Indirect Extracranial-Intracranial Bypass is a Valid Surgical Option for Non-Moyamoya Atherosclerotic Carotid Occlusion: Illustrative Case

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Introduction

- Indirect extracranial-intracranial (EC-IC) bypass, such as encephaloduroarteriosynangiosis (EDAS), is an effective treatment for moyamoya.
- In contrast, the effectiveness of indirect EC-IC bypass in non-moyamoya atherosclerotic carotid occlusion has been strongly contested, considering the limited potential for neoangiogenesis in adults.

Case Presentation

- 58-year-old man, heavy smoker with multiple cardiovascular risk factors (DM, HTN, CAD).
- Recurrent right hemispheric TIAs and ischemic strokes x 1 year despite maximal medical therapy.
- Mild left brachiofacial hemiparesis (mRS 2) at baseline.
- Brain MRI: multiple small watershed infarcts, acute and chronic, in the right cerebral hemisphere.
- Cerebral DSA: right ICA occlusion at its origin in the neck.
- Brain SPECT: decreased cerebrovascular reserve in right hemisphere.

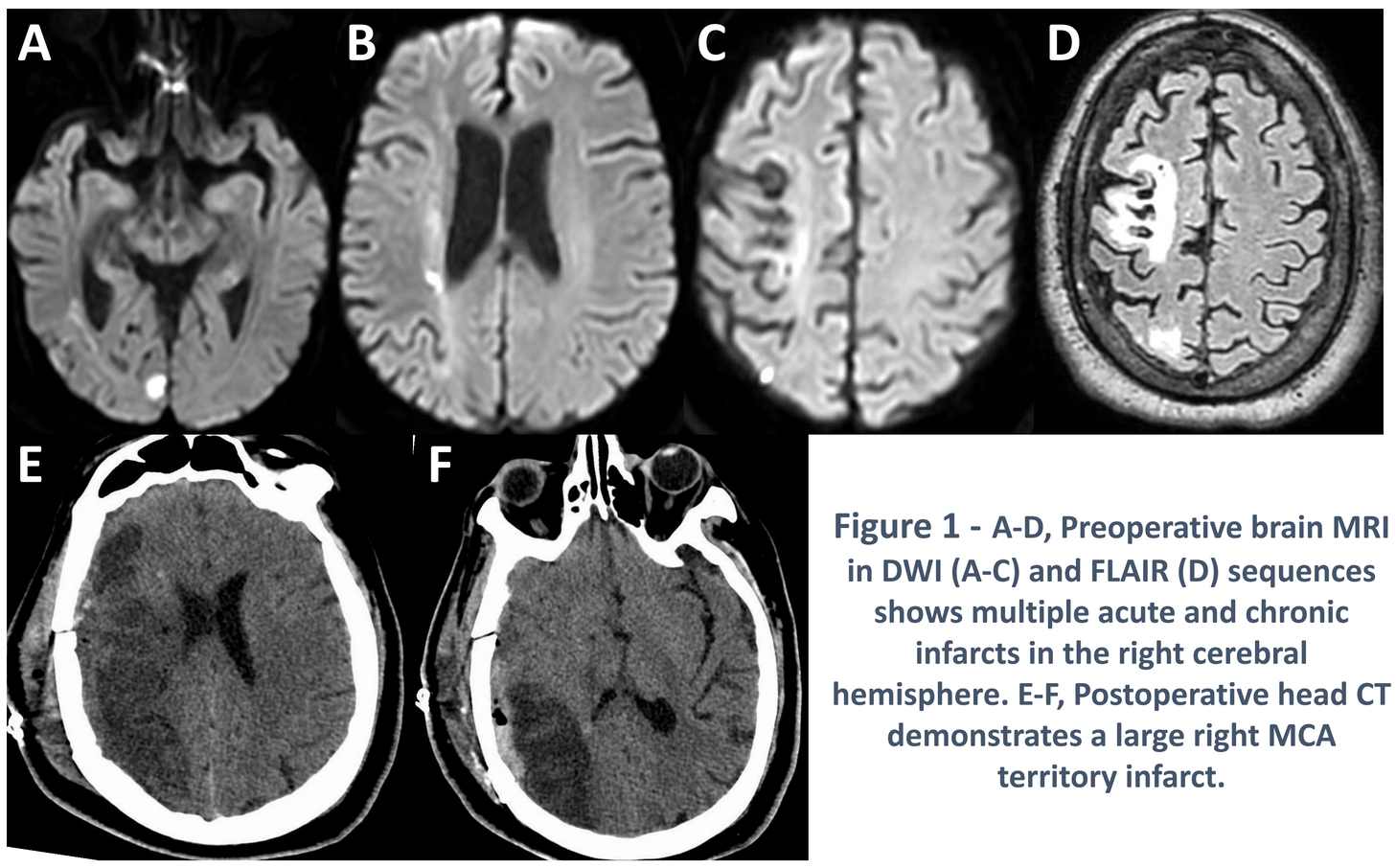

Figure 1 - A-D, Preoperative brain MRI in DWI (A-C) and FLAIR (D) sequences shows multiple acute and chronic infarcts in the right cerebral hemisphere. E-F, Postoperative head CT demonstrates a large right MCA territory infarct.

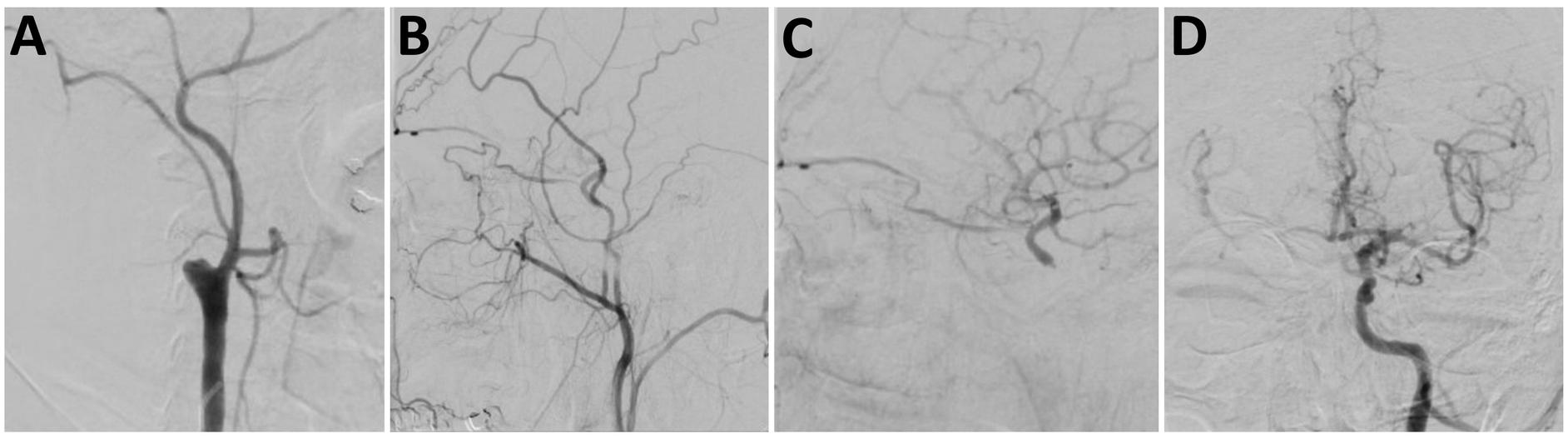

Figure 2 - Preoperative cerebral DSA. A, Right CCA injection (RAO projection) reveals right ICA occlusion at its origin in the neck. B-C, Right ECA injection (lateral projection) demonstrates distal reconstitution of the cavernous and supraclinoid segments of the right ICA via internal maxillary-ethmoidal-ophthalmic collaterals. D, Left ICA injection shows faint cross-opacification of the right MCA territory via the AComA.

- Direct EC-IC bypass (STA-MCA) attempted, but abandoned intraoperatively (poor recipient vessel quality).
- Indirect bypass (EDAS) performed, making use of the already harvested parietal branch of the STA.
- Initial postoperative course uneventful. However, following a hypotensive episode on POD#3, he developed a large right MCA territory infarct, resulting in a dense left brachiofacial hemiparesis. Ultimately discharged to rehab.

- 1 month postop: recurrent TIAs completely resolved.
- 1-year follow-up: moderate residual left brachiofacial hemiparesis, able to ambulate with assistance (mRS 3).

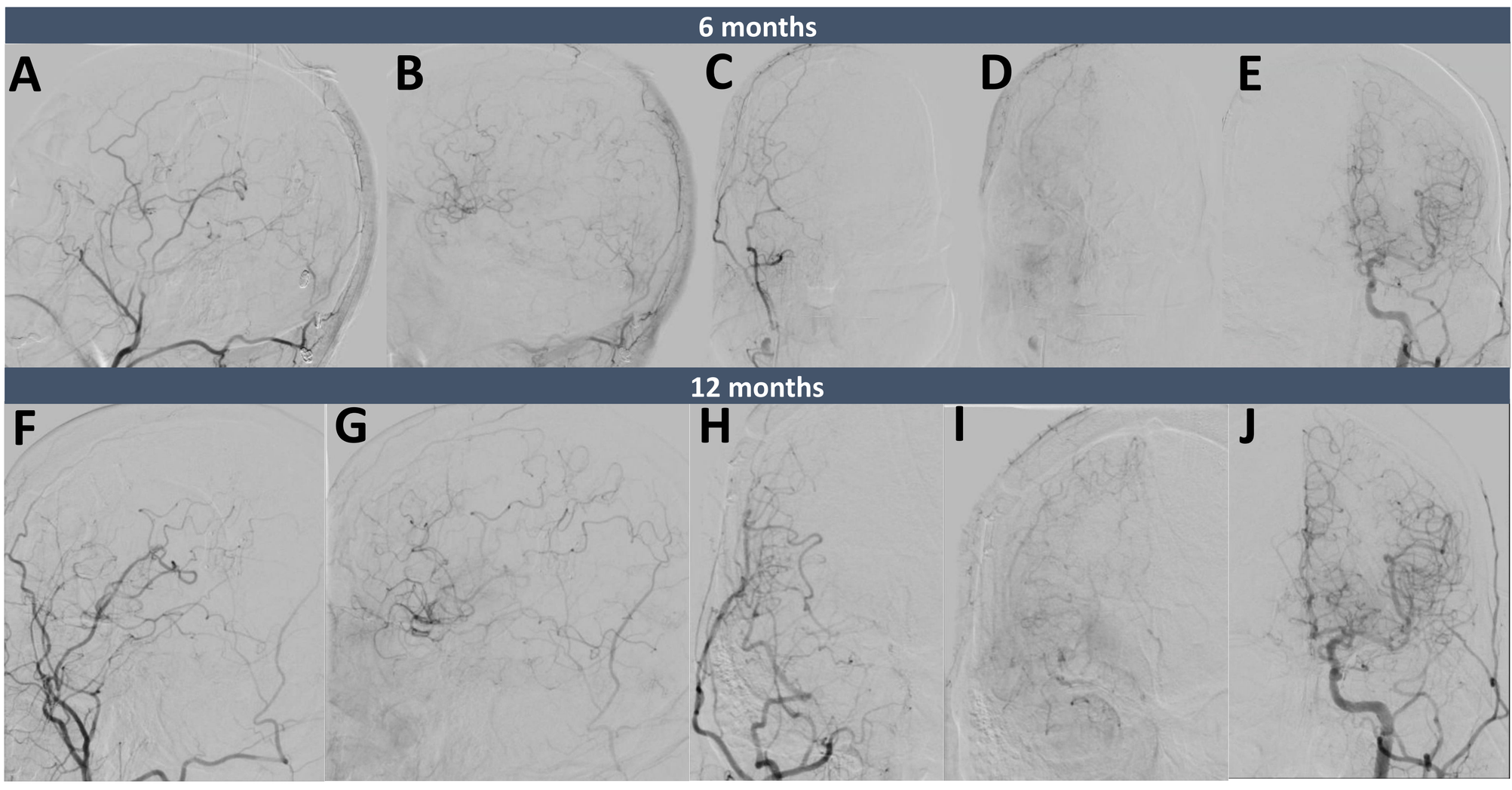

Figure 2 - Follow-up cerebral DSA at 6 months (A-E) and 1 year (F-J). Right STA injections (A-D and F-I, AP and lateral projections) demonstrate excellent revascularization of the right MCA territory via the indirect EDAS bypass, with the development of a rich network of EC-IC collaterals arising from the parietal branch of the STA and the MMA (Matsushima grade A). Note the regression of the previously seen internal maxillary-ethmoidal-ophthalmic collaterals. Left ICA injections (E and J) show resolution of cross-opacification via the AComA, consistent with improved blood flow in the right cerebral hemisphere.

Conclusion

- Indirect cerebral bypass, particularly EDAS, remains an effective surgical revascularization strategy in patients with non-moyamoya atherosclerotic carotid occlusion for whom a direct bypass strategy is not feasible or unsuccessful.