

# CT Cerebral angiography

# CT cerebral angiography

- **CT angiography of the cerebral arteries** (also known as a **CTA carotids** or an **arch to vertex angiogram**).
- It is a noninvasive technique allows visualization of the internal and external carotid arteries and vertebral arteries and can include just the intracranial compartment or also extend down to the arch of the aorta.
- The overarching goal of this examination is an optimal enhancement of the carotid arteries with little to no venous component; the technical aspect of the examination will vary from site to site.

# Indications

- CTA of the cerebral arteries is indicated in a wide variety of clinical scenarios including:
- ischemic stroke to detect occlusion and thrombosis.
- transient ischemic attack to detect carotid artery stenosis.
- subarachnoid hemorrhage for detection of aneurysms
- cerebral parenchymal hemorrhage to assess for the presence of a vascular malformation or ongoing bleeding (spot sign)

# Contraindication

- previous severe reactions to iodinated contrast, allergic to contrast.
- non-compliance

# Purpose

- The CTA of the cerebral arteries is performed to demonstrate the full patency of the cerebral arteries via contrast enhancement. It is important to time the scan as accurately as possible (see practical points) to ensure maximal opacification and decrease venous contamination

# Anatomy

- The brain is supplied by two sets of vessels. The anterior circulation roughly supplies the anterior  $2/3$  while the posterior circulation supplies the posterior  $1/3$  of the brain.

# Anterior circulation

- The anterior circulation consists of the carotid arteries.
- The right common carotid artery arises from the brachiocephalic trunk while the left common carotid artery arises directly from the aorta.
- They ascend behind the sternoclavicular joints, lateral to the thyroid gland and at the level of the upper border of the thyroid cartilage, each one divides into external and internal carotid arteries.
- The internal carotid artery ascends to enter the skull through the carotid canal and bifurcates into the anterior and middle cerebral arteries.

# Posterior circulation

- The posterior circulation consists of the vertebrobasilar system.
- Each vertebral artery arises from the 1<sup>st</sup> part of the corresponding subclavian artery. At the neck, it ascends inside the transverse foramina from C6 to C2 where it emerges and enters the cranium through the foramen magnum.
- Both vertebral arteries unite to form the basilar artery which passes in front of the pons and ends by bifurcation to posterior cerebral arteries on both sides.



# Technique

- **patient position**

supine with their arms by their side

- **scout**

mid-chest to vertex

- **scan extent**

aortic arch to vertex

- **scan direction**

caudocranial

can be performed craniocaudal to minimize venous contamination in the head portion of the scan, often utilized in slower scanners

- **contrast injection considerations**
  - monitoring slice (region of interest)
    - descending aorta
  - injection
    - 50-75 ml of non-ionic iodinated contrast with a 100 ml saline chaser at 4.5/5 ml/s
- **scan delay**
  - minimal scan delay
- **respiration phase**
  - suspended

# Post processing

- CTA images are usually presented as axial and coronal and/or sagittal multiplanar reformat of a variety of thicknesses depending on local preference.

- Additional post-processing techniques include:
- maximum intensity projection MIP: displays pixels with higher CT value
- curved planar reformats: delineates the entire course of the vessel and can be used when the vessel is tortuous
- shaded surface display volume rendering (SS-VRT): only the pixels above a user-defined threshold value are displayed as a 3D. It is used mainly for pre-operative planning

# Advantages

- CTA has a number of advantages over catheter angiography including the ability not only to evaluate the vessels from their origin at the aortic arch to the intracranial portion but also to assess non-vascular neck structures and brain parenchyma.
- Additionally, CTA allows multiplanar reconstruction and better appreciation of plaque characteristics and morphology <sup>7</sup>.
- It is also less expensive and at lower risk to the patient.

# Disadvantages

- There are a few disadvantages compared to catheter angiography. However, the inability to select a single vessel and the fact that it images the vessel at only one time does limit the ability to evaluate flow-related features of complex malformations. It also has a lower resolution than catheter angiography, making the assessment of subtle wall changes, such as those seen in dissection or vasculitis, more difficult to identify.
- Compared to MR angiography, its main disadvantage is the need for both ionizing radiation and intravenous contrast.

# CT cerebral image



**THANK YOU**