

*Ernesto Leon; MD, Ruth Yael Martinez Hernandez,, MD; Srikant Chakravarthi, MD, MS; ,
Jorge Marin; Alejandro Monroy-Sosa MD, MBA.
Hospital General Tlahuac ISSSTE*

Introduction

Pituitary adenomas, generally, are benign tumors. They may be considered aggressive/malignant if they invade the cavernous sinus, optic system, and/or the third ventricle. In practice, there are two techniques to remove the tumor bulk: intracapsular and extracapsular.

“Pseudocapsular” dissection can be defined as the separation of the plane between the tumor pseudocapsule and the normal pituitary gland. Tumor cells can infiltrate the pseudocapsule, potentially resulting in recurrence.

Methods and Materials

3 primary arms

- Anatomical: The sellar, parasellar and suprasellar regions were topographically organized in a “Cube Model”

- 1) Anterior plane; constitutes the anterior wall of the sella, tuber, limbus, MOCR, and middle clinoid process.
- 2) Lateral plane; both sides of the pituitary ligaments, dura and cavernous sinus
- 3) Inferior plane; the sellar floor
- 4) Superior plane; arachnoid and sellar diaphragm
- 5) Posterior plane; the dorsum sellae and the posterior clinoid process.

- Surgical/Technical:

Extracapsular resection, through en bloc or piecemeal resection, was performed. Anatomical landmarks of the sellar region were tuber sella, carotid eminences, the MOCR, middle clinoid process, and the interfalciiform ligament.

- Patient series:

Single-surgeon retrospective study was performed in 50 patients; functional and non-functional tumors were included. Surgical and endocrinological outcomes and complications were evaluated.

Results

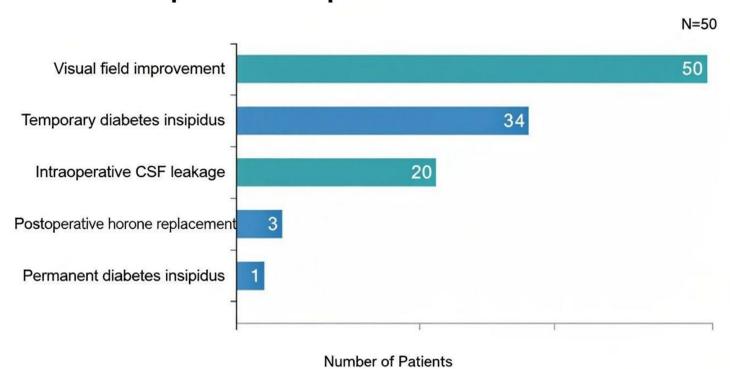
Extracapsular tumor resection was performed in 50 patients; 43 were non-functional and 7 were functional (2 prolactinomas and 5 growth hormone secreters). Total resection was performed in 49 cases, with one case leading to a subtotal resection (remnant tumor was seen adherent to the optic nerve). Intraoperative CSF leakage was observed in 20 patients and 2 patients presented with postoperative CSF fistula, which were subsequently reintervened. Temporary diabetes insipidus was observed in 34 patients, with one patient being permanent. Three patients required post-surgical hormone replacement. Visual field improved in all patients.

Wide, bilateral exposure of the sellar, parasellar and suprasellar regions allowed for sufficient exposure of relevant anatomical landmarks, including medial opticocarotid recess, middle clinoid process, and paraclinoid and parasellar carotids.

The sellar dura was opened in a rectangular fashion. The next step was to separate the pseudocapsule of the tumor adjacent to the cavernous sinus laterally. Posteriorly, separation between the pseudocapsule and the arachnoid plane was identified and allowed for tumor removal and localization of the pituitary gland. In cases of disruption of the arachnoid plane, the pituitary stalk was observed.

Separation between the tumor and the cavernous sinus allowed for observation of the internal carotid artery; in 5 cases, the tumor invaded the cavernous sinus. In all patients, the pituitary gland was observed.

Postoperative Complications and Evolution



Discussion

Oldfield et al. pioneered ER, demonstrating superior gross total resection rates (up to 90%) and biochemical remission (e.g., in acromegaly) compared to IR, with reduced recurrence. Studies by Li et al. and Quon et al. confirm ER’s advantages in endoscopic endonasal approaches, preserving pituitary function while minimizing complications like hypopituitarism or CSF leaks.

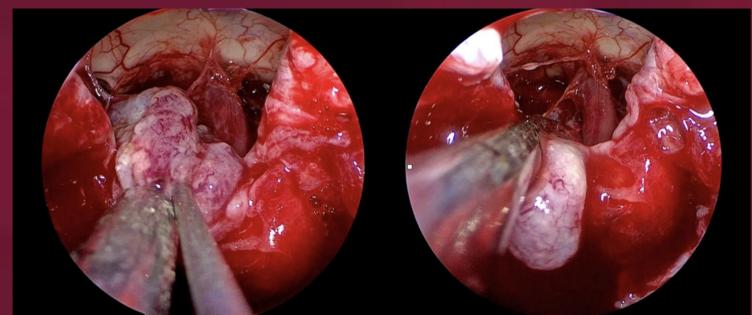


Figure 3. Intraoperative images of adenoma resection using a pseudocapsular technique show tumor retraction, with the pituitary gland and stalk preserved in the background.

Conclusions

Pseudocapsular resection is a technically feasible and safe approach; permitting preservation of the intact pituitary gland (potentially resulting in less need for hormonal replacement) and prevention of tumor recurrence.

The newly described “Cube Model” for systematic identification of surrounding structures, may help guide the surgeon in more effective tumor resection.

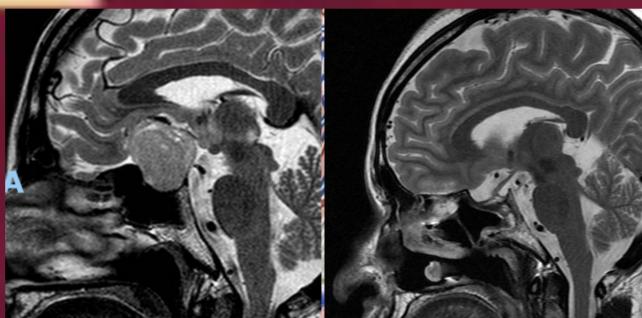


Figure 1. Adenoma en región sellar, con resonancia preoperatoria y posoperatoria, se observa glándula y tallo hipofisario preservado

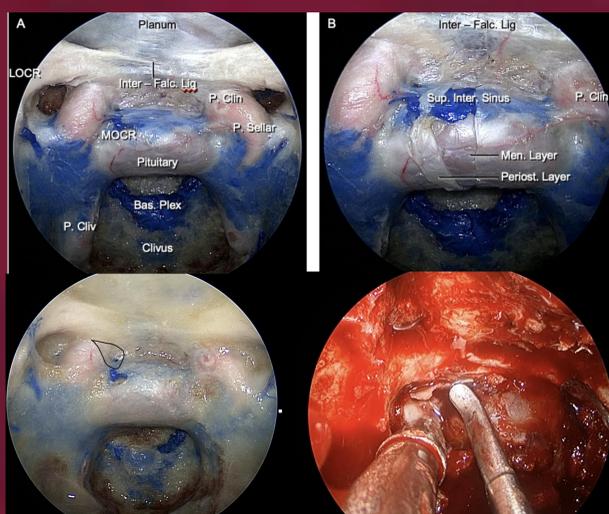


Figure 2. Anatomical images demonstrating anterior and superior walls, floor, medial and posterior walls, medial clinoid process, and medial carotid optic recess

Contact

Alejandro Monroy Sosa MD MBA
Hospital ISSSTE Tláhuac, Mexico City
Av. Heberto Castillo 216, Villa Centroamericana, Tláhuac CDMX
neurocirujano@mdmonroy.com
+52 55 72105929

References

1. Oldfield, E. H., & Vortmeyer, A. O. (2006). Development of a histological pseudocapsule and its use as a surgical capsule in the excision of pituitary tumors. *Journal of Neurosurgery*, 104(1), 7–19. <https://doi.org/10.3171/jns.2006.104.1.7>
2. Wang, X. B., Han, T. Y., Ma, J. G., He, C., Xue, L., Zhang, X., & Wu, Z. B. (2022). Pseudocapsule and pseudocapsule-based extracapsular resection in pituitary neuroendocrine tumors. *Frontiers in Endocrinology*, 13, Article 1056327. <https://doi.org/10.3389/fendo.2022.1056327>
3. Zhang, X., Fei, C., Zhang, Y., Li, Y., & Wang, Y. (2022). Comparison of outcomes between intracapsular resection and pseudocapsule-based extracapsular resection for pituitary adenoma: A systematic review and meta-analysis. *BMC Neurology*, 22(1), Article 74. <https://doi.org/10.1186/s12883-022-02574-9>
4. Li, Y., Li, Y., Zhang, Y., Li, Y., & Wang, Y. (2022). Pseudocapsule and pseudocapsule-based extracapsular resection in pituitary neuroendocrine tumors. *Frontiers in Endocrinology*, 13, Article 1056327. <https://doi.org/10.3389/fendo.2022.1056327> (Referencia complementaria con enfoque en ER)
5. Quon, J. L., Kim, L. H., DiToro, D. F., & Couldwell, W. T. (2023). Extracapsular resection of pituitary adenomas: A systematic review. *Journal of Neurological Surgery Part B: Skull Base*, 84(3), 234–245. <https://doi.org/10.1055/s-0043-1761237> (Revisión sistemática reciente sobre resección extracapsular).