THE CAROTID SYSTEM

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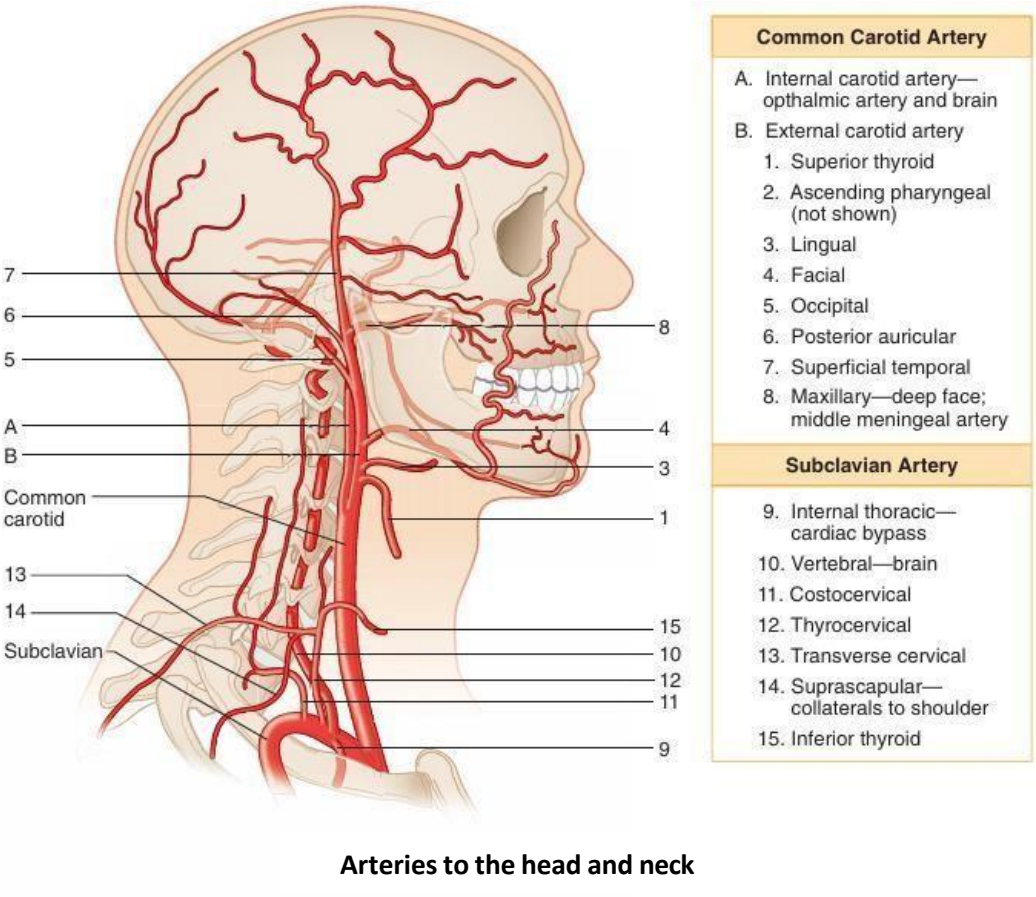
I – INTRODUCTION:

The carotid system plays a crucial role, providing arterial blood supply to most of the face, neck, and brain.



Arteries to the head and neck

II – COMMON CAROTID ARTERIES:

- There are two, right and left. They are the main arteries supplying the neck, the face, and the anterior part of the brain.

1. Origin:

- The left one arises from the convexity of the aortic arch.
- The right one arises as a terminal branch of the brachiocephalic trunk.

2. Course :

- It projects along a line from the sternoclavicular joint to the neck of the mandible.
- Both end by dividing into the external and internal carotid arteries at the level of the upper border of the thyroid cartilage.

3. Anatomical relations :

In the thorax, only the left common carotid runs through this region. It is related to the following structures:

- **Anteriorly:** The left brachiocephalic vein.
- **Posteriorly:** The esophagus, the inferior laryngeal nerve, the left subclavian artery, and the thoracic duct.
- **To the right:** The brachiocephalic trunk and the trachea.
- **To the left:** The vagus nerve and the left phrenic nerve.

III – EXTERNAL CAROTID ARTERIES:

They supply the anterior regions of the neck, the skin of the face, and the head.

1. Origin :

They arise from the common carotid artery, at the level of the upper border of the thyroid cartilage.

2. Course :

- They are anteromedial to the internal carotid artery.
- Then, they ascend vertically for about 2 cm, before inclining laterally and posteriorly to become lateral to the internal carotid artery.

3. Collateral branches of the external carotid artery :

They end below the neck of the mandible, giving rise to:

- the superficial temporal artery,
- and the maxillary artery.

4. Collateral branches:

a. Superior thyroid artery :

- **Origin :**
  It arises near the origin of the common carotid artery.

- **Course :**
  The superior thyroid artery lies against the inferior constrictor muscle of the pharynx.

- **Termination :**
  It ends in three branches:
  - the infrahyoid branch,
  - the sternocleidomastoid branch,
  - the superior laryngeal artery.

b. Lingual artery :

- **Origin :**
  It arises above the superior thyroid artery.

- **Course :**
  The lingual artery follows the lateral muscular wall of the pharynx.

- **Termination :**
  It ends in:
  - the deep artery of the tongue
  - the sublingual artery

c. Facial artery :

- **Origin** :
  It arises above the lingual artery, at the level of the greater horn of the hyoid bone.

- **Course :**

- It passes under the belly of the digastric muscle, then it loops around the submandibular gland.
- It lies against the mandibular angle before becoming subcutaneous in the nasolabial groove.

- **Termination** :
  It ends at the internal angle of the eye, giving off the angular artery, which anastomoses with the dorsal nasal artery, a branch of the ophthalmic artery (internal carotid artery).

- **Collateral branches:**

  - Superior and inferior labial arteries
  - Sublingual artery
  - Cutaneous arteries for the facial skin

d. Ascending pharyngeal artery :

It arises above the lingual artery and terminates in the lateral pharyngeal wall.

e. Occipital artery :

- **Origin :**
  It arises from the posterior aspect of the external carotid artery, at the level of the facial artery.

- **Course :**
  It follows the posterior belly of the digastric muscle towards the occipital bone.

- **Termination :**
  It ends at the occipital scalp, dividing into two branches:

  - The medial branch,
  - The lateral branch.

f. Posterior auricular artery :

- **Origin :**
  It arises above the posterior belly of the digastric muscle.

- **Course :**
  It follows a vertical course behind the auricle.

- **Termination :**
  It divides into two branches:

  - The auricular branch,
  - The occipital branch.

5. Terminal branches of the external carotid artery :

a. Superficial temporal artery :

- **Origin** :
  It arises from the external carotid artery and emerges from the parotid gland.
  It supplies the frontoparietal scalp.

- **Course** :
  At its origin, it runs vertically, pre-auricular, near the temporomandibular joint (TMJ).

- **Terminal branches**
  It ends in two branches:

  - The frontal branch,
  - The parietal branch.

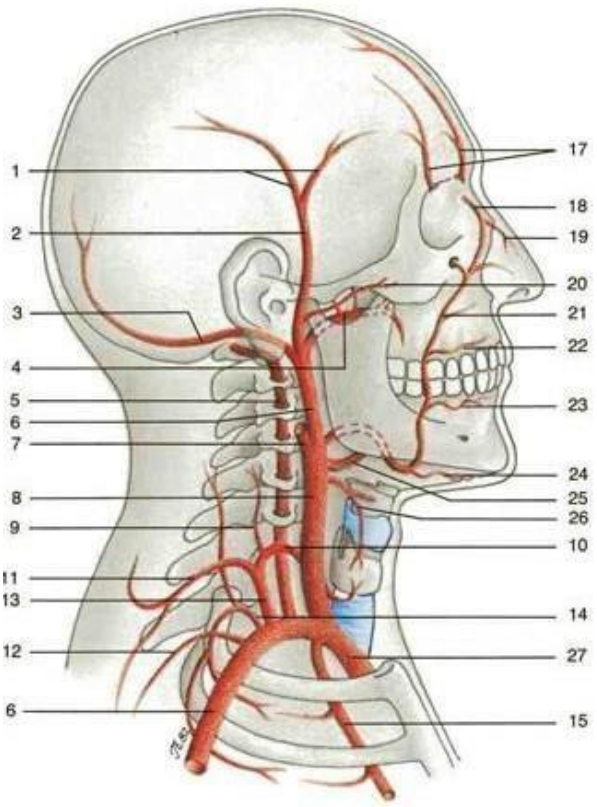
b. Maxillary artery :

- **Origin :**
  It is a deep artery that supplies the maxillomandibular and nasal bones.
  It arises behind the neck of the mandibular condyle.

- **Course :**
  It passes through the infratemporal fossa, then the pterygopalatine fossa, and makes contact with the V nerve (trigeminal nerve).

- **Termination :**
  It ends in a terminal branch: the sphenopalatine artery, which supplies the nasal cavity.

- **Collateral branches :**
    - The posterior pterygopalatine branch,
    - The ascending branches: superior maxillary and infraorbital arteries,
    - The mandibular and masseteric arteries.



1 Frontal and parietal branches of superficial temporal artery
2 Superficial temporal artery
3 Occipital artery
4 Maxillary artery
5 Vertebral artery
6 External carotid artery
7 Internal carotid artery
8 Common carotid artery (divided)
9 Ascending cervical artery
10 Inferior thyroid artery
11 Transverse cervical artery with two branches (superficial cervical artery and descending scapular artery)
12 Suprascapular artery
13 Thyrocervical trunk
14 Costocervical trunk with two branches (deep cervical artery and superior intercostal artery)
15 Internal thoracic artery
16 Axillary artery
17 Supra-orbital and supratrochlear arteries
18 Angular artery
19 Dorsal nasal artery
20 Transverse facial artery
21 Facial artery
22 Superior labial artery
23 Inferior labial artery
24 Submental artery
25 Lingual artery
26 Superior thyroid artery
27 Brachiocephalic trunk

Arteries of head and neck. Diagram of the main branches of external carotid and subclavian arteries.

IV – INTERNAL CAROTID ARTERIES:

1. Origin:

They arise from the common carotid artery at the level of the upper border of the thyroid cartilage.

2. Course:

- They ascend vertically for about 2 cm, then incline medially towards the lateral masses of the atlas.
- At this level, they pass through the carotid canal and the cavernous sinus.
- The internal carotid artery has four segments:
  - The cervical part,
  - The petrous part,
  - The cavernous part,
  - The cerebral part.

3. Anatomical relations:

❖ Cervical part

Within the carotid sheath, it is located anteriorly and laterally:

- Below the digastric muscle, it is in relation to the sternocleidomastoid muscle.
- At the level of the digastric muscle, it is in relation to the stylohyoid muscle, the occipital artery, and the posterior auricular artery.
- Above the digastric muscle, it is in relation to the glossopharyngeal nerve.
- Posteriorly, it is in relation to:
  - The cervical sympathetic trunk,
  - The longus capitis muscle,
  - The internal jugular vein.
- Medially, it is in relation to the pharyngeal wall.

❖ The petrous part

- It passes through the carotid canal, then emerges from the canal.
- It traverses the medial part of the carotid canal, passing between the lingula and the body of the sphenoid.

❖ The cavernous part

- The cavernous part is located within the cavernous sinus.
- It is in relation laterally to the oculomotor nerve and the trochlear nerve.

❖ The cerebral part

- The cerebral part passes through the roof of the cavernous sinus.
- It is in relation:
  - Medially: to the optic nerve and optic chiasm.
  - Laterally: to the anterior clinoid process.

4. Branches of the cavernous part :

The cavernous part gives several branches:

- Branches to the cerebellar tentorium,
- Branches to the cavernous sinus,
- The inferior and posterior hypophyseal arteries, supplying the posterior lobe of the pituitary gland.

5. Branches of the cerebral part :

The cerebral part gives the following branches:

a. Superior hypophyseal artery :

It is destined for the pituitary stalk and the inferior part of the hypothalamus.

b. Ophtalmic artery :

- It travels anteriorly to the optic canal, below the optic nerve.
- It terminates at the medial angle of the eye.
- Its collateral branches include:
  - The central retinal artery,

- The lacrimal artery,
- The supraorbital artery,
- The long posterior ciliary arteries (right side),
- The anterior ethmoidal artery.

- Its terminal branches are:
  - The supratrochlear artery,
  - The dorsal nasal artery.

6. Terminal branches of the internal carotid artery :

The cerebral arteries (anterior and middle) are branches of the internal carotid artery.

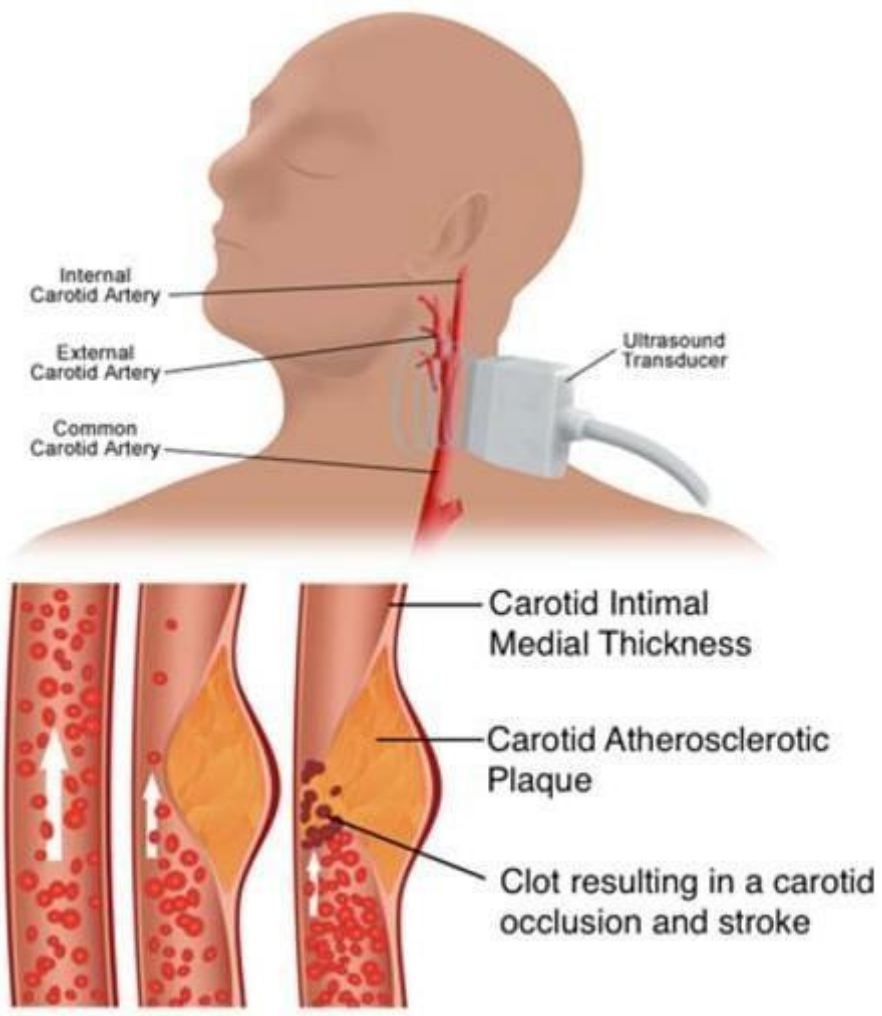
- **Anterior cerebral artery**:
  It supplies the medial portions of the frontal lobes and parietal lobes of the brain.

- **Middle cerebral artery**:
  It is the largest branch of the internal carotid artery and supplies the lateral aspects of the frontal, parietal, and temporal lobes, as well as the basal ganglia and internal capsule.

VI – CLINICAL APPLICATIONS:

Carotid thrombosis

- Carotid thrombosis is a serious condition that can lead to strokes and other severe neurological consequences.
- The main factors influencing its development include atherosclerosis, hypertension, smoking, diabetes, and a sedentary lifestyle.
- Diagnosis is made through imaging studies, and treatment can involve medications, endarterectomy, or angioplasty with stenting.
- Surgical approaches, such as oblique or longitudinal incisions, are used in cases that require direct access to the carotid artery.



V– APPROACH TECHNIQUES FOR THE CAROTID ARTERY:

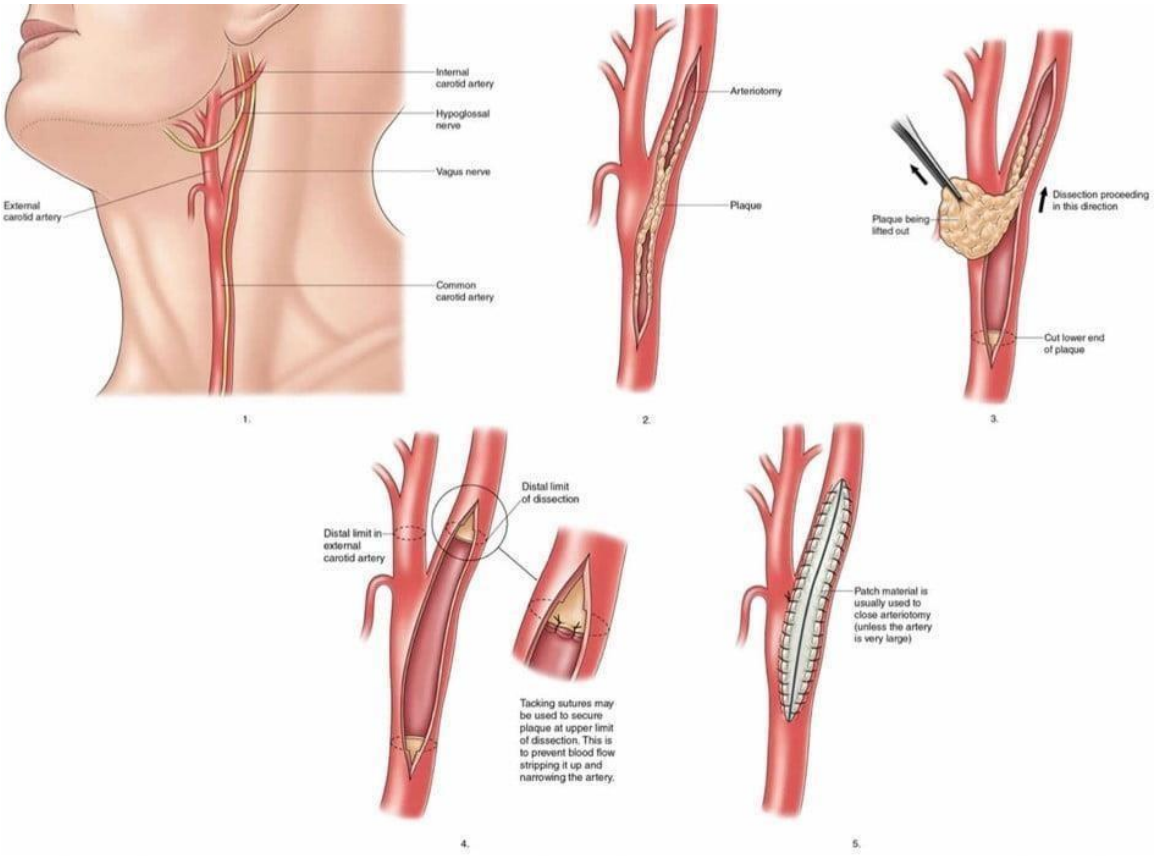
1. Oblique incision (pre-SCM):

- **Location**: Anterior to the sternocleidomastoid (SCM) muscle.
- **Use**: Provides access to the common carotid artery, its bifurcation, and the internal jugular vein.
- **Benefit**: Offers a clear view for carotid artery procedures like endarterectomy.

2. Longitudinal incision (between SCM heads):

- **Location**: Between the sternal and clavicular heads of the SCM.
- **Use**: Allows access to the carotid bifurcation and deeper structures.

- **Benefit**: Ideal for more extensive procedures or when revascularization is needed.



VI – CONCLUSION:

- The carotid system supplies blood to the face, neck, and brain.
- The left common carotid arises from the aortic arch, while the right comes from the brachiocephalic trunk.
- The common carotid bifurcates into the internal carotid, which feeds the brain, and the external carotid, which supplies the neck and face.