Case Report

A CASE OF ABRUPT TERMINATION OF THE FACIAL ARTERY WITH UNUSUAL MULTIPLE ARTERIAL ANASTOMOSES: CLINICAL IMPLICATIONS IN THE HEAD AND NECK

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ABSTRACT

Having up-to-date knowledge of the variability in facial artery topography is an essential starting point in performing certain surgical and radiological procedures on the head and neck (e.g. oromucosal reconstruction flaps, transarterial embolization). We report a unique case with: (1) the left facial artery truncating as an atypical inferior labial artery, (2) the left anterolateral face being perfused by unusual arterial collaterals derived from the right superior labial, left infraorbital and left dorsal nasal arteries, (3) the transverse facial artery not being one of the perfusing collaterals, and (4) the right submental artery piercing the mylohyoid muscle and entering the oral cavity. The embryologic basis of this atypical vascular pattern is discussed. Discovery of a highly atypical facial artery highlights the importance of performing a thorough pre-operative vascular evaluation to prevent iatrogenic injuries and complications before any surgical or therapeutic procedure.

KEY WORDS: Facial artery variation - Infraorbital artery - Labial arteries - Dorsal nasal artery.

INTRODUCTION

The facial artery (FA) is the major vessel, in hemodynamic balance with its subordinate vessels, providing blood to the face [1]. The typical FA arises from the external carotid artery (ECA) just superior to the greater cornu of the hyoid bone. It travels a short distance in the suprathyroid region before it gives off the submental artery. It curves superiorly onto the face along the mandible's inferior margin and travels anterior to the masseter muscle. At the angle of the mouth it gives rise to the inferior labial (IL) and superior labial (SL) arteries that supply the lower and upper lips, respectively. The FA ascends obliquely toward the medial canthus of the eye where it branches into the lateral nasal and angular arteries. The latter being the terminal branch of the FA.
The present case report describes an individual whose: (1) left facial artery terminated in an unusual inferior labial artery; (2) left anterolateral face, typically perfused by the FA, was instead supplied by branches of the right superior labial, left infraorbital and left dorsal nasal arteries; and (3) the left side face received no collateral branches from the transverse facial artery. Unrelated to the FA variation, the right submental artery pierced the mylohyoid muscle to enter the oral cavity. A search of the English literature failed to produce a description or illustration similar to this case.

Variations in the branching pattern and termination of the FA have been studied [2-4]. Termination of the FA as the ILA was reported by Koh et al. [2] in 5.5% of cadavers dissected. Lohn et al. [3] found it in 3% (6/201) of cadavers. However, Niranjan [5] report no cases in 25 cadavers. Interestingly, Loukas et al. [4] reported a rudimentary FA (classified as Type E) in 1.4% of 142 cadavers, and the terminal end of the FA is labeled “inferior labial artery” in their illustration of the Type E pattern. Review of these studies reveals that termination of the FA as the ILA is one of the least common variant patterns. Koh et al. [2] and Loukas et al. [4] proposed classification schemes to describe variable distributions and branching patterns but they did not describe compensatory collateral vessels in cases of FA truncation or atresia. However, Hollinshead [6], Soikkonen et al. [1], Ezure et al. [7] and Tubbs et al. [8] published findings in separate cases where an enlarged TFA was found with an absent FA. Additionally, Hollinshead [6] and Soikkonen et al. [1] described hypoplastic FA cases in which the TFA, dorsal nasal and maxillary branches became prominent.

In the present case, the collateral vessels to the anterolateral face with the truncated LFA followed neither of these compensatory patterns. Collateral distribution was both contralateral and ipsilateral from vessels that included the right superior labial artery, the LIOA and the LDNA. There was no contribution from the TFA or the maxillary artery.
Fig. 1: Photographs of dissections and corresponding line diagrams showing truncated left facial artery with multiple compensatory anastomoses of the left mid-face region (a, b, d, e), and the right submental artery piercing the mylohyoid muscle to enter the floor of the oral cavity (c, f). The arteries of interest were colored using Gimp software.

Typically, the upper lip is supplied by the SLA arising from its respective FA [11, 12]. Magden et al. [13] reported a unilateral origin of the SLA supplying the upper lip in 29% (4/14) of cases, and Tansatit et al. [14] reported unilateral SLA in 23% (6/26) of cases. Furthermore, Tansatit et al. [14] found 100% of the contralateral FAs were normal. In light of Tansatit et al. [14] findings, one might expect the LFA in the present case to be normal. However, the LFA was not normal and, in fact, was truncated well inferior to the angle of the mouth.

Finally, in the present case, the right FA exhibited variation in the suprahyoid region where the sublingual artery normally supplies the oral cavity. Bavitz et al. [15] reported that 53% (40/76) of hemisected heads with a small, insignificant or absent sublingual artery possessed a large compensatory SMA branch that perforated the mylohyoid muscle to supply the oral cavity. Fujita et al. [16] found the same pattern in 45% (45/100) of hemifaces. In the present case, the RSMA was similar to those described by these authors. Unfortunately, the right sublingual artery was not identified in our dissection.

The embryological basis for the variations seen in the present case is unknown, but experimental studies [17] on vascular development and blood flow demonstrated that flow-related
shear stresses and pressure gradients contribute to the number and position of arterial side branches, the topology of the arterial tree, and the number of existing collaterals. It is likely that a combination of these and other epigenetic factors contributed to the present variation complex.

CONCLUSION

The facial artery and its branches are important in facial reconstruction. Facial surgeries range from localized operations using single branches of the FA [18] to facial transplantation. Knowledge of variations in the facial artery is necessary to optimize procedure outcomes. Additionally, the FA serves as an important vessel for conducting therapeutic procedures, e.g. transarterial embolization to control bleeding from head and neck tumors [19] as well as administration of intraarterial chemotherapeutic agents [20].

Bilateral and unilateral FA variations range from minor branching deviations to complete absence. In all cases, collateral vessels develop reciprocally to ensure adequate perfusion of facial tissues. While FA termination as the inferior labial artery has been documented, it occurs at a low frequency (3-5.5%). The present report describes a face in which the LFA terminates as an atypical inferior labial artery and the collateral vessels compensating for the truncated LFA (the right superior labial, left infraorbital and left dorsal nasal arteries) form a previously undescribed pattern. In addition, the transverse facial artery, which commonly contributes to facial collaterals, was not a contributing collateral vessel. Discovery of a highly atypical facial artery and associated collaterals highlights the importance of performing a thorough pre-operative vascular evaluation prior to any surgical or therapeutic procedure to identify idiosyncratic patterns that, if unrecognized, could increase the risk of iatrogenic injuries and complications.

LIST OF ABBREVIATIONS

FA- Facial Artery
LFA- Left Facial Artery
LILA- Left Inferior Labial Artery
LA- Lingual Artery
RSLA- Right Superior Labial Artery
LIOA- Left Infraorbital Artery
LDNA- Left Dorsal Nasal Artery
RSMA- Right Submental Artery
FAS- Facial Arterial System
T-MAS- Transverse-Maxillary Arterial System

ACKNOWLEDGEMENTS

The authors acknowledge and gratefully thank the individual whose body and tissues were used in this study for the advancement of physician education and patient care.

Conflicts of Interests: None

REFERENCES


