Maxillary artery piercing the temporalis muscle: a rare variation in the infratemporal fossa


Abstract

Introduction
The variant course of the maxillary artery in the infratemporal region is very rare. From its origin, the external carotid artery, it courses through the infratemporal fossa, where its branches accompany the branches of the mandibular nerve and then enter the pterygopalatine fossa. In the infratemporal region, the maxillary artery is generally described in relation to the lateral pterygoid muscle, the key muscle of the infratemporal fossa.

Case report
We report here a rare case of the intramuscular course of the maxillary artery in which it had its peculiar course through the temporalis muscle. Otherwise, the origin and the branching pattern of the artery were normal.

Conclusion
Presence of such variations may cause severe clinical complications during endoscopic endonasal surgery for tumours of infratemporal fossa.

Figure 1: Dissection of the temporal fossa showing the course of second part of the maxillary artery within the substance of temporalis muscle. BA, buccal artery; BN, buccal nerve; DTB, deep temporal branch; IANV, inferior alveolar nerve and vessels; LHLP, lower head of the lateral pterygoid; LN, lingual nerve; MA, maxillary artery; MT, medial pterygoid muscle; tm, temporalis muscle; UHLP, upper head of the lateral pterygoid. (A, anterior; P, posterior; S, superior; I, inferior).

Introduction
Maxillary artery is the larger terminal branch of the external carotid artery behind the neck of the mandible within the substance of the parotid gland. It enters the infratemporal region by passing between the neck of the mandible laterally and sphenomandibular ligament medially. In the infratemporal fossa, it is in close contact with the lateral pterygoid muscle, and its course is divided into three parts for description purpose. The first or mandibular part is related to the inferior border of the lower head of the muscle, the second or pterygoid part usually lies superficial to the lower head of the lateral pterygoid muscle and medial to the temporalis, and the third or pterygopalatine part enters the pterygopalatine fossa by passing through two heads of the lateral pterygoid muscle and pterygomaxillary fissure.

Though the second part of the maxillary artery lies superficial to the lateral pterygoid muscle in 60% of the cases, there are occasions of it passing deep or medial to the muscle. It has been estimated that the frequency of such a course in the Mongoloid population is 7.3% and in the Caucasoid population is 38%.

Any variant course of the maxillary artery within the infratemporal fossa may be vulnerable to its injury, because the fossa is a clinically important anatomical area for local anaesthetic procedures in dentistry.
and maxillofacial surgery. Unusual course of the maxillary artery may entrap it, thus leading to clinical complications involving numbness or headache and may interfere with injection of local anaesthetics into the infratemporal fossa. This paper reports a case of a rare variation in the infratemporal fossa in the maxillary artery piercing of the temporalis muscle.

**Case Report**

During routine dissection of the infratemporal fossa for the first year medical undergraduate students, we observed a peculiar course of the maxillary artery in the infratemporal region on the right side of the adult male cadaver aged about 55 years. The maxillary artery arose normally from the external carotid artery behind the neck of the mandible, passed forward into the infratemporal region up to the lower border of the lower head of the lateral pterygoid muscle. It then coursed laterally and entered the substance of the temporalis muscle (Figure 1 and Figure 2). The artery, on its further course, entered the pterygopalatine fossa through pterygo-maxillary fissure. Hence, the classical description on its second part was obscured by its variant intramuscular course. Thus, in the current case, contrary to its normal relation with the lateral pterygoid muscle, the maxillary artery was in direct relation with the temporalis muscle.

**Discussion**

Based on the intimate relation of the maxillary artery (MA) to the lateral pterygoid muscle (LP) in the infratemporal region, variant patterns of the course of the artery was initially classified into three types by Loth as lateral, intermediate, and medial. This classification was according to the corresponding relation of the artery with the muscle within the infratemporal fossa. Later, slight expansion to this pattern was added by Fujitha, who had recommended five types of classification. With the increasing prevalence of unpredictable pattern of the course of the MA, Shin-go et al. suggested reclassification by adding two more groups recently in 2012. Thus, studied variations of MA led to the interpretation as being inconsistent among the authors. Very few reports on the abnormal course of MA have been documented in the literature. Some of the reported variations are abnormal course of the MA through the temporalis muscle, the maxillary artery superficial to the lateral pterygoid muscle, the maxillary artery piercing the temporalis muscle. A case of MA perforating the inferior alveolar nerve was reported.

With the report of the present case, it can be presumed that the second part of the MA is prone for its variant course than its remaining parts. Asymmetry in its pattern may be unilateral or bilateral and there are also reports of its ethnic differences. A study by Hussain et al., reported that prevalence of the second part of the MA relationship with the lower head of the lateral pterygoid muscle to its lateral and medial aspect is 71% and 29% respectively. In the same study, it has been concluded that there is a higher prevalence of the course of the maxillary artery superficial to the lower head of the lateral pterygoid muscle than the deep course in a Canadian population. An observational study of the second part of the maxillary artery has revealed 57% of incidences of its course superficial to the lower head of the lateral pterygoid muscle in a New Zealand population. It is also reported that there is a higher prevalence in females.

**Figure 2:** Dissection of the infra temporal fossa showing the intra-muscular course of the maxillary artery within the substance of temporalis muscle (TM). Muscle fibres of temporalis has been separated and retracted. (BA, buccal artery; DTB, deep temporal branch; IANV, inferior alveolar nerve and vessels; LN, lingual nerve; MA, maxillary artery; TM, temporalis muscle.) (A, anterior; I, inferior; P, posterior; S, superior.)

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than in males. A study on the position of the third part of the maxillary artery at the pterygomaxillary fissure among a Thai population reported that the mean location of the artery is at 23.5 mm from the inferior part of the pterygomaxillary junction.

The variant course of the maxillary artery may be attributed to its complicated embryological background. Initial vascular network rings developed in the early embryonic stage adjoining the soft tissue structures in the developing infratemporal fossa and eventual persistence of some of its parts might be responsible for the variant course of the artery.

Conclusion
Rare anatomical variations such as the one we reported here may set hurdles in certain major procedures like radical maxillectomy, as well as in simple procedures like inferior alveolar nerve blocks. The unusual superficial course and the entrapment of the artery within the substance of the temporalis muscle may also cause severe clinical complications during the complicated surgeries of the infratemporal region and also during endoscopic endonasal surgery for tumours of the infratemporal fossa.

Abbreviations list
LP, lateral pterygoid muscle; MA, maxillary artery.

References