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Comparison of the Contour Neurovascular System and Woven EndoBridge device for treatment of wide-necked cerebral aneurysms at a bifurcation or sidewall

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OBJECTIVE The authors compared the Contour Neurovascular System (Contour) with the Woven EndoBridge (WEB) device for the treatment of wide-necked cerebral aneurysms at a bifurcation or sidewall.

METHODS Prospective clinical and radiological data were collected for all patients treated with either the Contour or WEB at a tertiary university hospital from May 2018 to June 2022.

RESULTS In patients who had at least 3 months of follow-up data available (median patient age 60.0 [IQR 51.8–67.0] years, male/female ratio 1:1.4), the authors compared 40 aneurysms in 34 patients treated with the Contour and 30 aneurysms in 30 patients treated with the WEB. Overall, 26 middle cerebral artery, 24 anterior communicating artery, 9 basilar artery tip, 4 posterior communicating artery, 4 internal carotid artery, 1 anterior cerebral artery, 1 posterior inferior cerebellar artery, and 1 superior cerebellar artery aneurysm were treated. In the Contour cohort, complete occlusion at last follow-up was achieved for 30 aneurysms (75%) and a small neck remnant was seen in 6 aneurysms (15%), summing up to an adequate occlusion rate of 90%. One aneurysm (2.5%) had to be retreated, and 1 symptomatic thromboembolic event (2.5%) was observed with complete remission at discharge. Three adjunctive stents (10%) had to be used due to branch occlusion. In the WEB cohort, adequate occlusion was also seen in 90% of aneurysms (complete occlusion in 19 [63.3%] and remnant neck in 8 [26.7%], with a retreatment rate of 20%). Four WEBs (13.3%) needed additional stent placement due to device protrusion into a branch, 2 asymptomatic thromboembolic events (6.7%) were noted, and 1 major ischemic event (3.3%) due to M2 occlusion was noted. One patient treated with the WEB died between follow-ups of causes unrelated to the aneurysm, treatment, or device. Time from first measurement to deployment and thus total treatment time was significantly shorter in the Contour group ($p = 0.004$), regardless of whether a prior angiogram was available for aneurysm measurement and device sizing.

CONCLUSIONS Results for the Contour were promising, although longer follow-up is necessary to draw more solid conclusions on the utility and risk profile of this new device compared with the already widely used WEB device. Adequate occlusion at last follow-up was the same for both devices, whereas the probability of complete occlusion at last follow-up was significantly higher for the Contour, and the WEB showed a significantly higher retreatment rate. Median deployment times were significantly shorter with the Contour than the WEB.

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KEYWORDS aneurysm; contour; Woven EndoBridge; WEB; embolization; new device; endovascular neurosurgery; vascular disorders; surgical technique

Endovascular treatment modalities for various aneurysm forms have become widely available. While stent-assisted coiling and insertion of endoluminal flow diverters (FDs) have become feasible options, particularly for wide-necked aneurysms (WNAs), these treatments come with the downside of the need for dual antiplatelet therapy (DAPT). To address this limitation, intrasaccular FDs have been developed. The Woven EndoBridge (WEB) device, which has both barrel-shaped (SL) and spherically shaped (SLS) models, has been studied

ABBREVIATIONS ACA = anterior cerebral artery; ACom = anterior communicating artery; BA = basilar artery; DAPT = dual antiplatelet therapy; DTN = dome to neck; FD = flow diverter; ICA = internal carotid artery; MCA = middle cerebral artery; PCom = posterior communicating artery; PICA = posterior inferior cerebellar artery; mRS = modified Rankin Scale; RRC = Raymond-Roy Classification; SAH = subarachnoid hemorrhage; SCA = superior cerebellar artery; SL = barrel-shaped WEB; SLS = spherically shaped WEB; WEB = Woven EndoBridge; WNA = wide-necked aneurysm.

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TABLE 1. Comparison of respective properties of the Contour and WEB devices

Contour	WEB
Double-layer nickel-titanium & platinum wire mesh	Single-layer nitinol wire braided mesh
1 platinum radiopaque marker	2 platinum radiopaque markers
144 wires	144–288 wires
Profile range 0.019–0.025 inches	Profile range 0.016–0.028 inches
MRI compatible	MRI compatible
Concave shape	2 shapes (barrel, sphere)
Any electrolytic detachment power supply	Handheld, battery-powered detachment control device
Standard guide + intermediate catheters	Standard guide + intermediate catheters
Delivery through standard microcatheter (0.021 or 0.027 inches)	Delivery through VIA Microcatheter (MicroVention) (0.017, 0.021, 0.027, or 0.033 inches)
For aneurysm sized 2–10.5 mm	For aneurysm sized 2 mm (SL) and 3–10 mm (SLS)

most extensively. Regardless of all these advances, successful occlusion rates vary between approximately 40% and 70%.[1–4]

To meet the demands of additional treatment options for these aneurysms, the Contour Neurovascular System (Contour; Cerus Endovascular) was developed and received FDA Breakthrough Device designation in 2021. Constructed from drawn filled tube nitinol and a radiopaque platinum core in a dual-layer conformation with a total of 144 wires, the Contour acts as a flow disruptor as well as an FD. It can be deployed using current microcatheters (0.021- or 0.027-inch inner diameter), is fully resheathable and repositionable, and can be detached electrolytically. For comparison of the two devices, see Table 1. The sizing is based on the largest aneurysm width (the equatorial plane) and the neck size and is thus easier to adjust than WEB sizing (Fig. 1). Here we report our institutional experience with the Contour compared with WEB.

Methods

Case Selection

Prospective clinical and radiological data were collected for all patients treated with the Contour or WEB at our center from May 2018 until June 2022. Both unruptured and ruptured aneurysms, positioned at either a bifurcation or sidewall, were deemed suitable for treatment with either device. After discussing all alternative treatment options, including surgical clipping, stent-assisted coiling, and FD implantation, all patients gave consent prior to embolization. Only cases with at least 3 months of available follow-up data were included.

Analysis

Baseline data such as patient demographics and modified Rankin Scale (mRS) scores were collected. Follow-up mRS scores as well as complications were recorded, along with immediate posttreatment, 3- and 6-month, and 1-, 2-, and 3-year radiological follow-up data. Catheter angiography, contrast-enhanced MR angiography, or Dyna CT was used for follow-up. The timing of some of the scheduled follow-ups was affected by the COVID-19 pandemic, causing a certain variation in available early follow-up. Aneurysm occlusion was classified analogously to the Raymond-Roy Classification (RRC)[5] as complete occlusion (RRC1), neck remnant (RRC2), or residual aneurysm (RRC3). Complete occlusion and neck remnant were considered adequate occlusion according to recent studies.[6,7] The time from the first endovascular measurement to deployment was noted in all cases; however, total treatment time was not noted due to frequent additional treatments during the same surgical session, such as treatment of other aneurysm or carotid artery stenting.

Statistical Methods

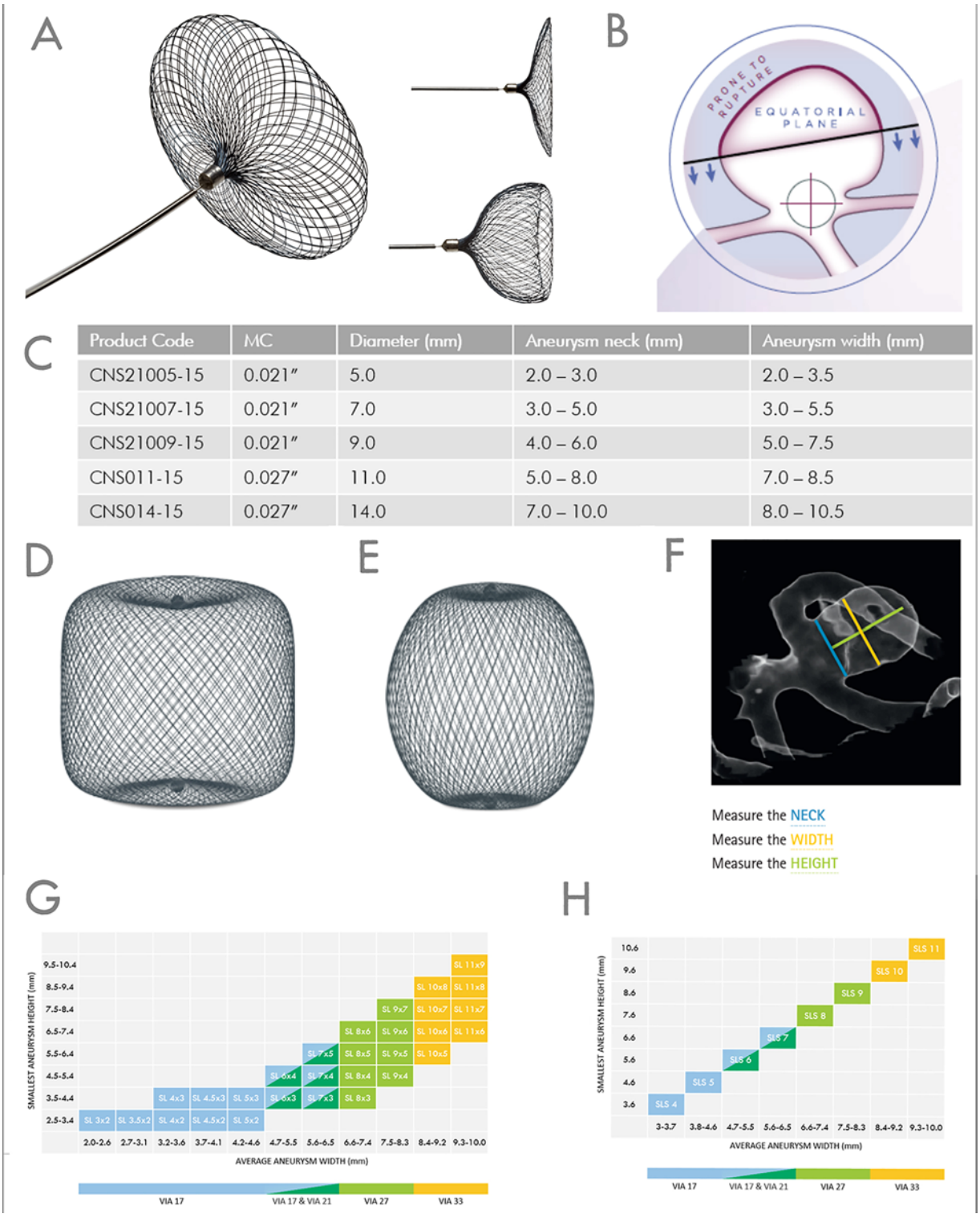
The numerical data are presented as the median (interquartile range) or number (percentage) for proportions. The comparisons between groups were performed with nonparametric tests (Kruskal-Wallis), and Fisher's exact test was used for proportions. Survival analyses were made with the binary outcome—adequate occlusion (complete occlusion + remnant neck) versus a Kaplan-Meier curve. We used the R statistical environment.[8]

Periprocedural Medication

All elective surgery patients were started on antiplatelets prior to surgery. In cases of clopidogrel nonresponder status according to the Multiplate Analyzer (Roche) performed on the day of treatment, ticagrelor or prasugrel was administered, mainly for bailout stenting. Patients undergoing acute treatment received loading prior to angiography. Following the procedure, acetylsalicylic acid (ASA) monotherapy was continued for at least 3 months. Further ASA monotherapy or DAPT was used if there were persistent indications (e.g., recent stenting, stroke, coronary artery disease).

Procedural Technique

General anesthesia was administered and a standard common femoral artery puncture and 6-Fr or 8-Fr sheath insertion were performed. A 6-Fr Chaperon (MicroVention) or 8-Fr Fubuki (Asahi Intecc) guide sheath was navigated into the target artery (i.e., internal carotid artery [ICA]). A 5-Fr Sofia (MicroVention) distal access catheter was used in most cases, along with a Headway-27 (MicroVention) microcatheter and an Asahi Chikai 14 (Asahi Intecc) or Synchro-2 (Stryker Neurovascular) microwire. The procedure was performed using biplane imaging with initial diagnostic runs for aneurysm sizing with an intraoperative 3D rotational angiogram. The Contour or WEB, sized according to a sizing chart, was then carefully inserted and deployed at the aneurysm neck once in a stable position. After deployment, postprocedural (immediate and delayed) angiographic runs were performed. Device placement and flow/stasis within the aneurysm were assessed using standard angiographic projections. The duration between measurement and deployment was noted.



Product Code	MC	Diameter (mm)	Aneurysm neck (mm)	Aneurysm width (mm)
CNS21005-15	0.021″	5.0	2.0 – 3.0	2.0 – 3.5
CNS21007-15	0.021″	7.0	3.0 – 5.0	3.0 – 5.5
CNS21009-15	0.021″	9.0	4.0 – 6.0	5.0 – 7.5
CNS011-15	0.027″	11.0	5.0 – 8.0	7.0 – 8.5
CNS014-15	0.027″	14.0	7.0 – 10.0	8.0 – 10.5

FIG. 1. A: The Contour device. The oblique view shows the braided structure and the detachment point, and the lateral views depict the cup-like appearance of the device after deployment. **B:** For sizing, the largest diameter at the equatorial plane is used. **C:** Sizing table of the Contour device with product codes, microcatheter (MC), and aneurysm size. **D and E:** The WEB SL (single layer) is more barrel shaped (D), and the WEB SLS (single-layer sphere) is more sphere shaped (E). **F:** Sizing of the WEB requires measurements of the average width and height from two projections. **G:** Sizing table of the WEB SL. **H:** Sizing table of the WEB SLS. Figure is available in color online only.

TABLE 2. Demographic data for both groups

	All Patients (n = 64)	Treatment Group		p Value
		Contour (n = 34)	WEB (n = 30)	
Female sex	38 (59.4)	16 (47.1)	22 (73.3)	0.043
Age, yrs	60.0 (51.8–67.0)	62.0 (57.0–69.2)	56.0 (51.0–64.8)	0.189
mRS score				
Preop				0.674
0	54 (84.4)	30 (88.2)	24 (80.0)	
1–2	4 (6.2)	2 (5.9)	2 (6.7)	
3–5	6 (9.4)	2 (5.9)	4 (13.3)	
Postop				0.773
0	53 (82.8)	29 (85.3)	24 (80.0)	
1–2	5 (7.8)	3 (8.8)	2 (6.7)	
3–5	5 (7.8)	2 (5.9)	3 (10.0)	
6	1 (1.6)	0 (0.0)	1 (3.3)	
Multiple aneurysms	24 (37.5)	13 (38.2)	11 (36.7)	>0.999
Prior SAH				0.480
None	49 (76.6)	28 (82.4)	21 (70.0)	
<2 wks	11 (17.2)	4 (11.8)	7 (23.3)	
≥2 wks	4 (6.2)	2 (5.9)	2 (6.7)	
Last clinical follow-up, mos	12.0 (6.0–36.0)	9.0 (6.0–12.0)	24.0 (12.0–36.0)	0.002

Values are presented as number (%) of patients or median (IQR) unless otherwise indicated.

Postprocedural MRA was performed the following day along with an additional Dyna CT in selected cases.

Results

Cohort

Over the observation period, 40 aneurysms were treated successfully with the Contour with sufficient follow-up for this analysis, 34 aneurysms were treated with the WEB (7 with SLS, 27 with SL), and 4 were acutely treated in foreign citizens and were lost to follow-up.

Of the 70 aneurysms, significantly more in female patients were treated in the WEB cohort (73.3% vs 47.1%, p = 0.043). The median patient age was 60 (IQR 51.8–67) years, with no difference between cohorts, and 54 aneurysms (77%) were in the anterior and 16 (23%) in the posterior circulation: 26 middle cerebral artery (MCA), 24 anterior communicating artery (ACom), 9 basilar artery (BA) tip, 4 posterior communicating artery (PCom), 4 ICA, 1 anterior cerebral artery (ACA), 1 posterior inferior cerebellar artery (PICA), and 1 superior cerebellar artery (SCA) aneurysm, with no statistically significant difference between the two cohorts.

Patients' demographic data are shown in Table 2.

Only saccular aneurysms were treated in both cohorts; 87% of all the aneurysms were WNAs, which were defined by a neck diameter > 4 mm or a dome-to-neck (DTN) ratio < 2. While there was no significant difference in median neck diameter between cohorts (p = 0.053), the median DTN ratio was significantly higher in the WEB cohort (1.3 vs 1.7, p = 0.002).

Most aneurysms (64.8%) were diagnosed incidentally. In 15 patients, subarachnoid hemorrhage (SAH) led to diagnosis of the aneurysm, and 5 patients had multiple aneurysms. In these 15 patients, 12 aneurysms (17%) were treated within 2 weeks after the SAH and 5 aneurysms (7%) after 2 weeks with either Contour or WEB. The pretreatment rate was low, with only 1 aneurysm (1%) pretreated microsurgically and 5 aneurysms (7%) treated endovascularly. However, 3 aneurysms (4%) first treated with the WEB were retreated successfully with the Contour.

Morbidity in general was low, with 90.6% of patients having an mRS score of 0–2 at last follow-up and no significant change due to the intervention or difference between both cohorts. One patient treated with the WEB died between follow-ups from a cause unrelated to the aneurysm, treatment, or device.

For aneurysm characteristics, see Table 3.

Contour

All but 6 patients were treated on an elective basis for incidentally found aneurysms.

Six months of follow-up data were available in 32 cases, 12 months in 21 cases, 24 months in 11 cases, and 36 months in 7 cases. Table 4 shows the respective occlusion rate at each time point. Adequate occlusion at 6 months was 87.5%, at 12 months 85.8%, and at last follow-up 90% (n = 36), with 75% complete occlusions and 15% displaying a remnant neck (Table 4).

Intraprocedural complications were rare, with only 1 observed symptomatic thromboembolic event (2.5%) noted, which was due to branch occlusion, in which hemiparesis was noticed right after extubation, which led to immediate repeat angiography, successful recanalization of an occluded branch, and placement of a stent with no long-

TABLE 3. Aneurysm characteristics

	All Aneurysms (n = 70)	Treatment Group		p Value
		Contour (n = 40)	WEB (n = 30)	
Morphology				>0.999
Saccular	70 (100.0)	40 (100.0)	30 (100.0)	
Height, mm	5.0 (3.9–6.3)	4.8 (3.9–5.8)	5.7 (4.1–6.7)	0.147
Width, mm	4.8 (3.7–5.6)	4.4 (3.4–5.2)	5.3 (3.8–5.9)	0.053
Neck, mm	3.2 (3.0–3.7)	3.0 (3.0–3.7)	3.2 (3.0–3.7)	0.867
DTN ratio	1.4 (1.2–1.7)	1.3 (1.1–1.5)	1.7 (1.3–2.0)	0.002
Aspect ratio	1.4 (1.3–1.7)	1.4 (1.2–1.6)	1.4 (1.3–1.8)	0.324
Max diameter, mm				0.369
<7	63 (90.0)	37 (92.5)	26 (86.7)	
7–9.9	6 (8.6)	2 (5.0)	4 (13.3)	
10–19.9	1 (1.4)	1 (2.5)	0 (0.0)	
Anterior circulation	54 (77.1)	32 (80.0)	22 (73.3)	0.573
Location				0.405
MCA	26 (37.1)	15 (37.5)	11 (36.7)	
ACom/ACA	25 (35.7)	15 (37.5)	10 (33.3)	
BA	9 (12.9)	4 (10.0)	5 (16.7)	
PCom	4 (5.7)	3 (7.5)	1 (3.3)	
ICA	4 (5.7)	3 (7.5)	1 (3.3)	
PICA/SCA	2 (2.9)	0 (0.0)	2 (6.7)	
Prior treatment				>0.999
None	64 (91.4)	36 (90.0)	28 (93.3)	
Endovascular	5 (7.1)	3 (7.5)	2 (6.7)	
Microsurgical	1 (1.4)	1 (2.5)	0 (0.0)	
Acute treatment (no)	59 (84.3)	35 (87.5)	24 (80.0)	0.511
Adjunctive treatment				0.732
No	61 (87.1)	36 (90.0)	25 (83.3)	
Coils	2 (2.9)	1 (2.5)	1 (3.3)	
Stents or FD	7 (10.0)	3 (7.5)	4 (13.3)	
Symptoms leading to diagnosis (per aneurysm)				0.219
Incidental	46 (64.8)	29 (72.5)	17 (54.8)	
SAH	16 (22.5)	6 (15.0)	10 (32.3)	
Headache	7 (9.9)	3 (7.5)	4 (12.9)	
Other	1 (1.4)	1 (2.5)	0 (0.0)	
Nerve palsy	1 (1.4)	1 (2.5)	0 (0.0)	

Values are presented as number (%) of aneurysms or median (IQR) unless otherwise indicated.

term neurological sequelae (Table 5). In 3 cases (10%), additional stenting due to device protrusion and resultant branch impingement, or additional coiling in 1 case, was necessary; however, no thromboembolic complications were visible on MRI.

No cases of long-term postoperative ipsilateral major stroke, aneurysmal rupture, or death due to neurological causes were encountered. One patient had a pontine stroke unrelated to the aneurysm treatment and had to be hospitalized 6 days after the treatment. Two patients had a pseudoaneurysm of the femoral artery due to groin puncture, with a need for surgical revision. Retreatment was required in only 1 case (2.5%).

Figure 2 shows preinterventional and follow-up angiograms of an exemplary case treated with the Contour device.

Woven EndoBridge

Half of the aneurysms were found incidentally, whereas in 8 patients SAH was the leading diagnosis.

Six months of follow-up data were available in 22 cases, 12 months in 22 cases, 24 months in 17 cases, and 36 months of follow-up data in 10 cases. Table 4 shows the respective occlusion rate at each time point. Adequate occlusion at 6 months was 86.4%, at 12 months 90.9%, and at last follow-up it was achieved in 90% (n = 27) of cases, with 63.3% achieving complete occlusion and 26.7% displaying a remnant neck (Table 4).

TABLE 4. Occlusion rates initially; at 3, 6, 12, 24, and 36 months; and at last follow-up

		Treatment Group		
	All Aneurysms (n = 70)	Contour (n = 40)	WEB (n = 30)	p Value
Occlusion rate				
Initial				<0.001
Complete	6 (8.6)	2 (5.0)	4 (13.3)	
Remnant neck	23 (32.9)	2 (5.0)	21 (70.0)	
Remnant aneurysm	41 (58.6)	36 (90.0)	5 (16.7)	
3 mos				0.025
Complete	35 (72.9)	27 (75.0)	8 (66.7)	
Remnant neck	6 (12.5)	2 (5.6)	4 (33.3)	
Remnant aneurysm	7 (14.6)	7 (19.4)	0 (0.0)	
6 mos				0.396
Complete	37 (68.5)	24 (75.0)	13 (59.1)	
Remnant neck	10 (18.5)	4 (12.5)	6 (27.3)	
Remnant aneurysm	7 (13.0)	4 (12.5)	3 (13.6)	
12 mos				0.096
Remnant neck	8 (18.6)	1 (4.8)	7 (31.8)	
Remnant aneurysm	5 (11.6)	3 (14.3)	2 (9.1)	
24 mos				0.322
Complete	18 (64.3)	6 (54.5)	12 (70.6)	
Remnant neck	8 (28.6)	3 (27.3)	5 (29.4)	
Remnant aneurysm	2 (7.1)	2 (18.2)	0 (0.0)	
36 mos				0.159
Complete	13 (76.5)	5 (71.4)	8 (80.0)	
Remnant neck	2 (11.8)	0 (0.0)	2 (20.0)	
Remnant aneurysm	2 (11.8)	2 (28.6)	0 (0.0)	
Last follow-up				0.463
Complete	49 (70.0)	30 (75.0)	19 (63.3)	
Remnant neck	14 (20.0)	6 (15.0)	8 (26.7)	
Remnant aneurysm	7 (10.0)	4 (10.0)	3 (10.0)	
Adequate occlusion at last follow-up	63 (90.0)	36 (90.0)	27 (90.0)	>0.999

Values are presented as number (%) of aneurysms unless otherwise indicated.

Two asymptomatic thromboembolic events were noted on postinterventional MRI. In 1 case, the patient presented with acute hemiparesis after waking up postoperatively, despite correct deployment and satisfactory control angiography (Table 5). Repeat angiography showed protrusion of the WEB and unrecanalizable occlusion of the superior temporal branch leading to 1 major ischemic event. In 1 patient, the WEB was deployed regularly into the aneurysm sac and seemed to adapt well. However, after detachment the device moved spontaneously inside the aneurysm sac and turned over, leading to insufficient occlusion and the need for additional Y-stenting. Two more aneurysms

TABLE 5. Complications, retreatment rate, and duration of implantation (time from first measurement until deployment)

	All Aneurysms (n = 70)	Contour (n = 40)	WEB (n = 30)	p Value
Thromboembolic complications				0.325
None	66 (94.3)	39 (97.5)	27 (90.0)	
Asymptomatic	2 (2.9)	0 (0.0)	2 (6.7)	
Symptomatic	2 (2.9)	1 (2.5)	1 (3.3)	
Retreatment rate	7 (10.0)	1 (2.5)	6 (20.0)	0.037
Duration, mins	67.5 (52.0–86.0)	57.5 (47.3–70.0)	75.5 (66.3–92.0)	0.003

Values are presented as number (%) of aneurysms or median (IQR) unless otherwise indicated.

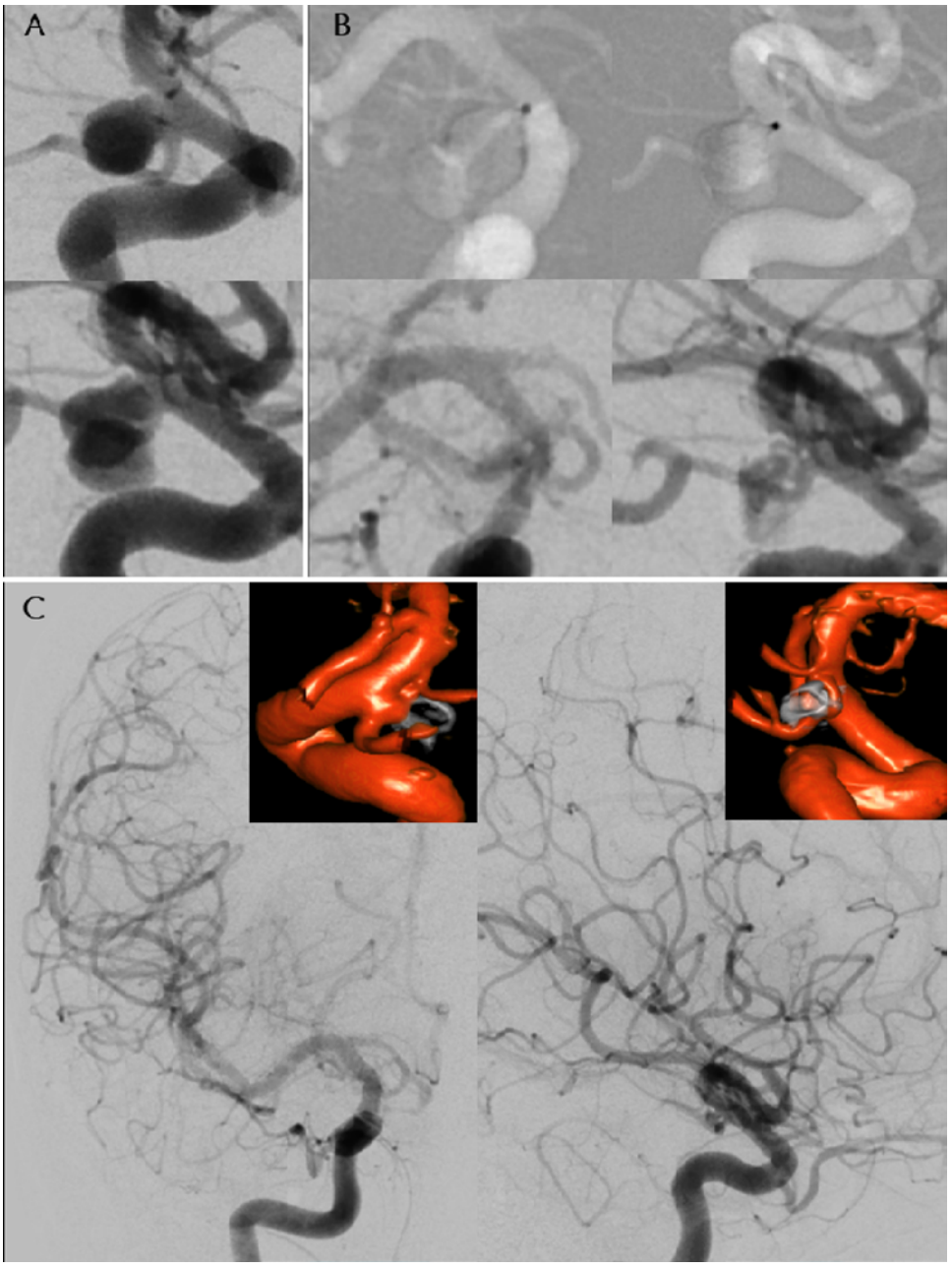


FIG. 2. A: Preinterventional angiogram shows two projections of a PCom aneurysm measuring 5.3 × 5.6 mm (*upper*) and 8 × 5.7 mm (*lower*). **B:** Postdeployment angiogram of the 7-mm Contour device used. **C:** Six-month follow-up angiograms show complete occlusion of the aneurysm. Figure is available in color online only.

needed additional stent (Neuroform Atlas [Stryker Neurovascular] or LVIS Jr. [MicroVention]) placement due to device protrusion into an arterial branch.

Two patients had an mRS score ≥ 2 prior to embolization. Morbidity (mRS score > 2) at last follow-up was 4% (due to a major ischemic event). One patient died between follow-ups from causes unrelated to the aneurysm/device, and 6 cases (20%) had to be retreated.

Comparison

Although the adequate occlusion rate at last follow-up and clinically relevant parameters for the Contour and WEB, such as device-related morbidity and mortality, were comparable or the differences were not statistically significant, two relevant differences were noted.

First, the retreatment rate of 20% in the WEB cohort was significantly higher than the 2.5% rate in the Contour cohort ($p = 0.003$). We also calculated the probability of complete occlusion over time by case and availability of last follow-up data. Figure 3 shows the probability of complete occlusion over time, with a significantly higher probability in the Contour cohort ($p = 0.0086$).

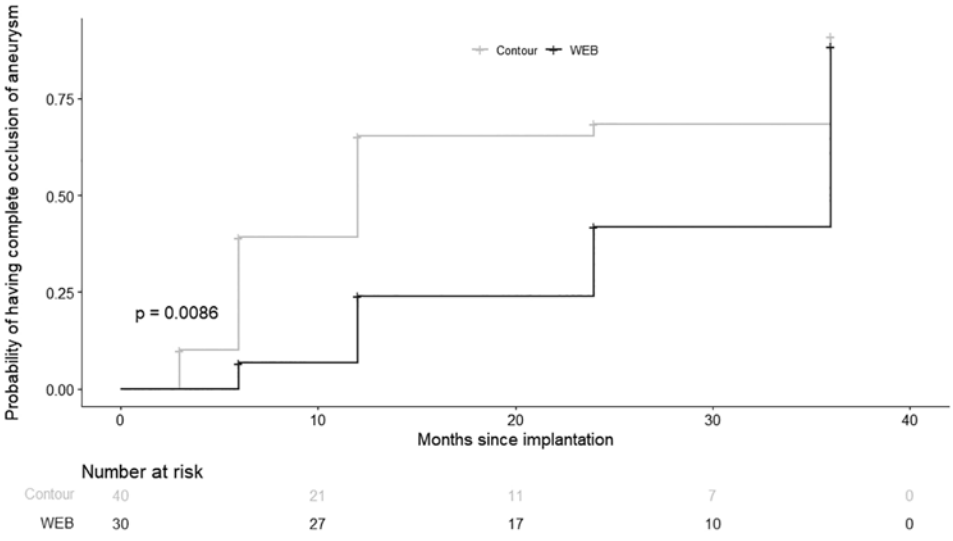


FIG. 3. Probability of having complete occlusion at last follow-up for the Contour and WEB devices.

Second, when the median duration of deployment in both cohorts was compared, the median duration of placement in the Contour cohort was 57.5 (IQR 47.3–70.0) minutes, whereas complex sizing led to a significantly longer median placement duration of 75.5 (IQR 66.3–92.0) minutes for the WEB (p = 0.0003) (Table 5).

Discussion

Although recent advances in endovascular technologies improved the safety and efficacy of endovascular aneurysm treatment, including WNA treatment, WNAs still pose a major challenge to the neurointerventionalist.[9,10] In recent studies, adequate occlusion rates varied between 40% and 63% with simple stent- or balloon-assisted coiling.[11] Various stents and balloons have been introduced to address these difficulties.[12,13] A systematic review and meta-analysis of stent-assisted coiling using the Neuroform Atlas stent showed an adequate occlusion rate of 86% (RRC1 70%, RRC2 16%) in WNA at 6 months.[14] For more complex aneurysm morphologies, a study by Aydin et al. showed that stent- plus balloon-assisted coiling is a feasible, effective, and relatively safe endovascular technique for the treatment of bifurcation WNAs located in the posterior and anterior circulation with an occlusion rate of 98.2% (RRC1 89.1%, RRC2 9.1%) and a complication rate of 11.5%.[15]

The WEB was first introduced in 2010 and updated in 2013 and is now widely used in unruptured and ruptured aneurysms. Several meta-analyses showed adequate occlusion rates (defined as either RRC1 or RRC2) above 80%[16–19] for unruptured aneurysms. A study by van Rooij et al. included single-layer versions of the WEB, which are currently more widely used, and showed an overall occlusion rate of 83.3%, a retreatment rate of 8.4%, and a thromboembolic event rate of 5.6%.[20] For ruptured aneurysms, several meta-analyses showed equally sufficient adequate occlusion rates,[21–24] whereas the thromboembolic event rate varied between 4.5% and 17%. The retreatment rate was 6%. Long-term adequate occlusion rates of 78.8%,[25] 86.9%,[26] and most recently 92.6%[27] have been reported. The retreatment rates were 11.4% and 7.5%.[27]

The data from our cohort, with an adequate occlusion rate of 90% at last follow-up and a complication rate of 10%, are comparable with data reported in the literature; however, our retreatment rate was slightly higher at 20%.

Although extensive data are available for the WEB, data for the Contour are scarce. Liebig et al.[28] recently reported data from 32 successfully treated aneurysms in patients who presented with an adequate occlusion rate of 84% at last follow-up and a retreatment rate of 3% (n = 1); however, the patient did not consent to retreatment. Biondi et al.[29] reported results similar to those of our cohort, with an adequate occlusion rate of 89.3% at 12 months. Other smaller case series showed similar results.[30–32] In 1 case (2.5%), the patient had to be retreated. The Contour showed no evidence of compression, a well-known problem that can occur with coils or the WEB, and no signs of migration were noted at the 2-year follow-up.

Comparison of the two devices revealed several similarities. Both are electrolytically detachable braided drawn filled tube nitinol wires in single- or double-layer mesh, delivered via a standard microcatheter, and available for aneurysms of around 2–10.5 mm in size. Both are easily deployed and DAPT might not be necessary. Disadvantages are the difficulties using MRA for follow-up due to the presence of artifacts at the detachment zone.

Advantages of the Contour are the ease of use, especially in comparison with the sizing methods for other devices. In our experience, the tulip-like structure of the Contour makes it easier to position inside the aneurysm sac as it adapts at the bottom of the aneurysm when deployed, whereas the WEB fills out the whole aneurysm sac, which might pose a certain unpredictability during deployment. The significantly shorter median deployment times (p = 0.003) confirm the ease of use of the Contour. Furthermore, long-term compression and migration have commonly been described for the WEB[25,33] but thus far have not been reported for the Contour.

Limitations of the Contour include the lack of data regarding effective use in ruptured aneurysms. Because the WEB was also initially used only in elective patients and later proved beneficial in the treatment of ruptured aneurysms, recommendation of the Contour for use in SAH cases may still be premature but is expected in the future.

The study limitations are the modest number of patients, with mid- to long-term follow-up of only 10–20 cases in both cohorts, while the median follow-up was significantly shorter in the Contour cohort ($p = 0.002$). Despite the promising data for the Contour, further studies in a greater number of patients with long-term follow-up are needed.

Conclusions

In this study, the results for the Contour were favorable regarding ease of use and demonstrated satisfactory adequate occlusion rates and a low complication rate comparable to that for the WEB, while the probability of complete occlusion at last follow-up was significantly higher for the Contour. The retreatment rate in the WEB cohort was also significantly higher than that for the Contour, and median deployment times were significantly shorter with the Contour than the WEB.

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Disclosures

Dr. Killer-Oberpfalzer reports personal fees from a Cerus Consulting contract outside the submitted work.

Author Contributions

Conception and design: Hecker, Broussalis, Killer-Oberpfalzer. Acquisition of data: Hecker, Broussalis, Killer-Oberpfalzer. Analysis and interpretation of data: Hecker, Broussalis, Pfaff, Griessenauer, Killer-Oberpfalzer. Drafting the article: Hecker, Broussalis. Critically revising the article: Hecker, Broussalis, Pikija, Griessenauer, Killer-Oberpfalzer. Reviewed submitted version of manuscript: Hecker, Broussalis, Pfaff, Griessenauer. Approved the final version of the manuscript on behalf of all authors: Hecker. Statistical analysis: Pikija. Administrative/technical/material support: Broussalis, Pfaff, Griessenauer. Study supervision: Broussalis.

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