

Case #58

NAME Educational Activities Committee

Case provided by:

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1. The decedent is a 52-year-old man with a history of atherosclerotic cardiovascular disease, diabetes mellitus type 2, and hypertension who was witnessed to become unresponsive and was pronounced shortly after arrival to the emergency department. What do the lesions of the brainstem most likely represent?

○ Fixation artifact

🔘 Internal capsule infarct

○ Rapid sodium correction

🔿 Unilateral subdural hematoma

O Multiple system atrophy (MSA)



B. Internal Capsule Infarct – (CORRECT ANSWER, 32.74 % of responses)

The image provided shows atrophy of the right cerebral peduncle, pons and medulla. The decedent in this case had a history of a large remote infarct with right middle cerebral artery (MCA) distribution (see picture), which involved the right posterior limb of the internal capsule causing a residual left motor deficit. The atrophy seen in our picture is a consequence of Wallerian degeneration of the corticospinal tract (CST) highlighted with LBF-PAS stains.



Remote MCA distribution infarct



The corticospinal tract is the major neuronal pathway providing voluntary motor function. It originates primarily from the frontoparietal cortices, including the primary motor cortex, secondary motor area, and somatosensory cortex, which come together to form bundles that travel through the internal capsule and cerebral peduncles. The bundles then travel ipsilaterally down to the brainstem. As the corticospinal tract continues to travel down into the medulla, 75 to 90% of the fibers decussate to the contralateral side via the pyramidal decussation, and then continue to travel down the spinal cord to provide innervation to the distal extremities and muscle groups.

It has been shown that the extent of the infarct's injury to the hemispheric course of the CST predicts the extent of remote tissue loss in the ipsilateral cerebral peduncle and distally, likely resulting primarily from axonal degeneration of the CST distal to the site of injury.

LFB-PAS Stain showing degeneration of the corticospinal tract in the brainstem and spinal cord



Corticospinal Tract Illustration



A. Fixation Artifact (10.50 % of responses)

Although improper positioning of the tissue during fixation can occasionally distort the gross appearance of tissue and become a confounding feature when evaluating for true atrophy, the atrophy seen in our pictures is extensive, multifocal and showing a distinct pattern. Additionally, the loss of white matter tracts is apparent in our gross picture. All these features favor a true lesion rather than an artifact.

C. Rapid sodium correction (19.57 % of responses)

Rapid correction of sodium can lead to central pontine myelinolysis, characterized by a demyelinating lesion at the central portion of the base of the pons. Grossly these lesions show a gray discoloration and slightly granularity involving much of the basis pontis. The lesion may extend up to the midbrain, but only rarely down to the medulla, and the mechanism of demyelination is still poorly understood. The distribution of the lesion in our picture, and the gross appearance of the lesion are not consistent with typical findings seen with rapid sodium correction.

D. Unilateral subdural hematoma (16.90 % of responses)

An accumulating subdural hematoma can lead to downward cerebral herniation, which in turn causes compression of the contralateral cerebral peduncle against the tentorial edge creating a phenomenon known as Kernohan's notch. However, this lesion would be focal and located at the level of the tentorium, rather than also involving the pons and medulla, as seen in our image. Additionally, the loss of white matter tracts is apparent in our gross picture.

E. Multiple system atrophy (MSA) (20.28 % of responses)

MSA is a unifying term for a group of rare fatal neurogenerative syndromes with similar clinical and pathologic brain pathologies characterized by glial cytoplasmic alpha-synuclein inclusions. Gross findings depend on the systems involved, but can present with atrophy of the cerebellum, middle cerebellar peduncles and pons, pallor of the substantia nigra and locus ceruleus or atrophy of the putamen. The pattern of atrophy seen in our case is most consistent with a focal injury affecting the corticospinal tract.

REFERENCES

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