

Brain Hemorrhage

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Traumatic intracranial haemorrhage

Trauma is the most common cause of ICH, and CT of the head is the initial workup performed to evaluate the extent of acute traumatic brain injury. MRI is increasingly being performed in the emergency department for the evaluation of traumatic brain injury, and MRI has been shown to be more sensitive than CT in the detection of small foci of intracranial haemorrhage or axonal injury.

Trauma may result in ICH through direct or indirect injury of arteries and veins located deep to the skull, and these injuries may result in ICH overlying the brain parenchyma or within the brain parenchyma. The most commonly encountered types of traumatic ICH include subarachnoid haemorrhage (SAH), epidural hematoma, subdural hematoma, hemorrhagic parenchymal contusions, and cerebral micro-haemorrhage due to shear injury. These various forms of traumatic ICH are discussed further below.

Traumatic subarachnoid haemorrhage

Traumatic SAH is the most commonly encountered form of traumatic ICH. SAH occurs when there is arterial or venous injury to the vessels coursing through the subarachnoid space overlying the brain parenchyma, and is identified on CT as an abnormal hyper density in the subarachnoid space. Traumatic SAH typically distributes in the cerebral sulci overlying the brain near the vertex of the head and tends to spare the basal cisterns, although severe trauma may result in diffuse SAH.

In the setting of a large volume of traumatic SAH, cerebral arterial vasospasm may rarely develop, which places patients at risk of cerebral infarction several days following the traumatic event. MRI is less commonly performed acutely for the evaluation of traumatic SAH, which is typically evaluated by CT. However, MRI has an excellent sensitivity for the detection of acute ICH, and traumatic SAH may be identified as hyper intense signal abnormality is overlying the cerebral sulci on Fluid Inversion Attenuation Recovery (FLAIR) sequences or hypo-intense susceptibility blooming on Gradient-Echo (GRE) or susceptibility-weighted imaging (SWI) sequences. The combination of FLAIR and SWI MRI sequences has been shown to be superior to CT in the detection of acute SAH.

Hemorrhagic parenchymal contusion

Hemorrhagic parenchymal contusions most commonly occur with significant head motion and head impact. These contusions are characterized on CT as hyperdense hemorrhagic within the brain parenchyma itself, and they are caused by microvascular arterial or venous injury.

Intraparenchymal haemorrhage due to hypertension

Intraparenchymal haemorrhage (IPH) secondary to hypertension typically affects patients in their sixth and seventh decades of life and has a 30-50% mortality rate. Acute IPH is identified by head CT as an intra-axial hyperdense region of haemorrhage that is classically centered within the basal ganglia, cerebellum, or occipital lobes.

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