Assessment of the Efficacy of Endoscopy in Pituitary Adenoma Resection

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Objective: To obtain objective evidence that the use of endoscopy in the surgical management of pituitary tumors improves intraoperative visualization and significantly impacts operative outcomes.

Design: Case series of pituitary adenomas treated surgically by endoscope-assisted microscopic resection.

Setting: University-affiliated tertiary care medical center.

Patients: Consecutive sample of 9 patients referred for surgical management of pituitary adenoma.

Interventions: Each patient underwent transseptal transsphenoidal microscopic tumor resection. The procedure was modified by the use of intrasellar endoscopy as an adjunctive imaging modality. Following complete microscopic resection of tumor, rigid 0° and 30° 4.0-mm endoscopes were used to conduct a final survey of the sellar and parasellar spaces. Residual tumor fragments identified during this endoscopic examination were removed.

Outcome Measures: Endoscopes were thought to have a significant impact on surgical therapy in cases where residual tumor that was not detected microscopically was identified and removed during endoscopic examination. Analysis of each case included correlation between intraoperative findings and retrospective review of dictated operative reports and intraoperative videotape.

Results: Three of the patients with macroadenoma (33% of total, 43% of macroadenoma cases) had tumor fragments that were only identified and removed endoscopically.

Conclusions: Endoscopy provides distinct advantages over microscopy in imaging intrasellar and parasellar structures during pituitary tumor resection. These data support the numerous anecdotal accounts of the usefulness of pituitary endoscopy and are consistent with the small amount of objective evidence offered on the subject.


The emphasis placed on minimally invasive surgery has guided the evolution of surgical practice over the past century in all surgical subspecialties. Progress in the field of pituitary surgery in particular exemplifies this. Harvey Cushing, widely credited as the innovative force behind many modern neurosurgical techniques, had extensive experience with both transcortical and transsphenoidal approaches to the pituitary gland over the first half of this century. Based on these experiences, he ultimately concluded that the transcortical subfrontal approach, despite its invasive nature, was the procedure of choice for surgical management of pituitary tumors, especially those with suprasellar extension. His opinions were contested by his contemporaries, who argued that the less invasive transphenoidal approach not only resulted in less morbidity but also that that the procedure was equally effective in providing access to suprasellar tumors.

This debate was not truly settled until the second half of the century. Following Hardy and Wisger's introduction of fluoroscopy and microscopy to the operating room, the transphenoidal technique emerged as the first choice in surgical therapy of the vast majority of pituitary tumors. With the operating microscope and intraoperative fluoroscopy available, the surgical field could be magnified and radiographically defined. These capabilities definitively answered Cushing's original lamentations regarding the obscurity of the pituitary gland when viewed from a transphenoidal perspective.
The following procedure was performed on 9 patients referred for surgical management of their pituitary tumors. Fully informed consent, including detailed explanations of the use of adjunctive endoscopy, was obtained from each patient by the senior surgeon (H.K.S.). The surgical protocol was reviewed and approved by our local institutional review board.

The approach to the pituitary gland closely resembles the transseptal transsphenoidal technique originally described by Cushing.5 Once the gland is exposed, microscopic resection of tumor proceeds until all identifiable parts of the lesion are removed. Following this, a 0° 4.0-mm endoscope (Karl Storz of America, Culver City, Calif) is advanced to the sella and used to conduct a survey of the surgical field. Any tumor fragments not originally identified using the microscope are removed under direct endoscopic visualization. Next, a 30° endoscope is introduced and used to provide additional exposure of the suprasellar and parasellar areas. Any residual tumor therein is also endoscopically removed.

Closure is obtained with reconstruction of the floor of the sella and placement of an abdominal fat graft into the space of the sphenoid sinus.

Results
Operative summaries and videotape were retrospectively analyzed. Comment on the efficacy of endoscopy in finding residual tumor was sought in the former and correlated with visual evidence in the latter.

Among the 9 patients, 3 were male (33%) and 6 were female (67%). Average age of the patient population was 41.9 years. Presenting symptoms included headache, visual disturbances, and physical manifestations of various endocrinopathies. Diagnostic magnetic resonance imaging revealed microadenoma in 2 patients; all others had a preoperative diagnosis of macroadenoma. There were no complications related to surgery, including stroke, neurological deficit, permanent diabetes insipidus, or cerebrospinal fluid fistula. The Table presents the baseline clinical data of the patients.

Table 1: Baseline Clinical Data of the Patients

In the 2 cases of microadenoma, resection was guided by gross identification of the normal pituitary gland and exploration of the intrasellar quadrant where tumor was identified on preoperative magnetic resonance images.

The 0° endoscope provided excellent visualization of the pituitary gland in its native position. By maneuvering the endoscope within the sella, a greater area was viewed compared with the static anteroposterior perspective under the microscope. When the 30° endoscope was used, structures in the suprasellar and parasellar spaces came clearly into view, including the medial walls of the cavernous sinuses and the optic chiasm.

Endoscopic survey revealed residual tumor in 3 patients with macroadenoma. This represents 33% of the total sample and 43% of macroadenoma cases. In all of these instances, tumor was abutting the medial walls of the cavernous sinuses, hidden from microscopic view (Figure). The tumor remnants were successfully removed under endoscopic visualization, resulting in complete gross tumor resection.

Comment
The use of endoscopy in the resection of pituitary adenomas, used to varying degrees by different authors, has been well described in recent years.16-20,22 Some have described their experience with endoscopy as the sole imaging modality for the entire procedure.21,23-26 Despite these numerous published reports, however, overall experience with fully endoscopic transnasal pituitary surgery remains limited. More widespread experience with this technique is required before it gains acceptance as an equivalent or preferable alternative to transseptal transsphenoidal microscopic surgery in the management of pituitary adenomas.

In general, before such a shift in surgical practice can occur, several fundamental considerations must be made. First, there should be some objective evidence that the proposed technique represents an improvement over the old method. Second, the proposed innovation should involve no undue burden or risk to the patient. Third, there must be a means by which a new surgical technique can be reasonably approximated in a controlled setting for training purposes.
In the case of fully endoscopic pituitary surgery, the second and third criteria have been met, but the first has yet to be satisfied. Surprisingly, the few published reports describing experience with fully endoscopic resection of pituitary adenomas have been preceded by a paucity of objective data in support of the merits of this technique. Some authors have criticized endoscopic equipment as being cumbersome and the endoscopic perspective as being limited in this setting.

Before sweeping changes in the standard of pituitary surgical practice are proposed or accepted, more impartial information should be available.

Spencer et al have contributed to the limited body of evidence that exists on this subject by quantifying and comparing the “volumes of view” of the endoscope and microscope in the setting of pituitary surgery. In their anatomical study of surgical approaches to the pituitary gland, they were able to objectively demonstrate with statistical significance that the 0° endoscope afforded more comprehensive views of the sella turcica than the microscope.

Even more compelling evidence is provided by Helal. In 15 (41%) of the 37 patients in his series, residual tumor fragments were discovered and successfully resected during endoscopic surveys of the sella turcica. These surveys were conducted only after tumor resection under microscopic exposure was thought to be complete, thereby highlighting the differences between the optical capabilities of the endoscope and the microscope.

In our series, we demonstrate a 33% detection of residual tumor not originally visualized under the microscope. When our analysis is restricted to only patients with macroadenomas, this rate increases to 43%. Naturally, the limited size of our patient population prevents these data from possessing a significant degree of statistical power. Considering the dearth of objective data in support of replacing the microscope with the endoscope in pituitary surgery, however, even these observations do provide evidence that endoscopic imaging of the intrasellar, parasellar, and suprasellar spaces is more comprehensive than that provided by the operative microscope. We can preliminarily conclude that the potential impact on the efficacy of tumor resection and subsequent rates of tumor recurrence is significant when endoscopy is implemented as an imaging modality in the surgical management of pituitary tumors. Experience with greater numbers of patients in multiple centers is necessary before definitive conclusions can be drawn on this subject and before a new standard in the surgical therapy for pituitary adenomas is set.

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