SUPPLEMENTAL MATERIAL

Clinical Experience With the Bendit Steerable Microcatheter: A New Paradigm for Endovascular Treatment

Supplementary Table 1: Procedural Characteristics

Patient	Patient age and details	Indication	Target vessel(s)	Procedural details	Guidewire used	Contrast applied through the Bendit?	Device used	Device delivered successfully with Bendit	Procedure time (min)
1	60s; dyslipidemia	Epistaxis nasal vessel embolization: Nosebleeds due to genetic disease (OWR syndrome)	ECA branches, right ECA	Embolization of right ECA; right ECA embolized with 0.3 mL Magic Glue (25%)	Yes	Yes	NA	NA	121
2	70s; baseline mRS: 0	Supraclinoid aneurysm (5 x 5.5 mm) following previous FD catheterization	ICA-intracranial	Inserted flow diverter inside previous Pipeline device in right ICA; good outcome; procedure failed to deliver Silk FD	Yes	NA	Silk Vista 4.5 x 15 mm	No	69
3	40s; baseline mRS: 0	AVM/Fistula: right-cheek AVM	Other: ECA-internal maxillary artery	Embolization with 0.2 mL of PHIL DMSO (25%)	No	NA	NA	NA	84
4	80s; NIHSS score: 12	Stroke	ICA-extracranial	Stroke treatment not achieved due to highly tortuous arch take off vessels	Yes	NA	NA	NA	133
5	60s, Hypertension	Aneurysm	Left M1	Complete aneurysm repair, intrasaccular device	Yes	NA	Contour 9mm	Yes	66
6	70s; dyslipidemia; neurological disease; baseline mRS: 0	Carotid aneurysm (4.4 x 3.8 mm) with previous history of cavernous carotid fistula previously treated with coils	CC, ICA-extracranial	Aneurysm coiled	NA	Yes	LVIS stent 4.5x18 LVIS stent 4.5x23 Hydrosoft10 coil 4x10 Hydrosoft10 coil 3x10	Yes Yes Yes Yes	60
7	40s; hypertension; baseline mRS: 0	A1 aneurysm (5 x 7 mm) previously treated with Phenox contour flow modulation	A1, CC, ICA-intracranial, ICA-extracranial	Complete aneurysm repair, intrasaccular device	NA	Yes	Contour 9mm	Yes	73

8	60s; hypertension; dyslipidemia; previous stroke; neurological disease; baseline mRS: 0	Basilar aneurysm (5 x 5 mm)	Basilar, vertebral	Contour device deployed	NA	NA	Contour 7mm	Yes	73
9	40s; hypertension; ACI; neurological disease; double vision; baseline mRS: 0	Side-wall aneurysm (3.0 x 2.9 mm)	ICA-intracranial	Contour device deployed	NA	NA	Contour 5mm	Yes	65
10	50s; hypertension, hypercholesterolemia; neurological disease; baseline mRS: 0	Diagnostic angiography to evaluate previous treatment of ophthalmic embolization with a flow diverter	ICA-intracranial	Diagnostic indication for ICA-intracranial region	NA	NA	NA	NA	61
11	50s; hypertension; hypercholesterolemia; neurological disease; baseline mRS: 0	Ophthalmic aneurysm; recurring blister (2.5 x 1.5 mm)	ICA-intracranial	Treated with flow diverter	NA	NA	Fred Flow Diverter 4.0x12/18mm	NA	54
12	60s; baseline mRS: 0	Diagnostic procedure to identify source of bleeding through contrast injections	Other: Costocervical trunk	Diagnostic; target vessels: vertebral and ICA-extracranial	NA	Yes	NA	NA	100
13	60s; baseline mRS: 0	ACOM aneurysm (7 x 5 mm); severe elongated and tortuous vessels	ACOM	Four different types of coils deployed; two Contour devices: 2 Bendits used	NA	NA	Coils Contour 9mm Contour 7mm	NA Yes NA	125
14	60s; CAD; baseline mRS: 0	Diagnostic	P1, ECA-branches, ICA-extracranial, ICA-intracranial, vertebral, basilar	Diagnostic, target vessels: vertebral, basilar, P1	NA	Yes	NA	NA	79

15	70s; hypertension; neurological disease; baseline mRS: 0	Cavernous aneurysm (17.1 x 22.3 mm)	ICA-intracranial	Partial embolism of aneurysm with flow diverter	Yes	NA	Fred flow diverter 4.5x39/45mm	NA	100
16	60s; hypertension; previous stroke; neurological disease; baseline mRS:0	60-70% right ICA stenosis with ulceration	CC, ICA-extracranial	Casper carotid stent system	Yes	NA	Casper stent 9x40	NA	47
17	30s; neurological disease; SAH; baseline mRS=0	Two aneurysms: right MCA and right ACOM	M1, ICA-intracranial, ICA-extracranial	Two intrasaccular devices	NA	Yes	Contour CNS21005-15 Contour CNS21009-15	Yes Yes	67
18	50s; hypertension; neurological disease; previous stroke; baseline mRS: 3	Basilar aneurysm (6.69 x 7.52 mm)	Vertebral, basilar	Flow diverter and intrasaccular device; Contour device did not pass Bendit luer to shaft	Yes	NA	Silk Vista 4.5x25 Contour CNS21009-15	NA No	93
19	70s; hypertension; neurological disease; previous TIA; baseline mRS: 0	Carotid stenosis	CC, ICA-extracranial	Casper carotid stent system, passing ICA stenosis with Bendit	NA	NA	Casper Carotid Stent System 9x30x143	NA	60
20	60s; hypertension; COPD; baseline mRS: 0	ACOM aneurysm (6 x 5 mm)	A1, ICA-extracranial, ICA-intracranial	Intrasaccular device	NA	NA	Contour CNS21007-15	Yes	71
21	70s; hypertension; neurological disease; previous stroke; male reproductive cancer; baseline mRS: 0	ICA stenosis	ICA-extracranial; ICA-intracranial	Casper stent	NA	NA	Casper 7x30x143	NA	72
22	60s; baseline mRS: 0	AVM/fistula: left type 3 dural fistula with arterial inflows from the ophthalmic artery and the internal maxillary artery	Other: cortical vein	Bendit inserted over a guidewire to access dorsal vein, replaced with Apollo 2 and Sonic, Second Bendit (same catheter) used to successfully access ophthalmic artery; injection with PHIL (25%) coil insertion to minimize	Yes	Yes	Coil Finish Barricade 3mm/8cm Coil Finish Barricade 4mm/10cm	NA NA	194

				reflux; fistula completely closed					
23	60s; baseline mRS: 0	Aneurysm (6 x 4 mm) of the left cerebral artery at the temporal branch	MCA	Balloon-assisted coiling of aneurysm; LEO Baby stent	Yes	NA	LEO Baby Stent 2.5x12 Hydrocoil10 4x8 Hydrocoil10 2x4 Hydrocoil10 1.5x2	NA NA NA NA	116
24	70s; hypertension, hypercholesterolemia; ICA stenosis; previous TIA; neurological disease; baseline mRS: 0	Aneurysm (7.6 mm max diameter); stenosis of right common carotid artery		High-grade ACI outlet stenosis probed with Transend; stenting and PTA balloon. Ascended with Bendit over guidewire; then removed guidewire and accessed aneurysm. Delivered 2 of 4 coils with Bendit and replaced the Echelon and complete embolization; jammed coil following delivery of two coils	Yes	NA	Hydrocoil10 6x20 Hydrocoil10 5x20 Hydrocoil10 4x10 Hydrocoil10 6x20	Yes No Yes No	90
25	60s; hypertension; baseline mRS: 1	Angioplasty	High-grade kink stenosis caused by a migrated stent	Stenosis probed using Bendit microcatheter on a Traxcess microwire	Yes	NA	Stent	NA	Unknown

*Treating physician did not define as device failure.
ACI=acute cerebral infarction; CAD=coronary artery disease; TIA=transient ischemic attack; OWR=Osler-Weber-Rendu syndrome; FD=flow diverter; AVM=arteriovenous malformation; ECA=external carotid artery; ICA=internal carotid artery; CC=common carotid artery; ACOM=anterior communicating artery; DMSO=dimethyl sulfoxide; PTA=percutaneous transluminal angioplasty; mRS=modified Rankin Scale.

Supplemental Table 2: Continued

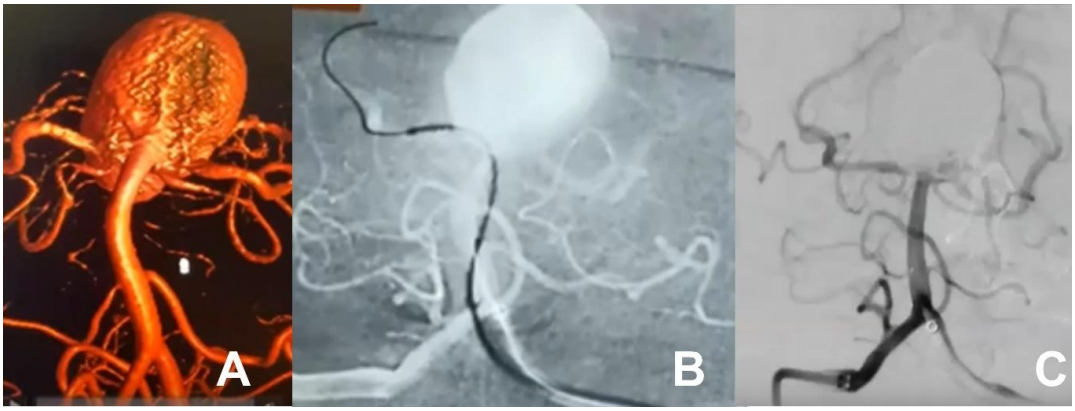
Supplementary Table 2: Questionnaire results

ID	Ability to deliver a guidewire through Bendit 21	Ability to deliver Bendit 21 through guiding catheter	Ability to deliver deliverables through Bendit 21	Ability to advance distal part of Bendit 21	Ability to shape (deflect) distal tip of Bendit 21	Responsiveness to rotation of Bendit 21	Sustaining position during material/ device delivery	Visibility of catheter body	Visibility of tip marker	Visibility of proximal marker	Ability to steer and lock using steering slider
1	5	5	5	5	5	5	1	5	5	5	5
2	5	5	1	1	5	5	1	5	5	5	5
3	NA	5	NA	4	3	4	1	5	5	4	4
4	5	5	NA	5	5	5	1	5	5	5	5
5	5	5	5	4	3	NA	5	5	5	5	4
6	NA	5	5	5	5	5	NA	4	5	5	5
7	NA	5	5	5	5	5	NA	5	5	5	5
8	NA	5	5	5	5	5	NA	5	5	5	5
9	NA	5	5	5	5	5	NA	5	5	5	NA
10	NA	5	NA	5	5	5	1	5	5	5	NA
11	NA	5	NA	5	5	5	NA	5	5	5	NA
12	NA	5	5	5	5	5	1	5	5	5	NA
13	NA	5	NA	5	3	3	NA	5	5	5	NA
14	NA	5	5	5	5	5	1	5	5	5	NA
15	5	5	NA	4	4	4	1	4	4	4	2
16	5	5	NA	5	5	5	NA	5	5	5	5
17	NA	5	5	5	5	5	NA	5	5	5	5
18	5	5	1	5	5	5	1	5	5	5	5
19	5	5	NA	5	5	5	1	5	5	5	NA
20	NA	5	5	5	5	NA	1	5	5	5	5
21	5	5	NA	5	5	5	NA	5	5	5	NA
22	5	5	5	5	5	5	NA	5	5	5	5
23	5	5	NA	4	1	1	1	5	5	5	1
24	5	5	5	5	5	5	NA	5	5	-	NA
25	5	5	NA	5	5	5	1	5	5	5	5

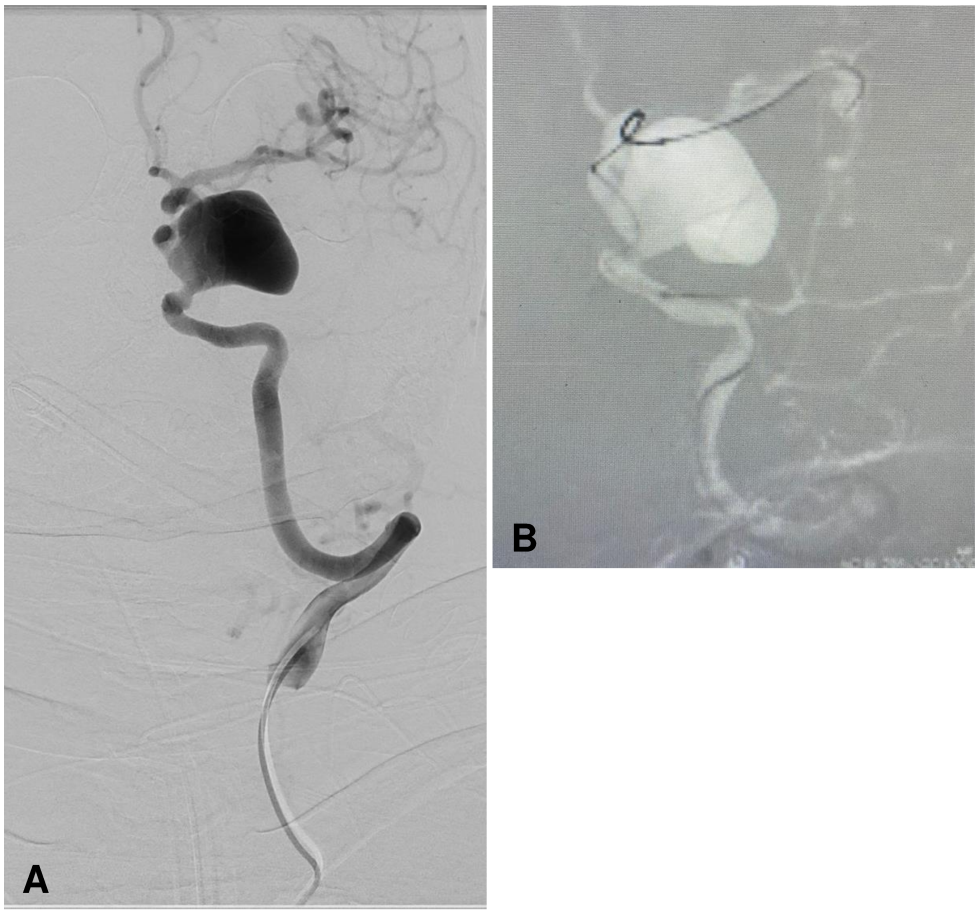
User satisfaction: 1=very complicated to use; 2=complicated to use; 3=neutral; 4=slightly complicated to use; 5=easy to use. NA=Not Applicable
User definitions: 1=very complicated to use/training is needed before using the device; 2=more complicated than similar devices on the market; 3=neutral; 4=slightly complicated/one or two steps are not easy; 5=all steps including device preparation were intuitive/easy.

ID	Ability to use the torque button	Ability to deliver contrast	Ability to deliver mechanical devices	Ease of retraction of the Bendit 21	How useful did you find the Bendit 21	General impression of performance and ease of use	Mean Response	Based on your experience following the use with Bendit 21, did the procedure take less time?	Would you use the Bendit 21 again in future procedures?
1	5	5	NA	5	3	5	4.6	Cannot evaluate	Yes
2	5	NA	1	5	1	1	3.5	Cannot evaluate	Yes
3	3	5	NA	5	5	5	4.1	No	Yes
4	NA	NA	NA	5	4	5	4.6	Cannot evaluate	Yes
5	NA	NA	NA	5	3	3	4.4	No	Yes
6	4	5	5	5	5	4	4.8	Yes	Yes
7	5	5	5	5	5	5	5.0	Yes	Yes
8	5	NA	5	5	5	5	5.0	Yes	Yes
9	5	NA	5	5	5	5	5.0	Yes	Yes
10	NA	NA	NA	5	5	5	4.6	Yes	Yes
11	5	NA	NA	5	5	5	5.0	Yes	Yes
12	NA	5	NA	5	5	5	4.7	Yes	Yes
13	5	NA	5	5	5	5	4.7	No	Yes
14	5	5	NA	5	5	5	4.7	Yes	Yes
15	4	NA	NA	5	5	5	4.0	Yes	Yes
16	NA	NA	NA	5	5	5	5.0	Yes	Yes
17	NA	NA	NA	5	5	5	5.0	Yes	Yes
18	NA	NA	1	5	5	5	4.2	Cannot evaluate	Yes
19	NA	NA	NA	5	5	5	4.7	Yes	Yes
20	NA	NA	5	5	5	5	4.7	Yes	Yes
21	NA	NA	NA	5	5	5	5.0	Yes	Yes
22	5	5	NA	5	5	5	5.0	Yes	Yes
23	1	NA	NA	5	1	-	3.1	No	No
24	NA	NA	5	5	5	5	5.0	Yes	Yes
25	5	-	NA	1	5	5	4.4	Yes	Yes

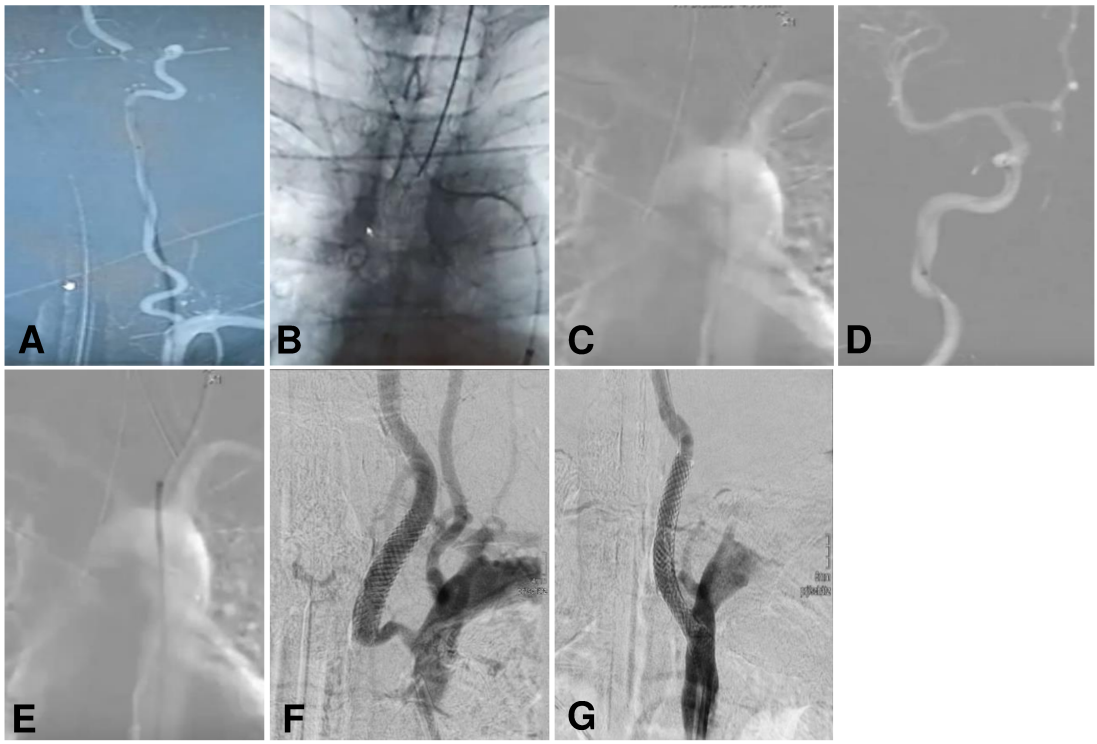
User satisfaction: 1=very complicated to use; 2=complicated to use; 3=neutral; 4=slightly complicated to use; 5=easy to use.
User definitions: 1=very complicated to use/training is needed before using the device; 2=more complicated than similar devices on the market; 3=neutral; 4=slightly complicated/one or two steps are not easy; 5=all steps including device preparation were intuitive/easy.



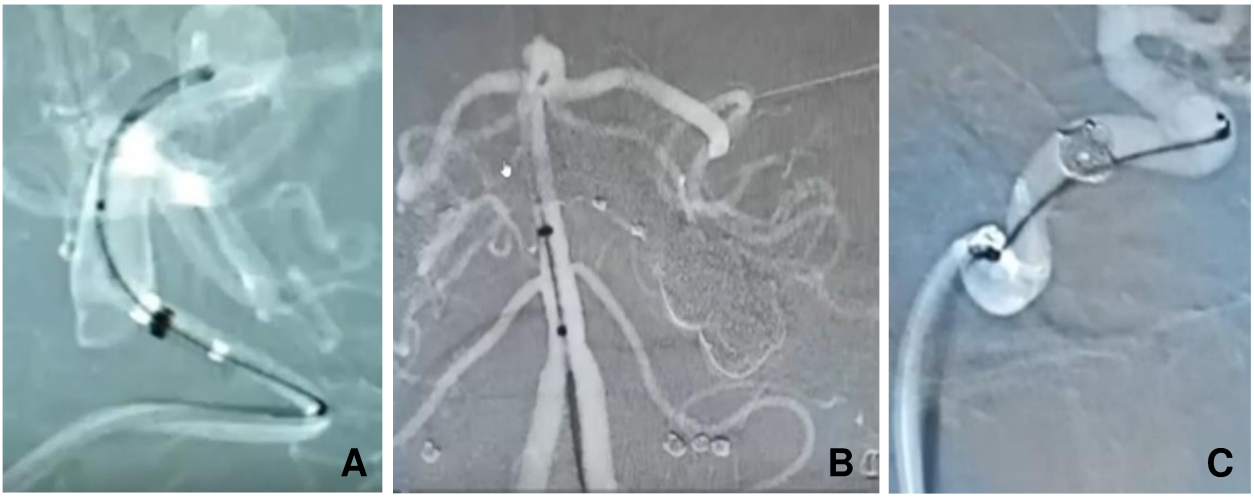
Supplementary Figure 1: Using the Bendit21 to coil a giant basilar tip aneurysm. A) The giant wide-necked basilar tip aneurysm (2.3 cm x 2.7 cm). Both posterior cerebral arteries (PCAs) originated from the aneurysmal sac. B) The Bendit21 used to advance a 0.014-inch Synchro 2 guidewire into the distal right P3. C) The treated aneurysm after embolization with 25 coils. Flow was preserved in the bilateral PCAs and superior cerebral arteries.



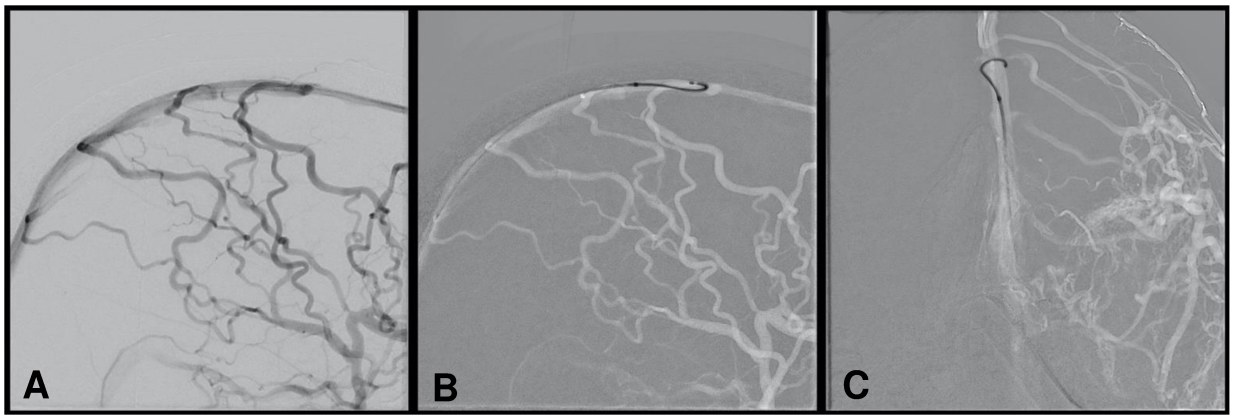
Supplementary Figure 2: A) Intra-procedural angiogram showing giant cavernous internal carotid artery aneurysm, with Bendit catheterization. B) Bendit21 crossing the aneurysm.



Supplementary Figure 3: The use of the Bendit21 to catheterize vasculature without a guidewire (A–D). The Bendit21 used to catheterize (A) the left vertebral artery (B), the right common carotid artery (C), the left common carotid artery (D), and the anterior cerebral artery. E) The Bendit21 acting as a scaffold for larger devices. F) Left vertebral artery stenosis with a displaced stent after deployment. The proximal stent was anchored into the arterial wall, making catheterization difficult. G) Using the Bendit21 and a 14-inch guidewire, a second stent was telescoped and deployed.



Supplementary Figure 4: The Bendit21 used to deploy the Contour Neurovascular System in three different aneurysms without a guidewire. A) Bendit delivers a 9-mm Contour device in an aneurysm of the ACOM artery (5 x 7 mm) with a broad neck (Patient 7 in **Supplementary Table 1**). B) AP view of Bendit remaining in a stable position while the 7-mm Contour device was deployed in a basilar aneurysm (5 x 5 mm) (Patient 8). C) Lateral view of the 5-mm Contour device being deployed in a wall aneurysm (3.0 x 2.9 mm) in the carotid artery (Patient 9). The stiff intrasaccular device does not move the Bendit.



Supplementary Figure 5: Transvenous navigation in Patient 22. A) Pre-procedure angiography showing the cortical vein, lateral view. B) Bendit21 catheterizing the cortical vein as it enters the superior sagittal sinus, followed by a microguidewire for exchange. C) Frontal view.