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Case Report

Unusual Course of the Accessory Meningeal Artery

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Abstract : This case report describes a variation in the course of the accessory meningeal artery relative to the mandibular nerve in the infratemporal fossa.

An accessory meningeal artery running superficially to the posterior division of mandibular nerve was found bilaterally in the cadaver of a 95-year-old male. It was observed by a topographic examination followed by a detailed dissection.

The accessory meningeal artery arose from the middle meningeal artery. It then passed upward and coursed superficial to the posterior division of the mandibular nerve before its division into the lingual and inferior alveolar nerves. The accessory meningeal artery subsequently ran deep and rostral to the anterior and posterior divisions of the mandibular nerve, respectively, before entering the foramen ovale.

The variation in the course of the accessory meningeal artery described herein should be helpful for surgeons in approaches to the foramen ovale region and infratemporal fossa.

Keywords : Accessory meningeal artery, Foramen ovale, Infratemporal fossa, Mandibular nerve

Introduction

The accessory meningeal artery runs through the foramen ovale into the middle cranial fossa and may arise either directly from the maxillary artery or as a branch of the middle meningeal artery, reportedly occurring in 96% of cases (Baumel and Beard 1961, Standring 2008). The accessory meningeal artery is sometimes replaced by separate small arteries, and usually runs deep to the mandibular nerve in the infratemporal fossa (Standring 2008).

In Terminologia Anatomica (FCAT 1998), its term is listed as the accessory branch of the middle meningeal artery. Its main distribution is extracranial, principally to medial pterygoid, lateral pterygoid (upper head), tensor veli palatini, the greater wing and pterygoid processes of the sphenoid, branches of the mandibular nerve and the otic ganglion (Standring 2008). After supplying adjacent extracranial structures, it enters the cranium through the foramen ovale and supplies the trigeminal ganglion and the adjacent dura mater (Woodburne and Burkel 1994).

Several surgical approaches to the foramen ovale, such as the percutaneous and lateral sublabial endoscopic approaches, have been used in the treatment of trigeminal neuralgia, as well as for performing biopsies of lesions located in the parasellar region (Abuzayed et al. 2010, Alvernia et al. 2010). Thus, a detailed knowledge of the foramen ovale region is invaluable for improving target accuracy and preventing complications (Alvernia et al. 2010). When the foramen ovale is approached surgically, the foramen and its related structures within the infratemporal fossa are encountered. Therefore, not only should surgeons have an in-depth knowledge of the anatomy of the foramen ovale region and the infratemporal fossa, but they should also recognize the anatomical variations of these structures so as to enable a safe approach and avoid potential risks.

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This case report describes a variation in the course of the accessory meningeal artery relative to the mandibular nerve, which was identified by a topographic examination followed by a detailed dissection, and thereby provides data that will be beneficial to surgeons during approaches to the foramen ovale region and the infratemporal fossa.

Case Report

An accessory meningeal artery running superficially to the posterior division of mandibular nerve was found bilaterally in the cadaver of a 95-year-old male (Fig. 1). The origin and course of the accessory meningeal artery were similar on the left and right sides. The accessory meningeal artery arose from the middle meningeal artery. It then passed upward and coursed superficial to the posterior division of the mandibular nerve before its division into the lingual and inferior alveolar nerves. The accessory meningeal artery subsequently ran deep to the anterior division of the mandibular nerve before entering the foramen ovale. The thicknesses of the accessory meningeal artery as it passed the posterior division of the mandibular nerve and just before entering the foramen ovale were 1.5 ± 0.1 mm (mean $\pm$ SD) and 0.9 ± 0.1 mm, respectively.

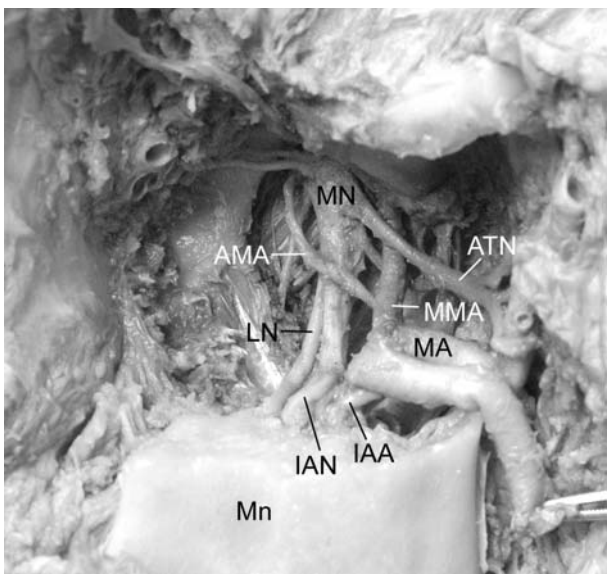

Fig. 1. Photograph showing the accessory meningeal artery (AMA) running superficial to the posterior division of the mandibular nerve (MN) (left side of the face). After the AMA arose from the middle meningeal artery (MMA), it passed superficial to the posterior division of the mandibular nerve. The AMA subsequently ran deep to the anterior division of the mandibular nerve before entering the foramen ovale. The ramus of the mandible (Mn) and the lateral pterygoid muscle were removed to expose the infratemporal fossa. The maxillary artery (MA) was cut and reflected inferiorly and posteriorly. ATN, auriculotemporal nerve; IAA, inferior alveolar artery; IAN, inferior alveolar nerve; LN, lingual nerve.

Discussion

One of the anatomic variations of the infratemporal fossa involves the relationship between the accessory meningeal artery and the posterior division of the mandibular nerve. Baumel and Beard (1961) classified that relationship into four types, and found that when the accessory meningeal artery arose from the middle meningeal artery, it passed deep to the mandibular nerve in 40 of 73 sides (54.8%), or passed between the lingual and inferior alveolar nerves in 4 sides (5.5%). In addition, when the accessory meningeal artery arose from the maxillary artery, it passed superficial to the nerve in 14 sides (19.2%) or rostral to the nerve in 15 sides (20.6%). The case described herein does not conform to any of these types, and nor has it been found in other previous studies. Although the accessory meningeal artery had an unusual course relative to the posterior division of the mandibular nerve, it had a common course just before entering the foramen ovale, being located rostral to the nerve.

The accessory meningeal artery is derived from part of the embryonic primary medial limb of the arterial loop formed by the primitive maxillary artery around the developing mandibular nerve. During normal development, the medial and lateral limbs of the arterial loop of the primitive maxillary artery surround the developing mandibular nerve. The medial limb is located deep to the mandibular nerve, and the lateral limb is superficial to the nerve (Baumel and Beard 1961). Since in the present case the accessory meningeal artery passed superficial to the mandibular nerve after arising from the middle meningeal artery, it is thought that the medial limb, which is a primitive form of the accessory meningeal artery, would be located superficial to the mandibular nerve. This reflects that the medial and lateral limbs of the arterial loop formed by the primitive maxillary artery did not surround the developing mandibular nerve in our case.

The variation in the course of the accessory meningeal artery described herein should be helpful for surgeons in

approaches to the foramen ovale region and infratemporal fossa.

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덧뇌막동맥의 해부학적 변이

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간추림 : 이 연구의 목적은 관자아래우묵에서 아래턱신경에 대한 덧뇌막동맥의 해부학적 경로 변이를 기술하는 데 있다.

덧뇌막동맥이 아래턱신경 뒤줄기의 표면을 지나가는 경우가 95세 남자 시신의 양쪽 관자아래우묵에서 관찰되었다. 덧뇌막동맥의 경로 및 주위구조와의 관계에 초점을 맞추어 해부하였다.

덧뇌막동맥은 중간뇌막동맥에서 일어났으며, 위쪽으로 올라가 아래턱신경 뒤줄기가 아래이틀신경과 혀신경으로 나누어지기 전의 신경 표면을 지나갔다. 그후, 덧뇌막동맥은 타원구멍으로 들어가기 전, 아래턱신경 앞줄기보다 깊게 지나갔으며, 아래턱신경 뒤줄기의 앞쪽으로 지나갔다.

덧뇌막동맥의 해부학적 경로 변이는 타원구멍과 관자아래우묵으로의 수술적 접근시 도움이 될 것으로 생각된다.

찾아보기 낱말 : 덧뇌막동맥, 타원구멍, 관자아래우묵, 아래턱신경

† 공동 제1저자로 동등한 역할을 수행하였음.

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