Supraorbital Keyhole Craniotomy for Intra-Axial Lesions

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Introduction

The supraorbital (SO) craniotomy is a keyhole approach widely used for anterior skull base and extra-axial pathology, offering a minimally invasive direct subfrontal corridor with limited soft-tissue disruption.

However, its utility for **intra-axial** lesions remains less well defined, and concerns persist regarding working angles and extent of resection.
We report a single-center experience using SO for **frontal intra-axial lesions**, examining feasibility, extent of resection, and perioperative morbidity.

Methods

- **Design:** Retrospective single-center review of supraorbital (SO) craniotomies for intra-axial lesions (2014–2025).
- **Inclusion:** Adults (>18 years) undergoing an SO approach for an intra-axial lesion.
- **Primary outcomes:** Radiographic extent of resection (EOR; gross total vs non-total) for tumor pathologies and perioperative morbidity within 30 days.
- **Secondary outcomes:** Length of stay, discharge disposition, discharge mRS, operative time, and estimated blood loss.
- **Analysis:** Descriptive statistics reported as mean ± SD (continuous variables) and n (%) (categorical variables).

Patient Demographics

A summary of patient demographics is provided below. Complete patient-level details are shown in **Table 1**.

- Cohort size: 9 patients
- Age: 59.1 ± 19.5 years
- Sex: 4 male (44.4%)
- Lesion location: All frontal lobe
- Lesion size: Mean maximum diameter 4.0 ± 1.4 cm (range 1.8–6.0)
- Pathology: Metastases (n=4), gliomas (n=3), ependymoma (n=1), abscess (n=1)

	Age	Sex	Lesion Size (cm)	Pathology
1	74	Male	5	Metastatic Melanoma
2	65	Female	2.8	Metastatic Lung SCC
3	82	Male	5	Giant cell glioblastoma
4	61	Female	3	Metastatic colon carcinoma
5	52	Male	4.4	Abscess
6	67	Female	1.8	Oligodendroglioma
7	34	Female	3.4	Ependymoma
8	74	Male	5	Metastatic Melanoma
9	23	Female	6	Astroblastoma

Table 1. Patient demographics

Results

A summary of operative outcomes is provided below. Patient-level details are shown in **Table 2**.

- Operative time: 259.4 ± 95.6 min (170–440)
- Estimated blood loss: 56.7 ± 58.6 mL (10–200)
- Adjuncts: Stereotactic navigation in 9/9 (100%); microscope in 7/9 (77.8%)
- Extent of resection (tumors only): GTR 5/8 (62.5%); near-total resection 3/8 (37.5%); abscess managed with drainage/irrigation/debridement
- Major complications (30-day): No mortality, stroke, infection or CSF leak
- Minor approach-related complications: Ptosis 1/9; transient frontalis weakness 1/9; mild frontalis weakness 2/9; transient forehead numbness 1/9; mild forehead numbness 2/9
- Disposition: Home 7/9 (77.8%); inpatient rehabilitation 2/9 (22.2%)
- Discharge function: mRS 1.6 ± 1.5 (0–4)

	Operative Time (Minutes)	EBL (mL)	Extent of Resection	Minor Complications	Disposition	mRS at Discharge
1	213	25	GTR	No	Inpatient Rehabilitation	4
2	170	25	NTR	Mild frontalis paresis, transient forehead numbness	Home	1
3	223	50	NTR	Transient frontalis paresis	Home	2
4	274	75	GTR	Mild frontalis paresis and forehead numbness	Home	3
5	178	10	Drained, Debrided	Mild ptosis	Home	1
6	227	25	GTR	No	Home	0
7	440	200	NTR	No	Home	0
8	213	25	GTR	No	Inpatient Rehabilitation	3
9	391	75	GTR	No	Home	0

Table 2. Patient-level surgical outcomes

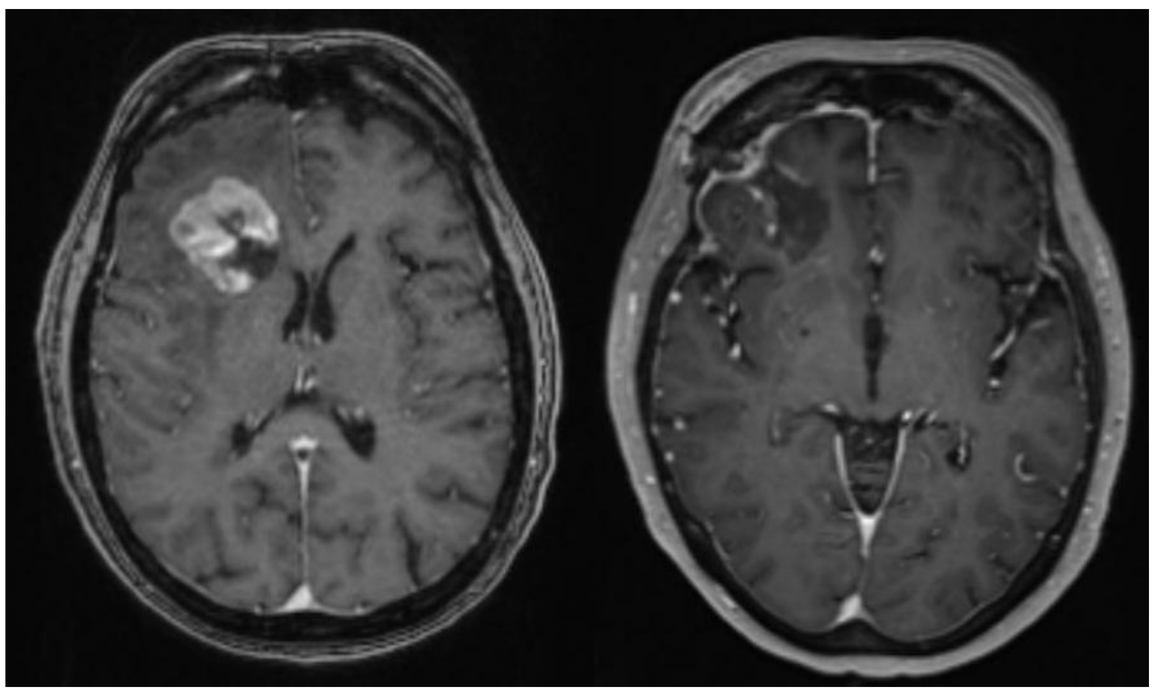

Figure 1. Pre- and postoperative axial T1-weighted post-contrast MRI

Conclusions

- In this series, the SO craniotomy provided **feasible access** to carefully selected **intra-axial lesions**.
- Major perioperative morbidity **was absent in our cohort**, with no 30-day mortality, stroke, CSF leak, or surgical-site infection observed.
- Extent of resection **was favorable** in tumor cases (GTR in 5/8), with only infrequent minor approach-related complications.
- These findings support the SO approach as a **viable minimally invasive corridor** for select intra-axial pathology and justify **larger, comparative studies** to define indications and limitations.

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