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Review on Surgical Anatomy of the Segments of the Internal Carotid Artery

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Internal carotid artery arises from the common carotid artery and anatomically is divided into seven segments which are : C1 cervical, C2 petrous, C3 lacerum, C4 cavernous, C5 clinoid, C6 ophthalmic, and C7 communicating. In clinical practice both surgically and radiologically, knowing the precise anatomy of each segment has its importance in avoiding complications during surgical approaches.

Using radiological methods to study the detailed anatomy of the artery, enables the surgeons to approach the lesions of the artery or the adjacent structures which may involve the artery, more precisely and consequently such approaches cause less side effects for the patients.

As knowing the surgical and imaging anatomy of this important anatomical structure is very critical in surgical approaches specifically in the setting of head and neck and skull base surgeries, this study has briefly reviewed the anatomy of this important structure in more detail from points of view of neurosurgery and neuroradiology.

The ICA segments can be classified mainly into 3 ones: "Cervical segment", "Skull base segment" and "Intracranial segment".

The Cervical ICA extends from carotid bifurcation to the skull base. After going through the petrous bone it turns up within the foramen lacerum. Then It passes under petrolingual ligament and afterwards it enters the cavernous sinus. After a turn anteriorly, it leaves the cavernous sinus. Then it goes through an area which is clinoid one. After that, it goes through the distal dural ring and then it continues into the hypophyseal region and continues its branches and bifurcation.

ICA segments classifications : ICA segments first classified by Fischer in 1938 , then in 1981 by Gibo, Lenkey and Rhoton and then by Bouthillier and colleagues in 1996. Also Ziyal and colleagues and Lasjaunias and Santoyo-Vazquez have two classifications. There is also a NYU classification.

The Brief description of each segment's anatomy includes:

C1, cervical : From the common carotid bifurcation to the entry of the carotid canal. It includes carotid sinus.

C2, petrous : This segment courses within the carotid canal and gives rise to mandibulovidian, caroticotympanic and variant stapedial arteries.

C3, lacerum : It begins at the intracranial entry above the foramen lacerum and ends at the petrolingual ligament.

C4, cavernous : It runs within the cavernous sinus and lies in the parasellar region. It gives off the inferolateral trunk, meningohypophyseal trunk and the capsular artery.

C5, clinoid : It lies between the proximal and distal dural rings.

C6, ophthalmic : It extends from the distal dural ring to the origin of the posterior communicating artery. It gives off the ophthalmic artery and superior hypophyseal arteries.

C7, communicating : It extends from the origin of the posterior communicating artery to the origin of the anterior choroidal artery. It gives rise to the posterior communicating artery and to a few perforators.

There are some variations in ICA anatomy include: Aberrant ICA , Kissing carotids, Congenital absence of the ICA, Lateralized internal carotid artery, Retropharyngeal ICA and Persistent carotid-vertebrobasilar anastomoses.

It is important for the surgeons to have detailed knowledge about the surgical anatomy of the ICA as one of the most important anatomical structures of the head and neck.

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