Case Report
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대한영상의학회지

# Separate Origins of the Internal and External Carotid Arteries Depicted on CT Angiography: A Case Report

# CT 혈관조영술에서 발견된 독립적으로 기시하는 속목동맥과 바깥목동맥: 증례 보고

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Agenesis of the common carotid artery (CCA) is a rare congenital anomaly. We presented a rare case of unilateral congenital absence of the right CCA with separate origins of the ipsilateral internal and external carotid arteries from the brachiocephalic artery. Further, we reviewed the embryological mechanism and clinical importance of this anomaly.

**Index terms**
Agenesis
Vascular Anomaly
Common Carotid Artery
CT Angiography

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## INTRODUCTION

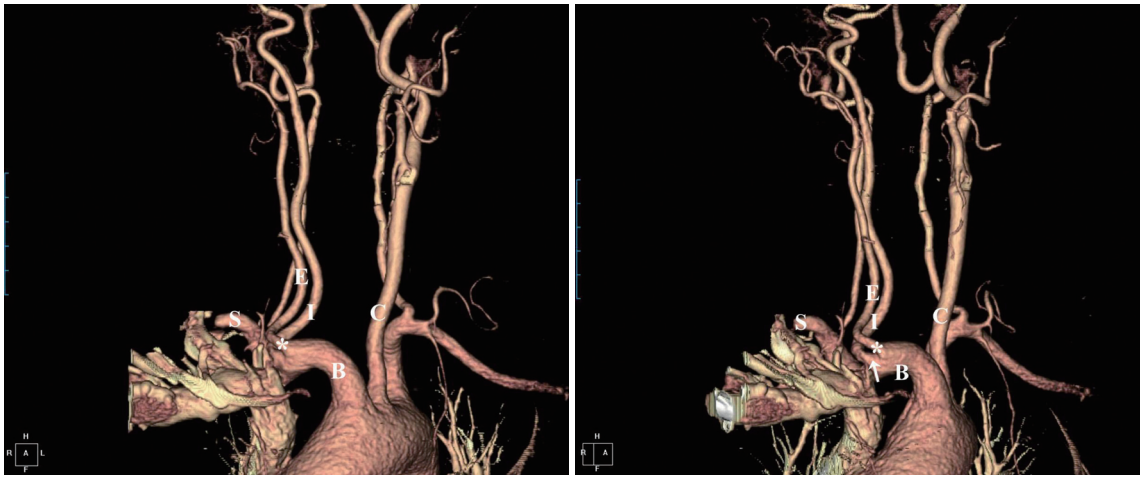
The congenital absence of the common carotid artery (CCA) with separate origins of the external carotid artery (ECA) and internal carotid artery (ICA) is a rare anomaly. The literature includes fewer than 25 such cases (1-6). The technological advances of noninvasive imaging modalities can better delineate anatomical variants and vascular pathologies in the major intracranial and cervical arteries (6, 7). Although congenital vascular anomalies are rare, the identification of these variants can be significant diagnostic and therapeutic challenges in clinical practice (2). We presented a rare case of a right CCA agenesis in a 61-year-old female patient that was detected by head and neck CT angiography (CTA). We also reviewed the relevant literature regarding this congenital anomaly and discussed its embryologic development and clinical significance.

## CASE REPORT

A 61-year-old female visited the hospital with a 5-day history of vertigo. She was completely conscious, and her vital signs were stable. The results of physical and neurological examinations were normal. She underwent a contrast-enhanced CTA to evaluate the major intracranial and cervical arteries. The CTA revealed the absence of the right CCA and independent origins of the ipsilateral ICA and ECA. The right ECA and ICA originated from the brachiocephalic artery, and the ECA arose proximal to the ICA. There was no significant stenosis or other vascular derangements in the major intracranial and cervical arteries within the scanned region (Fig. 1). The CTA also did not reveal any intracranial abnormality.

## DISCUSSION

The agenesis of the right CCA is an extremely rare congenital




A B

**Fig. 1.** A 61-year-old woman with incidentally diagnosed agenesis of the right common carotid artery (CCA) with independent origins of the right internal carotid artery (ICA) and the right external carotid artery (ECA).
**A, B.** Contrast-enhanced three-dimensional surface-shaded rendering CT angiography demonstrating the absence of the right CCA. The right ICA and ECA arise directly from the brachiocephalic artery, and the right ECA originates proximal to the right ICA. Arrow, right ICA origin; asterisk, right ECA origin; B, branchiocephalic artery; C, left CCA; E, right ECA; I, right ICA; and S, right subclavian artery.

anomaly that is typically associated with separate origins of the ICA and ECA directly from the brachiocephalic artery proximal to the right subclavian artery (2-5). Recently, CTA, MR angiography (MRA) and color-coded duplex ultrasonography have become widely available for the evaluation of major intracranial and cervical arteries in clinical practice. The widespread use of CTA and MRA has led to an increase in the incidental detection of congenital vascular anomalies including this CCA agenesis, during imaging workups for vascular derangement (6, 7).

During embryonic development, the ductus caroticus, which connects the third and fourth branchial arches, dorsally involutes, and the proximal portion of the ECA forms the CCA, the third branchial arch forms the carotid sinus and the proximal portion of the ICA, and the fourth branchial arch forms a portion of the main aortic arch on the left side and a portion of the SCA on the right side by the 6th week. Agenesis of the right CCA occurs when the ductus caroticus persists with regression of the third branchial arch or the fourth branchial arch involutes with a resultant cervical aortic arch. The typical form of right CCA agenesis involves an ECA that originates from the brachiocephalic trunk proximal to and separate from the ICA (2, 5, 6, 8, 9).

No clinical symptoms or signs related to this anomaly have been reported in the literature (8, 9). Although this anomaly is typically diagnosed as an incidental finding that occurs during imaging workups for other clinical situations, detailed knowledge of the congenital anomalies of the carotid arteries is potentially important to prevent inadvertent diagnostic or therapeutic challenges during endovascular procedures or cardiothoracic surgeries (2, 5, 6). Therefore, if the CCA cannot be found in the normal anatomical position, the possibilities of this anomaly and combined variations of the ipsilateral ICA and ECA should be considered.

In conclusion, we reported a rare case of right CCA agenesis with separate origins of the right ICA and ECA. This report suggested that the awareness of congenital vascular anomalies of the carotid arteries and their embryologic mechanisms can be helpful for the identification of unexpected vascular findings on CTA or MRA in clinical practice.

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# CT 혈관조영술에서 발견된 독립적으로 기시하는 속목동맥과 바깥목동맥: 증례 보고

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온목동맥의 무발생은 드문 선천성 혈관 기형이다. 본 저자들은 오른쪽 온목동맥의 무발생과 더불어 독립적으로 기시하는 속목동맥과 바깥목동맥의 증례를 경험하였으며 해당 기형의 발생학적 기전과 임상적 중요성을 문헌 고찰을 통해 보고하고자 한다.

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