

Cerebrospinal Fluid Leakage: Prevention and Management after Extended Subfrontal Approaches to the Skull Base

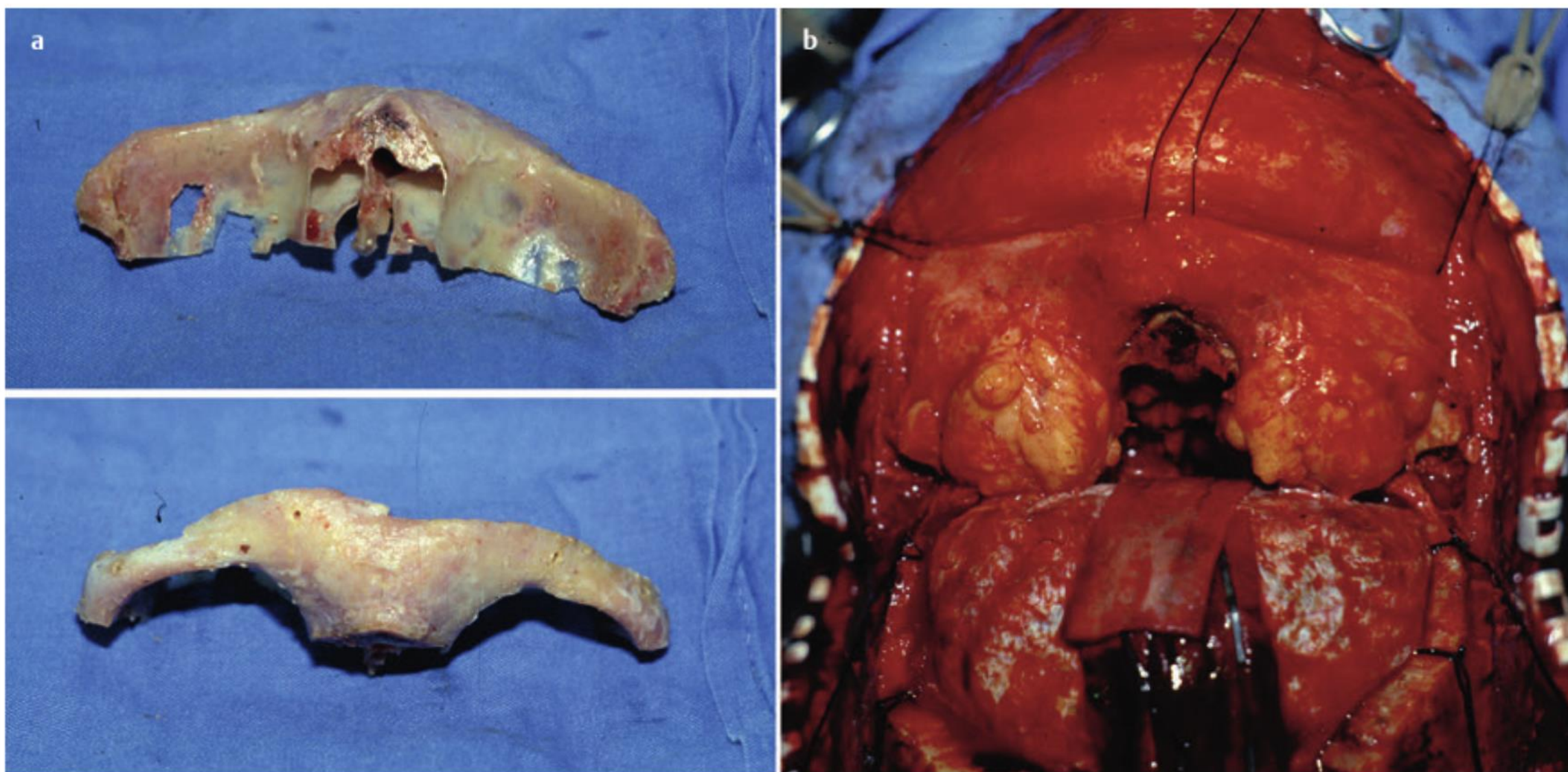
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Objective: To describe skull base reconstruction techniques after extended subfrontal approaches and management strategies for postoperative cerebrospinal fluid (CSF) leak.

The senior author (LNS) and associates developed the extended sub-frontal approach which combined the elements of the bifrontal craniotomy with the orbital-fronto-ethmoidal (OFE) osteotomy. Here, we describe anatomy, outcomes, reconstruction techniques for the extended subfrontal approach as well as management strategies for postoperative CSF leaks.

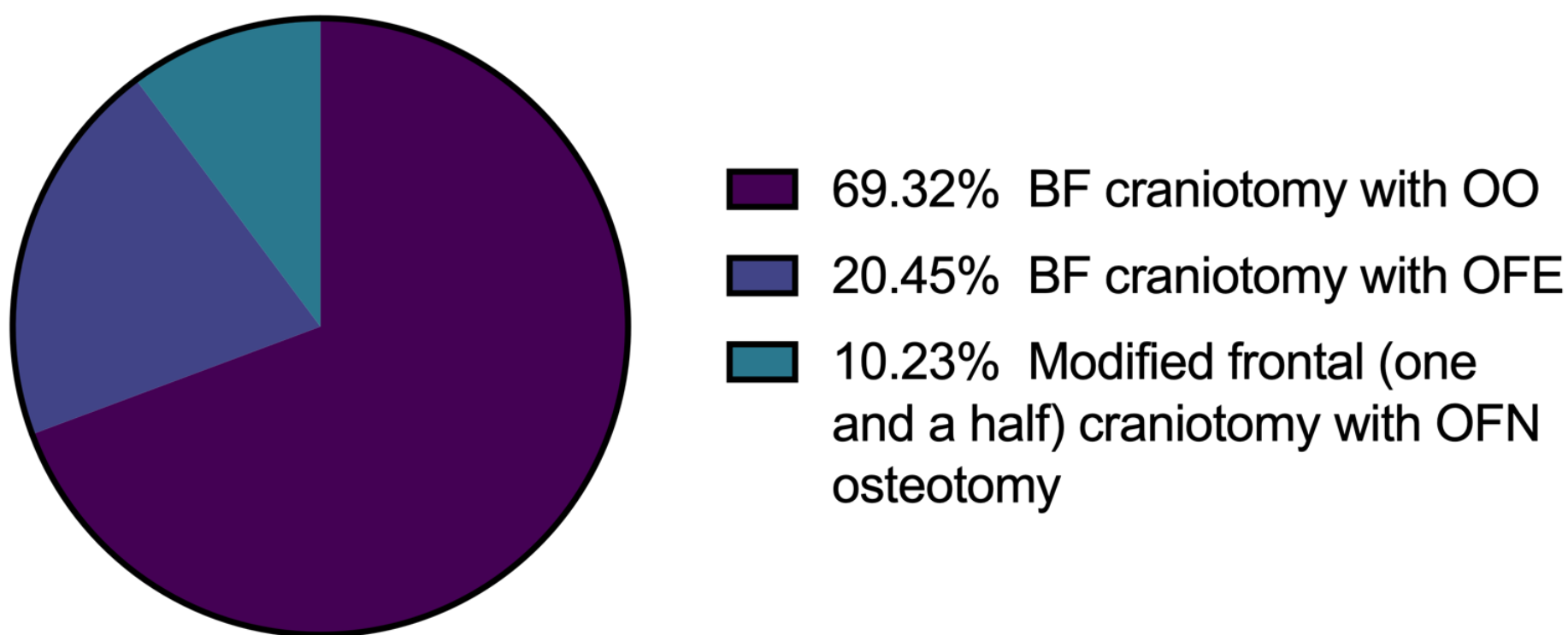


Extended subfrontal approach: bifrontal craniotomy with bilateral orbitotomies and orbitoethmoidal osteotomies.. R.G. Fessler and L.N. Sekhar, eds. New York: Thieme Medical Publishers; 2006

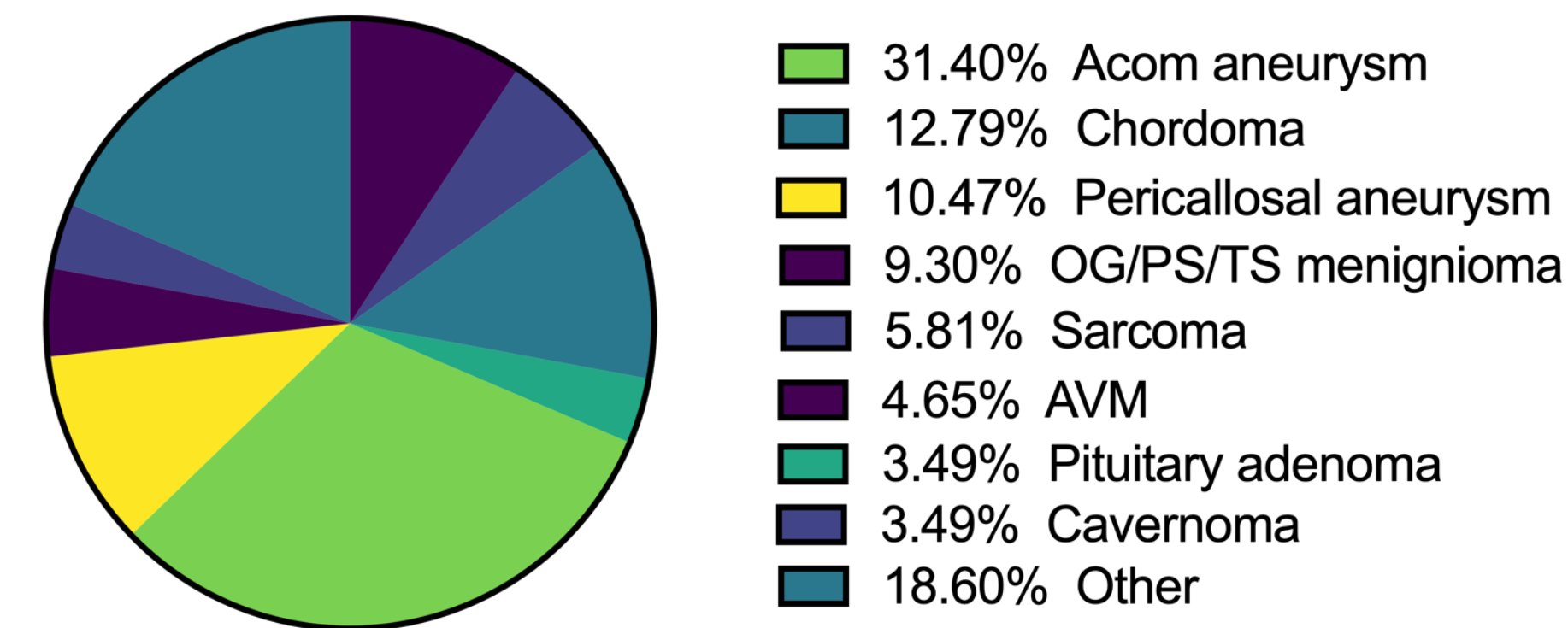
METHODS

We retrospectively reviewed all patients undergoing extended subfrontal approaches (bifrontal craniotomy or one-and-a-half craniotomy with orbitofrontal or orbitofrontoethmoidal osteotomy) between 2005-2022. Demographic, clinical, radiographic and treatment outcomes data were analyzed.

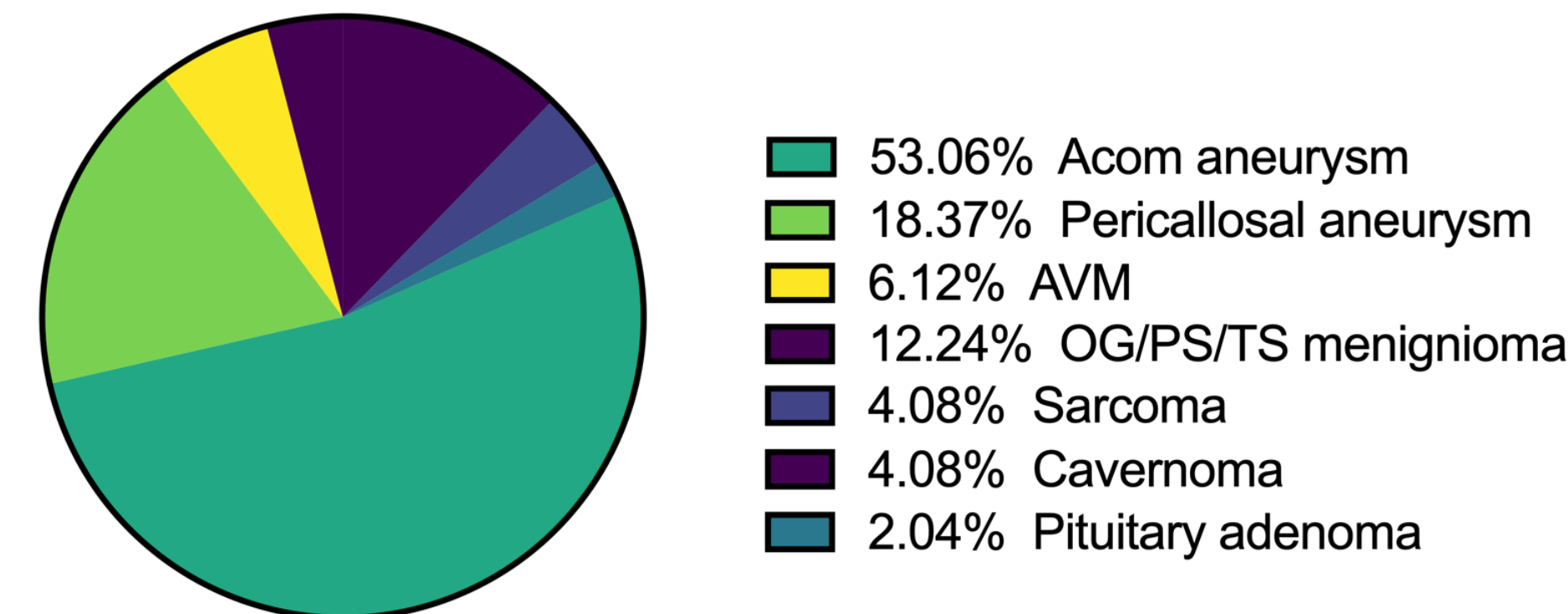
RESULTS



n = 88



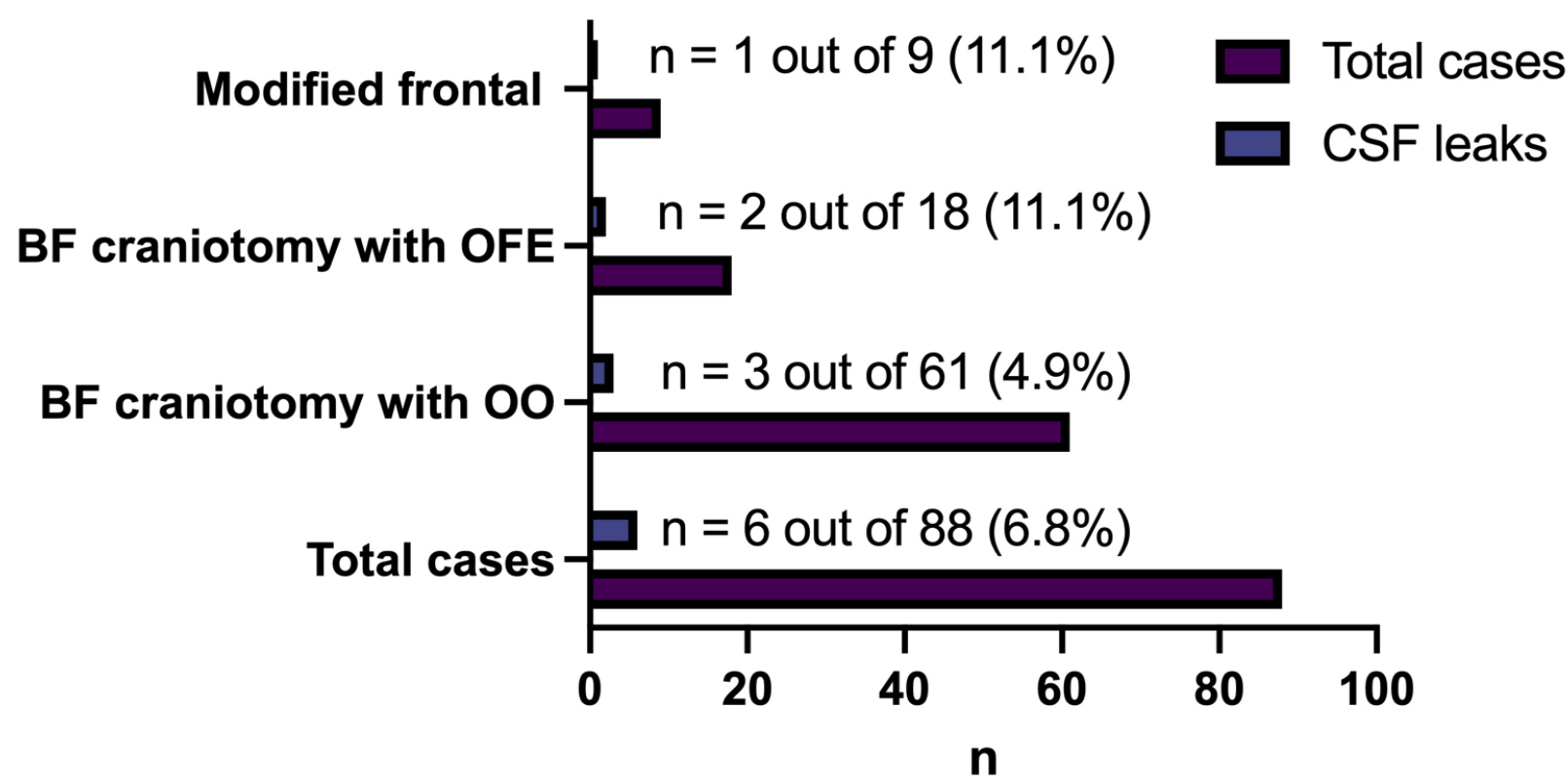
n = 88



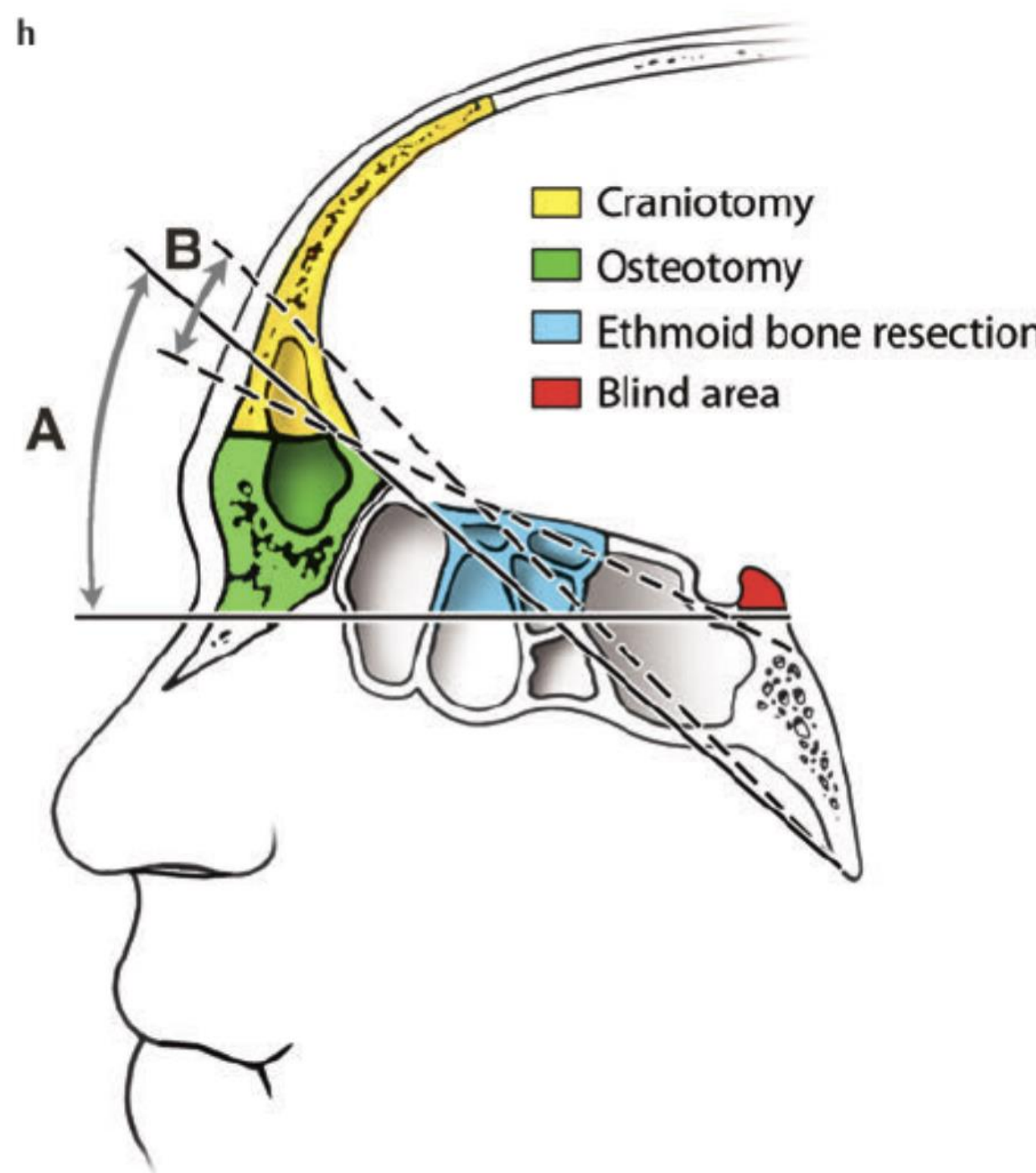
n = 49, BF craniotomy with OO

Anterior skull base reconstruction and repair

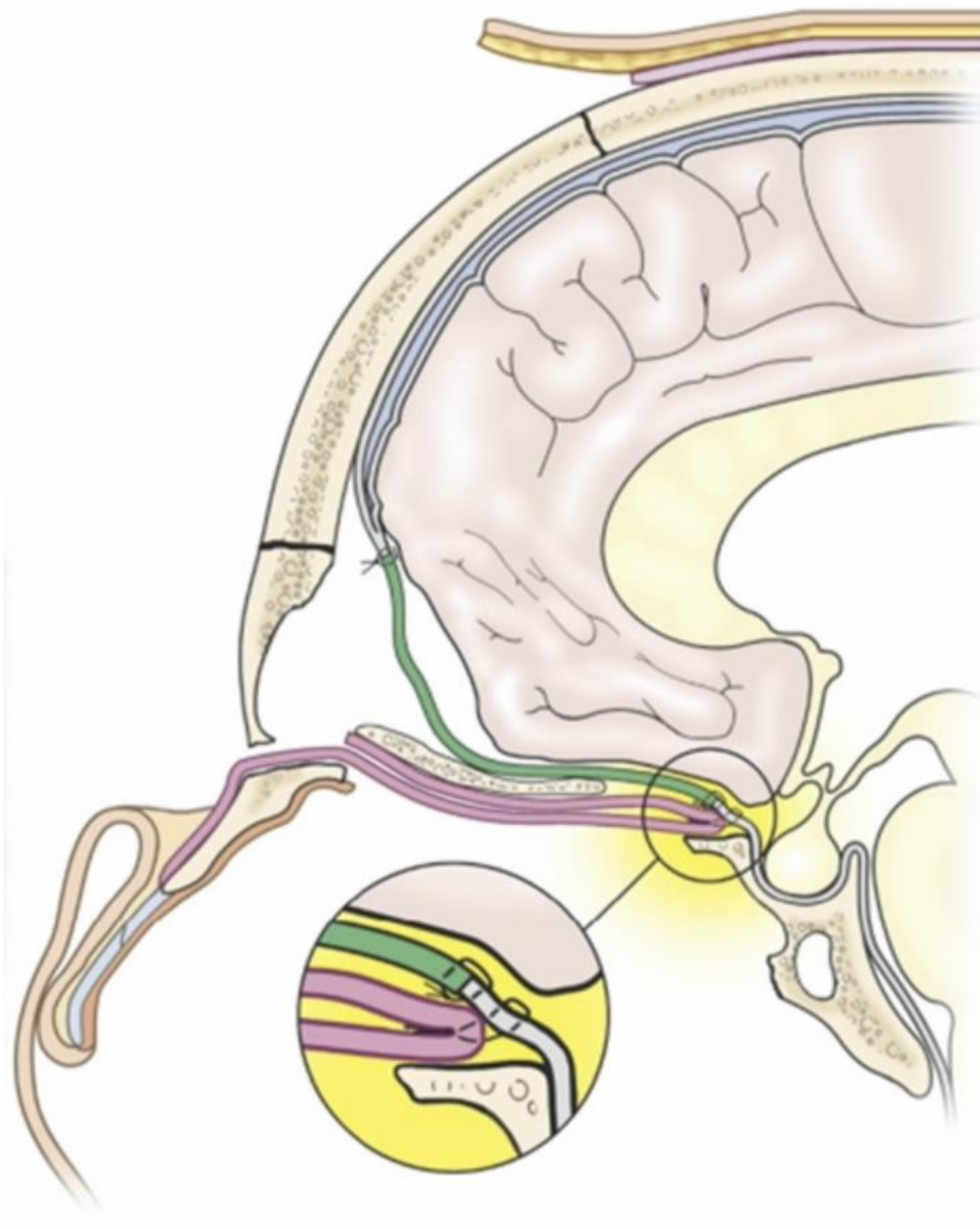
- The planning for the repair always begins at the start of the operation with the preparation of the flap, regardless from where it comes from
- Bony defects are covered with bone cement followed by a free graft of temporalis fascia sutured circumferentially to the dural edges.
- Mucosa from the frontal and sphenoid sinuses is removed entirely.
- The sinuses and frontonasal ducts are packed with fat. Bone cement covered with a vascularized pericranial flap is then used to close the sinus.
- In patients wherein the olfactory placode is saved, we use either a unilaterally based pedicled pericranial flap, or one from each side which goes around the olfactory-ethmoidal area.
- Free fat grats are used to obliterate dead space from the resection cavity above the pericranial flap



	Entire series	BF craniotomy with OO	BF craniotomy with OFE	Modified frontal (one-and-a-half) craniotomy with OFN
Number of cases	88	61 (27.0%)	18 (18.0%)	9 (10.3%)
Operative outcomes				
Total resection	29 (72.5%)	14 (73.7%)	9 (52.9%)	6 (66.7%)
Residual aneurysm	5 (13.9%)	5 (12.8%)	0	N/A
Residual AVM	0	0	N/A	0
Residual dAVF	0	0	N/A	N/A
Complications				
CSF leak	6 (6.8%)	3 (4.9%)	2 (11.1%)	1 (11.1%)
Wound infection	5 (5.7%)	2 (3.3%)	1 (5.6%)	2 (22.2%)
Meningitis	5 (5.7%)	2 (3.3%)	2 (3.3%)	1 (11.1%)
Visual deficit	2 (2.3%)	0	1 (5.6%)	1 (11.1%)
Seizure	5 (5.7%)	3 (4.9%)	0	2 (22.2%)
Stroke	2 (2.3%)	1 (1.6%)	1 (5.6%)	0
DVT	2 (2.3%)	2 (3.3%)	0	0
PE	2 (2.3%)	2 (3.3%)	0	0
Hemorrhage	1 (1.1%)	1 (1.6%)	0	0
Shunt	9 (10.3%)	7 (11.5%)	1 (5.6%)	1 (11.1%)
Shunt infection	2 (2.3%)	2 (3.3%)	0	0
Death (within 6 months)	3 (3.4%)	3 (4.1%)	0	0



Schematic drawing illustrating the improved exposure by the orbitofrontoethmoidal osteotomy (A) compared with the exposure obtained with the craniotomy alone (B). Removal of the middle and posterior ethmoidal cells is necessary to reach the foramen magnum inferiorly. The dorsum sellae remains a blind spot. R.G. Fessler and L.N. Sekhar, eds. New York: Thieme Medical Publishers; 2006



Anterior skull base reconstruction in layers: artificial dura, pericranial graft, and titanium plate or split-thickness bone graft to prevent frontal lobe herniation through the large cranial base defect. The senior surgeon developed this evolved reconstruction technique to reduce the risk of complications such as delayed cerebrospinal fluid leaks, meningitis, and frontal lobe sagging.