Case: H38

Patient Details	Background
78 year old male	ED
Clinical Details	
Fall from ladder at home, occipital head strike. Aspirin	
Provisional Diagnosis	**Examination Requested**
ICH	CT Brain

H38

CLINICAL INDICATION:
Fall from ladder at home, occipital head strike. Aspirin.

TECHNIQUE:
Non Contrast CT brain and CT cerebral angiogram.
COMPARISON:
None available.

FINDINGS:
CT brain and CT angiogram:

There is a 25 x 24 x 12 mm (CC x T x AP) intraparenchymal haemorrhage in the parafalcine frontal lobes bilaterally indenting the body of the corpus callosum. Small subdural haemorrhage along the falx cerebri. Extensive subarachnoid haemorrhage predominantly in the suprasellar and pre pontine cisterns and along the cerebral sulci in the frontoparietal region. Small volume of haemorrhage within the fourth ventricle.

No subfalcine, uncal or tonsillar herniation. The ventricular system is globally dilated, suspicious for hydrocephalus.

Small subgaleal haematoma in the right occipital region. No skull fracture. Mastoid air cells are normally aerated. Probable mucous retention cyst in the left maxillary sinus.

CT angiogram does not reveal an aneurysm. The circle of Willis demonstrates a normal anatomical configuration without evidence of tear stenosis or occlusion.

CONCLUSION:
1) 25 x 24 x 12 mm parafalcine intraparenchymal haemorrhage in the frontal lobes indenting the corpus callosum. Extensive subarachnoid haemorrhage and extension to the fourth ventricle. Small subdural haemorrhage along the falx cerebri. Hydrocephalus. No evidence of a cerebral aneurysm. Given the unusual location for a traumatic intraparenchymal haemorrhage, follow-up MRI is recommended to assess for an underlying lesion.

---

1. Methods for the image acquisition based upon a thorough analysis of request form.

This male in his late 70's has fallen from a height and on the back of his head and is in the Emergency Department. The most likely diagnosis according to the doctor is intracerebral haemorrhage. The patient should be scanned first using non-contrast CT which can then be compared to CT images using contrast. The non-contrast scan will highlight any acute bleeds as the freshly moving red blood cells are highly attenuating and appear bright in contrast to low attenuating CSF fluid (Birenbaum et al. 2011). This can help to distinguish between acute and chronic bleeds. If there is evidence of a bleed a CT cerebral angiogram should be performed using contrast to visualise the blood vessels in the brain. This can identify any aneurysms and blockages. Patients taking aspirin which has a low viscosity have an increased chance of bleeding without clotting because the drug acts as a blood thinner. When positioning, the chin should be lowered to reduce dose and remove the lens from the main beam. Tube voltage used should be around 120 kV with modulated mA between 100-200. We should then produce standard and sharp MPR reconstructions and consider including MIP and VR images for the cerebral angiogram images.

2. Provide a written description of the **typical CT appearances** of the **disease process** under investigation.

Typically, haemorrhages are acute and appear bright on CT. Haematomas are bleeds that have dried to form a blood clot and appear darker than fresh bleeds. Similarly, chronic bleeds also appear dark. The shade of grey may indicate how long ago the bleed occurred. Bleeds can often take up space and push normal structures into different orientations. In this case, the bilateral parafalcine bleed has put pressure on the borders of the corpus callosum, making it appear indented. Hydrocephalus is also a common occurrence that leads to the dilation of ventricles in the brain (Koleva and Jesus, 2023). This is generally caused when pressure due to the haemorrhage builds up and blocks the free flow of CSF through the ducts. As the CSF builds up, the ventricles will appear dilated. The patient suffered a subarachnoid haemorrhage which is a bleed that occurs between the arachnoid and pia matter. There is also a subdural haemorrhage that occurs beneath the outermost layer of the brain called the dura mater.

3. Explain the **importance** of **CT imaging** in the **disease process** under investigation.

There is a lot of inherent contrast even in a non-contrast CT brain scan which allows it to detect abnormalities. For example, the ventricles appear to be extremely dark, and the grey matter appears more hyperdense than the white matter (Bhargava, 2019). Traumatic falls often lead to haemorrhages which are best identified on CT scans. CT has always been considered the gold standard for acute pathology as it is accurate, quick, and widely available (Siddiqui et al. 2011). Putting the scan-time and availability aside, MRI has evolved to be more sensitive at picking up when a bleed commences as well as highlighting any underlying issues that may have caused the bleed. As a result, the radiologist report further recommends the patient to undertake an MRI scan to check for any lesions that may be another cause of the intraparenchymal bleeds (Kummer, 2002). Most likely he might want to rule out the presence of a parafalcine meningioma which can be life threatening especially if it is paired with haemorrhagic findings (Abolfotoh et al, 2021).

4. Review fine slice image data on the Siemens Syngo.Via Workstation, identify and describe any abnormalities present in the images.

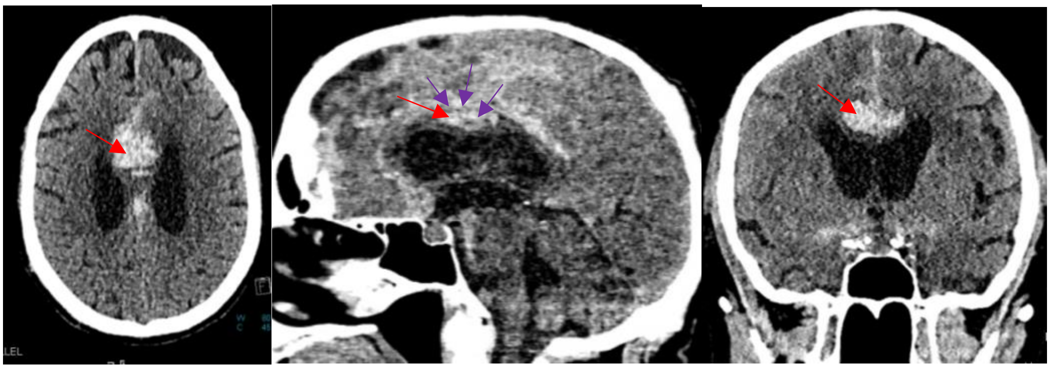

Figure 1. Shows the bilateral intraparenchymal parafalcine haemorrhage in all three planes (axial, sagittal and coronal) as indicated by the red arrows. In the sagittal reconstruction, we can see the indentation of the corpus callosum as indicated by the purple arrows.

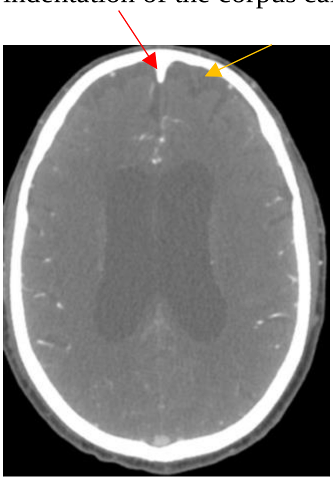

Figure 2. In this axial plane we can see a small subdural haemorrhage along the falx cerebri as shown by the red arrow. There is also a darker area along the frontal lobe shown by the yellow arrow that may be due to the shrinkage of the brain or the occupation of an old haemorrhage.

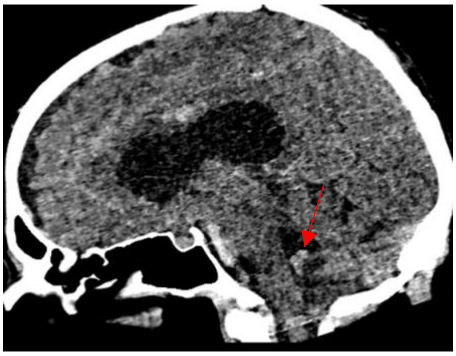

Figure 3. In this sagittal reconstruction, we can see another small haemorrhage in the fourth ventricle.

Figure 4. This image demonstrates enlarged ventricles, indicating hydrocephalus.

Figure 5. In this image, we can see foreign substances in the left maxillary sinus. The radiologist's report states that this is most likely a mucous retention cyst.

Figure 6. This image most likley shows a subgaleal haematoma in the occipital region. It occurs due to he accumulation of blood in the subgaleal space (between the skull and skin) during a traumatic incident (Kim et al. 2021). This condition resolves on its own over time.

References

Abolfotoh, M., Brzezicki, G., Fiester, P., & Tavanaiepour, D. (2021). A Rare Case of Life-Threatening Multicompartmental Spontaneous Intracranial Hemorrhage From a Grade 1 Convexity Meningioma. *Cureus*, *13*(11), e19178. https://doi.org/10.7759/cureus.19178

Bhargava R. (2019). CT Imaging in Neurocritical Care. *Indian journal of critical care medicine : peer-reviewed, official publication of Indian Society of Critical Care Medicine*, *23*(Suppl 2), S98–S103. https://doi.org/10.5005/jp-journals-10071-23185

Birenbaum, D., Bancroft, L. W., & Felsberg, G. J. (2011). Imaging in acute stroke. *The western journal of emergency medicine*, *12*(1), 67–76.

Kim, S. Y., Cha, H. G., Jang, S. Y., & Hwang, S. C. (2021). Delayed Massive Expansion of Subgaleal Hematoma Complicated with Proptosis in Hemophilia B. *Korean journal of neurotrauma*, *17*(2), 149–155. https://doi.org/10.13004/kjnt.2021.17.e14

Koleva M., Jesus O.D. (2023). Hydrocephalus. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK560875/

Kummer, R.V. (2002). MRI: The New Gold Standard for Detecting Brain Hemorrhage?. *Stroke*, *33*(7), 1748–1749. https://doi.org/10.1161/01.str.0000019882.06696.d6

Siddiqui, F. M., Bekker, S. V., & Qureshi, A. I. (2011). Neuroimaging of hemorrhage and vascular defects. *Neurotherapeutics : the journal of the American Society for Experimental NeuroTherapeutics*, *8*(1), 28–38. https://doi.org/10.1007/s13311-010-0009-x