



Case #80

NAME Educational Activities Committee

Submitted by:

Nicolas Kostelecky MD (Neuropathology Fellow)

Ahmed Mohamed MBBS (PGY3)

Zachary Coty-Fattal MD (PGY4)

Jon W Lomasney MD (Associate Professor of Pathology)

Rudolph J. Castellani MD (Professor of Pathology)

Feinberg School of Medicine, Northwestern University

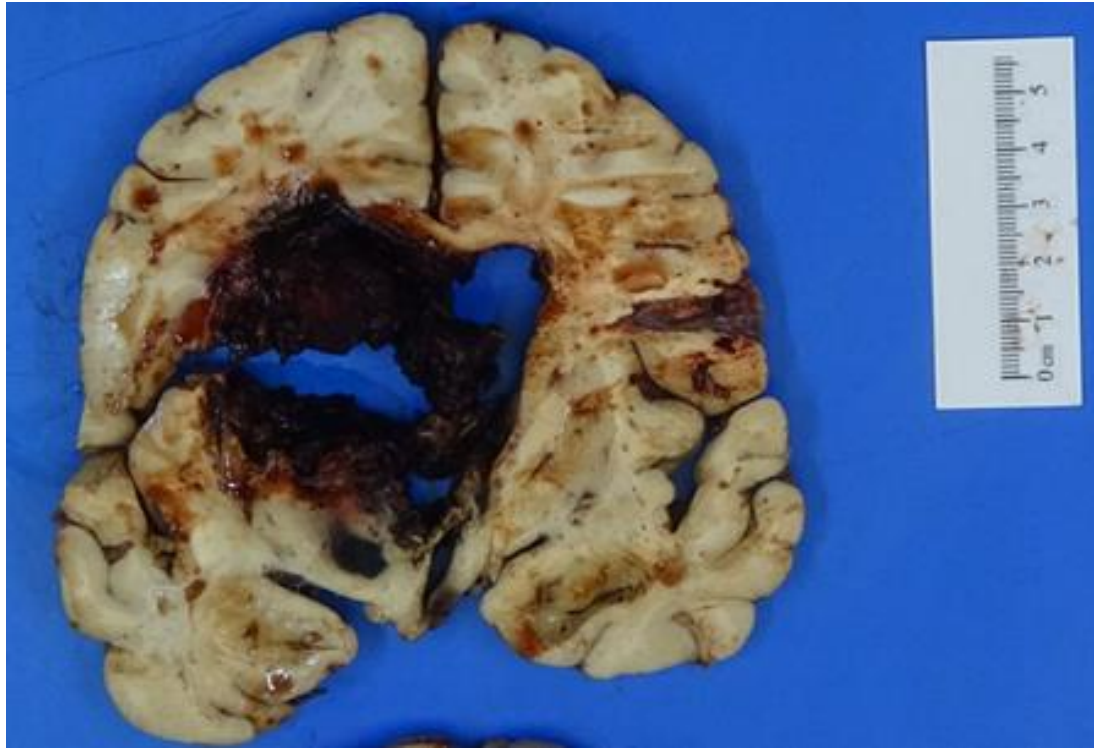


Image 1



Image 2

1. The gross lesion pictured above was identified during the neuropathologic examination of an 80-year-old male. What is the most likely source of this finding?

- Saccular aneurysm
- Hypertension
- Cerebral amyloid angiopathy
- Coagulopathy
- Trauma

Answer...

B. Hypertension (CORRECT RESPONSE, 29.86% of responses)

The two major causes of intracerebral hemorrhage (ICH) in older individuals are chronic hypertensive cerebrovascular disease and cerebral amyloid angiopathy (CAA). Both conditions may demonstrate the presence of a Charcot-Bouchard microaneurysm (Image 2), also called miliary aneurysms, on histologic examination (as seen in the histology provided). They typically measure 0.3 to 2 mm. (1,2, 4) In hypertensive cerebrovascular disease, Charcot-Bouchard microaneurysms are thought to represent the pathologic substrate for intracerebral hematomas, due in essence to focal weakening of the blood vessel wall with microaneurysmal dilatation, involving small penetrating arteries. Controversy exists as to whether these represent true aneurysmal dilatations, or simply tortuous vasculature cut in cross section. Whether they are required for hypertensive hemorrhage is uncertain but seems unlikely, with some authors suggesting they are not involved in the pathophysiology of hypertensive intracerebral hemorrhage at all. (4-5). As a practical matter, Charcot-Bouchard microaneurysms can be difficult to identify even with extensive sampling, and their absence does not exclude the diagnosis of hypertensive intracerebral hemorrhage. The most common locations for these hemorrhages are the basal ganglia, thalamus, pons, and cerebellum.

Other responses:

A. Saccular aneurysm (17.27% responses)

Saccular (berry) aneurysms are the most common (~95%) of the two types of aneurysmal dilatations affecting the cerebral vasculature, the other being fusiform aneurysms. They have an estimated prevalence of 2-5% and become more common with age. They are uncommon in children and adolescents. Genetic (mainly connective tissue disorders such as Ehlers-Danlos syndrome types II and IV), and environmental factors (smoking, hyperlipidemia, and hypertension) are implicated in their etiology. They are most common at bifurcations in the Circle of Willis, and their rupture typically results in subarachnoid hemorrhage. They occasionally cause intracerebral hematoma with little subarachnoid hemorrhage if the aneurysm tip and rupture point project into parenchymal tissue. (1-2) The absence of a saccular aneurysm, significant subarachnoid hemorrhage, and localization of hemorrhage to the deep gray matter all suggest that a ruptured saccular aneurysm is unlikely.

C. Cerebral amyloid angiopathy (37.17% responses)

CAA-related intracerebral hematomas are similar to hypertensive bleeds, but tend to be lobar (i.e. more superficial in a given cortical lobe) and rarely if ever present as deep hemispheric hemorrhages such as the present case. (2, 4) Microaneurysms in CAA are hypothesized to be secondary to amyloid deposition in small cortical arteries and consequent weakening of the arterial wall. (3) Of note, CAA may occur with and without associated Alzheimer's Disease pathology (i.e., cortical neuritic plaques) or neurocognitive impairment. (1-2)

D. Coagulopathy (6.35% responses)

Coagulopathy, primary or secondary (including iatrogenic), may result in intracranial or intracerebral hemorrhage. These tend to be multiple, although not always, and may have a distribution similar to those seen in hypertensive intracerebral hemorrhage or CAA. Such cases will, however, lack microscopic findings of arterial sclerosis, CAA, and Charcot-Bouchard microaneurysms. Subdural hemorrhage is often seen in older adults with coagulopathies (2), although some degree of trauma, especially falls from a standing position, are often noted in the history. (3)

E. Trauma (9.35% responses)

Traumatic intracranial hemorrhages are best classified based on the anatomic site of bleeding: epidural, subdural, subarachnoid, or intracerebral. The three former lesions have distinct localization of recent or clotted blood to either the epidural, subdural, or subarachnoid spaces. Depending on the size of the hematoma, mass effect may be evident, including distortion of the underlying brain, midline shift, and herniation. The current case does not show any evidence of mass effect or features to suggest an epidural, subdural, or subarachnoid hemorrhage. Traumatic intracerebral hemorrhages may be associated with contusions or may be contiguous with the subdural space (i.e., “burst lobe”), which are also absent in this case. (1-2) Isolated, deep traumatic intracerebral hematomas (hypertensive hemorrhage-like) without communication with the cortical surface are unusual, but can be seen, particularly in decedents with alcohol use disorders (RJC, unpublished observations), the being associated with mortality in traumatic brain injury (6).

References

1. Love S, Budka H, Ironside JW, Perry A, eds. Greenfield's Neuropathology, 9th edn. London: CRC Press, 2015.
2. Ellison D, Love S, Chimelli L, Harding BN, Lowe JS, Vinters HV, Brandner S, Yong WH, eds. Neuropathology A reference text of CNS pathology, 3rd edn. London: Elsevier, 2013.
3. Castellani RJ, Mojica G, Schwartzbauer G, Hersh, DS. Symptomatic acute on chronic subdural hematoma: A clinicopathologic study. American Journal of Forensic Medicine and Pathology 2017 Mar 18. doi: 10.1097/PAF.0000000000000300.
4. Magaki S, Chen Z, Haeri M, et al. Charcot-Bouchard aneurysms revisited: clinicopathologic correlations. Mod Pathol. 2021;34(12):2109-2121. doi:10.1038/s41379-021-00847-1
5. Challa VR, Moody DM, Bell MA. The Charcôt-Bouchard aneurysm controversy: impact of a new histologic technique. J Neuropathol Exp Neurol. 1992;51(3):264-271. doi:10.1097/00005072-199205000-00004
6. Wettervik TS, Enblad P, Lewen A. Pre-injury chronic alcohol abuse predicts intracranial hemorrhage progression, unfavorable outcome, and mortality in severe traumatic brain injury. Brain Inj 2021;35(12-13_):1569-1576. Doi 10.1080/02699052.2021.1975196.