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An Unusual Relationship Between the Inferior Alveolar Nerve, Lingual Nerve and Maxillary Artery

Una Inusual Relación Entre los Nervios Alveolar Inferior y Lingual y la Arteria Maxilar

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ABSTRACT: The knowledge of the neurovascular relationships of the infratemporal region is relevant in odontostomatology practice. In this article we present a case of atypical communication between the inferior alveolar nerve and lingual nerve associated with a change in relations with the maxillary artery, and discusses some clinical implications that these relations have on the development of the suplementary innervation and the anesthesia.

KEY WORDS: inferior alveolar nerve, lingual nerve, maxillary artery, pterygomandibular fossa, infratemporal fossa, dental anesthesia.

INTRODUCTION

In the infratemporal fossa neurovascular relationships are important, on the one hand mandibular nerve trunk and terminal nerve branches, inferior alveolar nerve and lingual nerve, and on the other the maxillary artery, which emits most of its collaterals in this region (Kim *et al*., 2004).

The inferior alveolar nerve (IAN) is a mixed nerve that provides sensory innervation to the lower teeth, lower lip and buccal mucosa located between the premolars and lower central incisor through the mental nerve. The motor innervation of the inferior alveolar nerve is addressed to the mylohyoid muscle and anterior belly of the digastric muscle through the mylohyoid nerve.

The lingual nerve (LN) is a complex nerve that carries sensory fibers to the mucosa of the floor of the mouth and the ventral side of the tongue, sensory properties to the anterior 2/3 of the tongue and secretory properties to the sublingual and submandibular glands.

Many anatomical variations have been reported of the nerves in the infratemporal region and its relationship with the maxillary artery. Roy *et al*. (2002) noted that the IAN was origin by two roots and the second portion of the maxillary artery passed through the two roots of the inferior alveolar nerve. Gülekon *et al.* (2005) reported communications between the IAN and the auriculotemporal nerve. This variation was also observed by Kim *et al.* who described a communication between the IAN and the nerve for the lateral pterygoid muscle. Anil *et al*. (2003) also described a communication between the inferior alveolar nerve and the auriculotemporal nerve bilaterally.

Communication between the IAN and the lingual nerve has been mentioned by several authors. Racz & Maros (1981) in a study of lingual nerve made in 48 human hemisectioned human heads found communications or bridges between the lingual nerve and inferior alveolar nerve in 25% of cases, which were formed by a single nerve or 2 or 3 branches; this also was reported by Khaledpour (1984) but with a lower incidence.

The purpose of this study is to report an unusual communication between the inferior alveolar nerve and lingual nerve associated with a variation in relations with the maxillary artery and discuss its clinical implications.

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CASE REPORT

During routine dissection of a 54-year-old male cadaver, Spanish nationality, perfused with fixative solution based on formaldehyde and the arterial system filled with red latex, we observed a communication between the IAN and LN in the pterygomandibular space.

Dissection procedure. The tendon of the temporalis muscle was removed, was resected insertion of the masseter muscle and the coronoid process of the mandible was cut to expose the pterigomandibular space, after the pterygoid plexus and the lateral pterygoid muscle was removed. After these procedures the mandibular nerve were clearly visible, a communicating branch was found between the IAN and LN.

Using a digital caliper (0.01 mm) the characteristics of the communicating branch was analyzed.

Communicating branch. There was a communication between the inferior alveolar nerve and lingual nerve, this communicating branch or nerve bridge was originated with an angle of 30º from the IAN in direction of the LN, which enters with an angle of 45° and with a medial to lateral direction, from posterior-to-anterior and superior-to-inferior. The length was 10.65 mm and diameter of 0.91 mm, its origin was found to 22.76 mm from the bifurcation of IAN and the NL and 11.69 mm from the origin of the mylohyoid nerve, reaching to the lateral surface of the lingual nerve near the posterior edge it. The origin of the communication was 22.76 mm under the foramen ovale and their arrival in the lingual nerve was found to 35.9 mm from the foramen ovale (Fig. 1).

Relations with the maxillary artery. The maxillary artery was observed along the nerve juncture produced between the IAN and LN and the nervous bridge between the two, located 5.4mm from the foramen ovale, passing between the lingual nerve and inferior alveolar nerve (post to AIN and pre-LN) finishing in the top of the pterygopalatine fossa (Fig.1).

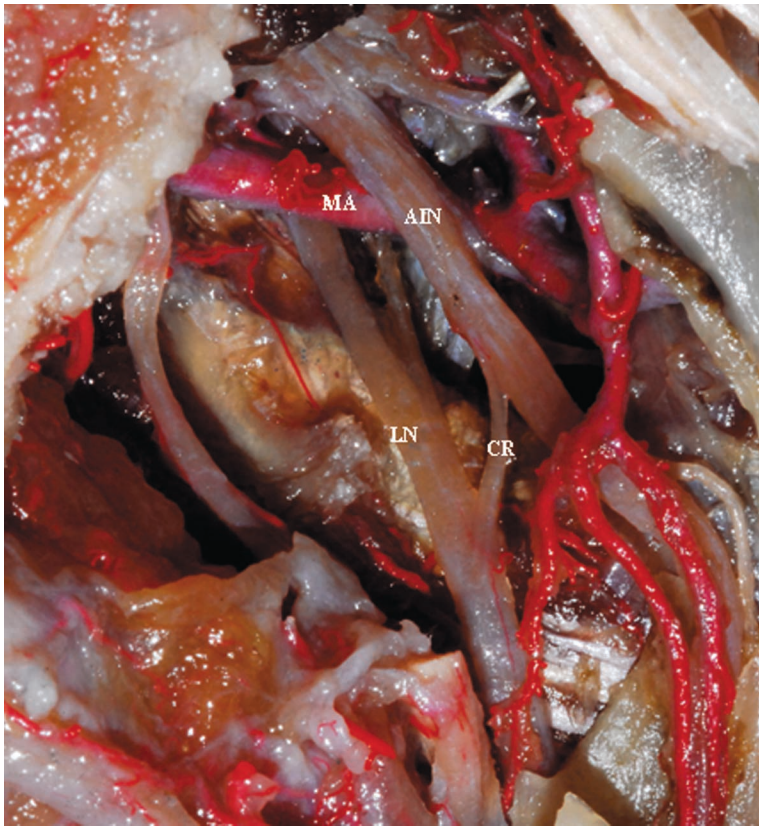

Fig 1. Neurovascular relationship image in the infratemporal region. MA= Maxillary artery; AIN= Alveolar inferior nerve; LN= Lingual nerve; CR= Comunicant ramus.

DISCUSSION

In this report we describe the presence of a communicating branch between the IAN and the LN; for Racz & Maros this condition is considered an anatomical variations with a prevalence of 16.6%, through this route sensory fibers from the IAN can be distributed by the regions innervated by the LN generating supplementary innervation clinically relevant for surgical procedures in the paralingual space.

The contribution of parasympathetic fibers from the LN to the IAN is also likely; this innervation may participate in the mechanism of secretion of the lower labial salivary glands and may explain the presence of secretion in the absence of efferents input from the otic ganglion to the IAN. This communication also suggests the passage of the IAN-sensitive fibers, this situation has been reported for other nerves and considered clinically relevant for the supplementary innervation of the lower molars (Sandoval *et al.,* 2008; Suazo *et al*., 2008).

In this case, we found that the maxillary artery is located between the IAN and the LN close to going back to the oval foramen passed posterior to the IAN and anterior to the LN, as Ortug & Moriggl (1991), but only mentioned that the maxillary artery passed between the IAN and the LN. Anil et al. reported two cases with variations of IAN, in this cases the maxillary artery passed through a connecting nerve loop, originated in the auriculotemporal nerve and the IAN on both sides.

Complications resulting from intravascular puncture of the maxillary artery due to the administration of local anesthetic can cause a hematoma in this region (the roof of the infratemporal fossa), which can exert a soft pressure on other anatomical structures around the artery in this space, like the LN and the IAN, generating sensory alterations, which must be considered in the differential diagnosis of facial pain, hyperalgesia, allodynia, and so on.

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RESUMEN: El conocimiento de las relaciones entre los elementos neurovasculares de la región infratemporal es relevante en la práctica odontoestomatológica. En el presente artículo presentamos el caso de una comunicación atípica entre el nervio alveolar inferior y el nervio lingual asociados a una variación en las relaciones con la arteria maxilar, y se discuten algunas implicancias clínicas que estas relaciones tienen en el desarrollo de inervación suplementaria y en la práctica anestésica.

PALANRAS CLAVE: nervio alveolar inferior, nervio lingual, arteria maxilar, fosa Pterigomandibular, fosa Infratemporal, anestesia Odontológica.

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