The Transition from Microscopic to Endoscopic Transsphenoidal Surgery in High-Caseload Neurosurgical Centers: The Experience of Foch Hospital

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Key words
- Endoscopic endonasal approach
- Endoscopic transphenoidal surgery
- Pituitary adenomas
- Pituitary tumors

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■ OBJECTIVE: **To report the experience of 1 hospital in the transition from the microscopic approach to the endoscopic endonasal approach for pituitary disease and skull base tumor surgery.**

■ METHODS: **From 2006 to August 2011, 1000 procedures to treat pituitary disease and skull base tumors were performed in our department by a single neurosurgeon using the endoscopic endonasal approach.**

■ RESULTS: **The endonasal endoscopic approach for pituitary adenoma surgery decreased nasal complications, increased patient comfort by avoiding postoperative nasal packing, provided a better view of the intrasellar and suprasellar areas, obtained the same endocrinologic results as the microscopic approach, provided better control of the invasion of the cavernous sinus, and allowed removal of tumors of the cavernous sinus in some cases.**

■ CONCLUSIONS: **It is important to separate the 2 approaches, the endoscopic endonasal transsellar approach and the endoscopic endonasal extended approach, and to avoid unnecessary extended approaches. The use of an endoscopic endonasal approach has added value for lesions localized between the tuberculum sellae and the odontoid. The added value of endoscopic endonasal approaches for lesions in front of the tuberculum sellae is less clear and must be evaluated in the future.**

INTRODUCTION

From 1960–2006 in our department, 6213 patients with pituitary disease or skull base tumors were operated on using the microscopic transsphenoidal approach by our neurosurgeons. Beginning 2006, we transitioned from the microscopic approach to the endoscopic endonasal approach for pituitary disease and skull base tumor surgery. Although one of our neurosurgeons, Gérard Guiot (12), did a movie in 1962 on the first removal of a pituitary adenoma under the endoscopic approach, this transition actually occurred in our department more later than in other neurosurgical departments.

When operating under an endoscope, the neurosurgeon has to adapt not only to the new tool but also to a new workspace—the endonasal approach without a speculum and without stereoscopic vision. Neurosurgeons who are used to working with a microscope can be compared with a watchmaker in terms of the precision of their work, and they need to learn to become like a "video gamer," keeping the same precision in their dissection as they adapt to the endoscope. This article comments on this transition from microscope to endoscope based on the experience at our hospital with the first 1000 endoscopic endonasal procedures.

MATERIALS AND METHODS

From 2006 to August 2011, 1000 endoscopic endonasal approaches for pituitary disease and skull base tumors were performed in our department by the same neurosurgeon (S.G.). The transition from the microscopic approach to the endoscopic approach has been done progressively, first for different types of adenomas and subsequently for extended approaches (**Table 1**).

Operative Technique

We kept the same installation we used when we operated with a microscope (**Figure 1**). We used a full high-definition video camera, a cleaning system, and a 4-mm endoscope with 0-degree and 30-degree diameter as well as a 2.7-mm endoscope with a 30-degree diameter for children. We believe it is very important to separate the 2 types of endoscopic approaches, according to the pathologies for which they are indicated and to avoid unnecessary extended approaches.

The *endoscopic endonasal transsellar approach* is used for the removal of purely intrasellar lesions or lesions with a midline and infradiaphragmatic suprasellar extension. In our practice, this approach requires only a single-nostril approach, most often without turbinectomy, septal resection, or nasoseptal flap. This the most frequent approach for pituitary adenomas (2, 5).

After lateralization of the middle turbinate, the mucosal incision is done posteriorly from the infundibulum to the ostium. The luxation of the nasal septum allows an approach of the sphenoid rostrum through the midline before the sphenoidotomy. The sphenoidotomy has to be large to obtain a sufficiently wide working cone and to avoid postoperative sinusitis (**Figure 2**).

The *endoscopic endonasal extended approaches* (transtuberculum, transplanum, transclival, transodontoid, and parasellar)

Table 1. Progressive Indications for the Endoscopic Approach over Time

Nonfunctioning adenomas
↓
Secreting adenomas except Cushing (GH, PRL)
↓
Cushing adenomas (notably with unclear MRI)
↓
Extended approach (e.g., craniopharyngiomas, chordomas, meningiomas, odontoid resection)

GH, growth hormone; PRL, prolactin; MRI, magnetic resonance imaging.

always require a binostril approach, a unilateral middle turbinectomy, a posterior septal resection, and nasoseptal flaps for the closure (Figure 3). Opening of the maxillary sinus for the parasellar approach is needed as an inverted "U" flap in the case of odontoid resection (13, 16-18, 20). For each extended approach, a tailored opening adapted to each lesion is recommended to decrease closing problems as much as possible (6, 8).

RESULTS

Global results and complications are summarized in Table 2. Comparing our experience with the microscopic approach and the endoscopic approach, we found that the endoscopic approach has allowed us to do the following:

- Decrease nasal complications (3, 7, 19, 21)
- Increase the patient's comfort by avoiding postoperative nasal packing

Figure 1. Patients are placed in a transatlantic position with the right thighs prepared for the musculoaponeurotic surgery in case of perioperative cerebrospinal fluid leak.

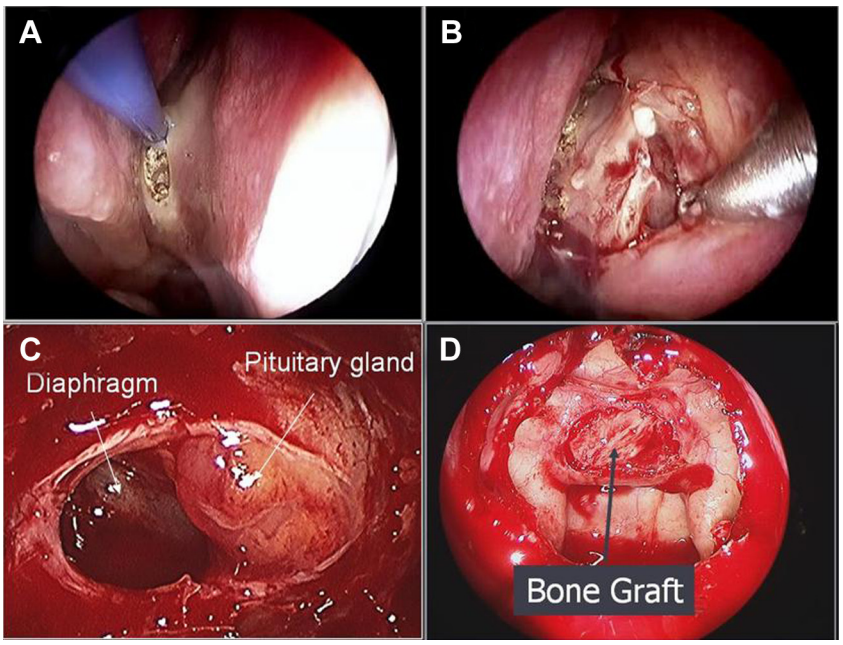

Figure 2. Example of single-nostril endonasal endoscopic approach for removal of a microadenoma. (**A**) Sphenoid mucosa incision. (**B**) Luxation of the nasal septum. (**C**) Intrasellar view after adenoma removal. (**D**) Sellar closure with a bone rostrum graft.

- Obtain the same endocrinologic results as obtained with the microscopic approach (1, 4, 9, 11, 22-24, 27)
- Obtain better control of invasion of the cavernous sinus and allow removal of tumors of the cavernous sinus in some cases (Figure 4) (10, 11)
- Obtain a better view of the intrasellar and suprasellar areas (3, 7, 14, 25, 26)

Regarding nonfunctioning adenomas, the global results are of little value because we must consider the size and the consistency of adenomas and their local invasions to study the results precisely (Figure 5). For large fibrous nonfunctioning adenomas, we prefer to use 2 consecutive stepwise intrasellar approaches rather than a single extended approach because these procedures are associated with lower morbidity.

DISCUSSION

There are some important points in the analysis of the transition from microscope to endoscope.

2 or 4 Hands?

In our opinion, the choice of 2- or 4-handed surgery is an arbitrary one, and we leave that decision to the surgeon's preference. In our department, the transsphenoidal microscopic approach was performed by 1 neurosurgeon alone, and we maintained this practice during the transition to the endoscope. It is important that neurosurgeons know the sinus and skull base anatomy perfectly. They also have to learn to use the endoscope and their new workspace. For the simple transsellar approach, such as for adenomas, neurosurgeons should be able to perform it alone.

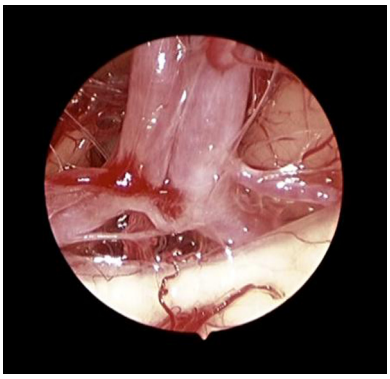

Figure 3. Endoscopic view during an extended approach.