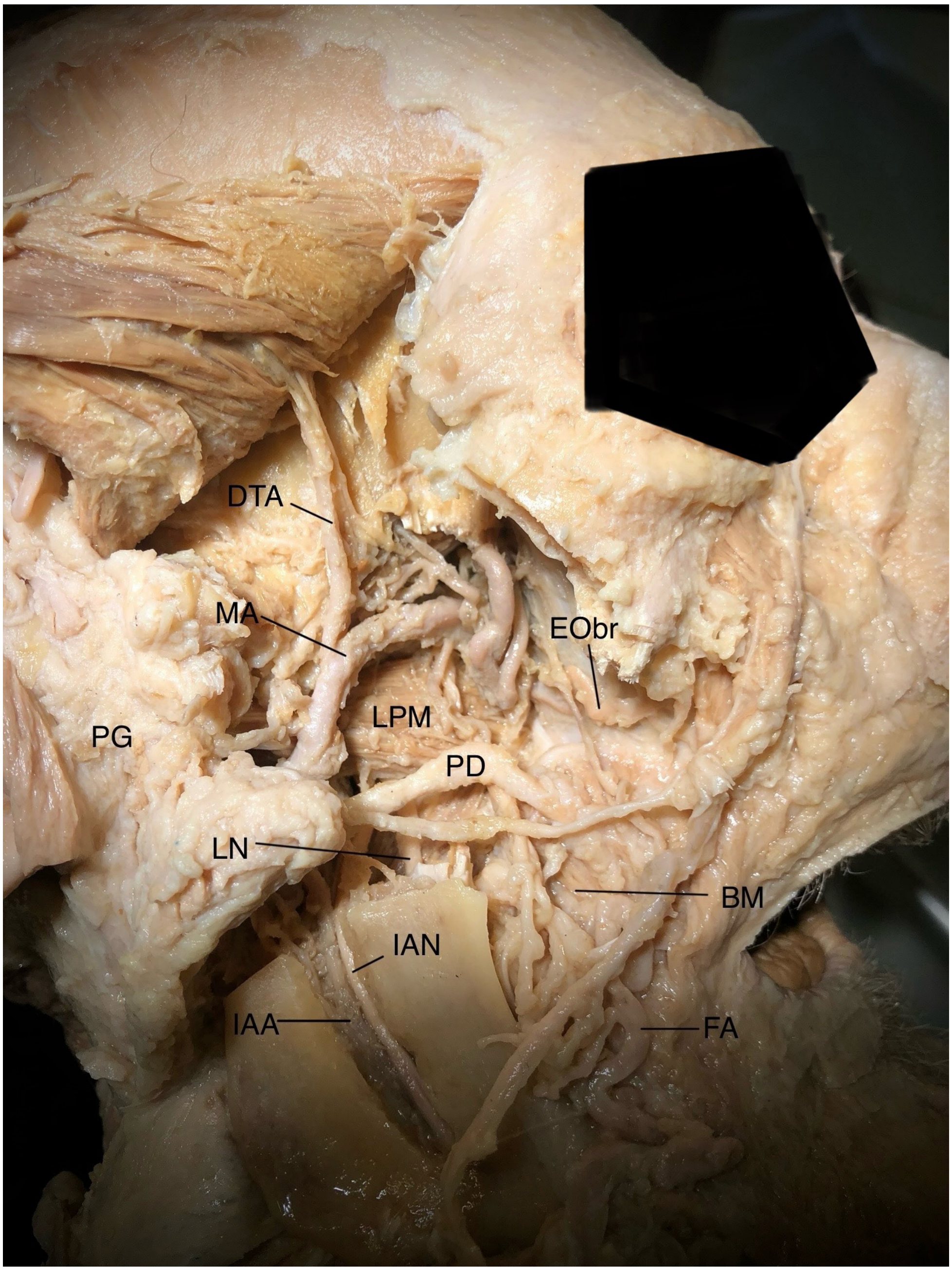

FIGURE 1 General view of the dissected specimen. MA – maxillary artery, PG – parotid gland, PD – parotid duct, BM – buccinator muscle, FA – facial artery, LPM – lateral pterygoid muscle, DTA – deep temporal artery, EObr – extraosseous branch of posterior superior alveolar artery, LN – lingual nerve, IAN – inferior alveolar nerve, IAA – inferior alveolar artery

nerve were preserved. Masseter muscle was dissected from apical approach and superior attachment was cut. Ramus of mandible was dissected in ⅗ of its length, cut was oblique with apical part on the anterior aspect of ramus. As a result, infratemporal fossa was feasible to present (**Fig. 1**). Patients also have atypical facial artery with superior labial branch as its main branch with residual angular artery, lack of lateral nasal artery and branch toward the buccal region (**Fig. 2**) [3].

Posterior superior alveolar artery

PSAA in cadaver have typical intraosseous branch and refined extraosseous branch, which have superior course right under the zygomatic arch and is continuous at the anterior aspect of maxilla in contrast to typical course which is significantly more inferior [1].

Diameter of the extraosseous branch (EObr) was estimated to be around 3.1 mm. At anterior aspect of maxilla gives one stronger branch toward facial region (superior branch from EObr) which goes under musculus orbicularis oculi and musculus levator labii superioris. In this area we also observed a branch which communicates with the final branch of the infraorbital artery (**Fig. 3**).

We assume that this atypical course of the PSAA is related to residual angular artery and the fact that the facial artery cannot supply in an effective manner most areas of the face due to its atypical anatomy. Subsequently the extraosseous branch of the PSAA provides arterial supply for the infraorbital region to aid other facial vessels.

Discussion

Available scientific data unequivocally indicate the increasing number of observed varieties and anatomical variations [4].

The presence of anatomical variability has been demonstrated in vivo anatomical examinations as well as during studies based on anatomical specimens [5-7]. The surge in anatomical variations remains a phenomenon whose causative factors elude a definitive understanding. Undoubtedly, the strides made in medical science, coupled with the continual refinement of anatomical skills, contribute significantly to this phenomenon. Yet, an exploration

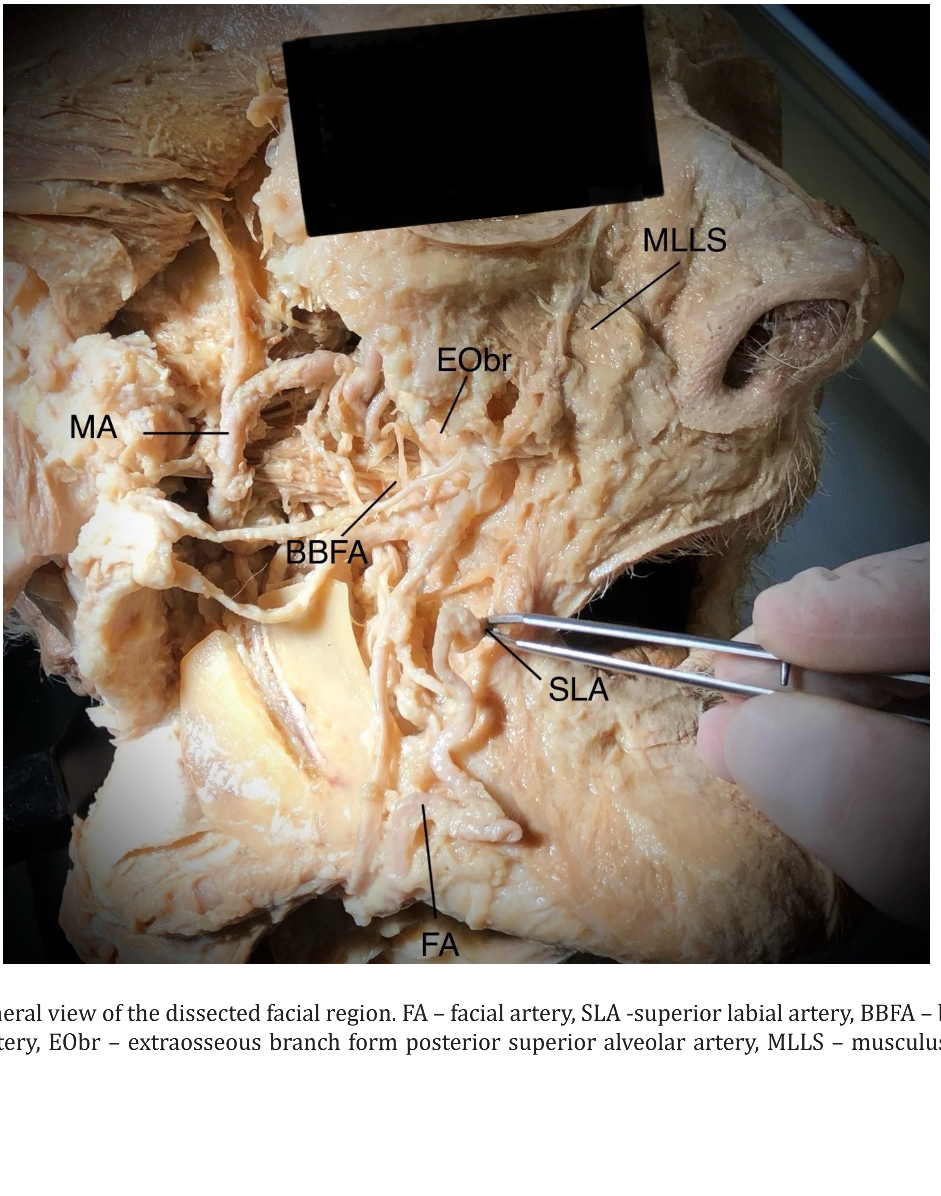

FIGURE 2 General view of the dissected facial region. FA – facial artery, SLA -superior labial artery, BBFA – buccal branch from facial artery, EObr – extraosseous branch form posterior superior alveolar artery, MLLS – musculus levator labii superioris

FIGURE 3. Precise view on extraosseous branch of posterior superior alveolar nerve. LPM – lateral pterygoid muscle, ZA – zygomatic arch, EObr – extraosseous branch of posterior superior alveolar artery, IObr – interosseous branch of posterior superior alveolar artery, SbrEO – superior branch of extraosseous branch

of alternative factors linked to human evolution is warranted.

Consideration must be given to evolutionary aspects, where mutations and natural selection are believed to be pivotal directional forces shaping anatomical diversity [8]. The authors posit that the observed variability may stem from a singular mutation disrupting or altering fetal development processes. Notably, alterations in embryogenesis have been demonstrated to impact the formation of anatomical variants, particularly in the case of vasculature [9]. Determining whether single mutations can significantly contribute to heightened vascular variability in humans is challenging.

Scientific evidence suggests that mutations arise inevitably due to suboptimal chemical bonds between DNA bases. The prevalence of mutations in humans is gradually rising, influenced by increased exposure to mutagenic agents and advancements in healthcare [10]. Overall, the impact of natural selection on contemporary populations is diminishing, largely attributed to advancements in modern medicine. The extent of this decline, however, can vary among countries based on distinct levels of sanitation, medical interventions, and public health measures.

Despite these shifts, natural selection remains a prominent evolutionary force, shaping alterations in gene frequencies within populations through the mechanisms of differential fertility and mortality over successive generations [11]. This reduction in evolutionary pressure leads to an upsurge in mutations and developmental disorders.

Consequently, this phenomenon may manifest as heightened variability and altered symmetry, marking a departure from historical norms [10]. Certainly, this issue requires further observation and analysis of many published case reports. It is noteworthy that the increasing number of anatomical variations makes the work of a physician – especially a surgeon – increasingly difficult [12].

Indeed, abnormal nerves or vessels can expose the patient to complications that are difficult to predict. This can increase the cost of treatment as well as compromise the quality of healthcare.

Conclusions

The anatomy, science considered to be static, still can surprise us in most unusual ways. We cannot find a new maxillary artery, but we must be mindful of its variations, like the discussed posterior superior alveolar artery.

Anatomy of any structure in human body cannot be defined in strict terms and that is what we can see every day in dissection room. We believe that this paper, among few others written by our team, can show the interesting and changing world of anatomy and shed a new light on modern consensus on what the, so called, normal anatomy is.

Ethical approval

The human research adheres to national regulations, institutional policies, and the Helsinki Declaration. All bodies were obtained through an informed donation program, with each deceased individual providing notarized consent as per the local bioethics committee's chairman. Committee approval is not required due to individual consents. The authors hold a positive opinion (No. 135/2023) from the local bioethics committee for anatomical research.

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Conflict of interest

The authors declare no conflict of interest.

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