

Original article:

Study of pattern of carotid arteries: Cadaveric study

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Abstract:

Introduction: Surgical anatomy of carotid bifurcation is of unique importance for numerous medical specialties. Despite extensive research, many aspects such as precise height of carotid bifurcation, micrometric values of carotid arteries and their branches as their diameter, length, and degree of tortuosity, and variations of proximal external carotid artery branches are undetermined.

Material and methods: Present work was done in our Anatomy Department of Grant Medical College during process of routine dissection for first MBBS students. We collected results for the duration of 2 years over including 30 bodies. Carotid pattern of both sides were compared and noted.

Results: The right common carotid may arise above the level of the upper border of the sternoclavicular joint; this variation occurred in only 2 cadaverous. The bifurcation occurred higher than usual in 10 cases and lower bifurcation were seen in 4 cases.

Key words: Common carotid artery, External carotid artery, Internal carotid artery, Thyroid cartilage

Introduction:

Surgical anatomy of carotid bifurcation is of unique importance for numerous medical specialties. Despite extensive research, many aspects such as precise height of carotid bifurcation, micrometric values of carotid arteries and their branches as their diameter, length, and degree of tortuosity, and variations of proximal external carotid artery branches are undetermined.⁶

The knowledge of point of bifurcation of common carotid artery (CCA) is very important in surgeries of head and neck region to prevent vascular accidents, during catheterization of carotid arteries and intra-arterial administration of chemotherapeutic agents. Furthermore carotid bifurcation is also involved in many pathologic processes, atheromatous disease being the commonest. Carotid atheromatous disease is a major predisposing factor for disabling and

possibly fatal strokes with geometry of carotid bifurcation playing an important role in its natural history.^{7,12,13} With this background present study was done to study pattern of carotid arteries in Cadaveric dissection

Material and methods:

Present work was done in our Anatomy Department of Grant Medical College during process of routine dissection for first MBBS students. The dissections were carried out according to the instructions given in Cunningham's manual of practical anatomy. We collected results for the duration of 2 years over including 30 bodies. Carotid pattern of both sides were compared and noted. The level of bifurcation of common carotid artery was noted and correlated with the upper border of thyroid cartilage. The study was on basis of qualitative study, hence we have not limited it

with sample size determination. It was just an observational study.

Results:

The right common carotid may arise above the level of the upper border of the sternoclavicular joint; this variation occurred in 2 cadavers. The bifurcation occurred higher than usual in 10 cases and lower bifurcation were seen in 4 cases.

The level of bifurcation of common carotid artery was found to be at the upper border of thyroid cartilage in 73.44%. The incidence of higher level of bifurcation of common carotid artery was 11.25%. The incidence of low bifurcation was low in the present study (6.6%). In present study showing higher left carotid bifurcation in 70% than the right in 30% cases.

Discussion:

The common carotid arteries are present on the left and right sides of the body. These arteries originate from different arteries, but follow symmetrical courses. The right common carotid originates in the neck from the brachiocephalic trunk; the left from the aortic arch in the thorax. These split into the external and internal carotid arteries at the upper border of the thyroid cartilage, at around the level of the fourth cervical vertebra.

The left common carotid artery can be thought of as having two parts: a thoracic (chest) part and a cervical (neck) part. The right common carotid originates in or close to the neck, so contains only a small thoracic portion. There are studies in the bioengineering literature that have looked into characterizing the geometric structure of the common carotid artery from both qualitative and mathematical (quantitative) standpoints.

The **external carotid artery** is a major artery of the head and neck. It arises from the common carotid artery when it splits into the external and internal carotid artery. It supplies blood to the face and neck. The external carotid artery begins at

the upper border of thyroid cartilage, and curves, passing forward and upward, and then inclining backward to the space behind the neck of the mandible, where it divides into the superficial temporal and maxillary artery within the parotid gland.

It rapidly diminishes in size as it travels up the neck, owing to the number and large size of its branches.

At its origin, this artery is closer to the skin and more medial than the internal carotid, and is situated within the carotid triangle.

The **internal carotid artery** is a major paired artery, one on each side of the head and neck, in human anatomy. They arise from the common carotid arteries where these bifurcate into the internal and external carotid arteries at cervical vertebral level 3 or 4; the internal carotid artery supplies the brain, while the external carotid nourishes other portions of the head, such as face, scalp, skull, and meninges.

The level of bifurcation of common carotid artery was found to be at the upper border of thyroid cartilage in 89% of 59 cases studied by Lo A and 50% by Lucev et al. The present study shows the higher incidence with the frequency of 73.44%. The higher level of bifurcation of common carotid artery was found to be 37.5% by Lucev et al. The incidence of higher bifurcation is low in the present study (11.25%). Lower cervical bifurcation of the carotid arteries was first reported by Orr in 1906. The lower division of Common carotid has been recorded to as frequent as 30%. It was reported to be 12.5% by Lucev et al. Gulsen et al reported a case of bilateral low-lying bifurcation of the common carotid artery. The incidence of low bifurcation was low in the present study (6.6%). Hypoglossal nerve lies closer in relation to the CCA bifurcation especially when it bifurcates at higher level. Gulsen et al had encountered

difficulties in a cervical discectomy operation in a patient with low-lying bifurcation of CCA . Smith and Larsen reported that the left carotid bifurcation to be higher than the right in 50% of the cases and the right bifurcation higher than left in 22% of the cases. In present study also showing higher left carotid bifurcation in 70% than the right in 30% of the cases.

Surgical anatomy of the CB area is complex but important for many different clinical and surgical applications. Anatomically it should not be seen as the bifurcation point between ICA and ECA only but rather in conjunction with other important anatomic structures in the area, including cranial nerves. Many questions on its detailed anatomy are not completely clarified including precise HCB, morphometry of the ICA and ECA, and tortuosity of the CCA.

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Conclusion:

Surgical anatomy of the CB area is complex but important for many different clinical and surgical applications. A thorough knowledge of the anatomy of the arch of aorta and its branches is of great importance today as the arch is assuming a key role in many endovascular surgeries. The varying configuration of the arch and its branching pattern are one of the main risk predictors in many endovascular surgeries such as carotid artery stenting.

In the present study the incidence of bifurcation of common carotid was more or less constant at the level of upper border of thyroid cartilage. The incidence of higher level of bifurcation is more than lower level of bifurcation. Higher origin of right common carotid artery was also seen.

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