Retrosellar Surgical Access: A Quantitative Comparison of Subtemporal, Transpetrosal, and Anterolateral Approaches

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Background

Surgical access to the retrosellar and retrochiasmatic retroclival spaces is constrained by dense neurovascular anatomy, bone, and proximity to the midbrain/pons. Approach selection is typically dictated by the dominant tumor compartment, but extensions into the upper retrosellar/retrochiasmatic region often drive residual disease and recurrence; therefore, corridor-specific access and maneuverability within this space require quantitative definition.

Objective

We quantitatively assess access to this region provided by the subtemporal, subtemporal transtentorial, anterior transpetrosal transtentorial, frontotemporal (pterional), and frontotemporal-orbital approaches, and compare the length of exposed neurovasculature and working area in order to assist in optimal surgical approach selection.

Methods

Stepwise anatomical dissections were performed with sequential measurement of exposure and working angles to the retrosellar region/retrochiasmatic space in the following approaches:

Anterolateral Approaches:
- Frontotemporal (pterional)
- Frontotemporal-orbital (FTO)
- Frontotemporal-orbitozygomatic (FTOZ)
- FTO and FTOZ Extension: Posterior Clinoidectomy

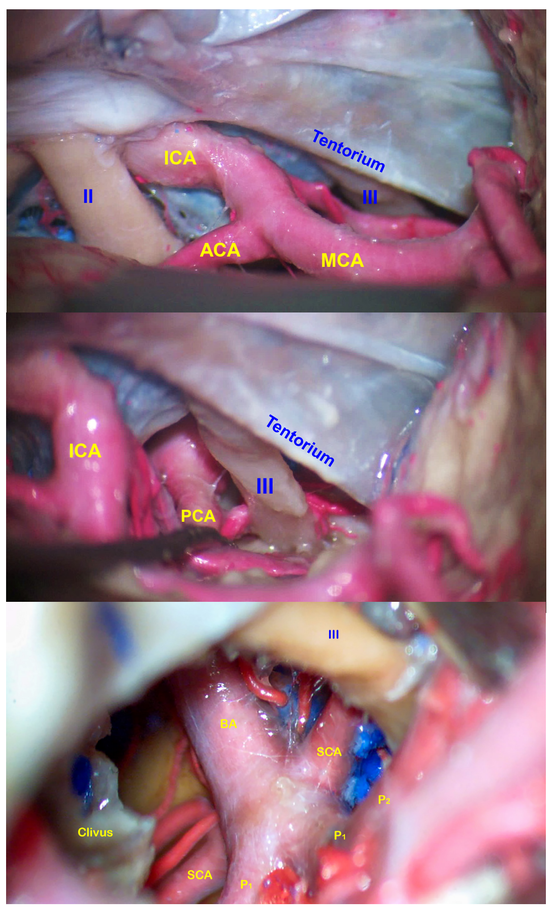
Lateral Approaches:
- Subtemporal
- Subtemporal Transtentorial
- Anterior Transpetrosal Transtentorial

Working angle within the retrosellar area was measured by linear exposure (length) of key neurovascular structures, and angular exposure to targets (CI 95%; significance threshold P <0.05).

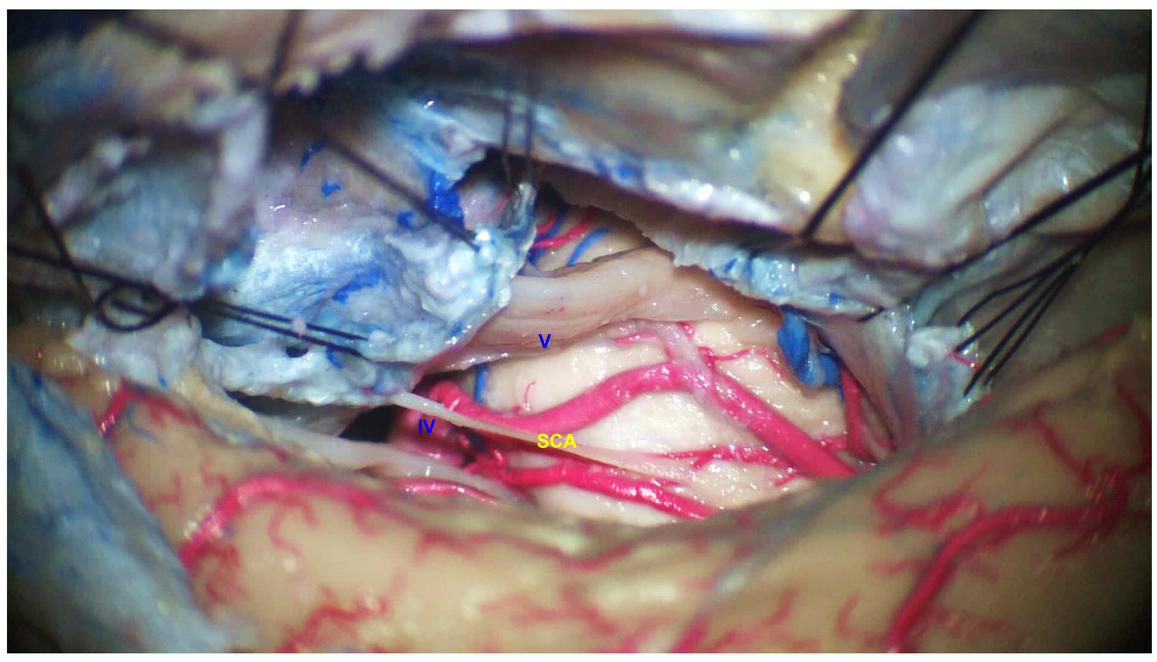
Results

Anterolateral Approaches
FTOZ demonstrated statistically significant increases (CI 95%; P <0.05) in:
- Angular exposure of C4 ICA (P = 0.003)
- Linear exposure of CN III (P = 0.009)
- Angular exposure of M1 (P = 0.005)
- Linear exposure of PCoA (P = 0.004)
- Anteroposterior working angle (P = 0.001)

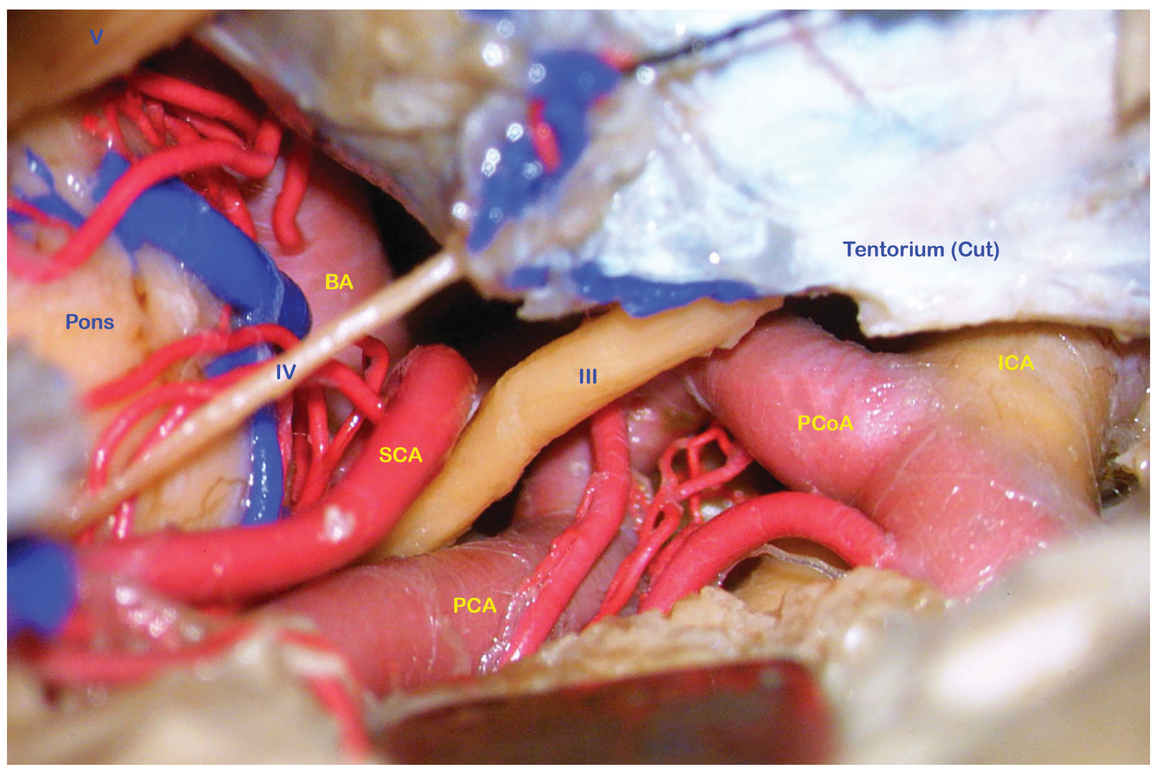
Posterior Clinoidectomy:
- Increase in angular exposure of CN III (P = 0.004)
- Allowed for surgical maneuverability around the upper basilar artery



Lateral Approaches
Subtemporal transtentorial yielded statistically significant gains over the subtemporal approach without incision of the tentorium (CI 95%; P <0.05):
- Full CN IV exposure; increased angular exposure of CN IV (P = 0.001)
- Increased SCA exposed length (P = 0.023)
- Increased exposure of the lateral upper and middle brainstem (P = 0.004), associated with a significant reduction in the obstructing tentorial area under the subtemporal corridor (P = 0.025)
- Increased maneuverability around CN III, PComA, SCA, and basilar artery



The anterior transpetrosal approach:
- Provided a statistically significant increase in exposure of the midportion of the basilar artery over the subtemporal approach (P = 0.011–0.012)
- Qualitatively improved maneuverability around CN IV compared to the subtemporal transtentorial approach



Conclusion

Anterolateral routes, particularly the FTOZ extended with a posterior clinoidectomy, provide superior access to the retrosellar region and upper retroclival space and remain optimal for sellar/parasellar targets extending retrochiasmatically or upper-clival lesions extending laterally. The subtemporal corridor is an effective route for upper clival lesions with lateral and/or upper petroclival extension. Transtentorial and transpetrosal extensions substantially improve infratentorial access and maneuverability for petroclival tumors with upper-clival extension.

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