



## Case Report

Copyright © All rights are reserved by Valchkevich DA

# Retropharyngeal Course of the Internal Carotid Artery: A Case Report

Tatun TV<sup>1</sup>, Astapenka KP<sup>2</sup>, Valchkevich DA<sup>1\*</sup>, Tokina I Yu<sup>1</sup>, Savoshchenya D<sup>1</sup><sup>1</sup>Department of Normal Anatomy, Grodno State Medical University, Belarus<sup>2</sup>Department of X-ray computer diagnostics, Grodno University Clinic, Belarus**\*Corresponding author:** Valchkevich Dzmitry, Associate Professor, Gorkogo str, 80, Grodno, Belarus.**Received Date:** May 11, 2023**Published Date:** May 31, 2023

## Abstract

A clinical case of bilateral C-shaped medial tortuosity of the internal carotid arteries and their location in the retropharyngeal space is described, and the anatomical and topographic features of the vessels of the head and neck on multiplanar reconstructions of CT images are considered in detail. Morphometric, topographic and X-ray anatomical characteristics of the internal carotid artery were established.

**Keywords:** Computer tomography; Internal carotid artery; Retropharyngeal space; Multiplanar reconstructions of CT images

## Introduction

The literature describes isolated cases of anatomical variations of the extracranial part of internal carotid artery. They are mostly accidental and asymptomatic findings [1,2]. Knowledge of the normal anatomy of the topography, course and anatomical variability of internal carotid artery are important for not only maxillofacial surgery, radiology, dentistry, but also for teachers of medical universities to expand knowledge about the anatomical and topographic aspects of the vessels of the head and neck [2,3].

Exact understanding of the topography and anatomical variability of internal carotid artery is a key point in the surgery. It can prevent operative complications and reduce the risk of vascular damage during any surgical manipulation in the region of pharynx, during drainage of a pharyngeal abscess and any intervention affecting the pharyngeal wall in the immediate vicinity of the internal carotid artery [4].

The main function of the carotid arterial system is the transportation of oxygenated blood to the organs and tissues of the

head and neck. The external carotid artery supplies blood to the organs of the head, while the internal carotid one supplies blood to the brain and partially the outer tissues of the skull. There are numerous anastomoses between the branches of both external and internal, carotid arteries. These anastomoses allow carrying out collateral blood supply in case of occlusion of any branch.

The common carotid artery is usually divided into its terminal branches at the level of the upper edge of the thyroid cartilage, which corresponds to the body of the C4 vertebra into internal and external branches [3,4]. The level of bifurcation of the common carotid artery can vary from the C1 to the T2 [5,6,7]. The internal carotid artery usually has a rectilinear ascending course on the neck and is located posterior and lateral to the pharyngeal wall and goes toward the base of skull. There are two types of ascending pathway of internal carotid: typical rectilinear course, and atypical variations of course: cowling, C- and S-shaped tortuosity, kinking, elongations, and kinks [8]. Tortuosity can be of various degrees, the most extreme is the pharyngeal transposition [3]. Tortuosity, kinks,

and twisting can lead to the expansion of parapharyngeal tissues and compression of the posterior part of the pharyngeal wall when the artery is in the submucosal position [3,9]. Clinically, this can be visualized as an elevation on the posterior wall of the pharynx.

A review of the literature pointed to various causes of the atypical position of the internal carotid artery. Abnormal tortuosity may develop due to the elongation of the artery, which causes bends or even loops formation. Excessive length of the internal carotid artery develops usually during the intrauterine period, so, the tortuosity of the artery is most often congenital. It can be assumed that incomplete straightening and remnant of embryonic curvature may lead to the presence of a atypical course of the internal carotid artery, including in the pharyngeal space, after the birth [8,10]. Abnormal tortuosity may be associated with age-related changes and lead to increased kinks in fibromuscular dysplasia, atherosclerosis, and cardiovascular pathology [1,9,11]. Elongation of the internal carotid artery can also develop because of advanced hypertension, when constantly high blood pressure causes the changes in the artery wall. Such tortuosity rarely affects cerebral hemodynamics and is more often a phenomenon that is accidentally found during the ultrasound of the main arteries [12].

In most cases, the retropharyngeal location of the internal carotid artery is an accidental finding and is asymptomatic [2,9]. Usually, the artery locating in the retropharyngeal space has a convexity which faces medially [11,12]. Also, it can be both unilateral and bilateral [13,14]. The aim of the research is to study and analyze a clinical case of bilateral C-shaped medial tortuosity of the internal carotid arteries and their location in the retropharyngeal space.

## Case presentation

We have observed a 40-year-old woman, who underwent multispiral computed tomography (MSCT) of the head and neck vessels at the Grodno University Clinic (Belarus). It was found a bilateral C-shaped medial tortuosity of the internal carotid arteries on both sides and their position in the retropharyngeal space. The branches of the aortic arch were arised as usual – brachiocephalic trunk, left common carotid and left subclavian artery. The brachiocephalic trunk was divided at the level of middle of body of the T2 vertebra into two: right subclavian artery and right common carotid. The outer diameter of the right common carotid was 6.62 mm. The outer diameter of the left common carotid artery at the level of its arising from the arch of aorta (middle of body of the T3 vertebra) was 7.06 mm. The relation of the common carotid artery to the internal jugular vein on both sides was the same: the artery was dorsomedial to the vein.

Both common carotid arteries were located on the same distance from the midline of neck, and they had a rectilinear course. The length of the left common carotid artery was longer (10.89 mm) than the right one (7.05 mm). The outer diameter of the right and left common carotid arteries below the level of their bifurcation was almost same (6.68 mm and 6.62 mm, respectively). The bifurcation of the right common carotid artery was at the level of the upper edge of the body of the C5 vertebra, while the left one

– at the level of the lower edge of the body of the C4 vertebra. The jugular veins and internal carotid arteries were in the frontal plane, the vein was medial to artery. The right common carotid artery bifurcates with an angle of 32°, the left artery – 35°.

The outer diameter of the right external and internal carotid arteries was 4.5 and 7.8 mm, respectively.

The outer diameter of the left external and internal carotid arteries was 4.8 and 8.3 mm, respectively.

The internal carotid artery occupied a dorsomedial position in relation to the external carotid. At the level of middle of the body of C3 vertebra, the right internal carotid artery sharply bends medially in the frontal plane and enters the retropharyngeal space. The bend is located 3.5 mm to the right of the midline and lies just behind the posterior wall of the pharynx. The concavity of bend is opened to the lateral side and is 117°, so it is not hemodynamically significant.

At the level of the lower edge of the body of the C2 vertebra, the left internal carotid artery also bends medially and adheres to the posterior wall of the pharynx. The angle of concavity is opened laterally and is 105° that has no clinical and hemodynamic significance.

## Conclusion

Retropharyngeal position of the internal carotid artery may be associated with a higher risk of bleeding and mortality during endotracheal intubation, various surgical manipulations, like drainage of the retropharyngeal abscess, biopsy in the area of posterior pharyngeal wall close to the vessels of neck. The possibility of the medial bending of internal carotid artery must be taken into mind during mentioned surgical interventions on the neck. Despite the rare occurrence of this vascular anomaly, it is important to keep in mind the variability of a course of neck vessels when planning surgical operations in the retropharyngeal region, since their damage can often be fatal.

## Conflict of interest

None.

## Acknowledgement

None.

## References

- Chandak S, Mandal A, Singh A (2016) Kissing carotids: An unusual cause of dysphagia in a healthy child. *J Pediatr Neurosci* 11(4): 380-385.
- Prasad KC, Gupta A, Induvarsha G, Anjali PK, Vyshnavi V (2022) Microsurgical anatomy of the internal carotid artery at the skull base. *J Laryngol Otol* 136(1): 64-67.
- Gupta A, Shah AD, Zhang Z, Phillips CD, Young RJ (2013) Variability in the position of the retropharyngeal internal carotid artery. *Laryngoscope* 123(2): 431-432.
- Pfeiffer J, Ridder GJ (2008) A clinical classification system for aberrant internal carotid arteries. *Laryngoscope* 118(11): 1931-1936.
- Kandemirli, S. G. (2020) Intrathoracic bifurcation of the left common carotid artery is associated with rib fusion and Klippel-Feil syndrome. *Surgical and Radiologic Anatomy* 42(4): 411-415.

6. Sonje P, Kanasker, N, Vatsalaswamy P (2019) Significance of level of bifurcation of common carotid artery and variant branches of external carotid artery in cervicofacial surgeries with ontological explanation: a cadaveric study. *International Surgery Journal* 6(10): 3681.
7. Solan S, Reddy Nune DR GK (2014) Unusual High Bifurcation of Common Carotid Artery Among Eastern Population- A Case Study. *IOSR Journal of Dental and Medical Sciences* 13(3): 102-105.
8. Arumugam S, Subbiah NK (2020) A Cadaveric Study on the Course of the Cervical Segment of the Internal Carotid Artery and Its Variations. *Cureus*.
9. Prakash M, Abhinaya S, Kumar A, Khandelwal N (2017) Bilateral retropharyngeal internal carotid artery: a rare and potentially fatal anatomic variation. *Neurol India* 65(2): 431-432.
10. Lukins DE, Pilati S, Escott EJ (2016) The moving carotid artery: a retrospective review of the retropharyngeal carotid artery and the incidence of positional changes on serial studies. *AJNR Am J Neuroradiol* 37(2): 336-341.
11. Chamanian G, Rijju J, Gunturi A, Tirkey AJ (2022) Abnormal Course of Internal Carotid Artery Encountered During Neck Dissection. *Indian Journal of Otolaryngology and Head and Neck Surgery* 74: 6255-6257.
12. De Regloix SB, Maurin O (2017) Retropharyngeal course of the internal carotid artery. *Journal of the Royal Army Medical Corps* 163(6): 426.
13. Srinivasan S, Ali SZ, Chwan LT (2013) Aberrant retropharyngeal (submucosal) internal carotid artery: an under-recognized, clinically significant variant. *Surg Radiol Anat* 35(5): 449-450.
14. SS, SM, TS, TK (2018) Retropharyngeal course of the internal carotid artery: A case report. *Neuroradiology* 60(10): 1135.