
Purpose To explore the significance of existing diffuse axonal injury with secondary demyelination (Wallerian degeneration) of the corticofugal fibers at the level of midbrain on MR imaging, in differentiating radiation injury versus tumor recurrence in patients previously treated for brain neoplasm, who present with new contrast-enhancing lesions at the site or vicinity of their primary tumor. 

Materials & Methods The follow-up MR imaging of a cohort of 22 patients have been analyzed for a period of 12 years. All patients had been treated previously with surgery for hemispheric brain mass and consequently underwent radiation therapy and chemotherapy. All patients developed radiation necrosis and underwent serial follow-up MR imaging in different time sequences (6 to 15 follow-up) over a maximum period of 12 years.

Results On serial post-treatment imaging studies, development of intraparenchymal lesions occurred in all patients, ranging from 5 to 120 months after radiation. They became manifest as intensive bright peripheral and intra-focal contrast enhancement, and abnormal T2 - weighted signal with remarkable discrepancy between the extension of the lesions and the existing non-relevant mass effect. There were a broadly based bright intensive enhancement with festoon-like or facet-like configuration. It develops often centrifugal from the margin of the post-surgery brain damage and involves both the gyral surface and the subependymal periventricular space. AI cases showed a progressive atrophy of ipsilateral cerebral peduncle and an abnormal T2 - weight signal, which developed as a late delayed feature, ranging from 15 to 120 months after the radiation. In the time of surgery, and respectively the first year after surgery, there were no signs of distant atrophy or signal abnormalities of the corticofugal fibers at the level of midbrain. This suggest a secondary neuroaxonal dystrophy, or demyelination secondary to axon degeneration (Wallerian degeneration), developed delayed-after the radiation therapy.

Conclusion X-irradiated white matter is more susceptible to partial demyelination than normal white matter and effects of loss of endothelial integrity after radiation has its most profound effect on white matter. The influence of radiation can act on the natural history of brain tumors by causing different morphological and metabolic changes over an unlimited interval after radiation therapy. The secondary diffuse axonal degeneration due to radiation-induced effects can lead to distant demyelination and atrophy of corticofugal long fibers at the level of midbrain. In cases with renewed growth of a mass at the site of previously treated brain tumor associated with contrast enhancement, and consequently raised issues of indication for and choices of treatment, the sign of Wallerian degeneration at the level of midbrain does indicate an existing radiation necrosis.

Disclosures A. Mironov: None.

Introduction Intracranial dural arteriovenous fistulas (dAVF) account for 10-15% of all arteriovenous malformations. Although the majority of dAVF are effectively cured after endovascular intervention, a small proportion of patients may have dAVFs recurrence or de novo formation after radiographic cure.

Case Report We present a case of a 69-year-old female with de novo formation of three dAVFs in different anatomic locations after successive endovascular treatments. Her initial dAVF was identified in the right posterior frontal parafalcine region and obliterated with transvenous Onyx embolization. The patient returned eight years later due to left-sided pulsatile tinnitus and a new dAVF in the left greater sphenoid wing region was seen on angiography. This was treated with transvenous Onyx embolization with complete resolution. One year later, she developed left sided pulsatile tinnitus again and was found to have a left carotid-cavernous dAVF. Given the low intracranial hemorrhagic risk associated with the third dAVF, it was managed conservatively with observation.

Discussion After reviewing the literature, we found 18 cases of de novo dAVF formation after endovascular treatment. Of the 18 cases, 16 had de novo formation of a second dAVF after intervention, however only two cases reported de novo formation of a third metachronous dAVF. Whilst the etiology of de novo dAVF formation is still unclear, they are likely generated by numerous factors stemming from changes in venous flow which trigger the widespread expression of vascular endothelial growth factor resulting in aberrant vascular development. There are multiple methods to treat dAVF, including microsurgery, radiosurgery, endovascular embolization with coils and/or liquid embolic agents. The current gold standard of therapy is endovascular treatment (EVT) with the copolymer Onyx due to the substantial research supporting its efficacy and safety. No cases of metachronous de novo dAVF formation were found with the use of Onyx. Most cases (13/18) had de novo formation of a secondary dAVF after EVT with coils. Here we present a rare case of three metachronous de novo dAVFs and the first with the formation of de novo metachronous dAVFs after EVT with Onyx.

Conclusion Given the evolving treatments available for dAVFs, it is important to have proper follow-up to further understand the relationship between EVT and dAVF formation. Expanding current research on dAVF treatments and outcomes will allow
for better prevention of subsequent dural arteriovenous malformations.


**E-214 ACTIVE REMOVAL OF CEREBRAL HAEMORRHAGE VIA CSF EXCHANGE**

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**Introduction** Intracerebral hemorrhage (ICH) associated with intraventricular hematoma (IVH) has higher rates of morbidity and mortality. Removal of IVH depends on passive external ventricular drainage, which is time-consuming and gives opportunity to IVH re-organise and have negative effect on neural tissue. Expedient removal of ICH and IVH should result in less organisation of blood in the cerebrospinal fluid (CSF) thus minimising neural toxicity and facilitating better neurologic outcomes for patient and reduction in ICU time.

**Methods** We tested a novel fluid exchange system (active EVD) with controlled tPA infusion on 7 ICH and IVH cases to determine if rapid removal of blood could occur. In 2 cases, 2mg of tPA was administered manually over 2 consecutive days. In the other 5 cases, 2mg of tPA in 1,000 cc’s of fluid was continuously infused over a period of 1–4 days.

**Results** In all 7 cases, CT demonstrated 90% removal of blood occurring in 72 hours or less. Further, in all cases, complete treatment with the device, from catheter insertion to removal, was completed in an average of 5 days. Figure 1 demonstrates removal of IVH in 47h with 2,4mg tPA.