



## Low level termination of external carotid artery and its clinical significance: A case report

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### ABSTRACT

The external carotid arterial system is a complex vascular system providing nourishment to the territorial areas of the head and neck. The branches of the external carotid artery are the key landmarks for adequate exposure and appropriate placement of cross-clamps on the carotid arteries during carotid endarterectomy. Knowledge of anatomical variation of the external carotid artery is important in head and neck surgeries. Variations in the branching pattern of the external carotid artery are well known and documented. We report a rare case of low-level termination of the external carotid artery. It terminated by dividing into maxillary and superficial temporal arteries deep into the posterior belly of the digastric muscle, one inch below the angle of the mandible. The occipital and posterior auricular arteries arose from a common trunk given off by the external carotid artery.

**Key words:** External carotid artery, maxillary artery, superficial temporal artery, neck, variation

### Introduction

The external carotid artery (ECA) is the chief artery of the head and neck region. It arises from the common carotid artery, lateral to the upper border of thyroid cartilage and level with the disc between the third and fourth cervical vertebra. From its origin it takes a slightly curved course, passes upward and forward, and then inclines backward to the space behind the neck of the mandible; here it divides within the substance of the parotid gland into the superficial temporal and maxillary arteries [1]. During its course it gives five other branches, namely the superior thyroid, lingual,

facial ascending pharyngeal, occipital, and posterior auricular arteries. The maxillary artery has a course in the infratemporal fossa, and nourishes the structures of that region. The superficial temporal artery provides blood supply to the lateral aspect of the scalp and face [2]. The branches of the external carotid artery may arise irregularly or be diminished or increased in number. Occasionally the branches close together from a common point just above the origin of the artery from the common carotid [3]. The branches of the external carotid artery can vary in their origin and course. The variations in the origin and course of facial, lingual, oc-

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**Received / Accepted** : April 04, 2013 / May 19, 2013

cipital, and posterior auricular arteries have been well documented [4-6].

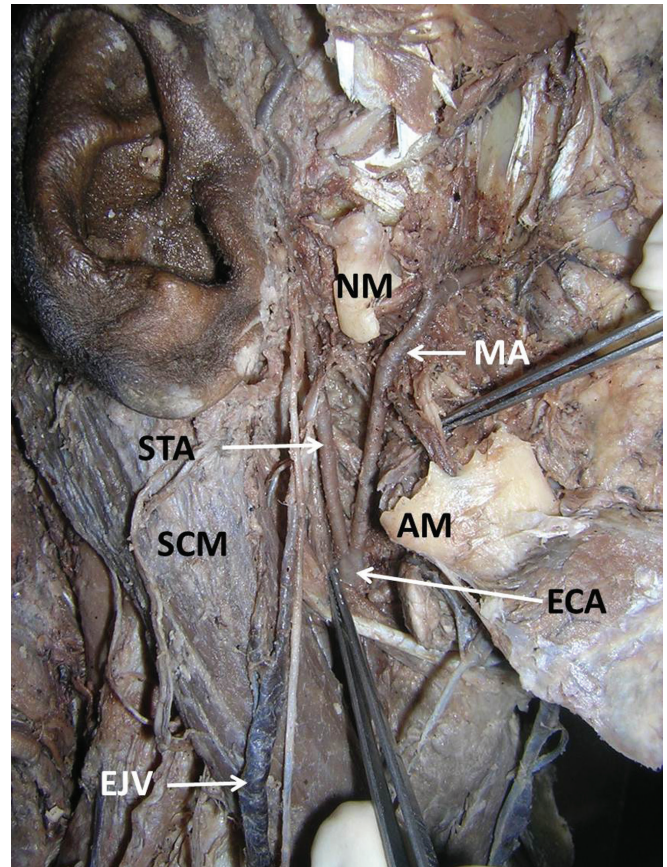
### Case Report

During the dissection classes for medical undergraduates, we found a low-level termination of the right external carotid artery. It was noted in a male cadaver aged approximately 65 years. The right external carotid artery took its origin at the level of the upper border of the lamina of the thyroid cartilage and ascended up in the carotid triangle. It terminated by dividing into maxillary and superficial temporal arteries deep into the posterior belly of the digastric muscle, one inch below the angle of the mandible (Figures 1 and 2). Both the terminal branches entered the parotid gland. The superficial temporal artery ascended vertically in the parotid gland, parallel to the posterior border of the ramus of the mandible, and the maxillary artery coursed obliquely in an upward direction medial to the ramus of the mandible. The course and branching pattern of the maxillary artery in relation to the lateral pterygoid muscle was normal. The occipital and posterior auricular arteries arose from the external carotid artery as a common trunk. The other branches of the ECA were normal. The branches and level of branching of ECA were normal on the left side.

### Discussion

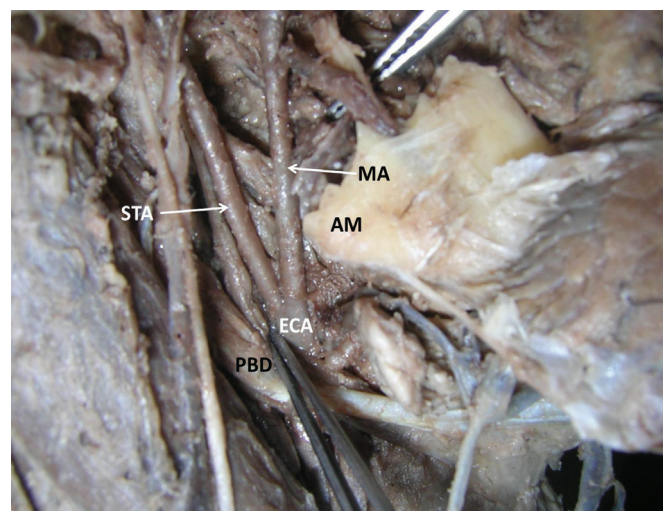
ECA is the chief artery of the head and neck region. Many studies have reported variations in the branching pattern of the ECA: high and low bifurcation of the common carotid artery. In the present case we report a rare type of low-level bifurcation of the external carotid artery. A variation similar to this could not be found in the literature. A common occipital-auricular trunk from ECA, dividing into the occipital and posterior auricular arteries, was also observed. According to Lapps et al., the occipital artery was found to arise as a separate branch from ECA in 83% of the cases and to share a common trunk with the posterior auricular artery in 13.50% of the cases [4]. The study by Luzsa revealed that 13.9% of the cases had a common trunk with the posterior auricular artery and that 0.6% cases had a common trunk with the superficial temporal artery [5]. The origin of the posterior auricular artery from the occipital artery has also been reported [6].

Knowledge of variations of ECA and its branches



**Figure 1.** Dissection of the upper part of the right side of the neck showing the low termination of the external carotid artery.

**ECA:** external carotid artery, **AM:** angle of the mandible; **NM:** neck of the mandible, **SCM:** sternocleidomastoid, **EJV:** external jugular vein, **MA:** maxillary artery, **STA:** superficial temporal artery.



**Figure 2.** Closer view of the bifurcation of the external carotid artery. **PBD:** posterior belly of digastric muscle.

and their recognition during diagnostic imaging is also important for vascular surgical procedures in the region, such as carotid endoplasty for the treatment of carotid stenosis [7,8]. The origin of the external carotid artery was found to be variable in a significant number of cases. In the study conducted by Lucev et al., they



found a normal level of bifurcation of ECA in 50% of the cases and a higher level in 37.50% of the cases [9]. Bregman et al. reported that the higher origin is of common incidence. The branches of ECA may arise irregularly or be diminished or increased in number [3]. Anatomical knowledge of the origin, course and branching pattern of the external carotid artery would be useful to surgeons when ligating vessels in the head and neck region during surgery and to avoid unnecessary complications during carotid endarterectomy [10]. The origin of maxillary and superficial temporal arteries from the main trunk of the external carotid artery running superficially to the stylohyoid and posterior belly of digastric muscles has been reported [11].

The anterior branches of the ECA were found to share a common trunk between them very frequently [10]. Zumer et al. have conducted an extensive study of bifurcation levels of the common carotid artery and variations of branches of the ECA in human fetuses. They found a linguofacial trunk in 20% of the cases, a thyrolingual trunk in 2.5%, a thyrolinguofacial trunk in 2.5%, and an occipitoauricular trunk in 12.5% of the cases [12]. Anu et al. have observed the level of bifurcation of the common carotid artery to vary from the second cervical vertebra to the fourth cervical vertebra [13]. A rare case was reported by Bryan et al. in which the left common carotid artery was absent and the internal and external carotid arteries were arising directly from the arch of the aorta [14]. A rare variation of ECA which had two separate trunks that united behind the condylar process of the mandible, whereby forming an annulus from which the branches arose, has also been reported [3]. The course of the maxillary artery in the current case might result in its iatrogenic injuries in maxillofacial surgeries because the artery ran obliquely, medial to the mandible. The level of termination is not at the expected level. Therefore, it may get injured in parotid surgeries also.

### Conclusions

Knowledge of the variation of origin and level of bifurcation of ECA and its branching pattern may be obligatory to avoid complications during various surgical procedures for surgeon and also for the radiologist while evaluating radiographs. Noting this variation may be beneficial for surgeons and radiologists.

### Conflict of interest statement

The authors have no conflicts of interest to declare.

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