

Extraoral Ligature of Lingual Artery: Anatomic and Topographic Study

Ligadura Extraoral de la Arteria Lingual: Estudio Anatómico y Topográfico

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SUMMARY: The lingual artery constitutes one of the branches of the external carotid artery, which is responsible for the vascularization of the tongue and neighbour regions. The hemorrhage caused by a lesion of the lingual artery can occur during a dental procedure (surgical accidents by the use of an instrument or rotating disc), by trauma, biopsy and dental implant. In some cases is difficult to stop the hemorrhage of injured vase, so is necessary to realize the extraoral ligature of this artery. Hence, this work studied the anatomic aspects of the lingual artery, by forty-eight dissections of twenty-four corpses settled in formol 10%, aiming to detail the origin, pathway and anatomic relations of the lingual artery in the region of anterior trigone of the neck, and also to measure the distances among the lingual artery and the arteries: facial, superior thyroid and with the bifurcation of the common carotid. The results concluded that the lingual artery is found in a position more inferior than classically described, based on the digastric muscle and the hypoglossal nerve; and that the hyoid bone can be used as a point of reference for the surgical access to the lingual artery in the region of the anterior trigone of the neck.

KEY WORDS: Lingual artery; Linguofacial trunk; Tongue; Irrigation.

INTRODUCTION

The neck is the region of transition which unites the head with the trunk. In the neck are found structures which have important functions, among then, the external carotid artery which is responsible for the irrigation of buccal cavity and neighbour regions. This artery shows various colateral branches, among then the lingual artery which is responsible for the vascularization of the tongue, which has important functions as mastication, phonation, suction and deglutition. The traumatic lesions which show craniofacial repercussions, mainly the ones caused by drive accidents, the damages after intraoral biopsies, the extractions, the dental implants, demands an immediate service by the surgeon, aiming to solve functional and esthetic problems of the patient. So, the hemorrhage of lingual artery becomes one of many other problems that can occur with these patients, demanding an immediate attitude by the surgeon for its control. Since the intraoral ligature of the lingual artery is not always an easy procedure, the extraoral ligature of this artery becomes very important when it is necessary Kruger (1984) and Bavitz *et al.* (1994).

The purpose of this study is to provide more information concerning about the origin, pathway and anatomic relations of the lingual artery in the region of the anterior trigone of the neck and also to measure the distances among the origin of this vase and facial and superior thyroid arteries and with the bifurcation of the common carotid artery aiming to characterize and to compare these distances, observing the presence or not of asymmetry, in order to auxiliante the general and bucomaxillofacial surgeons in the access of this artery.

MATERIAL AND METHOD

In this study were used 24 corpses of male sex adults, settled in formol 10% from the Departamento de Anatomia do Centro de Ciências Biológicas da Universidade Federal de Pernambuco. The technic used was the convenience

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sampling (Vieira, 1991), method adopted for the facility of access of the anatomic pieces for this sex. The region was carefully observed, the corpse which showed any alteration in the region of the neck were excluded from the study, due to the possibility of an alteration of the normal anatomy and modification of the results. The methods used for this study were the macroscopic dissection and the measurement of both sides of the neck.

After the isolation of the lingual artery, it was observed in its origin the presence or absence of the linguofacial trunk, the relations with the digastric muscle, the hypoglossal nerve and the hyoid bone, as well as the pathway of the artery in the region of the neck. Using a pachymeter with 0,02mm of accuracy the distances were measured taking as a reference the origin of the lingual artery related to the the facial artery, the superior thyroid artery and with the bifurcation of the common carotid artery (Fig.1). These values were obtained using the scapus of a pachymeter, which is used for measure depth (Mandarim-de-Lacerda, 1995).

To show these data were made tables and statistical analysis, by maximum and minimum value, average and standard deviation, Test t of Student and the Coefficient of Correlation of Pearson.

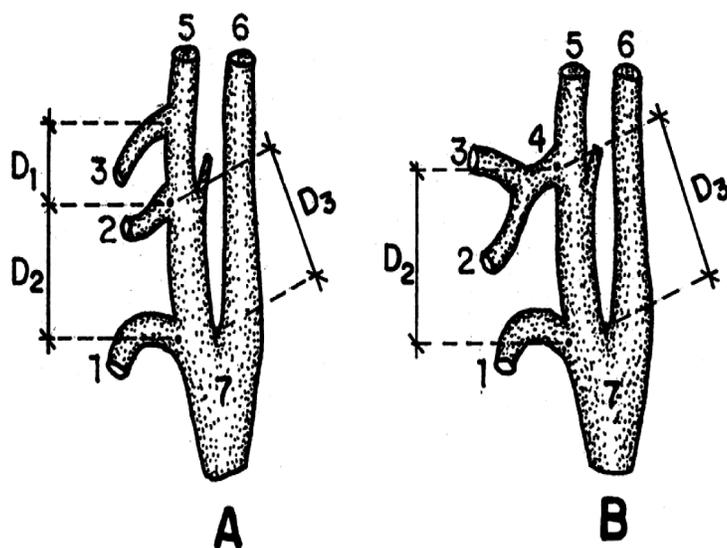


Fig. 1. Schematic drawing of the distances studied. In 1. Superior thyroid artery; 2. Lingual artery; 3. Facial artery; 4. Linguofacial trunk; 5. External carotid artery; 6. Internal carotid artery; 7. Common carotid artery. In the sequence: A) Absence of the linguofacial trunk and B) presence of the linguofacial trunk. D1- Distance between the origins of the lingual and the facial arteries; D2- Distance between the lingual and the superior thyroid arteries and D3- Distance between the lingual artery and the bifurcation of the common carotid artery.

RESULTS

Concerning about the lingual artery it was observed that in 25% of the cases were found the presence of the linguofacial trunk (Fig.2). It was observed its relations with the neighbour anatomic structures, and in 97,92% of the cases the lingual artery was found inferior to the tendon of digastric muscle, and in 89,58% of the cases was found superior to the hyoid bone. The artery was found inferior to the hypoglossal nerve in 72,92% of the cases, in 12,50% of the cases the artery was on the nerve and in 14,58% of the cases the artery was superior to it (Fig. 3).

The morphometric data found among the distances of the origins of the arteries showed the following values: the maximum distance between the origins of the lingual and facial arteries on the right side was 14,56 mm, and on the left side was 11,76 mm, the minimum distance was zero, what showed the presence of the linguofacial trunk in both sides; the maximum distance between the origins of the lingual and superior thyroid arteries was 39,04mm on the left side and the minimum distance was found on the right side 3,72 mm; concerning about the distance between the origin of the lingual artery and the bifurcation of the common carotid artery on the right side was found a maximum length of 37,42 mm and on the left side was found the minimum of 5,32 mm.

Using the Test t of Student (Table I) it was not observed a significant difference ($p \leq 0,05$) among the pairs of the average of the distances between the origins of the lingual artery with the facial artery and the superior thyroid artery of both sides. However, the result was significant between the average of the distances of the origin of the lingual artery with the bifurcation of the common carotid artery of both sides ($p = 0,008$).

DISCUSSION

The best way of control the lingual hemorrhages is to act directly in the bleeding region. if the bleeding was not controlled, the procedure consists of the extraoral ligation of the lingual artery for the suitable control of the intraoral hemorrhage Kruger and Bavitz *et al.*

In the study of the lingual artery in the anterior trigone region of the neck, the presence of the linguofacial trunk observed in our survey are partially according to the studies of Basmajian (1993); Shangkuan *et al.* (1998) and Shima *et al.* (1998) which

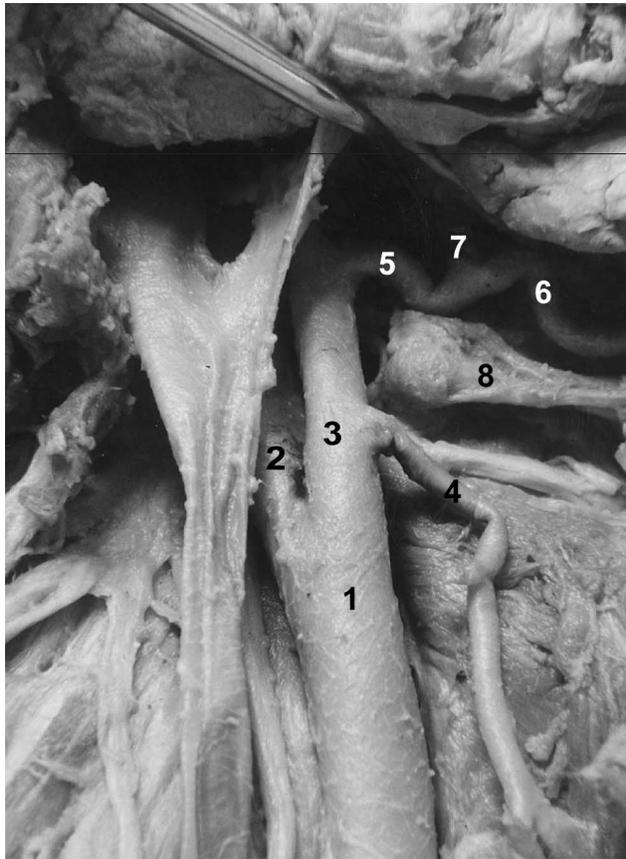


Fig. 2. Anterior region of the neck showing the lingual artery with its origin in the linguofacial trunk. 1. Common carotid artery; 2. Internal carotid artery; 3. External carotid artery; 4. Superior thyroid artery; 5. Linguofacial trunk; 6. Lingual artery; 7. Facial artery; 8. Hyoid bone.

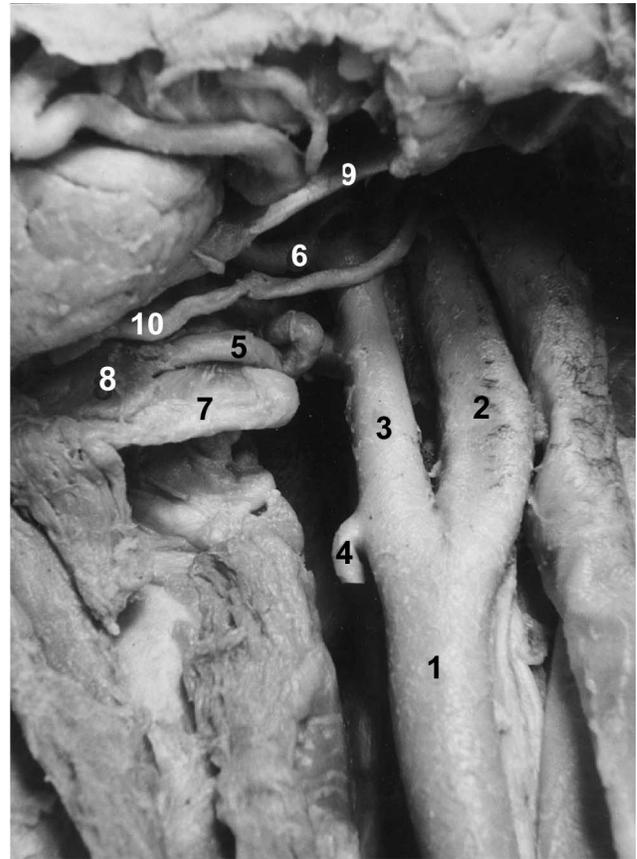


Fig. 3. Anterior region of the neck showing the relations of the lingual artery. 1. Common carotid artery; 2. Internal carotid artery; 3. External carotid artery; 4. Superior thyroid artery; 5. Lingual artery; 6. Facial artery; 7. Hyoid bone; 9. Tendon of digastric muscle; 10. Hypoglossal nerve.

Table I. Results of the statistical analysis (Test t for dependent samples) of the comparison between right and left sides.

Variables (D - E)	T	P
Lingual and facial artery	0,402	0,692
Lingual a. and superior thyroid a.	-0,961	0,347
Lingual a. and the bifurcation of the carotid a.	2,901	0,008

realized dissections in corpse and obtained results similar among them and our results. In the observation of the presence of the linguofacial trunk Basmajian related that in two hundred and eleven cases, 20% showed the trunk; Shangkuan *et al.*, observed that in twenty-five cases, 20% showed the trunk and Shima *et al.*, described that in thirty cases, 21,7% showed the trunk.

From the works found in the literature only Moore (1994) related that the lingual artery is found 5mm above the extremity of the greater horn of the hyoid bone and Homze *et al.* (1997), 6,3 mm above it; which are similar to our results.

The hypoglossal nerve constitutes an important anatomic structure that is related to the lingual artery. It was observed that in 72,92% of the cases the artery was inferior

to the nerve, 12,50% on the nerve and 14,58% superior to it. In the literature Snell (1984); Woodburne (1984); Garder *et al.* (1988); Basmajian and Moore described that the hypoglossal nerve crosses superficially the lingual artery; and only Homze *et al.*, allowed to improve the study about the hypoglossal nerve and the lingual artery observing that in 84,6% of the cases the artery was inferior to the nerve, 11% on the nerve and 4,4% superior to it, which are very similar to our results.

Concerning about the measurement of the distances among the origin of the lingual artery and the other arteries, it were not found data in the literature which could improve the discussion with our results.

Using the Test t of Student it was observed that among the pairs of the average between the origin of the lingual artery with the facial artery and the superior thyroid artery of both sides not showed a significant difference ($p \leq 0,05$), however, the average of the distances of the origin of the lingual artery with the bifurcation of the common carotid artery was significant $p = 0,008$, what indicates that on the left side the lingual artery is more inferior than on the right side.

Using the Coefficient of Correlation of Pearson, the distances among the origin of the lingual artery and the bifurcation of right common carotid and the distance of the origins of the lingual artery and the right facial artery was obtained a negative correlation, when one of the distances increases the other decreases. Concerning about the distances of the origins among the lingual artery and left facial artery with the right, it was observed a close relation and in the correlations among the distances of the origin of the lingual artery and the bifurcation of the left common carotid with the distance of the origin of the lingual artery and left facial artery it was not observed a relation.

Based on our results we concluded that:

1. The lingual artery often has its origin in the external carotid artery and also in the linguofacial trunk.
2. The lingual artery is found in a position more inferior than the one classically described based on the anatomic structures: the digastric muscle, the hyoid bone and the hypoglossal nerve.
3. The hyoid bone can be used as a point of reference for the ligation of the lingual artery once this vessel is often above this bone.
4. There is a correlation among the distances of the origins of the lingual artery and the left and the right facial artery.
5. The negative correlation between the lingual artery and the bifurcation of the right common carotid can suggest a work with children to verify when the asymmetry occurs.

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RESUMEN: La arteria lingual es un ramo de la arteria carótida externa, responsable de la vascularización de la lengua y regiones vecinas. La hemorragia proveniente de una lesión de la arteria lingual puede ocurrir durante el procedimiento dental (accidentes operatorios por un instrumento quirúrgico o disco rotatorio), por trauma, biopsia y por colocación de implante dentario. Como en algunos casos, se vuelve difícil contener la hemorragia donde el vaso fue lesionado, se hace necesario realizar la ligadura extra-oral de esta arteria. Por lo anterior, en este trabajo fueron estudiados los aspectos anatómicos de la arteria lingual, en 48 disecciones de cadáveres humanos fijados en formol 10%, con el objetivo de detallar el origen, trayecto y relaciones anatómicas de esta arteria en la región del triángulo anterior del cuello, como también medir las distancias entre la arteria lingual y las arterias: facial, tiroidea superior y con la bifurcación de la arteria carótida común. Los resultados permitieron concluir que la arteria lingual se encuentra, generalmente, más inferior de lo clásicamente descrito, tomándose como base el músculo digástrico y el nervio hipogloso; y que el hueso hioides puede ser usado como punto de referencia para el acceso quirúrgico a la arteria lingual, en la región del triángulo anterior del cuello.

PALABRAS CLAVE: Arteria lingual; Tronco linguofacial; Lengua; Irrigación.

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