Internal carotid artery segments

C1: Cervical segment

Begin in neck at carotid bifurcation where the common carotid artery divides into internal carotid artery and external carotid artery. Travels in carotid sheath with IJV and vagal nerve, encircled with postganglionic sympathetic nerves (PGSN). C1 ends where the ICA enters carotid canal of petrous bone. No branches.

The cervical segment, or C1, or cervical part of the internal carotid, extends from the carotid bifurcation in the skull anterior to the jugular foramen.

Internal carotid artery - dissection At its origin, the internal carotid artery is somewhat dilated. This part of the artery is known as the carotid sinus or the carotid bulb. The ascending portion of the cervical segment occurs distal to the bulb, when the vessel walls are again parallel.

The internal carotid runs vertically upward in the carotid sheath and enters the skull through the carotid canal. During this part of its course, it lies in front of the transverse processes of the upper three cervical vertebrae.

It is relatively superficial at its start, where it is contained in the carotid triangle of the neck, and lies behind and medial to the external carotid, overlapped by the sternocleidomastoid muscle, and covered by the deep fascia, the platysma, and integument: it then passes beneath the parotid gland, being crossed by the hypoglossal nerve, the digastic muscle and the stylohyoid muscle, the occipital artery and the posterior auricular artery. Higher up, it is separated from the external carotid by the styloglossus and stylopharyngeus muscles, the tip of the styloid process and the stylohyoid ligament, the glossopharyngeal nerve and the pharyngeal branch of the vagus nerve. It is in relation, behind, with the longus capitis, the superior cervical ganglion of the sympathetic trunk, and the superior laryngeal nerve; laterally, with the internal jugular vein and vagus nerve, the nerve lying on a plane posterior to the artery; medially, with the pharynx, superior laryngeal nerve, and ascending pharyngeal artery. At the base of the skull the glossopharyngeal, vagus, accessory, and hypoglossal nerves lie between the artery and the internal jugular vein.

Unlike the external carotid artery, the internal carotid normally has no branches in the neck.

C2: Petrous segment

C3: Lacerum segment The lacerum segment, or C3, is a short segment that begins above the foramen lacerum and ends at the petrolingual ligament, a reflection of periosteum between the lingula and petrous apex (or petrosal process) of the sphenoid bone. The lacerum portion is still considered 'extra-dural', as it is surrounded by periosteum and fibrocartilage along its course. The vidian artery arises from the lacerum segment, though it is often too small to be angiographically visible. It is erroneously stated in several anatomy text books that the internal carotid artery passes through the foramen lacerum. This at best has only ever been a partial truth in that it passes through the superior part of the foramen on its way to the cavernous sinus. As such it does not traverse the skull through it. The inferior part of the foramen is actually filled with fibrocartilage. The broad consensus is that the
internal carotid artery should not be described as travelling through the foramen lacerum.

C4: Cavernous segment

Oblique section through the cavernous sinus. The cavernous segment, or C4, of the internal carotid artery begins at the petrolingual ligament and extends to the proximal dural ring, which is formed by the medial and inferior periosteum of the anterior clinoid process. The cavernous segment is surrounded by the cavernous sinus.

In this part of its course, the artery is situated between the layers of the dura mater forming the cavernous sinus, but covered by the lining membrane of the sinus. It at first ascends toward the posterior clinoid process, then passes forward by the side of the body of the sphenoid bone, again curves upward on the medial side of the anterior clinoid process, and perforates the dura mater forming the roof of the sinus. The curve in the cavernous segment is called the carotid siphon. This portion of the artery is surrounded by filaments of the sympathetic trunk and on its lateral side is the abducent nerve, or cranial nerve VI.

The named branches of the cavernous segment are:

the meningohypophyseal artery the inferolateral trunk The cavernous segment also gives rise to small capsular arteries that supply the wall of the cavernous sinus.

C5: Clinoid segment The clinoid segment, or C5, is another short segment of the internal carotid that begins after the artery exits the cavernous sinus at the proximal dural ring and extends distally to the distal dural ring, after which the carotid artery is considered “intra-dural” and has entered the subarachnoid space.

The clinoid segment normally has no named branches, though the ophthalmic artery may arise from the clinoid segment.

C6: Ophthalmic segment

The ophthalmic artery and its branches. The ophthalmic segment, or C6, extends from the distal dural ring, which is continuous with the falx cerebri, to the origin of the posterior communicating artery. The ophthalmic segment courses roughly horizontally, parallel to the optic nerve, which runs superomedially to the carotid at this point.

The named branches of the ophthalmic segment are:

the ophthalmic artery the superior hypophyseal artery C7: Communicating segment The communicating segment, or terminal segment, or C7, of the internal carotid artery passes between the optic and oculomotor nerves to the anterior perforated substance at the medial extremity of the lateral cerebral fissure. Angiographically, this segment extends from the origin of the posterior communicating artery to the bifurcation of the internal carotid artery.

The named branches of the communicating segment are:

the posterior communicating artery the anterior choroidal artery The internal carotid then divides to form the anterior cerebral artery and middle cerebral artery. The internal carotid artery can receive blood flow via an important collateral pathway supplying the brain, the cerebral arterial circle, which is more commonly known as the Circle of Willis.
The course of the **internal carotid artery** (ICA) and its segment **classifications** were reviewed by means of a new and freely available interactive **3D model** of the artery and the **skull base**, based on human **neuroimages**, that can be freely downloaded at the Public Repository of the University of **Barcelona** ([http://diposit.ub.edu/dspace/handle/2445/112442](http://diposit.ub.edu/dspace/handle/2445/112442)) and runs under **Adobe Acrobat** Reader in Mac and Windows computers and Windows 10 tablets. The **3D-PDF** allows zoom, rotation, selective visualization of structures, and a predefined sequence view. Illustrative images of the different classifications were obtained.

In **1938** Fischer, described five **internal carotid artery segments** in the opposite direction to the **blood flow**.

These segments were based on the angiographic course of the intracranial ICA rather than its arterial branches or anatomic compartments. Subsequent attempts to apply modern nomenclature to these numerical segments failed to recognize Fischer's original intent of describing patterns of arterial displacement by tumors and, therefore, resulted in a nomenclature that was anatomically inaccurate. Fischer's system was further limited, because segments were numbered opposite the direction of blood flow and the extracranial ICA was excluded.

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Gibo et al. in **1981** studied the microsurgical **anatomy** of the **supraclinoid** portion of the **internal carotid artery** (ICA) in 50 adult cadaver cerebral hemispheres using X 3 to X 40 magnification. The ICA was divided into four parts: the C1 or cervical portion; the C2 or petrous portion; the C3 or cavernous portion; and the C4 or supraclinoid portion.

The C4 portion was divided into three segments based on the origin of its major branches: the ophthalmic segment extended from the origin of the **ophthalmic artery** to the origin of the **posterior communicating artery** (PCoA); the communicating segment extended from the origin of the PCoA to the origin of the **anterior choroidal artery** (AChA); and the choroidal segment extended from the origin of the AChA to the bifurcation of the **carotid artery**. Each segment gave off a series of perforating branches with a relatively constant site of termination. The perforating branches arising from the ophthalmic segment passed to the **optic nerve** and **chiasm**, **infundibulum**, and the floor of the third ventricle. The perforating branches arising from the communicating segment passed to the **optic tract** and the floor of the third ventricle. The perforating branches arises from the choroidal segment passed upward and entered the brain through the anterior perforated substance. The anatomy of the ophthalmic, posterior communicating, anterior choroidal, and superior hypophyseal branches of the C4 portion was also examined. Gibo-Rothon ([J Neurosurg](https://www.ncbi.nlm.nih.gov/pubmed/6892989) 55:560-574, 1981) follow the blood flow, incorporated the cervical and petrous portions, and divided the subarachnoid course-supraclinoid-in ophthalmic, communicating, and choroidal segments, enhancing transcranial microscopic approaches.

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see **Bouthillier classification**.

Bouthillier et al. described in **1996** a seven segment **internal carotid artery** (ICA) classification system. It remains the most widely used system for describing ICA segments.
The Kassam's group (2014), with an endoscopic endonasal perspective, introduces the “paraclival segment,” including the “lacerum segment” and part of the intracavernous ICA, and details surgical landmarks to minimize the risk of injury 5).

see also Carotid Siphon

Endoscopic classification

Based on anatomic correlations, the ICA may be described as 6 distinct segments:

(1) parapharyngeal (common carotid artery bifurcation to carotid canal)

(2) petrous (carotid canal to posterolateral aspect of foramen lacerum)

(3) paraclival (posterolateral foramen lacerum to the superomedial aspect of the petrous apex)

(4) parasellar (superomedial petrous apex to the proximal dural ring)

(5) paraclinoid (from the proximal to the distal dural rings)

(6) intradural (distal ring to ICA bifurcation).

Corresponding surgical landmarks included the Eustachian tube, the fossa of Rosenmüller, and levator veli palatini for the parapharyngeal segment; the vidian canal and V3 for the petrous segment; the fibrocartilage of foramen lacerum, foramen rotundum, maxillary strut, lingual process of the sphenoid bone, and paraclival protuberance for the paraclival segment; the sellar floor and petrous apex for the parasellar segment; and the medial and lateral opticocarotid and lateral tubercular recesses, as well as the distal osseous arch of the carotid sulcus for the paraclinoid segment 6).

see Intracavernous internal carotid artery.
References


