

## **Cerebral stroke and infections.**

### **Ischemic stroke:**

Causes of ischemic stroke:

- Tromboembolic
- Vasculitis
- Dissection
- Post anoxic ischemia

Ischemic stroke on CT:

- Earliest signs are demonstrated on CT after 6-12 hours
- Faint loss of discrimination between grey and white matter
- Loss of well defined sulci
- High density may be seen in occluded arteries
- Perfusion CT shows areas with no flow or reduced flow
  
- After 6-12 hours low density changes are seen
- Mass effect due to edema peaks between day 3-5
- Mass effect is gone in 2-4 weeks
  
- Blood-brain barrier breaks after 3 days
- Enhancement may be seen for a few weeks
- Enhancement is gyriform in cortical infarcts
- Enhancement is ring like in central parts of the brain
  
- After weeks to months a loss of substance develops
- The defect is filled with CSF
- A secondary enlargement of the ventricles may be seen

Ischemic stroke on MR:

- Earliest signs can be seen on MR within a few minutes
- On DWI high signal is seen after a few minutes, The signal decreases during the next week
- ADC is low at first and increases over weeks
- On PWI a reduced flow can be seen
- A hypoperfused area surrounding the DWI lesion may be seen – the penumbra
- The penumbra is the potentially salvageable tissue
- On MRA a large vessel occlusion can be seen
  
- On T2WI a high signal is seen after 6-8 hours
- The signal increases over weeks until water values are reached when tissue resorption is complete
- On T1WI low signal develops after 6-8 hours. The signal decreases until water values are reached

Nonischemic causes for decreased ADC:

- Abscess
- Lymphoma
- Multiple sclerosis

- Metabolic diseases (Canavans)
- Seizures
- Severe hypoglycaemia
- Trauma

Ischemic stroke – vasculitis:

- CT may show poorly demarcated low density areas
- MR shows high signal on T2WI and FLAIR often in more than one vascular territory
- MRA is most often normal

Ischemic stroke – dissection:

- Can cause stenosis or pseudoaneurysms
- Can give ischemic changes or hemorrhages
- On MRI a thrombus can be seen in the vessel wall
- Normal flow void is not seen in the vessel or part of the vessel

Ischemic stroke - post anoxic changes:

- Affects globus pallidus
- Can affect other areas

### **Hemorrhagic stroke:**

Causes of hemorrhagic stroke:

- Intraparenchymal hematoma
- Hemorrhagic infarctions
- Venous thrombosis
- Subarachnoid hemorrhage

Hemorrhagic stroke – intraparenchymal hemorrhage on CT:

- High density on CT images increases during day 1-3
- A surrounding low density rim consists of serum
- During the following days an edema develops
- Resorption starts in the periphery of the clot
- After a month resorption is complete
- Often very little is seen after resorption, a loss of substance may be seen

Hemorrhagic stroke – intraparenchymal hemorrhage on MR:

- Hyper acute: T2 hyperintense, T1 hypointense
- Acute: T2 hypointense, T1 iso-hypointense
- Early subacute: T2 hypointense, T1 hyperintense
- Late subacute: T2 and T1 hyperintense
- Chronic: T2 and T1 hypointense

Hemorrhagic stroke – hemorrhagic infarction:

- Reperfusion in infarction
- Occurs 6-12 hours after the initial stroke, but can be seen a week or more after ictus
- Hemorrhage is often patchy

Hemorrhagic stroke – venous thrombosis:

- Flow void in veins are replaced by clots

- The signal in the clots depends on the age of the clot
- Normal veins are subject to individual variations
- Infarcts or hemorrhages are often bilateral and subcortical

Hemorrhagic stroke – intratumoral hemorrhage

- Gradation of blood is often slower than in simple hematomas
- Blood will often obscure tumor as well as enhancement

Hemorrhagic stroke – subarachnoid hemorrhage:

- CT shows blood in subarachnoid space, in the ventricles or a hematoma
- CTA or MRA can demonstrate the aneurysm in most cases
- The final diagnosis and treatment plan is made by conventional angio
- Most aneurysms can be treated with coils

### **Infections:**

- Subdural and epidural empyema
- Meningitis
- Cerebritis
- Abscess
- Ventriculitis
- Herpes simplex encephalitis

Subdural and epidural empyemas:

- Extracerebral fluid collection
- Enhancement of membranes
- 10% develops venous thrombosis
- Can spread to brain parenchyma as cerebritis

Meningitis:

- A clinical not a radiological diagnosis
- Radiological examinations are performed only when complications are suspected
- Most patients have normal scans
- Some have meningeal enhancement
- Some will get complications – hydrocephalus or infectious involvement of the brain

Cerebritis:

- Early phase of abscess formation
- Low signal on T1WI and high signal on T2WI and Flair
- No enhancement

Abscess:

- Enhancing rim, often thin and regular
- Considerable edema
- High signal on low on ADC

Ventriculitis:

- Enhancement of ependyma
- Enlargement of ventricles
- Zones of low density around ventricles on CT

- Zones of high signal around ventricles on T2WI and FLAIR

Herpes simplex encephalitis:

- Locates in the temporal lobes, insula, the orbitofrontal region and cingulated gyrus
- Low density on CT
- High signal on T2WI and FLAIR
- Enhancement may be seen