Case Report

Variations in the origin and course of the inferior alveolar neurovascular bundle

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ABSTRACT

The knowledge of the neurovascular relationships of the infratemporal region is of great interest for any surgical procedure in the area. The region contains important structures such as the mandibular nerve, the maxillary artery and the muscles of mastication. In this article we present a case of atypical origin and course of inferior alveolar nerve (IAN) and inferior alveolar artery (IAA).

KEY WORDS: Inferior alveolar nerve, inferior alveolar artery, maxillary artery, infratemporal fossa.

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INTRODUCTION

The inferior alveolar neurovascular bundle is of importance in view of the many invasive procedures performed in the infratemporal region. 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. Its motor fibers get distributed by the mylohyoid nerve to the mylohyoid and the anterior belly of the digastric muscles. Within the mandibular canal, the IAN runs forwards accompanying with the inferior alveolar artery (IAA) and together they are called the inferior alveolar neurovascular bundle. Its larger terminal branch emerges from the mental foramen as the mental nerve and innervates the skin of the chin and the lower lip, while the smaller incisive branch supplies the canine and incisor teeth. The inferior alveolar artery descends with its corresponding vein and nerve, forming a neurovascular bundle that supplies the teeth of the mandible, gingivae, and the skin over the chin and lower lip.

The purpose of this study is to report an unusual origin of inferior alveolar nerve and inferior alveolar artery associated with variation in relation to the maxillary artery.

CASE REPORT

This study was carried out in the Department of Anatomy, Faculty of Medicine, King Saud University, Riyadh, Saudi Arabia. During routine dissection of a middle aged male cadaver, perfused with fixative solution based on formaldehyde we observed IAN arising by two roots from the mandibular nerve and the second part of the maxillary artery passing between the two roots. The inferior alveolar artery originated from the first part of the maxillary artery near the origin of the maxillary artery.

Dissection Procedure: The attachment of the masseter muscle from the zygomatic arch was resected and the muscle was reflected downward, detaching from the lateral surface of the mandible to expose the coronoid process and ramus of the mandible. The tendon of the temporalis muscle was detached from

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the coronoid process of mandible. The region of the bone between the neck of the mandible and a horizontal line in the ramus of mandible just above the mandibular foramen was removed carefully to expose the pterygomandibular space. After removing the pterygoid venous plexus and lower fibers of the lateral pterygoid muscle, inferior alveolar neurovascular bundle was cleaned. IAN was followed to its origin from the mandibular nerve and IAA to its origin from the maxillary artery. Using a digital caliper the distance between the origin of the maxillary artery and origin of IAA from the maxillary artery was noted.

RESULT

It was discovered that the inferior alveolar nerve originated from the mandibular nerve by two roots that surrounded the second part of the maxillary artery. The two roots joined each other below the maxillary artery and the inferior alveolar nerve entered the mandibular foramen in a normal fashion. The inferior alveolar artery originated from first part of the maxillary artery 4.5 mm from the origin of the maxillary artery. This vessel was found to course anteriorly and then travelled inferiorly and entered the mandibular foramen lateral to the IAN (Fig-1).

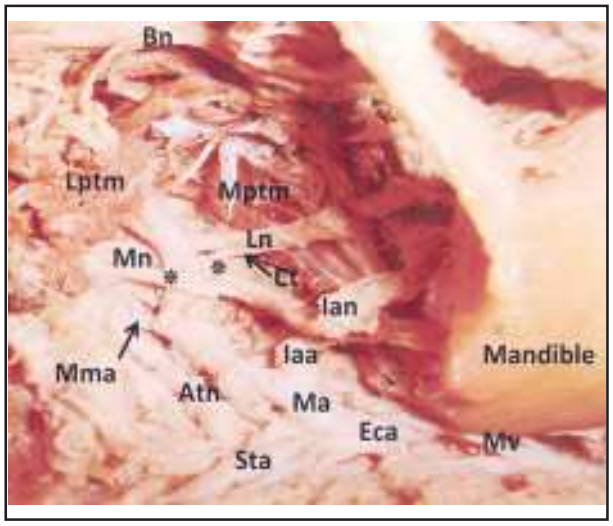

Figure-1: Right infratemporal fossa showing maxillary artery, mandibular nerve and their branches.

Atn= Auriculotemporal nerve, Bn= Buccal nerve,
Ct= Chorda tympani,
Eca= External carotid artery, Iaa= Infeior alveolar artery,
Ian= Inferior alveolar nerve,
Ln= Lingual nerve, Ma= Maxillary artery,
Mma= Middle meningeal artery,
Mv= Maxillary vein, Sta= Superior temporal artery,
Lptm= Lateral pterygoid muscle,
Mptm= Medial pterygoid muscle* indicate roots of Ian.

DISCUSSION

Many anatomical variations have been reported regarding the nerves in the infratemporal region and their relation with the maxillary artery.[1] The communication between the branches of the lingual nerve, inferior alveolar nerve (IAN) and auriculotemporal nerve has been reported in literature.[2-4] Kim *et al*.[5] described a communication between the IAN and the nerve for the lateral pterygoid muscle. In this case we report the unusual origin of IAN by two roots and the maxillary artery passing between the two roots of the IAN. A similar case has been reported earlier by Roy *et al*.[1] This type of arrangement may result in entrapment of the maxillary artery between the roots of the IAN. Such variations can be expected in the IAN as embryologically, in the early development, the inferior alveolar nerve innervates the anterior teeth group, premolar and the molar region in an independent way. Later on, the rapid process of membranous ossification of the jaw determines the formation of the mandibular canal, being able to configure this division.[6]

The maxillary artery and its branches are of great importance in dental, oral, and maxillofacial surgery. The main branches of the maxillary artery within the infratemporal fossa are the middle meningeal, deep temporal, masseteric and inferior alveolar arteries. The maxillary artery is variable in regard to its course. It has been reported to be located between the IAN and the lingual nerve.[7] Anil *et al*.[2] reported two cases in which the maxillary artery passed through a connecting nerve loop, originated in the auriculotemporal nerve and the IAN on both sides. Although the origin of the branches of the maxillary artery is usually constant, the masseteric artery[8] and the inferior alveolar artery have been reported to originate from the external carotid artery.[9]

The inferior alveolar nerve is the largest branch of the mandibular nerve and descends with the inferior alveolar artery. Blocks of the inferior alveolar nerve are one of the most common injections performed during dental procedures to achieve mandibular anaesthesia. A potential hazard of the procedure is vascular trauma. Arterial penetration during mandibular blocks is reported in up to 20% of cases. Complications resulting from intravascular puncture of the maxillary artery may lead to hematoma formation in this region which may exert pressure on the surrounding structures including the lingual and inferior alveolar nerves. Intravascular injections during the inferior alveolar nerve block may lead to local, distant and systemic complications.[10]

CONCLUSION

Any variation in the inferior alveolar neurovascular bundle may predispose a patient to increased vulnerability to intravascular injections. Neurovascular entrapment can cause pain and numbness. Anatomical variations in this region should be kept in mind while performing invasive procedures.

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