

## Report of a Variation of the Right Common Carotid Artery

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### Abstract

Carotid artery is the most important artery that carries the major part of the blood supply to the head and neck. The branching of the common carotid artery usually occurs at the upper edge of the thyroid cartilage. The placement of carotid sinus has also increased its importance in this area. Considering the clinical importance of knowledge about carotid artery variations, this case is reported.

During the routine dissection of a 55-year-old man, a unilateral variation of right common carotid artery was found in the dissection saloon of School of Medicine. This artery was divided into two branches at the inferior border of the thyroid cartilage. The left common carotid artery was branched at the superior border of the thyroid cartilage.

Knowledge of carotid artery variations is necessary for anatomists, neurosurgeons, in neck, ENT, and jaw surgeries as well as for angiography, catheterization and carotid arterectomy.

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### Introduction

The carotid artery is the largest artery in the neck region that is separated from the aortic arch in the left side and from the brachycephalic trunk in the right side. This artery is responsible for blood flow to the neck, head and parts of the brain (1). The upper border of the thyroid cartilage is the usual place of dividing this artery into its two end branches, the internal and external cardiac arteries. The location of the carotid sinus is also in this area (2). This level is used as a landmark in determining the cutting location in radical neck surgeries (3). Vascular variations are usually unmarked and may remain unidentified during a person's life. These

variations may be due to vascular diseases, aneurysms or other pathological conditions. Variations may even be found during angiographic tests or surgery. Some cases of anatomical variation of the carotid arterial system are mentioned in articles. They are one of the risk factors for damage to the arteries during ear, neck and jaw surgeries (4).

Knowledge of these variations is important in extensive neck surgery in metastatic cancers, carotid arterectomy surgery for cardiopulmonary plaque removal, or for neurological trauma, plastic surgeons, radiologists and surgeons in the ear, throat and nose (5, 6). Lack of knowledge about these cases may lead to irreparable mistakes. By

considering the importance of this matter in diagnosis and treatment interventions, this report presents the anatomical variation of carotid artery.

### Case report

During a routine dissection of a 55-year-old Caucasian male, we observed a one-way variation at the level of two branches of the joint common carotid artery in anatomy saloon at the Faculty of Medicine in Gonabad University. The common carotid artery on each side was divided into internal and external carotid arteries. The carotid artery carries the brain inside. The arteries on both sides, entered petrous after the passage of carotid canal and after passing through lacerum

foramen, it went to Sinus Cavernous. At the end, it had ophthalmic and communicating branches. The external carotid arteries supplied some parts of the face, meninges and skull. This artery passed on both sides of the neck of mandible and was divided into maxillary and superficial temporal branches.

The appearance of the corpse was healthy and there was no damage or surgical scars. On the right side of the neck, the joint site of the common carotid artery was located at the lower border of the thyroid cartilage. At the left, the site was at its usual level (at the upper border of the thyroid cartilage (Fig. 1).



**Figure 1.** Images A-D shows the common left and right carotid arteries taken with the forceps

## Discussion

The carotid arterial system in the neck is responsible for blood supply to the neck, head and parts of the brain. Anu et al reported that carotid arteries bifurcation is commonly at the level of C3-C4 cervical vertebrae, and in only 10% of cases, this level is C2 and, in rare cases (1%) it is at a lower level than C5 (2). A research by Gulsen et al. showed that the common carotid artery usually splits around the C3-C4 vertebrae to its end branches (7). The common location of carotid bifurcation is reported in many studies in the upper border of the thyroid cartilage (2, 4, 6), that may be in the level of the hyoid bone or cricoid cartilage; more rarely, it bifurcates at the level of the fourth thoracic vertebra (8). In the study by Al-Rafiah and colleagues, 48.3% of the cases had bifurcation at the upper border of thyroid cartilage and in 25% it was in hyoid bone and in 3.3% it was higher than the hyoid bone. In 5% of the cases it was at a lower level than the upper edge of the thyroid cartilage (4). In other articles, the incidence of bifurcation of carotid was reported from 11% to 15% below the upper border of thyroid cartilage (9, 10). For the first time, Orr reported carotid bifurcation at the level of inferior cervical vertebrae in 1906 (11). Gailloud et al. reported carotid bifurcation at the level of thoracic vertebrae with Klippel-Feil anomaly in a 72-year-old male patient (8).

In Gulsen et al study, the common carotid was bifurcated at C5-C6 level on the left side and on the right side between the C6-C7 vertebrae (7). Studies have reported different results on the level of carotid bifurcation at inferior border of thyroid cartilage in different countries. It was 6% in 36 corps in New Zealand (12), 80 cadavers (13.3%) in Kenya (13) and 80 cadavers (11.3%) in Japan (14). According to reports, neck surgery is more difficult and requires more time and precision

to prevent vascular damage in patients with carotid bifurcation at lower levels of the cervical vertebra than surgery with usual side of carotid bifurcation (15).

The common carotid artery originates from the third aortic arch during the embryonic development. The proximal portion of the internal carotid artery forms the third arch and its distal part is formed from the dorsal aortic artery and the external carotid artery is a bud of the third aortic arch (16, 17). Many variations arise due to the disruption of the embryonic origin of this artery. There is no reliable clinical sign that can be used to determine the level of two branches of the carotid bifurcation in a person. In addition, the location of the carotid sinus, which is adjacent to the carotid bifurcation site must be considered during surgery. The carotid sinus plays a central role in maintaining the balance of blood pressure. Hypersensitivity carotid sinus is a severe response to carotid sinus stimulation. In the carotid sinus reflex, ventricular conduction delay, bradycardia and vascular tone reduction cause hypothermia, and in surgeries that involve sinus manipulation, patients should be monitored continuously for pulse, blood pressure and other vital signs (18).

## Conclusion

Knowledge of these variations is very important during neck surgery, radiological diagnosis and angiographic tests. Determining the level of artery bifurcation via ultrasound and angiography can be beneficial and reduces the chance of damage in the area in patients undergoing operation. Besides, understanding variations of carotid artery is necessary for anatomists, neurosurgeons and in neck, ENT, and jaw surgeries as well as for catheterization and carotid arterectomy. Common carotid artery is often used to measure

pulse, especially in patients who are shocked. Increasing the thickness of this artery is a marker for atherosclerosis.

Carotidynia is a syndrome characterized by soreness of the carotid artery near the bifurcation.

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