World Journal of Veterinary Research

Research Article

Anatomic Surgical Orientation of the Intraglossal Neurovascular Termination of Egyptian Bovine

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Abstract

Although many surgical techniques of the bovine tongue are well established, the available literature lacks precise data about the anatomical structure of the bovine tongue that may guide surgeons to improve their technique to obtain optimal results. The current study performed on eight fresh cattle cadaver heads. Tracking anatomy of the lingual blood vessels and nerves was performed. Cavernous property of the tongue tissue was detected; the deep branch of lingual nerve extends rostral, parallel to the medial plane to the apex of the tongue. The hypoglossal nerve lies deeply at the medial-ventral aspect of the tongue. Lingual artery and vein originate at the root of the tongue and run on the floor of the apex of the tongue closely to the median plane. Surgical techniques presented for ventral aspect of the tongue represent resection of elliptical portion of the mucosa and muscles or suturing. Further study to evaluate healing process of each technique regarding tissue invasion.

Keywords: Cattle; Glossectomy; Surgical anatomy; Tongue

Introduction

The tongue is an accessory digestive organ that is responsible for prehension, mastication, swallowing and regurgitation of food in cattle. Tongue subjected to many infectious and noninfectious lesions that may necessitate surgical intervention. Euthanasia is elected for congenital disorders except for bifurcated tongue that may be treated primarily. Acquired surgical disorders of the tongue are treated with primary closure, second intention or glossectomies. Some vice as wind sucking, self-sucking and lolling with tongue are not primarily tongue disorders, but, surgical treatment is directed to partial glossectomy to correct these disorders. Healing of tongue wounds is very good and fast because of high vascularization property. Although surgical procedures of the tongue are well established, available literature 2 lack detailed surgical anatomy of the bovine tongue with special reference to vasculature and enervation and its accommodation for various surgical procedures especially glossectomy. The present article presents detailed descriptive surgical anatomy of the Egyptian crossbred bovine tongue; musculature, vasculature and enervation and its accommodation for ventral aspect tongue surgical procedures.

Materials and Methods

The anatomical preparation of the study based on obtaining 8 freshly cut heads adult apparently healthy Egyptian cattle of both sexes and age collected from the slaughtering house. The heads washed several time by the running water to remove the blood remnants and preserved in the formalin solution 10% for five days. Coloring the vessels by injecting colored milky latex solution red for the arteries and blue for veins via external carotid artery and lingo facial vein respectively. The heads left for two days allowing the latex solution to solidify and fill the terminal vascular branches. The dissection of the heads starts by reflecting the skin covering the face, facial muscles and structures and removing the mandibular ramus by using the bone cutter and hammer. The oral cavity, pharyngeal and laryngeal regions are now exposed and carefully dissection to determine the lingo facial artery, lingual vein, lingual nerve of mandibular, hypoglossal nerve and the lingual branch of the glosso-pharyngeal nerve. Tracking the intraglossal course of the above mentioned neurovascular structures from the torus to the apex linguae. For detecting the intraglossal orientation of the blood vessels and nerves, several cross sectional slices are allowed by using a sharp knife at four levels in order from the rostral to caudal; at the lingual tip, mid distance between the latter and frenulum linguae, frenulum linguae, between the corpus and torus linguae and at the mid part of the latter.

Results

The intraglossal neural orientation represents in the lingual branch of the mandibular nerve of trigeminal cranial nerve, the lingual branch of glosso-pharyngeal nerve and the hypoglossal nerve. The vascular arborization includes the lingual vein and artery.

The lingual nerve of mandibular

Descends rostroventrally on the lateral posterior half of the styloglossus muscle shown in Figures 1,2 and 4-6. The nerve inclines on the ventral border of the latter muscle, where it detaches a superficial branch and a deep one. The former descends ventrally to pass along the sublingual salivary gland with the sublingual vein and artery, while the deep branch crosses the ventral border of the stylogossus muscle in a rostromedial direction, where it combines with the hypoglossal nerve. The nerve pass in a tortious manner and

Citation: Nazih MA, El-Sherif MW. Anatomic Surgical Orientation of the Intraglossal Neurovascular Termination of Egyptian Bovine. World J Vet Res. 2019; 1(1): 1001.

Publisher Name: Medtext Publications LLC

Manuscript compiled: June 20th, 2019

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regress in size to ramifies rostral parallel to the medial plane of the tip of the lingual apex. Many ascending branches are detached along its course on the lateral aspect of the genioglossus muscle; they terminate in the substance of the tongue.

The hypoglossal nerve

The mostly deeper one, it passes on the lateral aspect of the pharyngeal region caudally to the lingo facial artery shown in Figures 1-4. The nerve traverses rostroventrally to cross the facial artery ventral to the epihyoid, it extends on the lateral aspect of the hyoglossus muscle and detaches a branch to the geniohyoideous muscle. The nerve continues rostral a long the deep face of extendance of the styloglossus muscle and laterally to the genioglossus one. It receives a deep branch from the lingual nerve of mandibular and distribute in the substance of the tongue. The nerves proceed rostral in a medioventral direction where at the level of the frenulum linguae, it terminates in the rostral end of the styloglossus muscle.

The lingual branch of glossopharyngeal nerve

The passes caudally to the stylohyoid process and rostral to the lingo facial artery show in Figure 3. The nerve turns deeply on the medial aspect of the latter process and the epihyoid, where it inclines dorsally to reach the glossoepiglottic fold and embedded in the root of the corresponding site on the root of the tongue.

The lingual vein

The arises from both sides of the floor of the apex of the tongue shown in Figure 1,2 and 6. It is superficially detected from the midline of the lingual apex by about 1.5 cm to 2 cm, laterally to the terminal ramification of the lingual nerve of mandibular. It receives many descending branches which evacuate the venous blood from bloody filled cavernous spaces. The latter formed from a minute fibrous septa derived from the lingual apical dorsum, the spaces are widely in diameter at the rostral and dorsal aspects of the lingual apex while they diminish in size on both lateral apical aspects. The vein runs caudally embedded in the muscular mass of the styloglossus muscle, it reaches the hyoglossus muscle where the vein turns medially on the lateral aspect of the latter muscle. It gradually descends in a caudoventral direction to terminate in the lingo facial vein.

The lingual artery

The stout vessel arrives the root of the tongue ventrally to the level of the epihyoid show in Figure 1-6. It erupts from the lingo facial artery and proceeds rostral on the deep face of the hyoglossus muscle. Where the artery reaches the lateral face of the genioglossus muscle, an arterial branch detaches to the latter and passes on its caudolateral aspect. The branch runs in a rostroventrally direction following the corresponding vein. The lingual artery extends rostroventrally and laterally to the genioglossus muscle where it reaches the

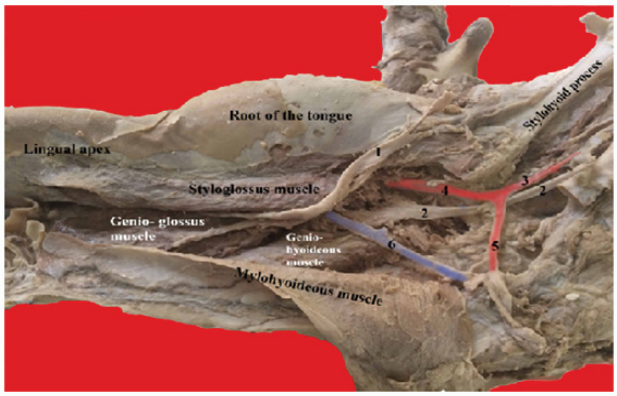

Figure 1: A photograph showing deep anatomical structures after removing the mandibular ramus (left side). 1: Lingual nerve of mandibular, 2: Hypoglossal nerve, 3: Lingo facial artery, 4: Lingual artery, 5: Facial artery, 6: Lingual vein.

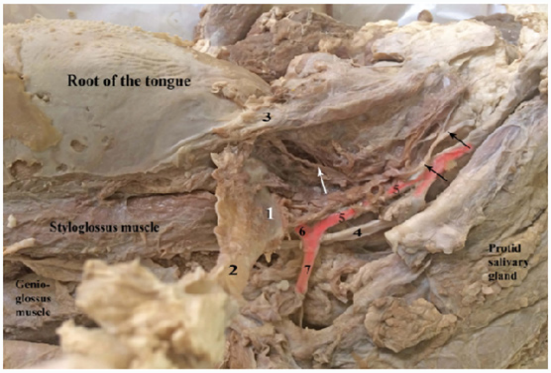

Figure 3: A photograph showing the deep anatomical structures after removing the left mandibular ramus. 1: Epihyoid, 2: Stylohyoid process, 3: Glossoepiglottic fold, 4: Hypoglossal nerve, 5: Lingo facial artery, 6: Lingual artery, 7: Facial artery. The arrows indicate the lingual branch of gloss pharyngeal nerve.

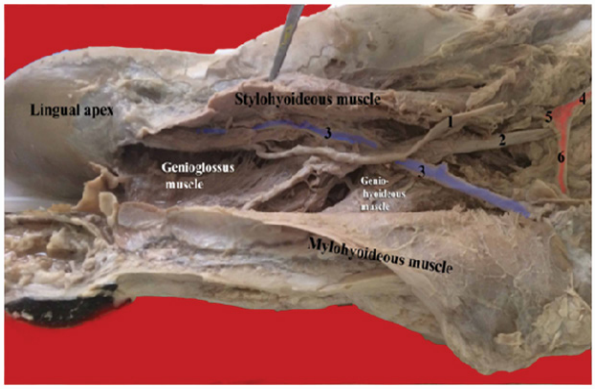

Figure 2: A photograph showing deep anatomical structures after removing the mandibular ramus and cutting styloglossus muscle (left side). 1: Lingual nerve of mandibular, 2: Hypoglossal nerve, 3: Lingual vein, 4: Lingo facial artery, 5: Lingual artery, 6: Facial artery.

Figure 4: A photograph showing the deep anatomical structures after reflecting the styloglossus muscle. 1: Lingual artery, 2: Facial artery, 3: Hypoglossal nerve, 4: Lingual nerve of mandibular.

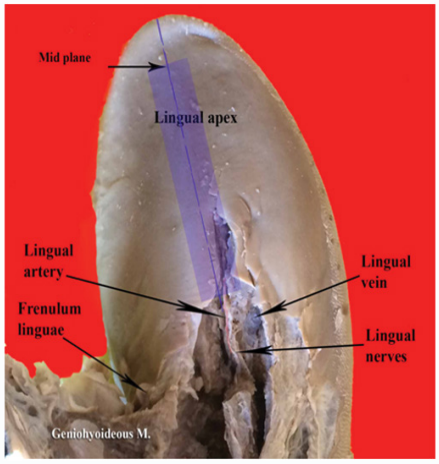

Figure 5: A photograph showing the lingual apex (ventral view). The bluish area indicates the region of the neuroarterial termination (1 cm-1.5 cm) laterally to the mid plane.

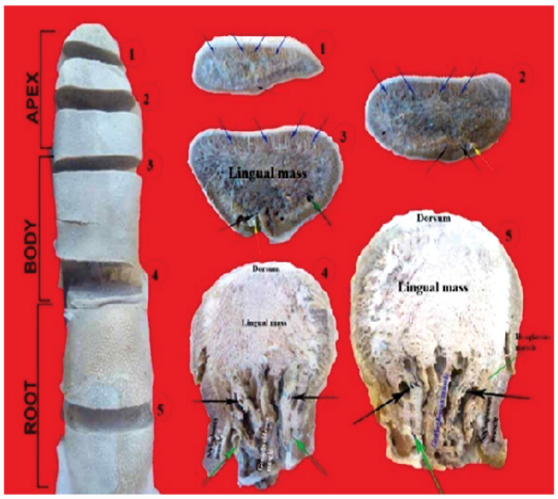

Figure 6: A photograph showing cross sectional slices of the tongue at deferent levels. 1: Section at the tip of apex linguae, 2: Section at mid distance between the frenulum linguae and the tip of apex linguae, 3: Section at the level of the frenulum linguae, 4: Section at the level between the torus and corpus linguae, 5: Section the mid of torus linguae. The blue arrows indicate the venous cavernous spaces; The yellow arrows indicate the terminal branches of the lingual branch of mandibular nerve; The black arrows indicate the lingual artery; The green arrows indicate the lingual vein.

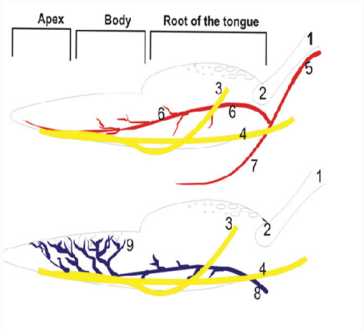

Figure 7: A diagram showing the intraglossal neurovascular orientation (Lateral view) 1: Stylohyoid process, 2: Epihyoid, 3: Lingual nerve of mandibular, 4: Hypoglossal nerve, 5: Lingo facial artery, 6: Lingual artery, 7: Facial artery, 8: Lingual vein Lingual cavernous spaces

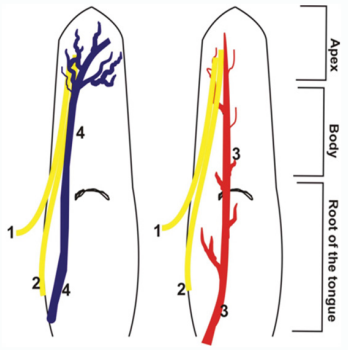

Figure 8: A diagram showing the intraglossal neurovascular orientation (Dorsal view), 1: Lingual nerve of mandibular, 2: Hypoglossal nerve, 3: Lingual artery, 4: Lingual vein, Lingual cavernous spaces.

Figure 9: A photograph showing resection steps of an elliptical portion of the mucosa and muscle from the ventral aspect of the tongue.

Figure 10: A photograph showing suturing the ventral aspect of the tongue without resection.

deep aspect of the styloglossus muscle, it gradually diminishes in diameter accompanying the terminal branches of the lingual nerve of mandibular and hypoglossal nerve (Figure 7 and 8). The artery extends medially to the latter nerves and at the level of the frenulum linguae, it runs on the floor of the apex of the tongue closely to the median plane. Many minute branches where detach along its passage.

Discussion

The present study spotted a light on the anatomical orientation of the intraglossal neurovascular terminations. This allows the veterinary surgeons to improve their knowledge about the nerve and blood supply of the bovine tongue during lingual operations. Our work was not attended the mind of the authors among the available literatures, mostly focused on scanning the lingual papillae in cow and zavot cattle [1,2]. Others recorded a statistical study on the tongue dimensions

in dog [3]. While O'Brien and Williams et al., [4] used only a new technique for the radiological studding of the head vascularization in some domestic animals, without vascular details. Our study detected the emergence of the lingual artery from the lingo facial artery similarly findings in domestic animals, and domestic mammals [5-7]. While in dog, in Giraffe, in alpaca and in camel recorded that both arteries did not formed a common lingo facial trunk and the lingual artery arose separately from the ventral surface of the external carotid artery [8-11]. The intraglossal course of the lingual artery has been described in our recent work and revealed that it extended along the tongue musculature in a cranio-ventromedial direction and within the torus linguae, the artery appears dorsally situated while it diminish in diameter and descend gradually on the floor of the lingual apex to be terminated closely to the median plane at the tip of the lingual apex. A description which not mentioned in the available literatures. In this regards, in domestic mammals and in camel cited that the lingual artery penetrates the hyoglossus muscle and passed along the tongue [11,12]. The recently recorded anatomical features of the lingual artery allowed surgeons to safely operate at the peripheral aspects of lingual apex where the termination of the artery was much smaller and medially located. Concerning the lingual venous drain, the present research described the cavernous venous spaces on the dorsum of the apical region of the tongue which drained in the lingual vein at the peripheral aspects of the lingual apex. The vein emerged caudally within the styloglossus muscle and terminated in the lingo facial vein. A study which not met by the most of the available literatures. Two surgical techniques for altering the contour of the tongue for the treatment of wind and self-sucking vices were described. The first technique was to resect 5 elliptical portion from the ventral aspect of the tongue, including mucosa and partial or full thickness of the muscle followed by apposition with interrupted sutures in cattle, and in cattle (Figure 9) [13-16]. The other technique was to interrupt the contour of the tongue by applying several inverting sutures without resection of the ventral aspect of the tongue (Figure 10). Regarding anatomical findings, healing of the tongue for both procedures was rapid, may be awing to the cavernous property of the tongue tissue. Meanwhile, the technique reported kept blood vessels and nerves at the ventral aspect of the tongue unaffected when anatomical relations are considered [17-19]. Resection of an elliptical portion with variable thicknesses from the ventral aspect of the tongue involves more tissue invasion and destruction of vessels and nerve terminals. Further study should be initiated to evaluate healing process in each procedure.

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