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Dominant A1 Flow Diverter Deployment for Bilateral-Supply Anterior Communicating Artery Aneurysms: A Single-Center Retrospective Experience in 30 Consecutive Patients

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Abstract

Background Anterior communicating artery (AComA) aneurysms with bilateral anterior cerebral artery (ACA) supply pose unique challenges for flow diverter (FD) deployment owing to small parent vessel caliber and hemodynamic vulnerability. Evidence supporting a dominant A1 strategy in this population remains limited.

Methods Thirty consecutive adults with unruptured bilateral-supply AComA aneurysms treated with FD implanted exclusively in the dominant A1 between April 2023 and February 2026 were retrospectively identified from a single-center database (Chinese Clinical Trial Registry ChiCTR2600117882, retrospectively registered January 12, 2026). Inclusion required angiographic confirmation of bilateral ACA supply and unilateral A1 dominance (asymmetry ratio ≥ 1.1 on DSA). Preprocedural dual antiplatelet therapy (≥ 5 days) was verified by platelet function testing when available. Follow-up combined modified Rankin Scale (mRS) assessment with DSA scheduled at 6 and 12 months and annually thereafter. The primary endpoint was adequate angiographic occlusion (O'Kelly–Marotta [OKM] C + D) at last follow-up. Secondary endpoints were complete occlusion (OKM D), composite major complications, and absence of treatment-related neurological worsening (mRS stability or improvement from baseline).

Results All 30 procedures were technically successful (100.0%). Median age was 59 years (interquartile range 54–62); 60.0% were male. Hyperlipidemia was present in 53.3%, hypertension in 50.0%, prior ischemic stroke in 40.0%, and admission mRS > 0 in 26.7%. Median parent vessel diameter was 2.25 mm; median A1 asymmetry ratio was 1.40, with left dominance in 63.3%. Nine FD models were used; median diameter difference < 0.3 mm in 46.7%. At a median angiographic follow-up of 7.5 months (DSA ≥ 6 months in all patients; ≥12 months in 40%), complete occlusion (OKM D) was achieved in 24/30 (80.0%) and adequate occlusion (OKM C + D) in 26/30 (86.7%), increasing to 30/30 (100.0%) when the four collar-sign borderline cases were counted as adequate. The composite major complication rate (symptomatic ischemic stroke, symptomatic intracranial hemorrhage, or mortality) was 6.7%. No patient experienced treatment-related neurological worsening. No mortality, retreatment, or loss to follow-up occurred.

Conclusions Dominant A1 FD deployment is technically feasible and achieved high rates of adequate angiographic occlusion without treatment-related neurological worsening in bilateral-supply AComA aneurysms. Longer-term durability and prospective multicenter validation are warranted.

INTRODUCTION

Flow-diverting stents (FDs) have redefined the endovascular management of intracranial aneurysms by enabling parent vessel reconstruction through controlled hemodynamic modulation, with demonstrated efficacy and safety across multiple large cohorts.[1–3] Despite this paradigm shift, anterior communicating artery (AComA) aneurysms remain underrepresented in pivotal FD trials because of concerns about small parent vessel caliber, complex perforator anatomy, and the potential for branch occlusion following stent placement.[4–7]

Among AComA aneurysms, those dependent on bilateral anterior cerebral artery (ACA) supply constitute a particularly high-risk subgroup. Bilateral supply is associated with larger aneurysm size, elevated rupture propensity, and increased procedural complexity compared with unilateral supply variants.[8–10] Flow diversion in this subgroup is technically demanding because the FD must be deployed within narrow A1 segments (typically 1.7–2.8 mm) while preserving flow to the contralateral hemisphere through the anterior communicating artery.

We hypothesized that strategic FD implantation within the dominant A1 segment achieves targeted flow reduction toward the aneurysm sac while preserving critical contralateral perfusion via the non-dominant A1. This hemodynamic remodeling exploits the inherent anatomical asymmetry present in more than 80% of ACA bifurcations, frequently driven by left ICA dominance,[11] and may promote progressive intrathrombotic organization within the sac. The present study retrospectively reports the procedural safety and mid-term occlusion efficacy of this dominant A1 strategy in 30 consecutive bilateral-supply AComA aneurysms treated at a single high-volume neurointerventional center. The use of flow diverters for the treatment of AComA aneurysms is currently considered an off-label indication in most regulatory jurisdictions.

METHODS

Study Design and Patient Selection

This was a retrospective single-center cohort study. The protocol was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for cohort studies, with attention to items relevant to a single-arm feasibility series. The study was conducted in accordance with the Declaration of Helsinki and was registered with the Chinese Clinical Trial Registry (ChiCTR2600117882) on January 12, 2026. The institutional review board of Zhuhai People's Hospital approved the study protocol with a waiver of informed consent given the retrospective design and use of de-identified clinical data.

Setting and Study Period

All procedures were performed at the Department of Cerebrovascular Surgery, Zhuhai People's Hospital, a tertiary high-volume neurointerventional center. Consecutive enrollment spanned April 2023 to February 2026, with the latest clinical and angiographic follow-up completed in August 2026.

Patient Selection

Inclusion criteria were: (i) angiographic confirmation of bilateral ACA supply to the aneurysm, defined as visible opacification of the aneurysm sac from both internal carotid artery injections; (ii) unilateral A1 dominance, defined as A1 asymmetry ratio ≥ 1.1 on DSA; and (iii) FD deployment exclusively within the

dominant A1 segment. Exclusion criteria were: prior endovascular or surgical treatment of the index AComA aneurysm, ruptured presentation, and inability to complete antiplatelet therapy. Patients with prior subarachnoid hemorrhage or treatment of intracranial aneurysms at other locations (e.g., middle cerebral artery, posterior communicating artery) were eligible, provided the index AComA aneurysm was treatment-naïve.

A1 asymmetry ratio was defined as the ratio of dominant to non-dominant A1 diameter, measured at the mid-portion on 3D-DSA reconstruction. All measurements were performed by the operating neurointerventionalist and independently verified by a senior observer blinded to clinical outcomes.

The patient selection process is summarized in Fig. 1. Of 969 patients treated with FD for intracranial aneurysms at our institution during the study period, 77 had unruptured AComA aneurysms. After excluding 17 patients with unilateral A1 dysplasia (defined as angiographic non-visualization or diameter < 50% of the contralateral A1, resulting in single-sided rather than bilateral aneurysm supply), 60 patients with bilateral ACA-supplied AComA aneurysms remained. Of these, 30 were excluded because the aneurysm was treated adjunctively by coil embolization or Woven EndoBridge (WEB) device rather than by FD monotherapy. The final study cohort thus comprised 30 consecutive patients treated by FD monotherapy implanted exclusively in the dominant A1.

Antiplatelet Therapy and Platelet Function Testing

All patients received dual antiplatelet therapy (DAPT) comprising aspirin 100 mg daily and a P2Y12 inhibitor (ticagrelor 60 mg twice daily or clopidogrel 75 mg daily), initiated at least 5 days before the procedure and maintained for 6 months postoperatively, followed by aspirin monotherapy. P2Y12 inhibitor selection (ticagrelor vs. clopidogrel) was at the discretion of the treating physician and evolved over the study period. Platelet function testing (VerifyNow PRU; Accumetrics, San Diego, CA) was performed in a subset of patients treated after 2022 when testing became institutionally available; PRU values were recorded when available but were not used as a prespecified inclusion criterion. Procedures were performed under general anesthesia with systemic heparinization (activated clotting time > 250 s). Femoral or radial access was established using a coaxial delivery system. FD selection followed manufacturer sizing recommendations, with the smallest clinically available FD diameter (typically 2.5 mm) preferentially used to minimize diameter difference (DD). All flow diverters were used as an off-label indication for AComA aneurysms, in accordance with the manufacturers' instructions for use.

Procedural Details and Outcome Definitions

Clinical variables (demographics, comorbidities, baseline neurological status), anatomical features (parent vessel diameter, neck, width, height, aspect ratio, daughter sac, branch involvement), procedural details (access route, FD model and size, DD defined as FD diameter minus parent vessel diameter, procedure time, technical success), and outcome data (immediate and follow-up OKM grade,

complications, follow-up mRS) were extracted retrospectively from the electronic medical record and angiographic records. Technical success required complete stent apposition confirmed by intraoperative DynaCT.

Angiographic outcome assessment was performed by the operating team using the OKM classification (A = complete/near-complete filling > 95%; B = incomplete filling 5–95%; C = cervical residual < 5%; D = complete occlusion).[4] Four cases initially labeled as 'Collar Sign' (focal contrast pooling at the stent margins suggestive of minor residual neck filling) on follow-up DSA were classified by consensus reading between the operating team and an independent senior observer blinded to clinical outcomes as a borderline subtype of OKM grade C ('OKM C, collar sign'); the consensus process required agreement of both readers, with a third adjudicator resolving disagreement. The primary endpoint was adequate angiographic occlusion (OKM C + D) at last follow-up, with the four collar-sign cases counted as not adequate under the strict definition; an inclusive definition counting these four cases as adequate was also specified and is reported alongside throughout (30/30). Secondary endpoints included complete occlusion (OKM D), symptomatic ischemic stroke, symptomatic intracranial hemorrhage, perioperative complications (including access-site complications), retreatment, mortality, and treatment-related neurological safety (defined as mRS stability or improvement from baseline rather than a primary efficacy endpoint).

Given the high prevalence of prior ischemic stroke in this cohort (40.0%), follow-up mRS values primarily reflect the natural history and recovery from prior cerebral infarction rather than a treatment-specific outcome of FD deployment. Accordingly, mRS was interpreted as a safety endpoint (absence of treatment-related neurological worsening) and not as a primary efficacy outcome.

Follow-up Protocol

Clinical and angiographic follow-up were scheduled at 6 and 12 months post-procedure and annually thereafter. DSA was the preferred follow-up imaging modality for angiographic assessment; MRA or CTA was used when DSA was medically contraindicated or refused by the patient, or when a non-invasive modality was considered sufficient at later time points. The follow-up imaging modality was determined by the treating team and recorded for each patient.

Statistical Analysis

Continuous variables are presented as medians with interquartile ranges (IQR; Table 1) or medians with ranges (Tables 2 and 3) given the small sample size; categorical variables are presented as counts and percentages, with Wilson 95% confidence intervals (CI) reported for the principal proportions. No inferential statistical testing was performed given the retrospective single-center design and cohort size. All analyses were conducted using Python 3 (SciPy v1.11 for statistical calculations; statsmodels for Wilson score confidence intervals). Given the descriptive nature of the analysis, observed associations should be interpreted as exploratory and hypothesis-generating rather than confirmatory. Sample size

was determined by consecutive enrollment rather than a priori power calculation, which is acknowledged as a limitation for any downstream comparative inference.

Table 1
Baseline Demographic and Clinical Characteristics (N = 30)

Characteristic	**Overall (N = 30)**
N	30
Age, years, median (IQR)	59 (54–62)
Male sex, n (%) [95% CI]	18 (60.0% [42.3–75.4])
Hypertension, n (%) [95% CI]	15 (50.0% [33.2–66.8])
Hyperlipidemia, n (%) [95% CI]	16 (53.3% [36.1–69.8])
Diabetes mellitus, n (%) [95% CI]	5 (16.7% [7.3–33.6])
Coronary artery disease, n (%) [95% CI]	0 (0.0% [0.0-11.4])
Active smoking, n (%) [95% CI]	9 (30.0% [16.7–47.9])
Prior ischemic stroke, n (%) [95% CI]	12 (40.0% [24.6–57.7])
Prior SAH from non-AComA aneurysm*, n (%)	4 (13.3%)
Prior aneurysm treatment at non-AComA site*, n (%)	4 (13.3%)
Admission mRS 0, n (%) [95% CI]	22 (73.3% [55.6–85.8])
Admission mRS > 0 (attributable to prior stroke), n (%) [95% CI]	8 (26.7% [14.2–44.4])

**Prior subarachnoid hemorrhage or aneurysm treatment at locations other than the index AComA aneurysm did not constitute exclusion criteria. CI = confidence interval; IQR = interquartile range; SAH = subarachnoid hemorrhage; mRS = modified Rankin Scale.*

Table 2
Aneurysm and Procedural Characteristics (N = 30)

Characteristic	Overall (N = 30)
N	30
Dominant A1 side — Left, n (%) [95% CI]	19 (63.3% [45.5–78.1])
Dominant A1 side — Right, n (%) [95% CI]	11 (36.7% [21.9–54.5])
A1 asymmetry ratio, median (range)	1.40 (1.1–1.8)
A1 ratio ≥ 1.5, n (%) [95% CI]	13 (43.3% [27.4–60.8])
Parent vessel diameter, mm, median (range)	2.25 (1.7–2.8)
Aneurysm neck, mm, median	2.70
Aneurysm height, mm, median	2.70
Aspect ratio, median (range)	0.90 (0.5–1.8)
Morphology — saccular, n (%)	30 (100.0%)
Daughter sac, n (%) [95% CI]	12 (40.0% [24.6–57.7])
Branch involvement, n (%) [95% CI]	11 (36.7% [21.9–54.5])
Access route — transfemoral, n (%) [95% CI]	23 (76.7% [59.1–88.2])
Access route — transradial, n (%) [95% CI]	7 (23.3% [11.8–40.9])
FD diameter difference (DD), mm, median (range)	0.30 (− 0.3 to 0.8)
DD < 0.3 mm, n (%) [95% CI]	14 (46.7% [30.2–63.9])
Procedure time, min, median (range)	64 (30–105)
Technical success, n (%) [95% CI]	30 (100.0% [88.6–100.0])
Adjunctive coiling, n (%)	0 (0.0%)
FD model distribution: *Surpass Evolve: 8 (26.7%); Pipeline Flex: 7 (23.3%); Tubridge: 6 (20.0%); Aucura: 3 (10.0%); Nuva: 2 (6.7%); Tubridge Plus: 1 (3.3%); Pipeline Shield: 1 (3.3%); FRED: 1 (3.3%); Choydar: 1 (3.3%). DD = FD diameter minus parent vessel diameter; CI = confidence interval; FD = flow diverter.*	

Table 3
Angiographic and Clinical Outcomes (N = 30)

Outcome	Overall (N = 30)
N	30
Angiographic follow-up, months, median (range)	7.5 (6–40)
Clinical follow-up, months, median (range)	19.0 (6–40)
DSA follow-up ≥ 6 months, n (%) [95% CI]	30 (100.0% [88.6–100.0])
DSA follow-up ≥ 12 months, n (%) [95% CI]	12 (40.0% [24.6–57.7])
DSA follow-up ≥ 24 months, n (%) [95% CI]	2 (6.7% [1.8–21.3])
Final vascular assessment — DSA / CTA / MRA, n	18 / 10 / 2
Immediate OKM D, n (%) [95% CI]	0 (0.0% [0.0-11.4])
Immediate OKM C + D, n (%) [95% CI]	6 (20.0% [9.5–37.3])
Last follow-up OKM D, n (%) [95% CI]	24 (80.0% [62.7–90.5])
Last follow-up OKM C + D, n (%) [95% CI]	26 (86.7% [70.3–94.7])
Symptomatic cerebral infarction, n (%) [95% CI]	1 (3.3% [0.6–16.7])
Symptomatic intracranial hemorrhage, n (%) [95% CI]	1 (3.3% [0.6–16.7])
Composite major complication*, n (%) [95% CI]	2 (6.7% [1.8–21.3])
In-stent stenosis (any), n (%) [95% CI]	2 (6.7% [1.8–21.3])
Retreatment, n (%) [95% CI]	0 (0.0% [0.0-11.4])
Mortality, n (%) [95% CI]	0 (0.0% [0.0-11.4])
Loss to follow-up, n (%) [95% CI]	0 (0.0% [0.0-11.4])
Last mRS 0, n (%) [95% CI]	27 (90.0% [74.4–96.5])
Last mRS 0–2, n (%) [95% CI]	30 (100.0% [88.6–100.0])
Patients with admission mRS > 0, n	8
mRS improved at last follow-up (vs baseline), n	7
mRS stable at last follow-up (vs baseline), n	23

**Composite of symptomatic cerebral infarction, symptomatic intracranial hemorrhage, and mortality. CI = confidence interval; OKM = O'Kelly–Marotta scale; mRS = modified Rankin Scale. Including the four collar-sign cases classified as adequate, adequate occlusion (OKM C + D) was 30/30 (100.0%); under the strict definition reported in the table these cases were counted as not adequate. Follow-up mRS primarily reflects recovery from prior ischemic stroke and is analyzed as a safety endpoint (absence of treatment-related neurological worsening), not as a primary efficacy outcome.*

Outcome	Overall (N = 30)
mRS worsened at last follow-up (treatment-related), n	0
Femoral access — OKM C + D, n/N (%) [95% CI]	21/23 (91.3% [73.2–97.6])
Femoral access — perioperative complications, n/N (%)	3/23 (13.0%)
Radial access — OKM C + D, n/N (%) [95% CI]	5/7 (71.4% [35.9–91.8])
Radial access — perioperative complications, n/N (%)	0/7 (0.0%)

**Composite of symptomatic cerebral infarction, symptomatic intracranial hemorrhage, and mortality. CI = confidence interval; OKM = O'Kelly–Marotta scale; mRS = modified Rankin Scale. Including the four collar-sign cases classified as adequate, adequate occlusion (OKM C + D) was 30/30 (100.0%); under the strict definition reported in the table these cases were counted as not adequate. Follow-up mRS primarily reflects recovery from prior ischemic stroke and is analyzed as a safety endpoint (absence of treatment-related neurological worsening), not as a primary efficacy outcome.*

RESULTS

Patient Population

Between April 2023 and February 2026, after application of the screening criteria outlined above and in Fig. 1, 30 consecutive patients (18 male [60.0%, 95% CI 42.3–75.4]; median age 59 years, IQR 54–62) with unruptured bilateral-supply AComA aneurysms underwent FD deployment in the dominant A1 segment (Table 1). Hyperlipidemia was the most common comorbidity (53.3% [36.1–69.8]), followed by hypertension (50.0% [33.2–66.8]), active smoking (30.0% [16.7–47.9]), and diabetes mellitus (16.7% [7.3–33.6]); no patient had coronary artery disease (0.0% [0.0–11.4]). Prior ischemic stroke was present in 40.0% (24.6–57.7), explaining the elevated admission mRS (> 0) in 8 patients (26.7% [14.2–44.4]). Four patients (13.3%) had a history of subarachnoid hemorrhage from intracranial aneurysms at non-AComA locations; none had prior treatment of the index AComA aneurysm. The last clinical and angiographic follow-up was completed in August 2026.

Anatomical Characteristics

The dominant A1 was on the left in 19 cases (63.3% [45.5–78.1]) and on the right in 11 (36.7% [21.9–54.5]). Median A1 asymmetry ratio was 1.40 (range 1.1–1.8); 43.3% (27.4–60.8) had an A1 ratio ≥ 1.5. Median parent vessel diameter was 2.25 mm (range 1.7–2.8). Median aneurysm neck, height, and aspect ratio were 2.70 mm, 2.70 mm, and 0.90, respectively. Daughter sac was present in 40.0% (24.6–57.7) and branch involvement in 36.7% (21.9–54.5) (Table 2).

Procedural Details

Transfemoral access was used in 23 cases (76.7% [59.1–88.2]) and transradial access in 7 (23.3% [11.8–40.9]). All 30 procedures achieved successful FD deployment (100.0% [88.6–100.0]) without adjunctive coiling. Nine FD models were deployed: Surpass Evolve (n = 8, 26.7%), Pipeline Flex (n = 7,

23.3%), Tubridge (n = 6, 20.0%), Aucura (n = 3, 10.0%), Nuva (n = 2, 6.7%), and Tubridge Plus, Pipeline Shield, FRED, and Choydar (n = 1 each). Of the 30 implanted devices, 25 were 2.5 mm in diameter; the remaining five were 2.0 mm (n = 1), 2.75 mm (n = 2), and 3.0 mm (n = 2). Median diameter difference (DD) was 0.30 mm (range − 0.3 to 0.8 mm); 46.7% (30.2–63.9) achieved the optimal DD < 0.3 mm. Median procedure time was 64 minutes (range 30–105).

Angiographic and Clinical Outcomes

Immediate post-deployment angiography demonstrated complete occlusion (OKM D) in 0/30 (0.0% [0.0–11.4]) and adequate occlusion (OKM C + D) in 6/30 (20.0% [9.5–37.3]). At a median DSA follow-up of 7.5 months (range 6–40; clinical follow-up median 19.0 months), complete occlusion (OKM D) was achieved in 24/30 (80.0% [62.7–90.5]) and adequate occlusion (OKM C + D) in 26/30 (86.7% [70.3–94.7]) (Table 3). Under the strict definition, adequate occlusion excludes the four collar-sign cases (26/30, 86.7%); under the inclusive definition these were counted as adequate (30/30, 100.0%). Follow-up DSA was available at ≥ 6 months in 30/30 (100.0% [88.6–100.0]), ≥ 12 months in 12/30 (40.0% [24.6–57.7]), and ≥ 24 months in 2/30 (6.7% [1.8–21.3]). The final vascular assessment was performed by DSA in 18 patients, CTA in 10, and MRA in 2. A representative case with 12-month angiographic follow-up demonstrating complete occlusion is shown in Fig. 2.

Safety and Functional Outcomes

Perioperative complications occurred in 10.0% (3/30; 3.5–25.6): one symptomatic cerebral infarction in a patient with Pipeline Shield implantation following antiplatelet interruption for gastrointestinal bleeding (full recovery, mRS 0 at 90 days), one intraprocedural aneurysm rupture (mRS 1 at last follow-up), and one femoral access-site pseudoaneurysm (asymptomatic, mRS 0). Postoperative interruption of dual antiplatelet therapy occurred in 2 patients (6.7%), and acute in-stent occlusion detected intraoperatively occurred in 1 patient (3.3%), which was treated without clinical sequelae (mRS 0 and complete occlusion [OKM D] at last follow-up). The composite major complication rate (symptomatic ischemic stroke + symptomatic intracranial hemorrhage + mortality) was 6.7% (1.8–21.3). In-stent stenosis of any severity was detected in 6.7% (1.8–21.3). The angiographic and diffusion-weighted imaging findings of the symptomatic ischemic case are illustrated in Fig. 3. No retreatment (0.0% [0.0–11.4]), no mortality (0.0% [0.0–11.4]), and no loss to follow-up (0.0% [0.0–11.4]) were observed.

With respect to treatment-related neurological safety, no patient experienced mRS worsening from baseline. At last follow-up, mRS was 0 in 27/30 (90.0% [74.4–96.5]) and 0–2 in 30/30 (100.0% [88.6–100.0]). Of the 8 patients with admission mRS > 0 (attributable to prior cerebral infarction rather than the index AComA aneurysm), 7 demonstrated mRS improvement and 1 remained stable at last follow-up; none worsened. These findings indicate that FD deployment did not produce any treatment-related neurological deterioration, although the high baseline prevalence of prior stroke precludes interpretation of mRS as a treatment-specific efficacy outcome.

Subgroup Analysis by Access Route

Among transfemoral cases (n = 23), complete occlusion (OKM D) was achieved in 19/23 (82.6% [62.9–93.0]) and adequate occlusion (OKM C + D) in 21/23 (91.3% [73.2–97.6]); perioperative complications occurred in 3/23 (13.0% [4.5–32.1]). Among transradial cases (n = 7), complete occlusion was achieved in 5/7 (71.4% [35.9–91.8]) and adequate occlusion in 5/7 (71.4% [35.9–91.8]); no perioperative complications occurred (0.0% [0.0–35.4]). Although the transradial subset was underpowered for formal comparison, the absence of access-site or systemic complications in this group is consistent with prior reports favoring radial over femoral access for FD deployment.

DISCUSSION

Principal Findings

In this 30-patient retrospective single-center series of bilateral-supply AComA aneurysms treated by FD deployment in the dominant A1 segment, adequate angiographic occlusion (OKM C + D) was achieved in 86.7% under the strict definition (100% [30/30] under the inclusive definition that counts the four collar-sign cases as adequate) at a median follow-up of 7.5 months, with complete occlusion (OKM D) in 80.0%, a composite major complication rate of 6.7%, and no treatment-related neurological worsening. These findings support the technical feasibility and preliminary safety of the dominant A1 strategy in this specific AComA aneurysm population.

Comparison with Prior AComA and Distal ACA FD Series

The most directly comparable evidence comes from the multicenter study by Benalia et al.,[7] which reported 86.4% complete occlusion and a 2.1% major complication rate among 144 unruptured AComA aneurysms treated by FD monotherapy at a median 17-month follow-up. Our complete occlusion rate (80.0%) is numerically lower, but our adequate occlusion rate (86.7%) is comparable to published benchmarks for this anatomy. The CRETA Registry of 168 distal ACA aneurysms reported a 70.2% complete occlusion rate at 16.5 months,[12] while Cagnazzo et al. observed complete occlusion rates of 66–80% in distal ACA aneurysms treated by FD with systematic review.[9] Older series of AComA FD treatment (Colby et al.[13] 50 cases; Pagiola et al.[6] 23 cases with various stent placement strategies) reported progressive improvements in occlusion rates as device iterations and technique matured. The current study extends this trajectory by reporting 86.7% adequate occlusion in a strictly selected bilateral-supply population using a uniform anatomical strategy.

Anatomical Rationale for Dominant A1 Deployment

The dominant A1 strategy exploits the inherent anatomical asymmetry present in the majority of ACA bifurcations. By deploying the FD in the dominant A1, flow is redirected away from the aneurysm sac while preserving perfusion to the contralateral hemisphere through the uncovered non-dominant A1.[14] Post-procedurally, the contralateral A1 may demonstrate increased prominence and flow velocity, allowing each hemisphere to be supplied independently without relying on cross-flow through the AComA. This hemodynamic remodeling directly addresses a key limitation of FD treatment in bilateral-

supply AComA aneurysms: persistent sac filling from the contralateral side, which has been documented in previous series.[4] All patients in our cohort had unilateral A1 dominance (median A1 ratio 1.40; 43.3% [27.4–60.8] with ratio ≥ 1.5), supporting the feasibility of this strategy in the selected population.

Stent Sizing and Procedural Considerations

The median DD of 0.30 mm in our cohort reflects a deliberate strategy of using the smallest clinically available FD diameter (typically 2.5 mm) for small A1 vessels (median 2.25 mm), achieving DD values close to biomechanical thresholds. Experimental models have demonstrated that DD > 0.5 mm produces porous transition zones at the stent margins, generating local flow disturbances that elevate thromboembolic risk,[15] and clinical data suggest an OR of 2.37 per 1-mm increase in DD for thromboembolic complications.[16] Maintaining DD < 0.3 mm in 46.7% (30.2–63.9) of our cohort may have contributed to the low symptomatic complication rate despite nine different FD models being used.

Access Route: Transradial versus Transfemoral

Although the transradial subset was small (n = 7) and underpowered for definitive comparison, the absence of perioperative complications in this group (0/7 vs 3/23 with transfemoral access) is consistent with prior reports favoring radial access for FD deployment.[17] Both access routes achieved comparable adequate occlusion, suggesting that the choice of access route does not compromise angiographic efficacy. The transradial proportion in our series (23.3% [11.8–40.9]) is lower than previously reported and reflects evolving institutional practice patterns as case complexity increased.

Limitations

Several limitations should be acknowledged. First, the retrospective single-center design constrains causal interpretation; the absence of a control group (e.g., bilateral-FD, conservative management, or surgical clipping) precludes comparative inference. The sample size (n = 30) was determined by consecutive enrollment rather than a priori power calculation and therefore lacks statistical power for formal subgroup or multivariable analysis. Second, the median angiographic follow-up of 7.5 months is relatively short; only 40.0% (24.6–57.7) of patients have ≥ 12-month DSA and only 6.7% (1.8–21.3) have ≥ 24-month DSA. Long-term durability—including late occlusion, in-stent stenosis, and delayed complications—remains to be established. Third, angiographic outcome assessment was performed by consensus between the operating team and an independent senior observer but without independent core-laboratory adjudication using a prespecified imaging protocol; the four 'Collar Sign' reclassifications further highlight the operator dependence of this outcome. Fourth, the study population was treated with nine different FD models, reflecting real-world practice heterogeneity but precluding device-specific conclusions; readers should interpret the aggregated outcomes as a class effect rather than evidence for any single device. Fifth, P2Y12 inhibitor selection evolved during the study period (from clopidogrel toward ticagrelor in more recent cases),[18] and VerifyNow PRU testing was available only in a subset of patients; the impact of P2Y12 choice and platelet reactivity on outcomes could not be formally assessed. Sixth, the high prevalence of prior ischemic stroke (40.0%) in this cohort precludes

interpretation of follow-up mRS as a treatment-specific efficacy outcome; mRS is appropriately analyzed only as a safety endpoint (absence of treatment-related neurological worsening). Seventh, no quantitative hemodynamic assessment (computational fluid dynamics or quantitative MR angiography) was performed to directly demonstrate the proposed contralateral-flow preservation mechanism. Eighth, the transradial access subset was small (n = 7), limiting the statistical robustness of access-route comparisons. Finally, the single-center setting may limit external generalizability, particularly to low-volume centers or different patient populations. Future multicenter studies should specifically address these gaps.

Implications and Future Directions

These pilot findings support the feasibility of dominant A1 FD deployment as a strategy for bilateral-supply AComA aneurysms and provide hypothesis-generating evidence to inform a prospective multicenter registry with core-laboratory adjudication, standardized antiplatelet protocols (with PRU-driven drug selection), and extended angiographic follow-up. Future studies should specifically address (i) the durability of adequate occlusion beyond 24 months; (ii) the hemodynamic consequences of FD deployment via computational flow analysis; (iii) the comparative effectiveness of dominant A1 deployment versus bilateral or conventional single-FD strategies using propensity-matched cohorts; and (iv) treatment-related neurological outcome assessed independently of confounding prior stroke history.

CONCLUSION

Dominant A1 flow diverter deployment represents a feasible and potentially effective strategy for bilateral-supply AComA aneurysms, achieving 86.7% adequate angiographic occlusion under the strict definition (100% [30/30] under the inclusive definition) without treatment-related neurological worsening in this selected 30-patient cohort. Prospective multicenter validation with extended follow-up is warranted to confirm long-term efficacy.

Declarations

Ethics approval and consent to participate

Approved by the Institutional Review Board of Zhuhai People's Hospital, with a waiver of informed consent given the retrospective design and use of de-identified clinical data. The study was registered with the Chinese Clinical Trial Registry (ChiCTR2600117882) on January 12, 2026.

Consent for publication

The Institutional Review Board of Zhuhai People's Hospital waived informed consent owing to the retrospective design and the use of de-identified clinical data. This waiver covers publication of the de-identified clinical data and angiographic images presented in this article.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Author Contribution

Zhejing Ding: Conceptualization, methodology, investigation, writing – original draft. Tianyang Guan: Data curation, formal analysis, writing – review & editing. Zhongliang Li: Investigation, data curation. Jing Huang: Investigation, resources. Dan Jin: Resources, validation. Tao-An: Resources, validation. Guangsen Cheng: Conceptualization, supervision, writing – review & editing. Yu Liu: Conceptualization, supervision, project administration, funding acquisition, writing – review & editing. All authors have approved the final manuscript and agree to be accountable for all aspects of the work.

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Availability of data and materials

References

1. Shehata MA, Ibrahim MK, Ghozy S, et al. Long-term outcomes of flow diversion for unruptured intracranial aneurysms: a systematic review and meta-analysis. J Neurointerv Surg. 2023;15:898–902.
2. Hanel RA, Cortez GM, Lopes DK, et al. Prospective study on embolization of intracranial aneurysms with the pipeline device (PREMIER study): 3-year results with the application of a flow diverter specific occlusion classification. J Neurointerv Surg. 2023;15:248–54.
3. Pistocchi S, Blanc R, Bartolini B, et al. Flow diverters at and beyond the level of the circle of Willis for the treatment of intracranial aneurysms. Stroke. 2012;43:1032–8.
4. Dakay K, Cooper JB, Greisman JD, et al. Flow diversion in anterior cerebral artery aneurysms. Brain Circ. 2021;7:247–52.
5. Bhogal P, Martinez Moreno R, Ganslandt O, et al. Use of flow diverters in the treatment of unruptured saccular aneurysms of the anterior cerebral artery. J Neurointerv Surg. 2017;9:283–9.

6. Pagiola I, Mihalea C, Caroff J, et al. Flow diversion treatment of aneurysms of the complex region of the anterior communicating artery: which stent placement strategy should 'I' use? A single center experience. J Neurointerv Surg. 2019;11:1118–22.
7. Benalia VHC, Cortez GM, Mounayer C, et al. Safety and efficacy of flow diverters for treatment of unruptured anterior communicating artery aneurysms: retrospective multicenter study. J Neurointerv Surg. 2023;15:1181–6.
8. UCAS Japan Investigators. The natural course of unruptured cerebral aneurysms in a Japanese cohort. N Engl J Med. 2012;366:2474–82.
9. Cagnazzo F, Fanti A, Lefevre PH, et al. Distal anterior cerebral artery aneurysms treated with flow diversion: experience of a large-volume center and systematic review of the literature. J Neurointerv Surg. 2021;13:42–8.
10. Piano M, Trombatore P, Lozupone E, et al. Flow diverter devices in the treatment of anterior communicating artery region aneurysms: would the regional anatomy and the aneurysm location affect the outcomes? Brain Sci. 2022;12:1524.
11. Fredon F, Hardy J, Baudouin M, et al. An MRI study of typical anatomical variants of the anterior communicating artery complex. Surg Radiol Anat. 2021;43:1983–92.
12. Scarcia L, Clarençon F, Dmytriw AA, et al. Flow-diverting stents for the treatment of unruptured distal anterior cerebral artery aneurysms: analysis of the CRETA Registry. J Neurointerv Surg. 2024. 10.1136/jnis-2024-022315.
13. Colby GP, Bender MT, Lin LM, et al. Endovascular flow diversion for treatment of anterior communicating artery region cerebral aneurysms: a single-center cohort of 50 cases. J Neurointerv Surg. 2017;9:679–85.
14. Gawlitza M, Januel AC, Tall P, et al. Flow diversion treatment of complex bifurcation aneurysms beyond the circle of Willis: a single-center series with special emphasis on covered cortical branches and perforating arteries. J Neurointerv Surg. 2016;8:481–7.
15. Estrade L, Makoyeva A, Darsaut TE, et al. In vitro reproduction of device deformation leading to thrombotic complications and failure of flow diversion. Interv Neuroradiol. 2013;19:432–7.
16. Tong X, Han M, Wu Z, et al. Effects of different stent size selection on pipeline embolization device treatment of intracranial aneurysms. Ther Adv Neurol Disord. 2023;16:17562864231151475.
17. Li Y, Chen SH, Guan J, et al. Lower complication rates associated with transradial versus transfemoral flow diverting stent placement. J Neurointerv Surg. 2021;13:91–5.
18. Hurtado-Ortiz KD, Lantos J, Duda T, et al. Comparison of clopidogrel and ticagrelor for dual antiplatelet therapy of patients with unruptured cerebral aneurysms undergoing endovascular treatment. World Neurosurg. 2023;177:e408–14.

Figures

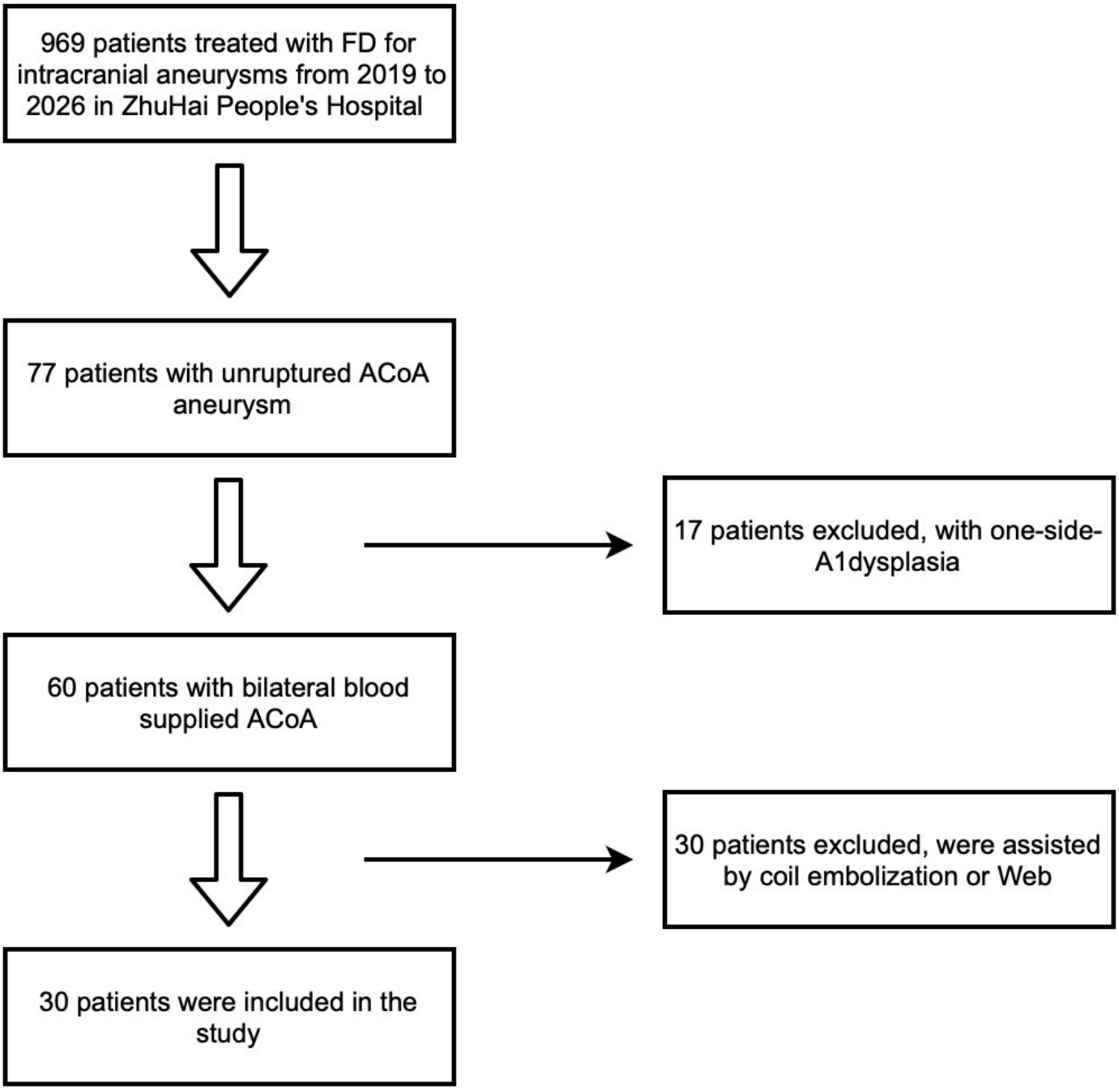


Figure 1

Patient enrollment flowchart. Of 969 patients treated with flow diverter (FD) for intracranial aneurysms during the study period, 77 had unruptured anterior communicating artery (AComA) aneurysms. After excluding 17 patients with unilateral A1 dysplasia, 60 had bilateral ACA-supplied AComA aneurysms. Of these, 30 were excluded because treatment involved adjunctive coil embolization or Woven EndoBridge (WEB) device rather than FD monotherapy. The final study cohort comprised 30 consecutive patients.

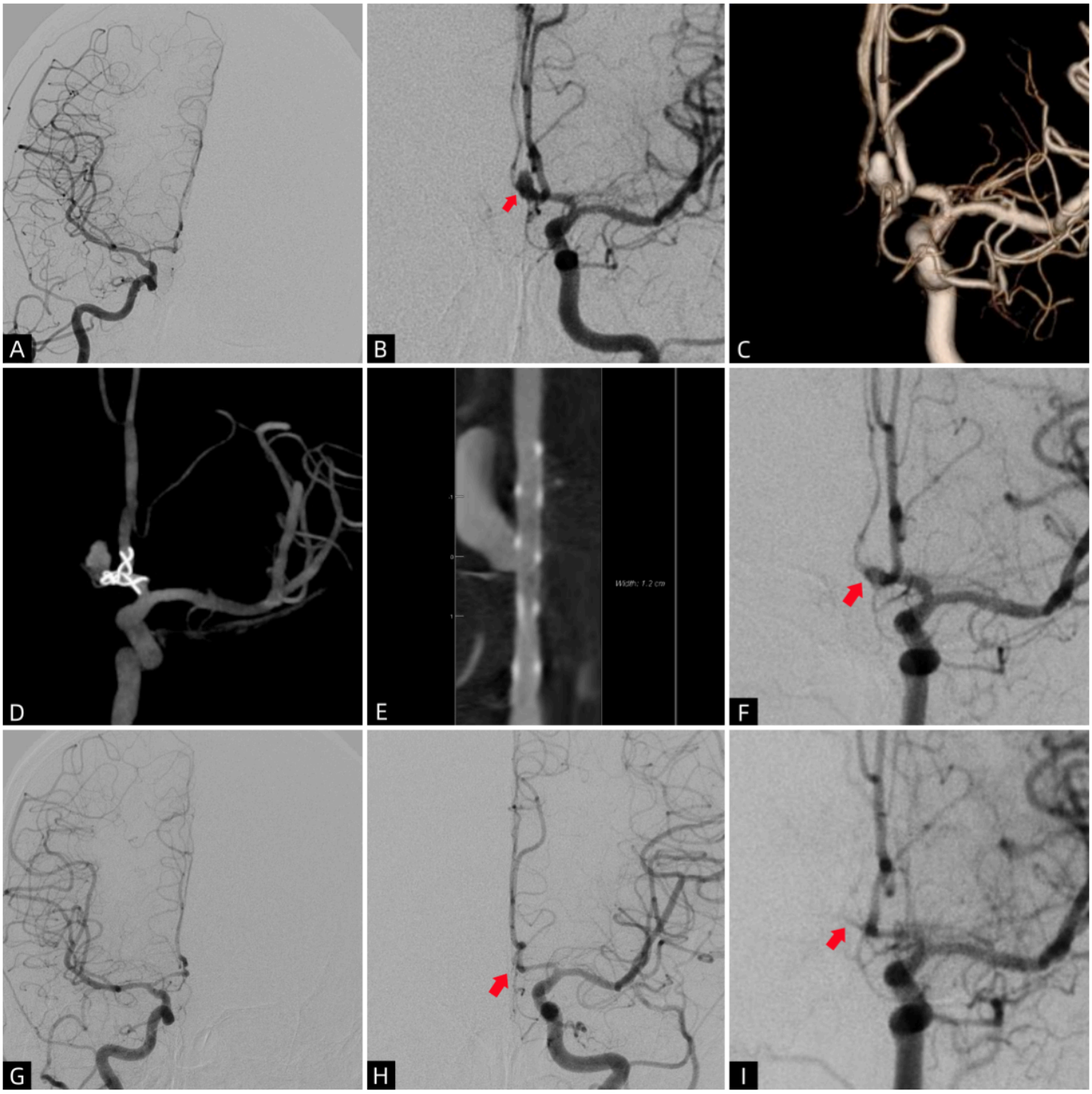


Figure 2

Representative case of bilateral-supply AComA aneurysm treated by FD deployment in the dominant left A1. (A) Right ICA injection: aneurysm not opacified (cross-flow via AComA). (B) Pre-treatment left ICA angiogram showing aneurysm sac. (C) 3D-DSA reconstruction demonstrating aneurysm morphology. (D-E) Immediate post-deployment diluted-contrast fluoroscopy showing optimal stent coverage and wall apposition. (F) Post-procedural left ICA angiogram showing reduced aneurysm filling. (G-I) 12-month follow-up DSA demonstrating complete aneurysm occlusion (OKM D) with preserved right A1 perfusion.

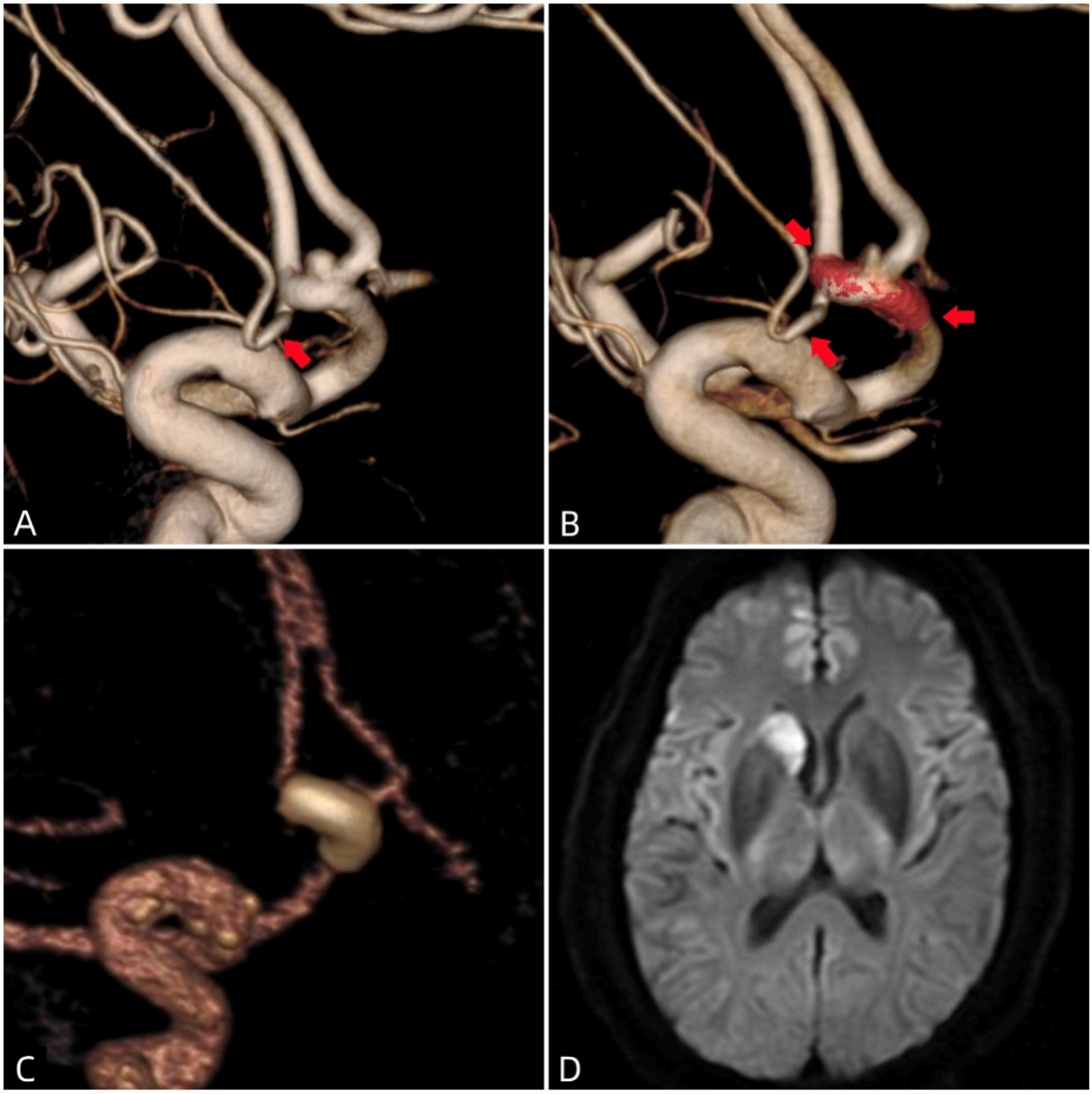


Figure 3

Ischemic complication following antiplatelet interruption in a Pipeline Shield™ case (A-B) Baseline angiography: Recurrent artery of Heubner (arrow) originating from the parent artery, with preserved branch patency post-FD deployment. (C) Acute-phase CTA: Patent distal ACA trunk post-infarction. (D) DWI: Acute infarction in right caudate nucleus head and putamen, confirming recurrent artery territory ischemia.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- TablesV1.0.docx
- Data.xlsx