Arterial supply to the floor of the mouth and lingual gingiva

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According to many anatomy textbooks, the blood supply to the mandibular lingual gingiva and the floor of the mouth is derived from the sublingual branch of the lingual artery. Sometimes a variation exists in which the submental branch of the facial artery pierces the mylohyoid muscle to supply this region in addition to or in lieu of the sublingual artery. The purpose of this study was to detail the vascular supply to this region and to delineate the relative contribution and importance of the sublingual versus the submental artery in humans. A large branch of the submental artery that perforates through the mylohyoid muscle was found in 60% of the cases. The sublingual artery was found to be small, missing, or insignificant in 53% of cases. In these 53% of cases, a large perforating branch from the submental artery was present. Consequently, the submental artery can be considered the main arterial blood supply to the floor of the mouth and mandibular lingual gingiva. This study demonstrates the need to change the procedure of extraoral ligation for control of hemorrhage in the floor of the mouth. On the basis of the results of this study, the submental artery or its parent facial artery should first be ligated. Then, if bleeding is not controlled, the lingual artery should be ligated to insure satisfactory hemostasis in this region. (ORAL SURG ORAL MED ORAL PATHOL 1994;77:232-5)

According to many anatomy textbooks, the primary blood supply to the mandibular lingual gingiva and the floor of the mouth is derived from the sublingual branch of the lingual artery.1,4 However, Sicher5 describes a variation in which the submental branch of the facial artery pierces the mylohyoid muscle to supply this region in addition to or in lieu of the sublingual artery. Damage to this region's arterial supply has been described after intraoral biopsy, trauma, extractions, implant placement, and restorative dentistry.6-9 Occasionally, extraoral ligation of the lingual artery has been required for hemorrhage control.10 If, however, the injured artery is in fact a branch of the facial artery, this ligation procedure would be ineffective. The purpose of this study is to describe in greater detail the vascular supply to this region, and to delineate the relative importance of the sublingual versus the submental artery.

MATERIAL AND METHODS

Seventy-four adult human cadavers were used for this study, 52 were men, 22 women. The age ranged from 45 to 92 years with the average age of 73.15 years. All were white with the exception of one Oriental and one African-American. One hundred twenty-four extraoral dissections of the submental and submandibular triangles were made; 50 were bilateral and 24 were unilateral. Cadavers with only unilateral dissections had undergone previous surgery or research on the nonusable side that prohibited their use in the statistics. The submental artery was traced to discern the presence or absence of a large branch that perforated through the mylohyoid muscle. For the purpose of this study, any branch one-third the diameter of the submental artery or larger was arbitrarily defined and recorded as a “large” branch (Fig. 1).

The presence of large branch perforating through the mylohyoid muscle indicated that it played a role in the arterial circulation to the floor of the mouth. When this large branch existed, the size of the submental artery proximal to the large branch was determined. The diameter of the vessel was measured using a needle compass and millimeter ruler. In addition, the point of perforation through the mylohyoid muscle was measured in millimeters from the menton. The menton was used as it was easily palpated and near the surgical site.

For the sublingual artery assessment, 38 of the 50 original bilateral specimens were bisected, and dissections of the bilateral floor of the mouth were performed (76 total dissections). Therefore every specimen that had an evaluation of the sublingual artery also had a dissection of the corresponding submental region. Again, previous surgery or research prevented evaluation of the sublingual artery on the remaining heads. The sublingual artery was evaluated and recorded in two groups, (1) normal, and (2) small, insignificant, or missing. The normal group is the traditional description of the sublingual artery that supplies blood to the floor of the mouth. Here the artery originates from the lingual artery at the anterior bor-
Fig. 1. Dissection of the submandibular region. G, submandibular gland; F, facial artery; s, submental artery; p, perforating branch; m, mylohyoid muscle; A, anterior belly-digastric; I, inferior border of mandible.

Fig. 2. Classic lingual artery terminal branches and distribution. M, mandible; E, epiglottis; T, tongue (reflected superior-medially); L, lingual artery; P, profunda lingual artery; s, sublingual artery.

RESULTS
A large branch of the submental artery perforating the mylohyoid muscle was found in 74 of 124 dissections (59.7%). No large branch was found in the remaining 50 dissections (40.3%). In addition, in 69 of 74 (93.2%) of the positive sides, the perforating branch was larger than one half the diameter of the parent submental artery and thus could be considered the terminal branch.

The point at which this branch perforated the mylohyoid muscle was on average 37 mm posterior to the
menton, measured along the inferior border of the mandible (range, 20 to 55 mm, standard deviation, ±8.6).

The floor of the mouth evaluation revealed that 40 of 76 dissections (52.6%) contained a small, insignificant, or missing sublingual artery. The remaining 36 of 76 dissections (47.4%) revealed a normal sublingual artery. In all cases with a small, insignificant, or missing sublingual artery, a large perforating branch of the submental artery was found.

DISCUSSION

The lingual artery is typically the third branch of the external carotid artery. From its place of origin approximately at the level of the hyoid bone, the lingual artery courses anterior; it makes a small loop and passes deep to the hyoglossus muscle. Medial to this muscle, the artery continues anteriorly and superiority. At the approximate area of the anterior border of the hyoglossus muscle, the lingual artery releases the sublingual artery and continues as the profunda (deep) lingual artery, which is the terminal branch and main artery to the body of the tongue. The sublingual artery is situated in the floor of the mouth medial to the sublingual gland and supplies blood to the gland, the mucous membrane of the floor of the mouth, the mylohyoid muscle, the lingual gingiva, and sends small branches into the tongue as well as into the mandible through foramina in the genial tubercle area.11

The facial artery, except when arising as a common trunk with the lingual, is the fourth branch arising from the external carotid artery. After its route through the submandibular gland and before it crosses the inferior border of the mandible, the facial artery gives rise to the submental artery. The submental artery courses anteriorly along the inferior surface of the mylohyoid muscle. The submental artery supplies blood to the submandibular triangle, the anterior belly of the digastric muscle, and the mylohyoid muscle. Some anatomy texts mention that the submental artery anastomoses with the sublingual artery through the substance of the mylohyoid muscle via perforating branches. It has also been stated that the blood supply to either side of this muscle may be taken over functionally by one of these arteries in the absence of the other.5

Our study revealed approximately 60% of the lateral neck dissections had a large branch of the submental artery perforating the mylohyoid muscle. This indicates that the submental artery plays a very significant role in the blood supply to the floor of the mouth and lingual gingiva. Approximately 53% of the dissections of the floor of the mouth revealed a small, insignificant, or missing sublingual artery. In each of these cases, a large branch of the submental artery was found perforating the mylohyoid muscle. This indicates that the submental artery is most often the major arterial source and sometimes the only arterial source to the floor of the mouth. There were a few cases in which a normal sublingual artery existed, and a large perforating branch was also found.
The literature describes a “reverse” situation in which the sublingual artery may perforate the mylohyoid muscle to supply the submental region. This variation was never found in our study. Occasionally, a perforating branch of the submental artery was present that crossed the midline to supply the contralateral floor of the mouth.

Because the submental artery is a major arterial source to the floor of the mouth, standard hemorrhage control procedures should be altered. With severe hemorrhages in the floor of the mouth, it may be difficult to clamp off the artery locally because of the lack of visualization and retraction of the severed branch into the tissue. The classic procedure of an extraoral ligation of the lingual artery in Lesser’s triangle may in some instances be necessary for hemorrhage control. If the perforating branch of the submental artery is the artery severed and not the sublingual artery, attempts to control bleeding by Lesser’s triangle approach would be ineffective. We therefore suggest, in cases of recalcitrant intraoral bleeding when an extraoral ligation procedure is necessary, to first ligate the submental artery or the parent facial artery before it gives off the submental artery. If this fails to stop the intraoral bleeding, then continue the dissection into Lesser’s Triangle and ligate the lingual artery.

**CONCLUSIONS**

1. The submental artery has a more significant role in the arterial supply to the floor of the mouth and lingual gingiva than described in textbooks.

2. A large branch of the submental artery that perforates through the mylohyoid muscle was found in 60% of dissections. Consequently, the submental artery can be considered the main arterial blood supply to the floor of the mouth and mandibular lingual gingiva.

3. The sublingual artery was found to be small, missing, or insignificant in 53% of cases. In each of these cases, a large perforating branch from the submental artery was present.

4. The perforating branch of the submental artery originated an average of 37 mm posterior to the menton.

5. This study demonstrates the need to change the procedure of extraoral ligation procedures for control of hemorrhage in the floor of the mouth. On the basis of the results of this study, both the facial or submental arteries should first be ligated, and if bleeding is not controlled then the lingual artery should be ligated to insure satisfactory hemostasis in this region.

**REFERENCES**


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