



The Extended Endoscopic Endonasal Approach for the Treatment of Intracranial Aneurysms: Indications, Technical Nuances, and Results Gleaned from Two Decades of Clinical Experience

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Maria Karampouga, MD¹, Ali A. Alattar, MD, MAS¹, Bradley A. Gross, MD¹, Garret Choby, MD², Eric W. Wang, MD², Carl H. Snyderman, MD, MBA², Paul A. Gardner, MD¹, Georgios A. Zenonos, MD¹

¹Department of Neurological Surgery, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania

²Department of Otolaryngology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania

Introduction

The advancement of the endoscopic endonasal approach (EEA) and its extension in the sagittal and coronal planes have broadened its applications beyond tumor pathologies. The ventral operative perspective offered by this approach can even facilitate the management of lesions, such as cerebral aneurysms, that were previously considered unapproachable through the endonasal route. Herein, we present our relevant clinical experience to elucidate the indications and limitations of this technique.

Methods and Materials

The clinical records of all patients with intracranial aneurysms that were treated via EEA in our institution, from the unveiling of the technique in March 2005 until October 2024, were retrospectively reviewed. Patient-specific treatment indications, surgical results and technical parameters were examined.

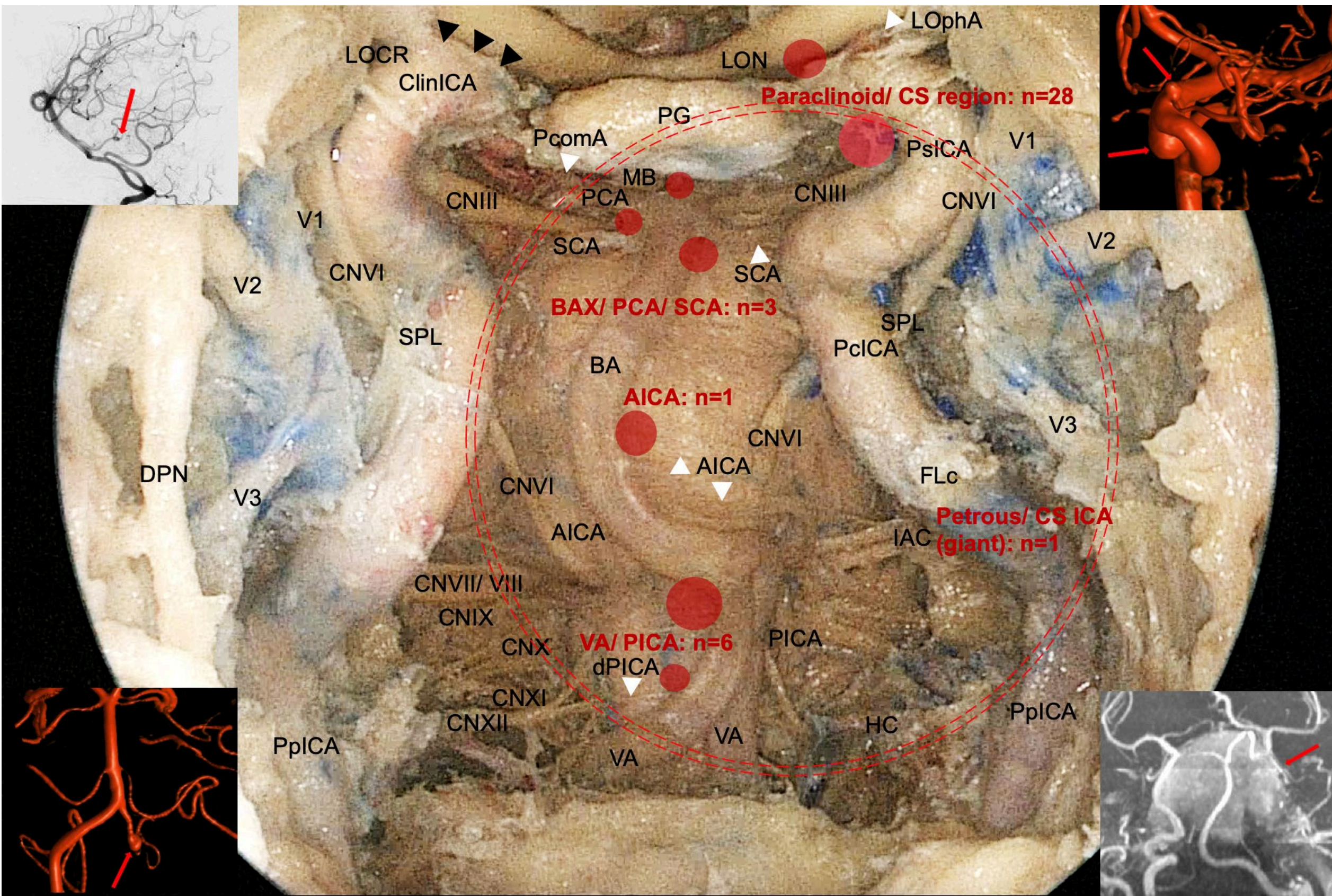


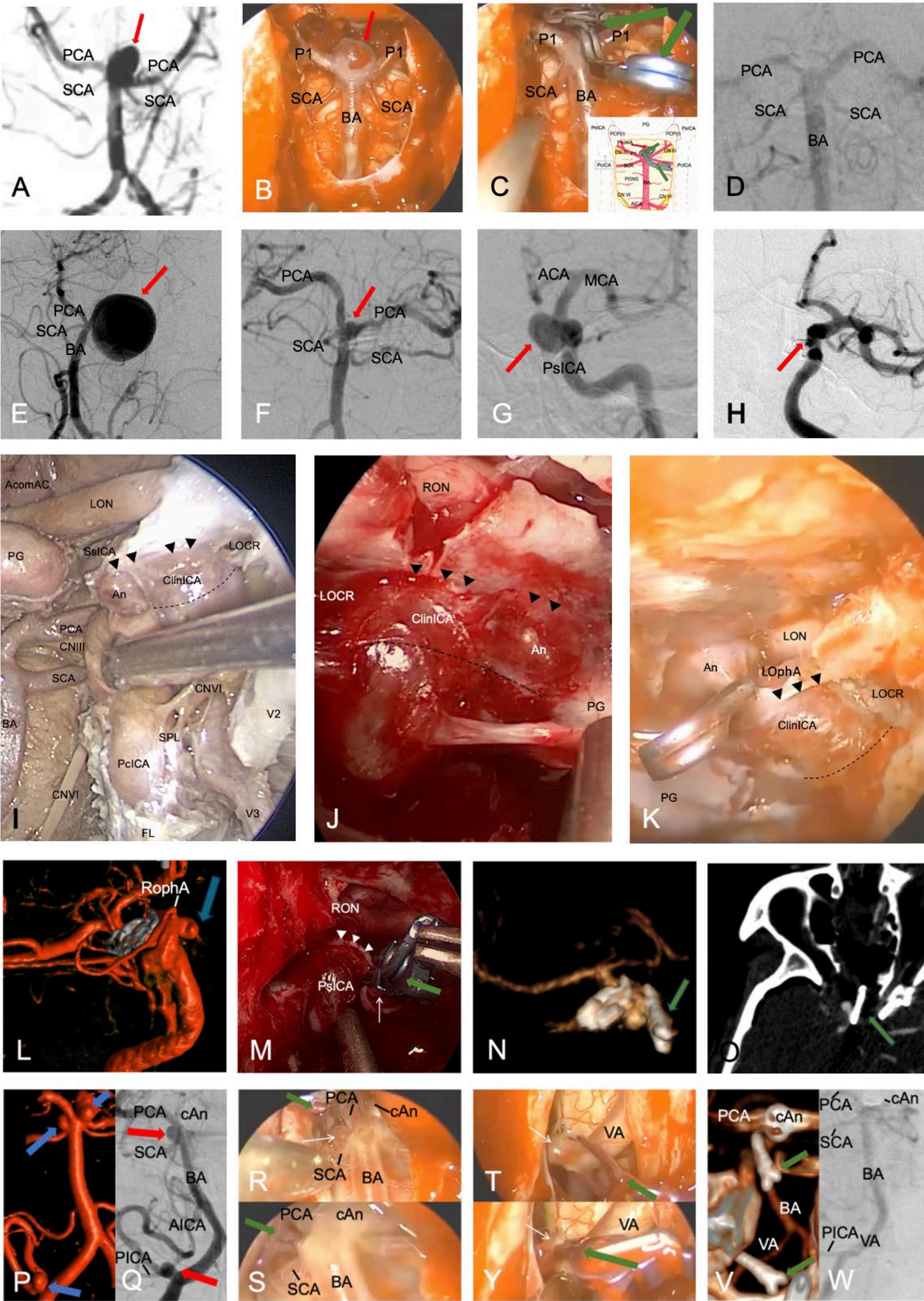
Figure 1. Cadaveric dissection showing the various aneurysm locations.

	Values (percentage)		Since 2019		Up to 2019	
Treatment modality						
EEA	30		13		17	
EVT+ EEA	2		0		2	
EEA+ craniotomy	1		0		1	
No. of clips applied						
Mean	1.4		1.1		1.6	
Range	0-3		1-2		0-3	
CSF drainage						
LD	23 (70%)		9		14	
EVD	5 (15%)		3		2	
Preexisting VP shunt	1 (3%)		1		0	
None	4 (12%)		0		4	
	All cases	Rupt. / Unrupt.	All cases	Rupt. / Unrupt.	All cases	Rupt. / Unrupt.
LOS						
Mean	9d	20.7/ 6.4d	10.1d	23.2/ 4.3d	8.2d	15.5/ 7.4d
Range	2-37d	10-37/ 2-20d	3-37d	10-37/ 3-6d	2-20d	11-20/ 2-20d
Complications						
Intra-op						
Intraoperative rupture	3 (9%)	1/ 2	1	1/ 0	2	0/ 2
Post-op						
CSF leak	8 (24%)	4/ 4	4	3/ 1	4	1/ 3
Meningitis	3 (9%)	1/ 2	1	1/ 0	2	0/ 2
Clip exposure	2 (6.5%)	0/ 2	0		2	0/ 2
Lacunar stroke (total)	3 (9%)	1/ 2	0		3	1/ 2
-w/ mild disability	2 (6.5%)	1/ 1	0		2	1/ 1
CN palsy (total)	4 (12%)	0/ 4	1	0/ 1	3	0/ 3
-completely resolved	2	0/ 2	1	0/ 1	1	0/ 1
Early fatalities	0		0		0	
Late fatalities	1 (3%)	1/ 0	0		1	1/ 0
Cosmesis						
Mild nasal deformity	2 (6.5%)	0/ 2	1		1	
Follow-up						
Mean	67.8mos		30.7mos		92mos	
Range	0-210mos		0-64mos		1-210mos	
Occlusion rate (n=39)						
Complete occlusion	36 (92%)	6/ 30	14	4/ 10	22	2/ 20
Suspicious non-confirmed remnant	2 (5%)	0/ 2	1	0/ 1	1	0/ 1
Incomplete occlusion	3 (8%)		1	0/ 1	2	0/ 2
Retreatment (pipeline)	1	0/ 1	1	0/ 1	0	
Surveillance	2	0/ 2			2	0/ 2

Table 1. Treatment outcomes

Results

The study cohort comprised 33 patients (27 females), with a mean age of 52 years. Six patients had two aneurysms clipped during the same endonasal procedure, while 3 others had a sellar tumor excised concurrently. Out of 39 aneurysms treated by EEA, 7 initially presented with subarachnoid hemorrhage and 4 were pseudoaneurysms. Anatomically, 28 were situated in the paraclinoid or cavernous sinus region, 10 in posterior circulation, whereas a giant one was mainly supplied by the petrous and cavernous internal carotid artery (Figure 1). In two cases a staged endovascular- endonasal procedure was performed to secure the aneurysm, and in another a combined open and endoscopic approach was chosen to obtain proximal and distal control due to aneurysm size. For all the aneurysms, the location and morphology were considered better suited for access through a ventral corridor, rather than an endovascular or open approach. Moreover, 4 patients underwent EEA due to mass effect, 2 after post-coiling recanalization and 3 because of antiplatelet intolerance. As for the postoperative complications, 8 patients experienced cerebrospinal fluid leak, 3 meningitis, 2 clip exposure, 3 lacunar infarcts, (two causing mild disability), and 4 new cranial nerve palsies that either improved or completely resolved. There were no procedure-related mortalities. During an average follow-up of 67.8 months, one patient required retreatment with a flow diverter (Table 1, Figure 2).



Conclusions

The advantageous ventral surgical corridor provided in EEA can facilitate the treatment of selected intracranial aneurysms, due to factors such as bilateral presentation, proximity to the midline, accompanying sellar pathology, or intolerance to antiplatelet therapy. However, cerebrospinal fluid leak, lack of direct revascularization options, and reconstructive challenges represent the main limitations.

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Contact

Georgios A. Zenonos, MD
UPMC Center for Cranial Base Surgery
200 Lothrop Street, PUH B-400, Pittsburgh, PA, 15213
ZENONOSG2@UPMC.EDU
Phone: (001) 412-647-8186