

Novel closure technique for the endonasal transsphenoidal approach

Technical note

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✓ Transsphenoidal microsurgery has been the standard approach to sellar lesions since the repopularization of the technique with modifications by Dott, Guiot, and Hardy. The endonasal transeptal transsphenoidal approach, as introduced by Hirsch, is still commonly used by pituitary surgeons to remove lesions of the sellar and parasellar region. One disadvantage of this approach is that the submucosal dissection requires postoperative nasal packing, which is a source of discomfort in patients who undergo transsphenoidal surgery. The authors describe a novel closure technique for the unilateral endonasal transsphenoidal approach that eliminates the need for full nasal packing, minimizing postoperative rhinological morbidity. This technique has been performed in 67 patients harboring sellar and parasellar lesions. All patients recovered rapidly without significant rhinological sequelae.

KEY WORDS • endonasal transsphenoidal approach • pituitary tumor • sellar lesion • surgical closure

THE first recorded attempt at resection of a pituitary tumor was performed by Caton and Paul⁴ in 1893, who used a subtemporal approach suggested by Sir Victor Horsley. The first transsphenoidal approach, in which a lateral rhinotomy was successfully used, was reported by Schloffer²⁶ in 1906. Since then, as we have discussed recently,²³ significant modifications and improvements have been contributed by Kocher,²⁰ Kanavel,¹⁹ Halstead,¹³ Hirsch,¹⁵ Cushing,⁷ and Hardy.¹⁴ Dott and Bailey⁹ and Guiot and Thibaut¹² are credited with preserving the transsphenoidal technique during a time when it had been abandoned. Today, nearly a century after its inception, the transsphenoidal approach remains the standard for surgical removal of pituitary tumors and other sellar lesions.^{1,5,10,11,21–25,29,30}

Recently, nasal endoscopes have been used in the removal of sellar lesions, with advantages and disadvantages attributable to the technology.^{2,3,8,16–18} One distinct advantage of endoscopic sellar surgery is the absence of submucosal septal dissection and subsequent lack of need for nasal packing. Moreover, the pain and paresthesias noted with sublabial or transcolumellar incisions are avoided.²⁸ Despite these advantages, endoscopic transsphenoidal surgery has been slow to be adopted because of the need for comfort both in visualization of the tumor and in instrument manipulation. In addition, binocular visual control with the operating microscope cannot be reproduced with the current endoscopes.²⁷

We have developed a minimally invasive approach to the sella turcica that obviates the need for full nasal packing and results in minimal postoperative discomfort. The placement of the incision results in no scar or paresthesias. In addition, the advantages of binocular microscopic visualization and bimanual surgery are retained. Use of nasal endoscopy to assess for and, if necessary, remove residual tumor is also possible. We describe this technique and our experience with it in 67 patients.

Surgical Procedure

Surgical Approach

This approach is indicated in primary cases or regrowth of sellar and/or parasellar lesions. The patient is positioned with the head fixed either in a horseshoe headholder or in Mayfield pins and turned slightly toward the left shoulder. After topical treatment with oxymetazoline and injection with lidocaine containing 1:100,000 epinephrine, an incision is made in the right nasal septal mucosa approximately 2 to 3 mm behind the mucosal–cutaneous junction (Fig. 1). The incision is continued posteriorly as it descends to keep it behind the nasal sill, and it extends to the lateral portion of the nasal floor. A submucoperichondral plane is developed and the submucosal dissection, which extends onto the nasal floor, is completed on the right side as classically described.

The quadrangular cartilage is incised 2 cm posterior to the rostral margin and a similar submucoperichondral and

Abbreviation used in this paper: CSF = cerebrospinal fluid.

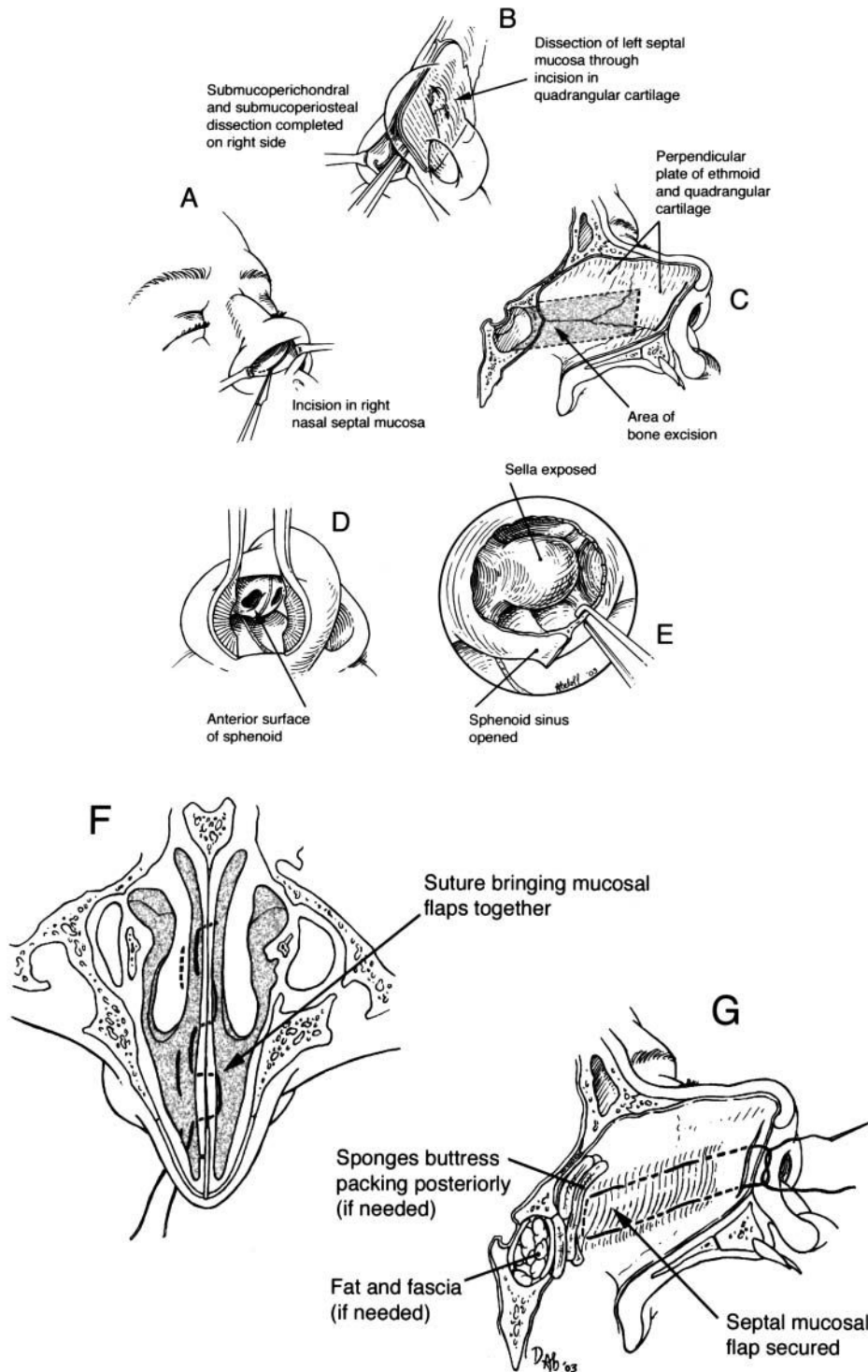


FIG. 1. A–E: Drawings illustrating the endonasal transsphenoidal approach. A: Endonasal incision. B: After completing the submucosal dissection on the right side, the quadrangular cartilage is incised 2 cm posterior to the rostral margin and a similar submucosal dissection of the nasal septum is completed on the left side. C: The posterior portion of the quadrangular cartilage and the perpendicular plate of the ethmoid bone are then removed. D: The mucosa on the rostrum of the sphenoid bone is elevated laterally on both sides until the sphenoid ostia are clearly visualized. E: The sphenoid sinus is opened with a micro-Kerrison punch to expose the sellar floor. F and G: Drawings illustrating the closure technique. The septal mucosal flaps are reapproximated by suturing them together with a running 4-0 plain gut suture on a short septal needle. The suture is begun anteriorly and superiorly, extending posteriorly, then brought back inferiorly from posterior to anterior in a continuous, mattress quilting fashion. Because the septal flaps are reapproximated, no packing is needed. If the sphenoid sinus has been packed with fascia and fat (in cases of intraoperative CSF leakage), small 1 × 2-cm sponges can be placed in the sphenothmoidal recess to buttress the sphenoid packing.

Endonasal transsphenoidal approach closure technique

submucoperiosteal dissection of the nasal septum is completed on the left side (dissection of the left nasal floor is not necessary). The posterior portion of the quadrangular cartilage and the perpendicular plate of the ethmoid bone are then removed. The keel of the vomer is identified, and the mucosa on the rostrum of the sphenoid bone is elevated laterally on both sides until the sphenoid ostia are clearly visualized. An appropriately sized and shaped bivalve self-retaining speculum is then placed and the operating microscope is brought into position. If the nostril is particularly small, the aperture can be widened with a relaxing alar incision or a columellar incision, similar to an open rhinoplasty or transcolumellar incision (this is rarely necessary). In such a case, however, the cartilaginous support of the nasal tip is left undisturbed to preserve the aesthetic appearance of the nose.

The sphenoid sinus is opened with a micro-Kerrison punch and the sphenoid intersinus septum is followed posteriorly to the sellar floor. Occasionally the intersinus septum may deflect laterally, which is easily detected on preoperative imaging. These deflections may insert into the bone covering the internal carotid artery. Such deflections are taken into account as the sphenoid intersinus septum is removed.

Once the sella turcica and dura mater are opened, the sellar tumor is removed with ringed curettes and microinstruments, as with any standard transsphenoidal resection.^{6,25} We use angled endoscopes to inspect areas that are hidden from the microscope's view. In our experience, this has been particularly useful to resect residual tumor that is hidden behind redundant folds of suprasellar arachnoid, as well as tumor extending into the cavernous sinus. If no CSF leakage is observed intraoperatively, closure proceeds as described later. If a tear in the arachnoid is encountered, however, sellar reconstruction is performed using autologous fascia lata and fat grafting to prevent a CSF fistula. A small piece of fascia lata is placed over the dural opening, and is buttressed in place with fat packed in the sphenoid sinus. A piece of Marlex mesh is custom fit to hold the fat within the sphenoid sinus as previously described.^{6,23,25} A Valsalva maneuver is performed after insertion of the graft to assess its integrity.

Closure Technique

To close the site, the speculum is removed and the septal mucosal flaps are reapproximated. The septal incision is closed with two or three interrupted 5-0 chromic gut sutures. The flaps are stitched together with a running 4-0 plain gut suture on a short septal needle. This straight needle is approximately 1 cm in length so that it is long enough to be passed through the septum from one nostril and grasped in the other nostril, yet short enough to be manipulated within the nasal cavity. A needle driver with an angled handle facilitates the placement of the suture (for example, needle driver No. 515217; Karl Storz Endoscopy, Culver City, CA). The needle can then be visualized with the aid of loupes and a standard headlight by using a long nasal speculum. Working through both nostrils, the needle is passed from one side to the other. The suturing is begun anteriorly and superiorly, extending posteriorly and then brought back inferiorly from posterior to anterior in a continuous, mattress quilting fashion (these are known as mattress sutures; Fig. 1). By working methodically in this way,

the flaps are kept tightly opposed as the surgeon proceeds posteriorly, maximizing the working space and visualization within the nasal cavity. The return of the suture inferiorly, from posterior to anterior, is then also readily seen. The suture is then easily tied in the anterior portion of the nasal cavity under direct visualization.

Because the septal flaps are reapproximated and the single septal incision is closed, no nasal packing is needed to prevent hematoma or bleeding. If the sphenoid sinus has been packed with fascia and fat (in cases of intraoperative CSF leakage), small 1 × 2-cm sponges (Kennedy sinus sponges; Medtronic Xomed, Jacksonville, FL) can be placed in the sphenoidal recess to buttress the sphenoid packing (Fig. 1). The sponges are typically separated from the packing with dissolvable material (for example, Gelfoam) to prevent adhesion and displacement of the packing during sponge removal. The small size of the sponge allows the patient to breathe through the nose postoperatively and causes minimal discomfort. The sponges are easily removed 2 or 3 days after the procedure.

Discussion

We describe a unique closure technique for the endonasal transseptal transsphenoidal approach that allows reapproximation of the submucosal flaps with a mattress suture. This obviates the need for full nasal packing, which is often a major source of discomfort in patients undergoing transsphenoidal surgery.³⁰ In our experience with 67 patients, 10 who had undergone previous transsphenoidal surgery followed by full nasal packing experienced significantly less discomfort with our approach. There was also an overall decrease in the use of narcotic drugs, which may be attributed to the decrease in postoperative discomfort caused by full nasal packing. All patients recovered rapidly without significant rhinological sequelae. When the sella turcica requires reconstruction, as in cases of intraoperative CSF leakage, we use small sponges in the sphenoidal recess to buttress the sphenoid fat packing. Because of the small size of the sponge, patients can continue to breathe through the nose postoperatively and experience minimal discomfort.

Alternatively, there are other minimally invasive approaches to the sella that do not require elevation of the mucosal flaps; these include the direct endoscopic endonasal transsphenoidal approach¹⁸ or the endonasal septal pushover technique.^{11,30} Both of these methods provide a direct route to the sphenoid sinus through the nasal cavity, thereby bypassing submucosal dissection and minimizing disruption of normal submucosal planes. Because submucosal dissection is not performed in these approaches, nasal packing is usually avoided. For pituitary surgeons who use an endonasal transseptal approach that involves submucosal dissection, however, the closure technique described here provides a simple method of approximating the mucosal flaps and avoiding nasal packing.

One potential drawback of the direct transnasal endonasal septal pushover technique is the deviation from a strictly midline approach. This problem, however, can be resolved with the use of angled endoscopes, which enable the surgeon to look around corners. The endonasal transsphenoidal approach that we perform maintains a relatively more midline approach than is used in the endonasal septal

pushover technique. With the speculum in the right nostril, there is a 1- to 2-mm deviation off the midline toward the left posteriorly. This "cross-court" view is advantageous for visualizing unilateral sellar tumors that are contralateral to the nostril. Thus, if a tumor projects more to one side, the contralateral nostril is used for the approach.

The technique we describe is an adaptation of a familiar approach. Our technique combines the advantages of binocular microscopy and bimanual dissection with the decreased rhinological morbidity associated with endoscopic resections. If necessary, a nasal endoscope can also be used to visualize and remove tumor hidden from the operating microscope's view. Our closure technique can be performed easily and eliminates the need for full nasal packing, which minimizes postoperative discomfort and rhinological morbidity.

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