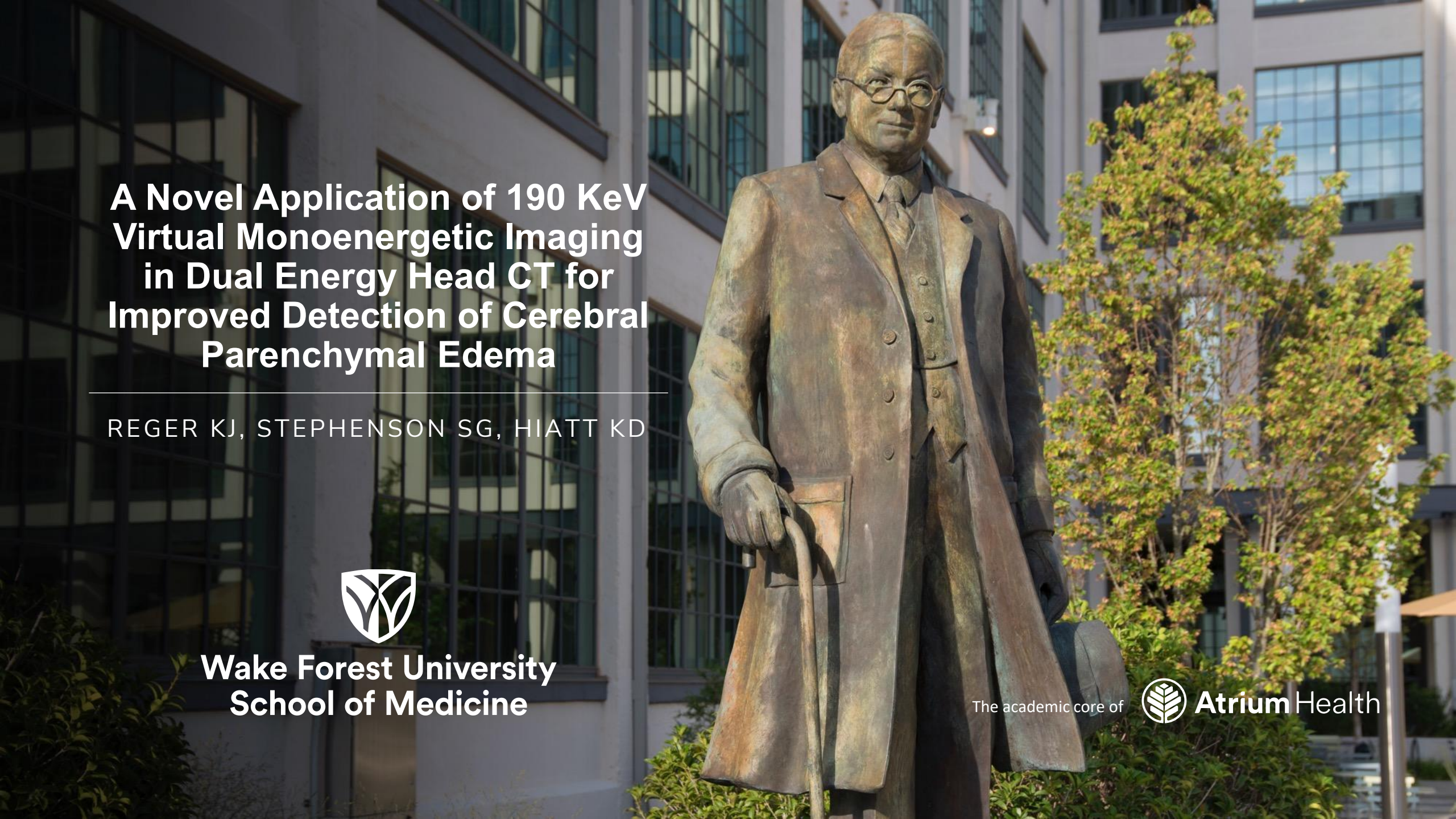

A Novel Application of 190 KeV Virtual Monoenergetic Imaging in Dual Energy Head CT for Improved Detection of Cerebral Parenchymal Edema

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Disclosures

THE AUTHORS HAVE NO RELEVANT DISCLOSURES.

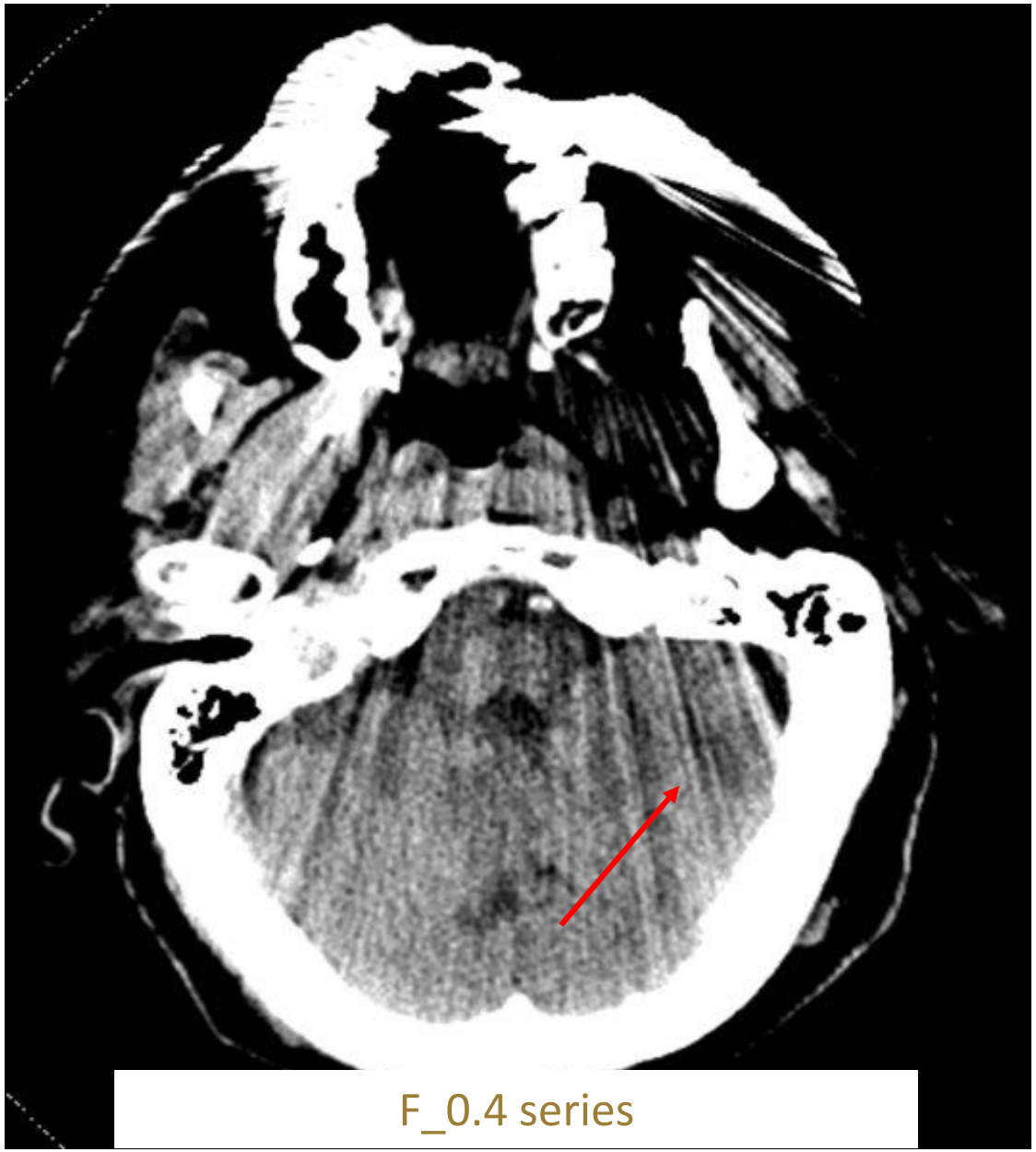
Teaching Point

The use of virtual monoenergetic imaging (VMI) in dual energy CT (DECT) could provide a novel tool to aid in improved radiologist detection of cerebral edema, illustrated by four cases.

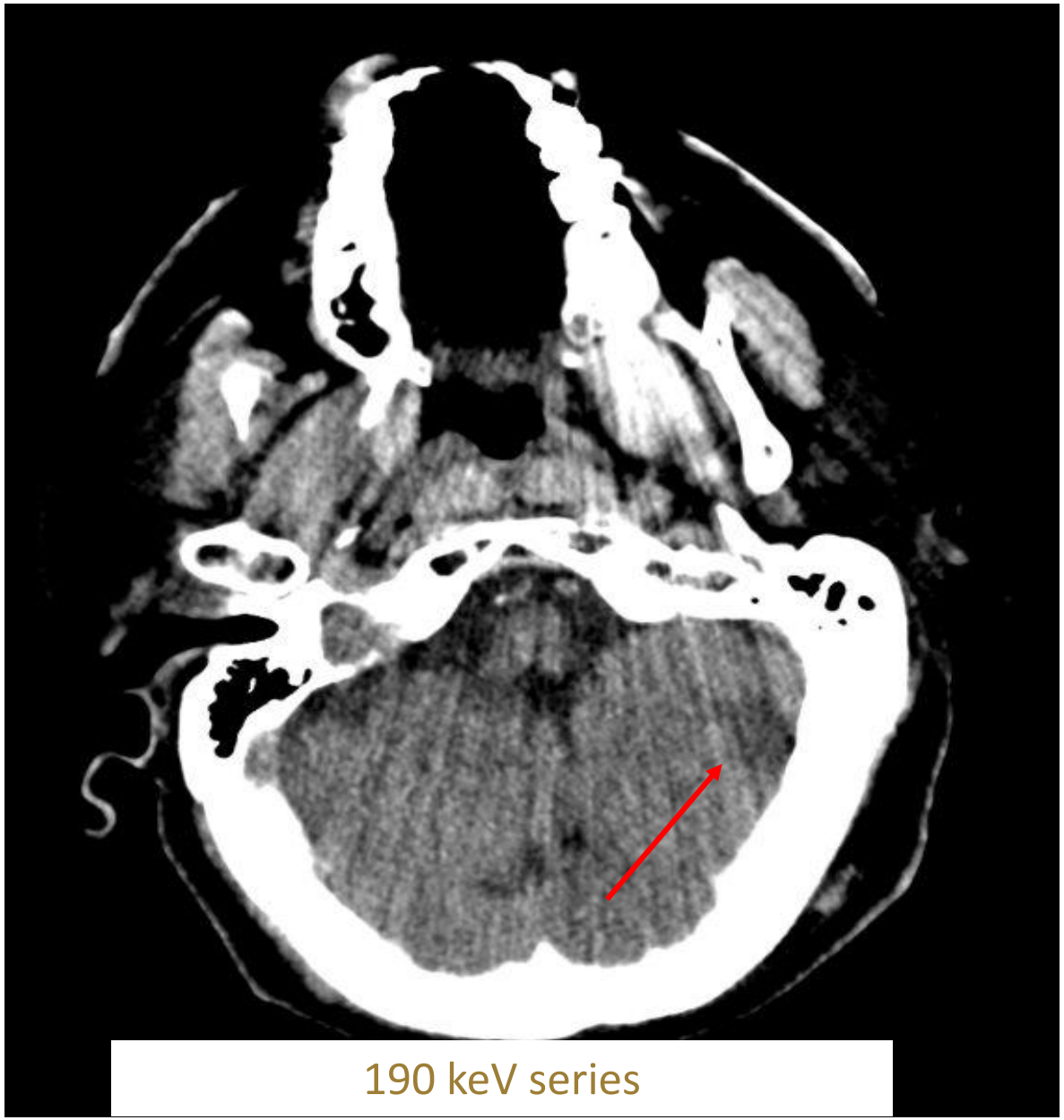
Case 1

HPI: 67 yo M with a PMH of CHF admitted for medical therapy for dyspnea.

- Head CT obtained during admission for difficulty rousing after weaning sedation.
- WW/WL 80/35.



F_0.4 series



190 keV series

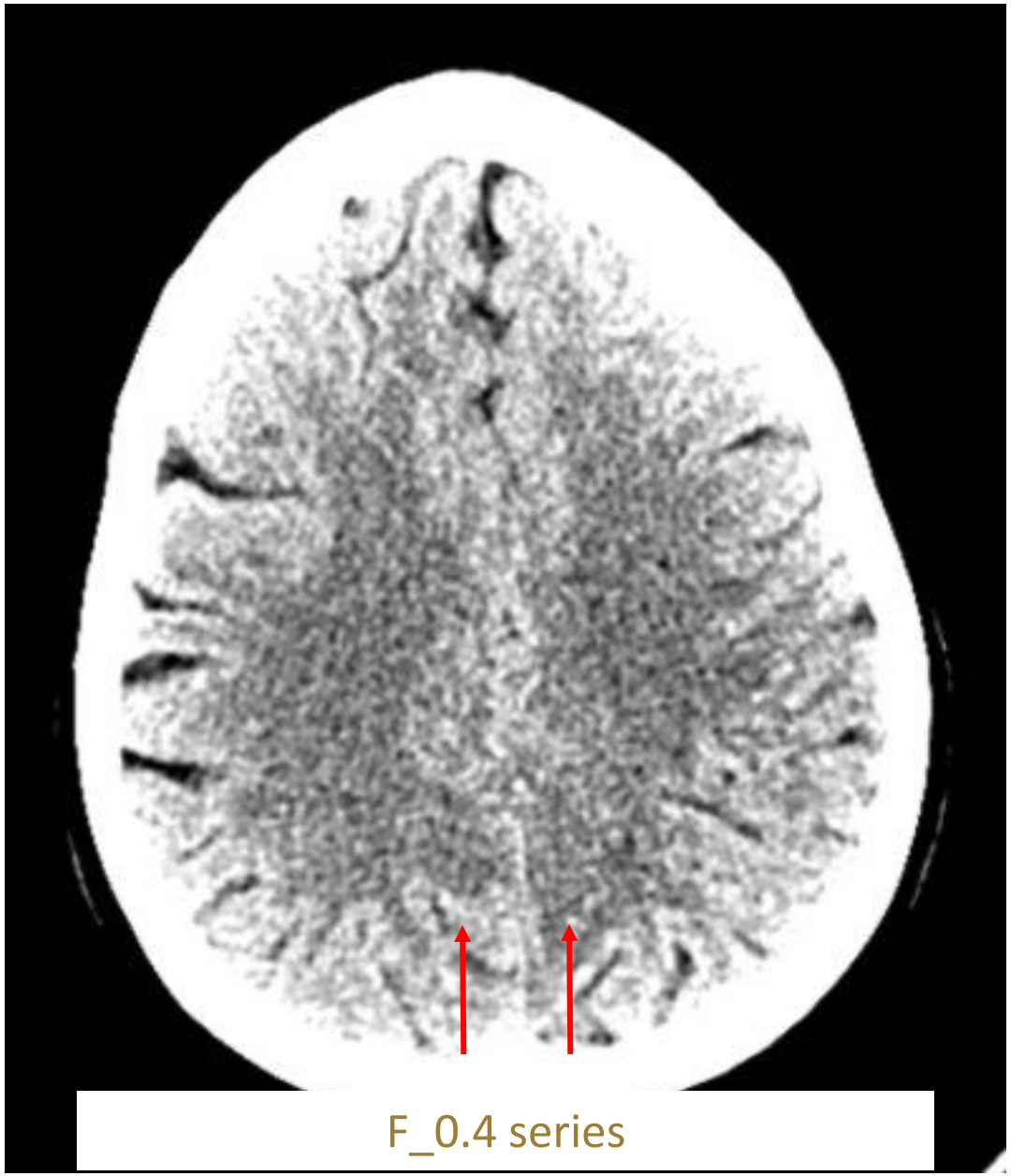
Case 1 Discussion

- CT Head showed areas of hypoattenuation in the posterior fossa concerning for acute/subacute infarcts, with increased conspicuity on the 190 KeV VMI series.
- This case demonstrates an additional benefit of VMI, with reduction of beam hardening artifact as well as improved visualization of the region of hypoattenuation.
- Follow-up MRI was substantially motion degraded for evaluation of posterior fossa; but demonstrated multiple infarcts in different supratentorial vascular territories concerning for central embolic source.

Case 2

HPI: 35 yo F with PMH of MDD presented to the emergency department for seizure-like activity.

- CT head ordered, findings shown on next slide.
- WW/WL 32/32.



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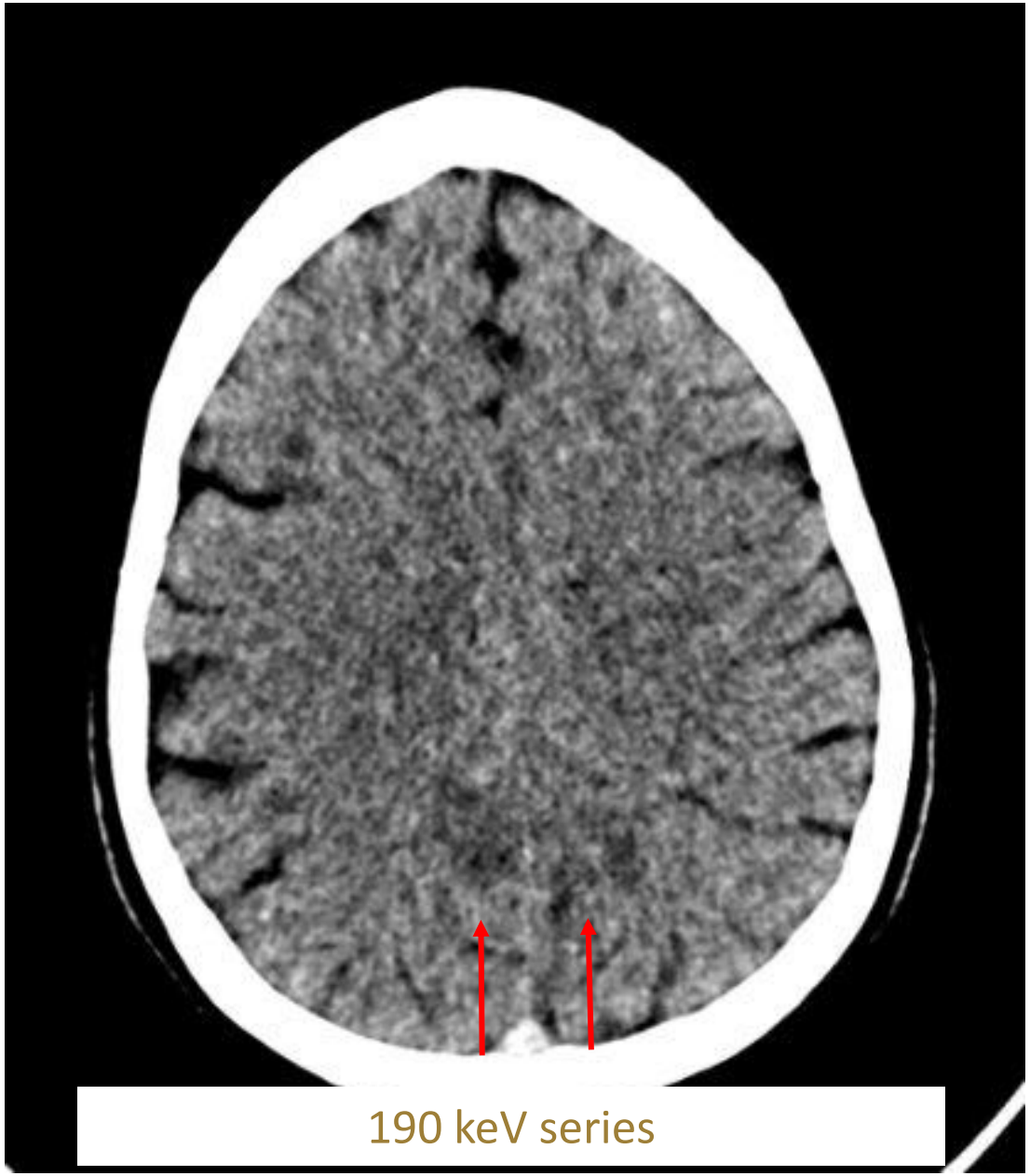
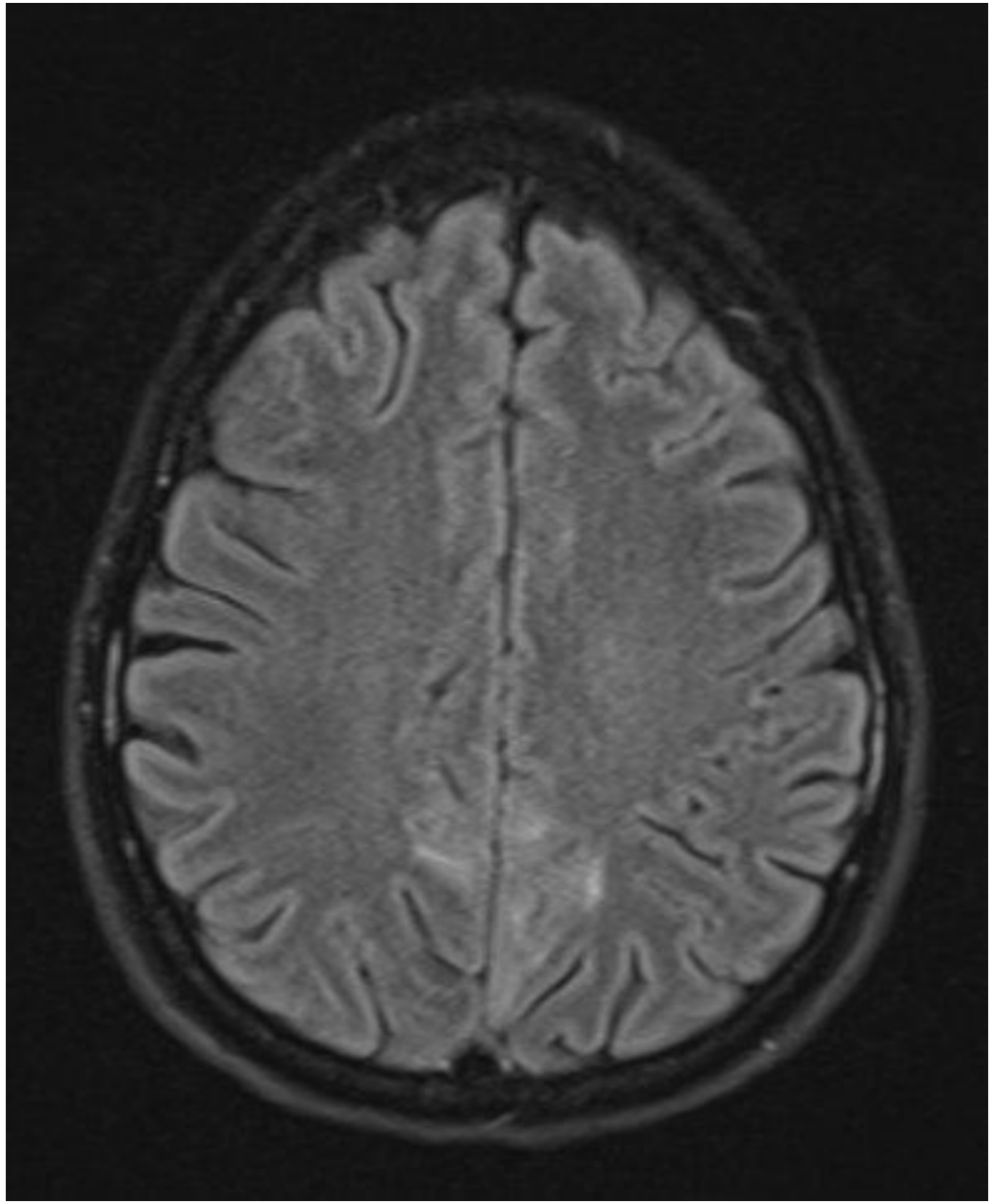


190 keV series



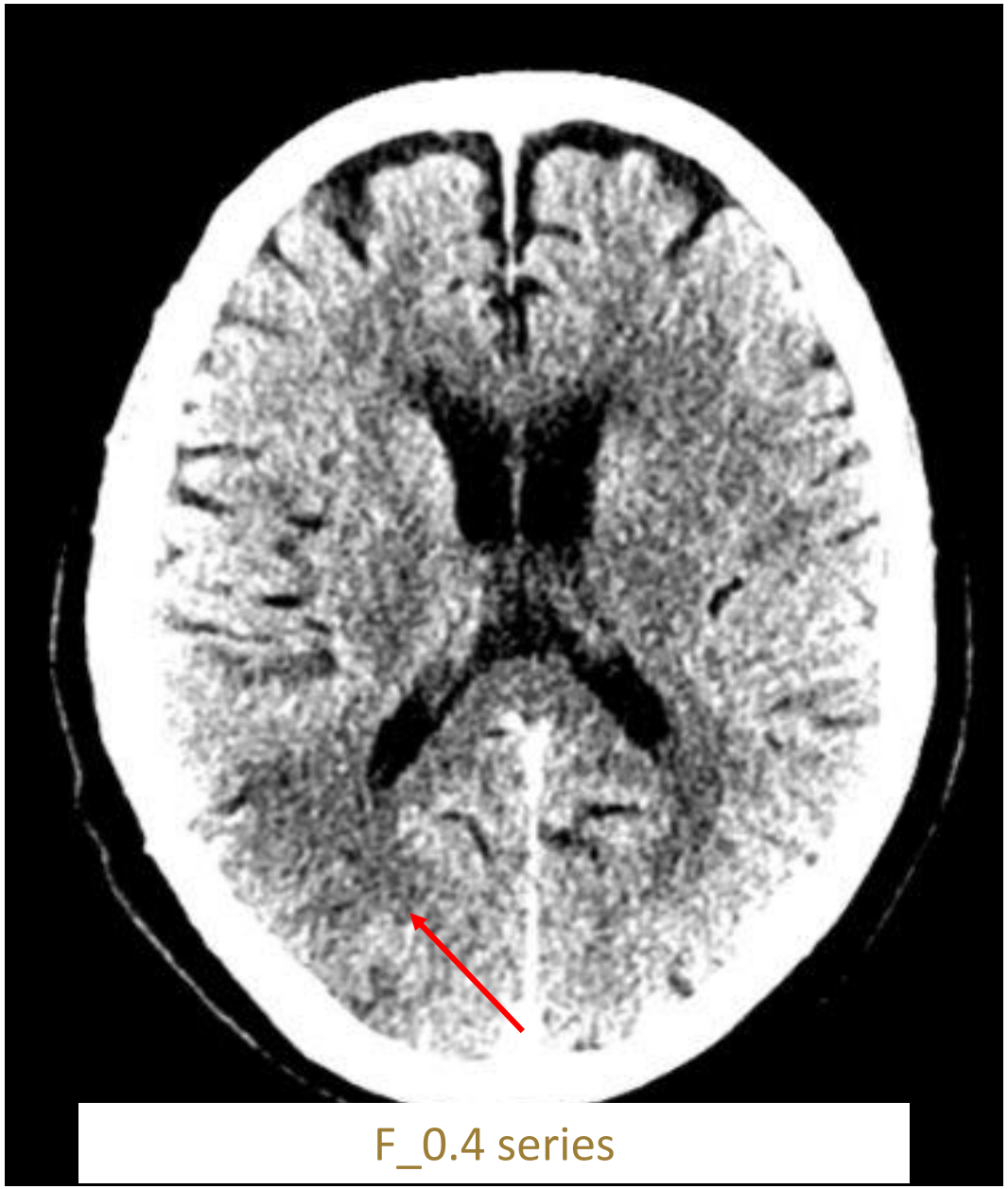
Case 2 Discussion

- CT head showed foci of hypoattenuation in the bilateral posterior parietal lobes, more apparent on VMI 190 KeV series; compatible with subcortical/cortical edema and concerning for PRES vs encephalitis.
- MRI demonstrates abnormal T2/FLAIR hyperintense signal in the bilateral parietal lobes, favored to reflect PRES.

Case 3

HPI: 85 yo M with PMH of hypertension presented to the emergency department for confusion and vision loss.

- CT head ordered with concern for acute infarct.
- WW/WL 32/32.



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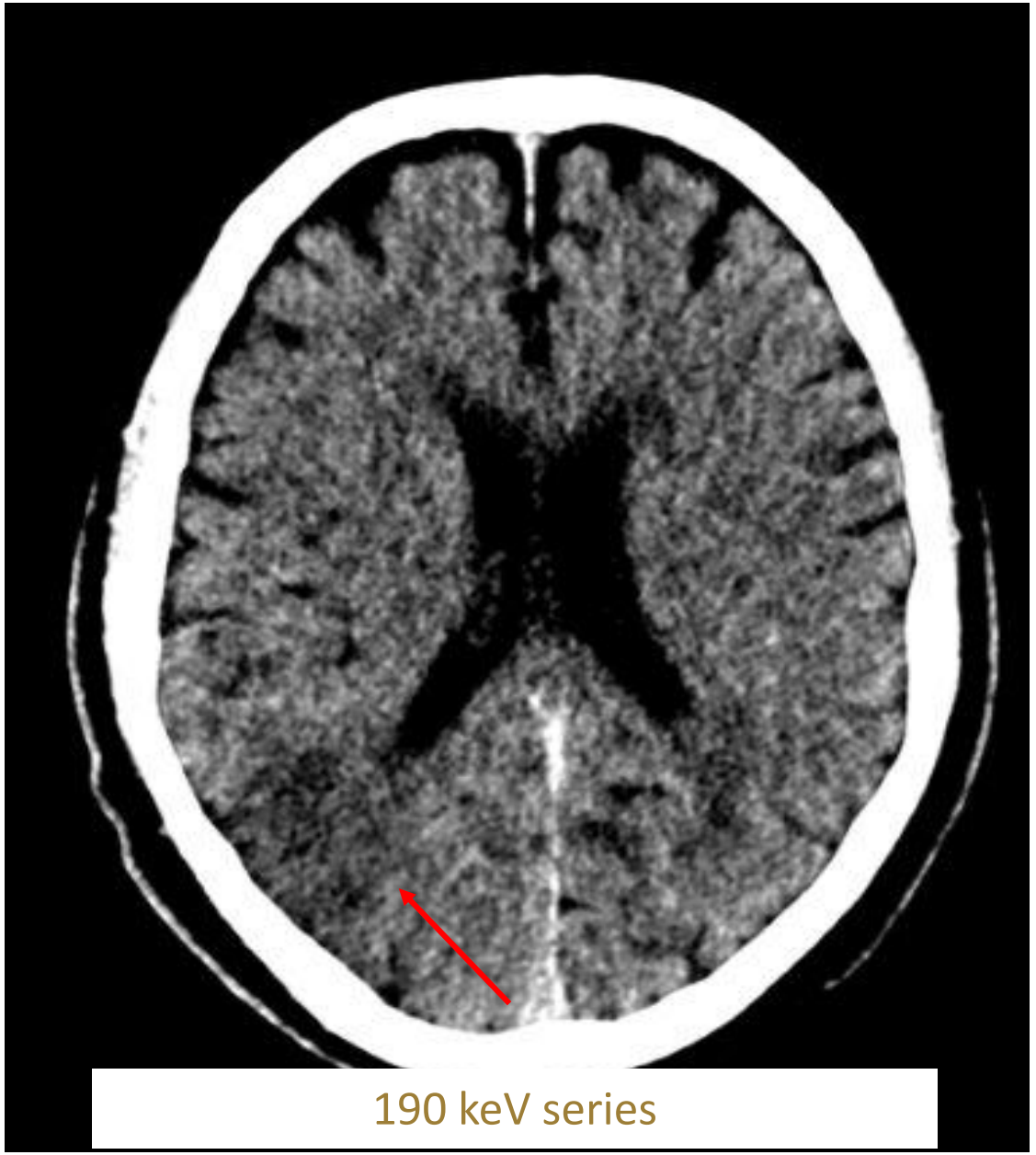
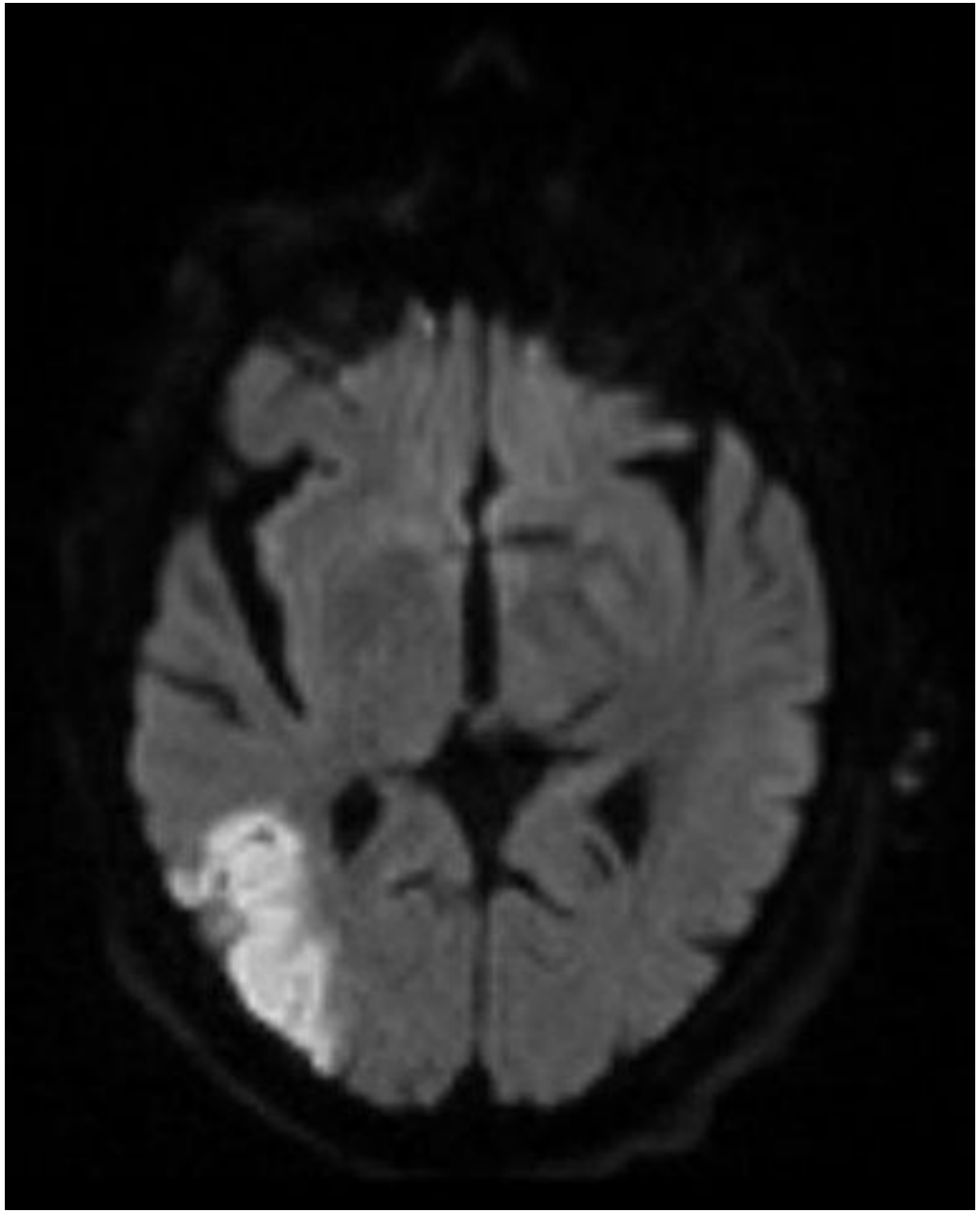


190 keV series



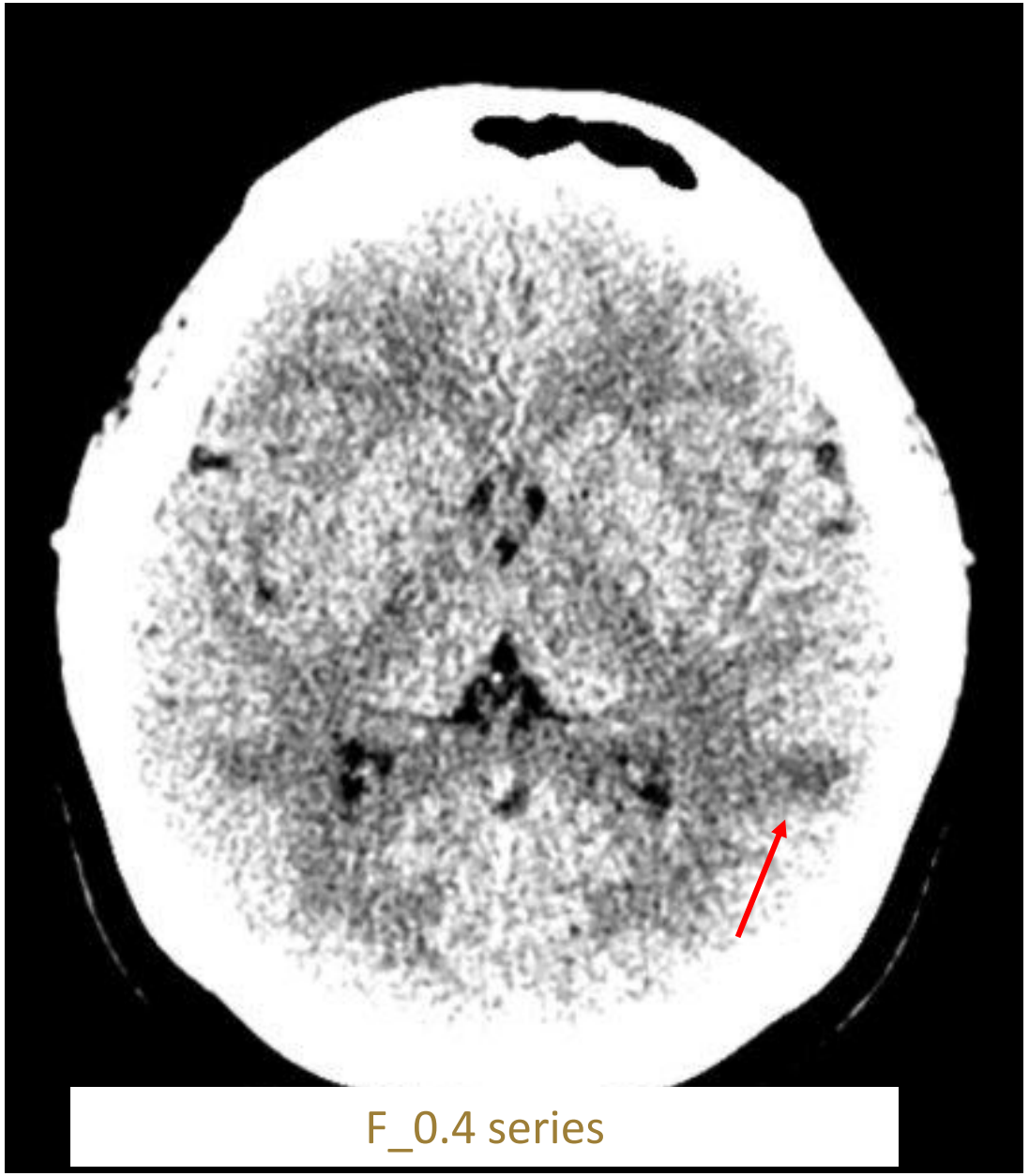
Case 3 Discussion

- CT head showed a faint area of hypoattenuation and loss of gray-white differentiation in the right posterior MCA territory concerning for acute/subacute infarct, with increased conspicuity on 190 KeV VMI.
- Subsequent MRI DWI demonstrates restricted diffusion in the right MCA territory corresponding to region of hypoattenuation on CT, consistent with recent infarct.

Case 4

HPI: 22 yo female without significant PMH presented to the emergency department for 4 days of RUE numbness and weakness.

- CT head ordered.
- WW/WL 32/32.



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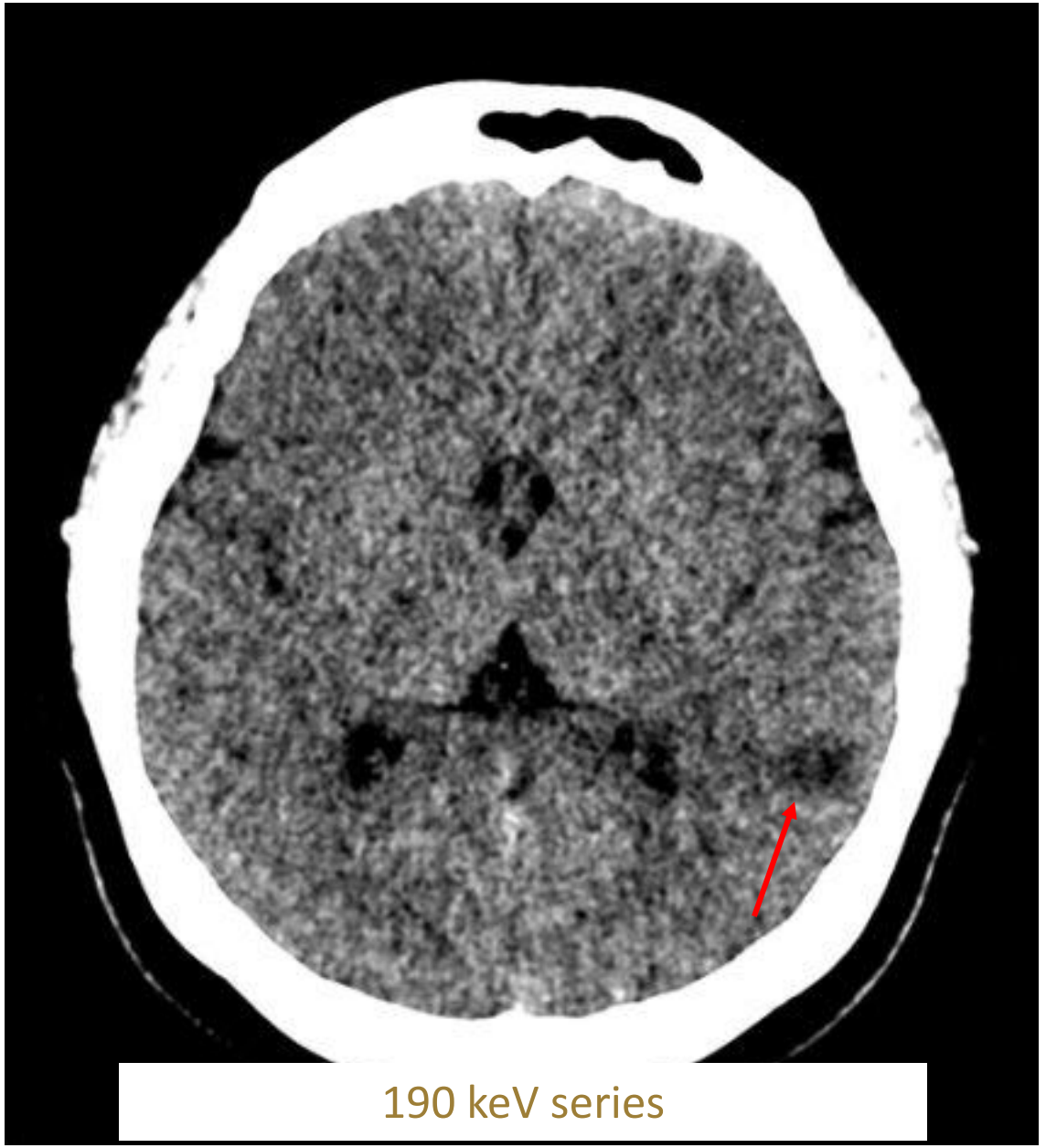
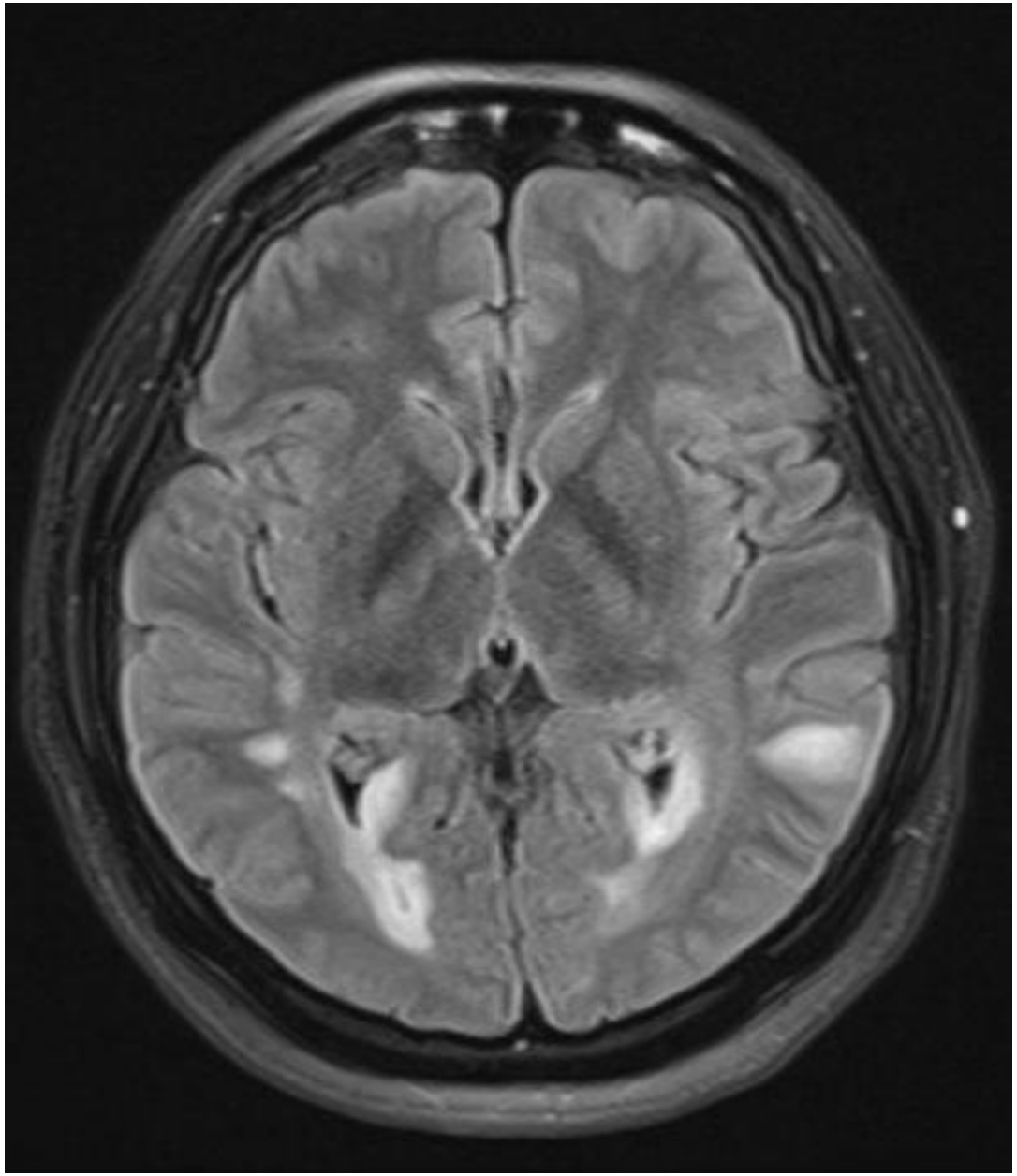
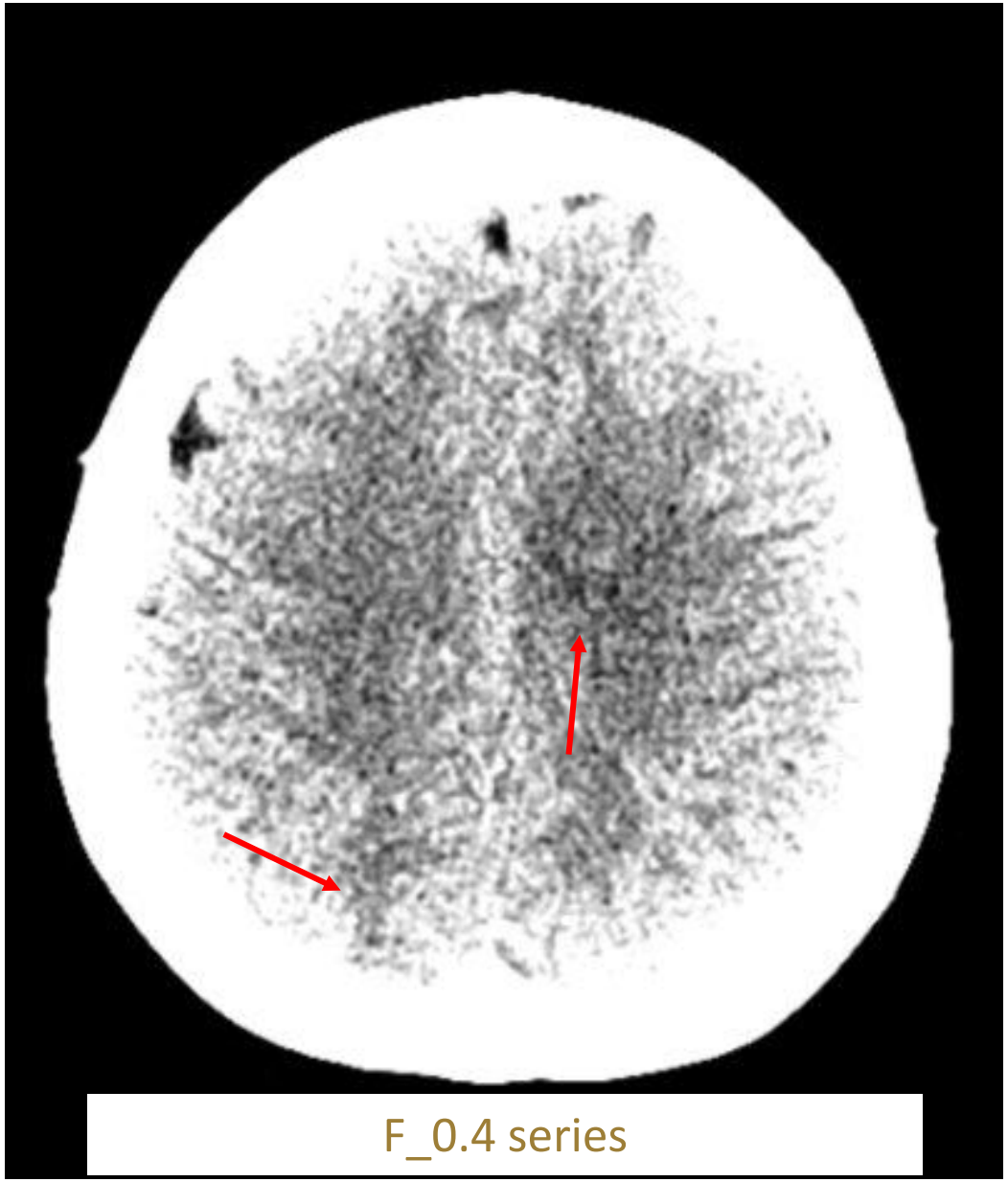


190 keV series





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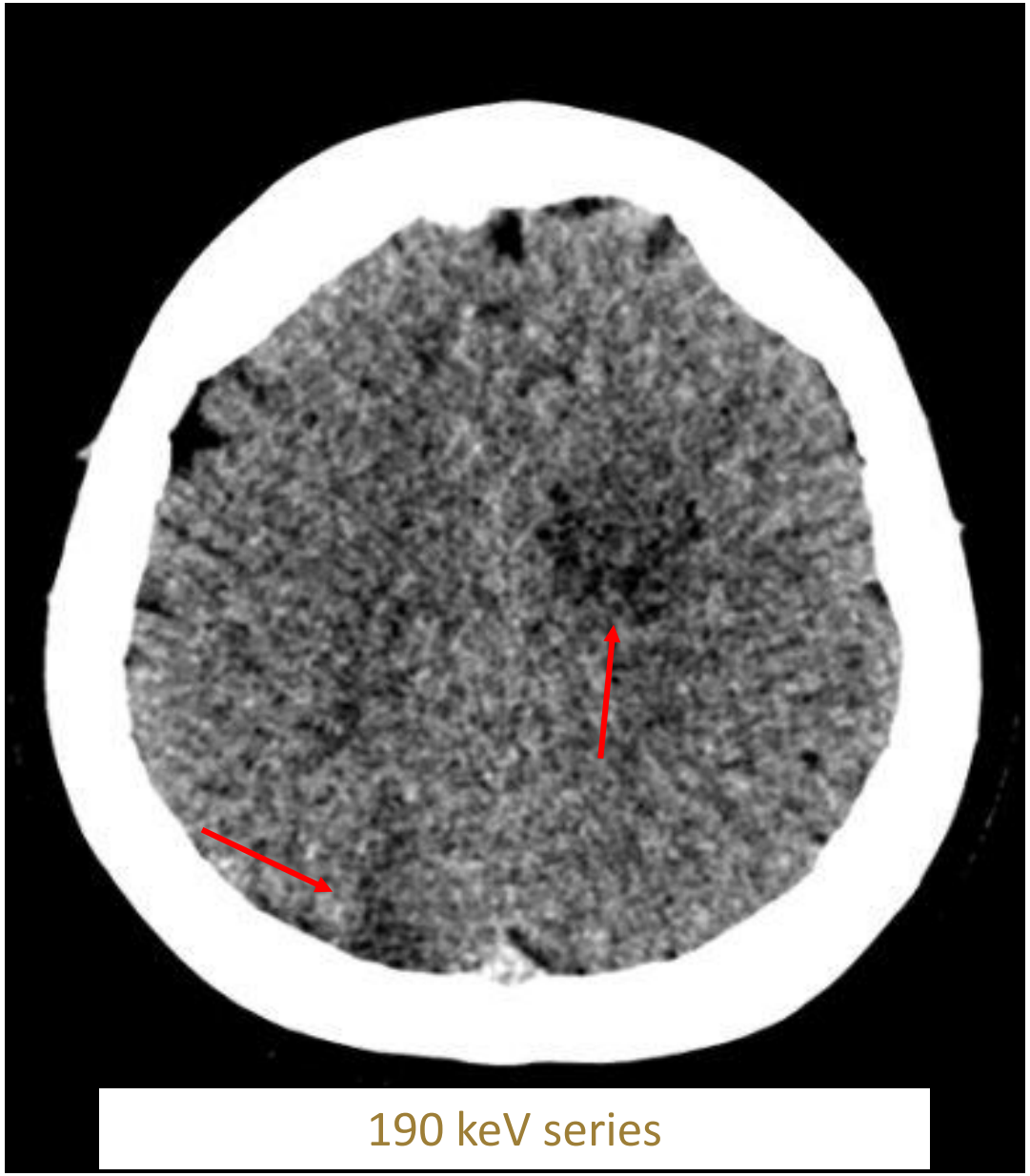
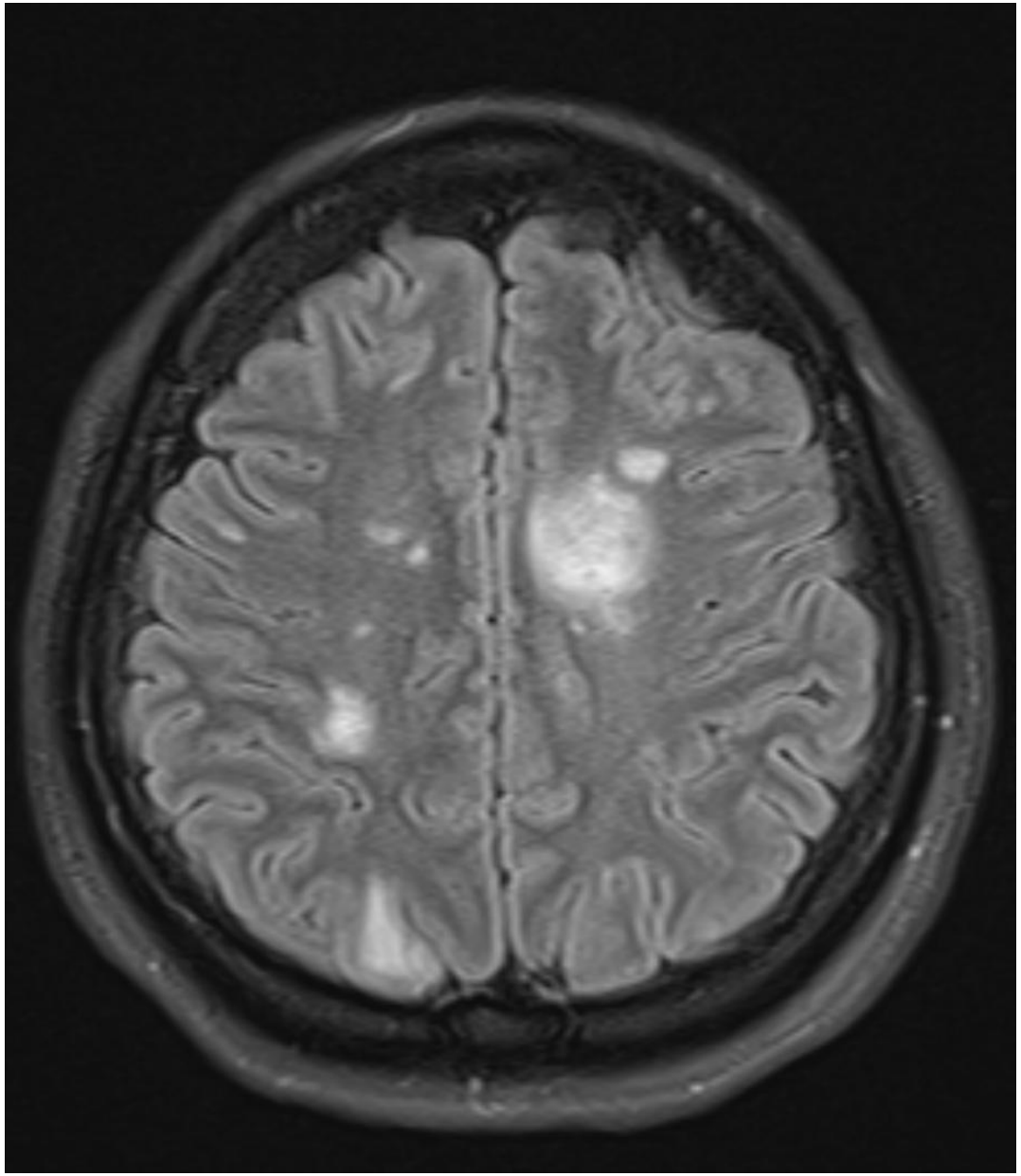


190 keV series



Case 4 Discussion

- CT head showed numerous supratentorial foci of hypoattenuation, more conspicuous on 190 KeV VMI series; concerning for demyelinating or infectious etiology.
- Brain MRI with contrast showed expansile T2 hyperintense lesions throughout the supratentorial and infratentorial brain with location, signal, and enhancement characteristic of demyelinating lesions of varying activity.
- Cervical spine MRI showed additional evidence of demyelinating cord lesions
- Patient diagnosed with multiple sclerosis.

Conclusions

- The known benefit of high energy VMI in DECT in differentiating hemorrhage from iodine and calcium is well-established.
- We have observed additional use of 190 KeV VMI which may improve visualization of cerebral edema and reduce artifacts on head CT, as illustrated through our cases.
- Future research is needed to better quantify this effect.