Precentral arteriovenous malformation

- Impact of arteriovenous malformations in the precentral and postcentral gyri on intracranial volumes
- Multimodal and Repeated Localization of Primary Hand Motor Function to the Lateral Postcentral Gyrus in a Case of Frontal Motor Area Brain Metastasis
- Microsurgical Resection of a Left Precentral Gyrus Arteriovenous Malformation: 3-Dimensional Operative Video
- Motor cortical stimulation for the treatment of trigeminal neuropathic pain secondary to an arteriovenous malformation. A case report
- Efficacy of repeat arterial spin labeling for angiogram-negative ruptured micro-arteriovenous malformation: A case report
- Microsurgical Resection of Tonsillar Arteriovenous Malformation: Operative Video
- Awake Microsurgical Resection for a Precentral Gyrus Arteriovenous Malformation-Three-Dimensional Video and Anatomic Landmarks
- Microsurgical Treatment for a Cerebral Arteriovenous Malformation of the Central Sulcus

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A precentral arteriovenous malformation (AVM) refers to an abnormal tangle of arteries and veins located in or near the precentral gyrus, which is the region of the brain responsible for voluntary motor control (also known as the primary motor cortex).

Key Features

1. Location Precentral gyrus, anterior to the central sulcus.

Contains the primary motor cortex, which controls contralateral voluntary movement—especially of the face, upper limbs, and lower limbs depending on the somatotopic distribution.

2. Clinical Presentation

Seizures (focal motor), especially if cortical irritation occurs.

Progressive motor deficits, weakness, or hemiparesis if the AVM causes mass effect or hemorrhage.

Intracerebral hemorrhage: common initial presentation in young patients.

3. Imaging

MRI + MRA: detailed localization and relationship with eloquent cortex.

Digital Subtraction Angiography (DSA): gold standard for vascular architecture, nidus size, feeders, and drainers.

4. Treatment Considerations

Complex due to eloquent cortex involvement.

Options include:

Microsurgical resection: risky in eloquent areas; reserved for small, superficial AVMs.

Stereotactic radiosurgery: often preferred for small-to-medium AVMs in motor cortex.

Endovascular embolization: typically adjunctive.

Risk of postoperative motor deficits must be weighed against hemorrhage risk.

5. Functional Mapping

Intraoperative motor evoked potentials (MEPs) and cortical mapping are crucial in surgery.

Navigated TMS and fMRI may aid preoperative planning.

Retrospective observational case-control studies using neuroimaging volumetric analysis

In a retrospective observational case-control study using neuroimaging volumetric analysis Gokoglu et al. from the Erciyes Medical School. Kayseri System Hospital, Vocational Health School, Cappadocia University, Nevşehir, Department of Neurosurgery, Bezmialem Vakif University, İstanbul published in Revista Neurocirugía [1] to determine whether cerebral arteriovenous malformations (AVMs) located in the precentral and postcentral gyri are associated with volumetric changes in other brain structures — both near and remote — using advanced MRI-based analysis:

1. Conceptual Overreach and Misplaced Enthusiasm

The authors attempt to attribute widespread volumetric brain changes to AVMs located in a highly focal cortical region. While neuroplasticity and diaschisis are known phenomena, this sweeping claim of remote structural reorganization is insufficiently justified. The title itself sets the tone for an overgeneralized hypothesis masquerading as discovery.

2. Methodological Ambiguity and Opaque Design

Key details about patient selection, AVM size, Spetzler-Martin grade, hemorrhagic history, or eloquence of surrounding cortex are absent. Were the AVMs ruptured or not? Were the MRIs taken before or after seizure onset, steroid use, or surgical planning? This lack of clinical metadata renders the volumetric findings speculative at best.

3. Small Sample Size and Statistical Overfitting

The study uses **25 patients**, yet compares **135 distinct brain structures**, creating an immense multiple comparisons problem. Bonferroni or FDR correction? Not discussed. This opens the door to

false positives and **spurious correlations**, undermining the credibility of the statistical claims.

4. The Software Fetish

Vol2Brain, HIPS, and Ceres are invoked as if their combined use inherently validates the pipeline. But multi-software approaches **do not substitute** for clinical rigor or biological plausibility. Their use appears more ornamental than scientific, producing beautifully color-coded brain maps detached from meaningful interpretation.

5. No Control for Confounding Factors

There is no mention of cognitive status, anti-epileptic drugs, corticosteroid usage, or duration of disease — all of which can affect brain volume. Comparing a neurologically symptomatic AVM group with healthy controls without adjusting for these is **intellectually dishonest**.

6. No Mechanistic Hypothesis, Only Buzzword Scatter

The authors allude to “mass effect”, “neuroplasticity”, and “remote volume change”, but never commit to a mechanistic model. The result is a soup of vague neuroanatomical inferences built on shaky anatomical correlation.

7. Conclusion Drift

The conclusion leaps from a narrow MRI study into speculative clinical territory: “Understanding these volumetric changes can aid in explaining patient symptoms.” Really? Which symptoms? Were any clinical correlations measured? This is **hypothesis-generation disguised as practice-changing insight**.

8. Editorial Lapses

Multiple keyword redundancies (“hipocampo”, “hippocampus”, “volumen cerebral”) and translation inconsistencies reflect a lack of editorial care. The title also oversells the scope of the findings.

Verdict

This paper is a textbook example of how **software-enabled volumetric analysis can produce data-rich but insight-poor conclusions**. Its methodological fragility, small sample size, and exaggerated claims about remote structural changes reduce it to a cautionary tale in neuroimaging interpretation.

Buzzword Inflation Index: 9/10

Scientific Merit: 3/10

Clinical Impact: 1/10

Final Assessment: Technically elaborate, clinically irrelevant. Another case of *when segmentation pipelines run faster than critical thinking*.

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Gokoglu A, Yiğit H, Dündar TT, Unur E, Selçuklu A. Impact of Arteriovenous Malformations in the Precentral and Postcentral Gyri on Intracranial Volumes. Neurocirugia (Engl Ed). 2025 Jun 13:500705. doi: 10.1016/j.neucie.2025.500705. Epub ahead of print. PMID: 40517905.

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