Reviewing a CT scan

Suggested systematic approach to interpretation

- Check patient information and review scan protocol (e.g. non-contrast/ contrast enhanced).
- Check the scout image. May reveal a fracture or gross abnormality not obvious on the axial images. Review alignment of upper cervical vertebrae.
- A quick 'first pass' is recommend, noting gross pathology, followed by a more detailed analysis of the images.
  Use the mnemonic ***'ABBCS'*** to remember important structures.
- Finally, extend search pattern to include orbits, sinuses, oropharynx, ears, craniocervical junction, face, vault and scalp.

ABBCS

- '**A**' – *Asymmetry* – Assess all slices comparing one side with another, remembering to allow for head tilt and to account for various forms of artefact.
- '**B**' – *Blood* – Acute haemorrhage appears hyperdense in relation to brain, due to clot retraction and water loss. Haemorrhage typically has a CT number in the range of 50–100 HU.
  - Assess for both blood overlying the cerebral hemispheres, and within the brain parenchyma.
  - Assess the ventricles and CSF spaces for the presence or layering of blood.
  - Review the sulci and fissures for subtle evidence of a SAH.
  - Remember slow-flowing blood within a vessel can mimic clot. Conversely clot within a vessel is an important diagnosis:
    - Venous sinus thrombosis
    - Dense MCA sign in acute CVA
- '**B**' – *Brain*
  - **Abnormal density**
    - Hyperdensity – acute blood (free and within vessels), tumour, bone, contrast and artefact/foreign body.
    - Hypodensity – oedema/infarct, air and tumour.
  - **Displacement**
    - Look for midline shift.
    - Examine midline structures such as the falx cerebri, pituitary and pineal glands.
    - Look for asymmetry of CSF spaces such as effacement of an anterior horn of the lateral ventricles or loss of sulcal pattern suggesting oedema.

    - Assess for effacement of the basal cisterns and tonsillar herniation at the foramen magnum, as an indicator of raised intracranial pressure.
  - **Grey/white matter differentiation**
    - Normal grey/white matter differentiation should be readily apparent; white matter is of slightly reduced attenuation in comparison to grey matter due to increased fatty myelin content.
    - In an early infarct, oedema leads to loss of the normal grey/white matter differentiation. This can be subtle and again only apparent when comparing both sides; identify normal structures such as internal capsule, thalamus, lentiform and caudate nuclei.
- '**C**' – *CSF spaces* – Cisterns, sulci and ventricles
  - Assess the sizes of the ventricles and sulci, in proportion to each other and the brain parenchyma.
  - Identify normal cisterns (quadrigeminal plate, suprasellar and the mid brain region) and fissures (interhemispheric and Sylvian).
  - The ventricles often hold the key to analysing the image:
    - Pathology may be primary, within a ventricle, or may result from secondary compression from adjacent brain pathology.
    - If a ventricle is enlarged, consider whether it is due to an obstructive/non-communicating or non-obstructive cause. The former depends on site and the latter usually involves pathology in the subarachnoid space.
    - Dilatation *ex vacuo* is caused by loss/atrophy of brain tissue, often resulting in abnormal secondary enlargement of the adjacent ventricle. Small ventricles can be normal in children (increases in size with age).
    - Diffuse brain swelling can result in ventricular compression and reduced conspicuity of the normal sulcal/gyral pattern. Causes include metabolic/anoxic injury, infection, trauma and superior sagittal sinus thrombosis.
- '**S**' – *Skull and scalp* – Assess the scalp for soft tissue injury.
  - Can be useful in patients where a full history is absent.
  - Can help to localise coup and contracoup injuries.
  - Carefully assess the bony vault underlying a soft tissue injury for evidence of a fracture.
  - Assess the bony vault for shape, symmetry and mineralisation (focal sclerotic or lytic lesions).
  - Remember to adjust windowing to optimise bony detail.