Editorial

Extended transphenoidal approach

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We followed the lead of others by adopting the direct endonasal transphenoidal approach in the early 1990s, but very often we use the sublabial route for the extended approach because it provides a wider scope of exposure and the opportunity for the use of a broader retractor. This is very helpful in dealing with skull base manipulations, drilling of the floor of the skull, and obtaining suitable angles for direct bipolar cauterization of capsular feeders. In this article the authors make the point that the endonasal approach was suitable for their cases. I am sure that is true, but it seems a relatively minor point that one uses this approach to avoid the sublabial transphenoidal route to the skull base, which has been used so successfully for many years and with minimal complications.

Our group began using the endoscope relatively recently, in 1998, encouraged by the excellent contributions of de Divitiis. Cap abbianta, and others. It was the work of Dr. H. D. Jho, particularly his demonstration of the transphenoidal endoscopic removal of anterior skull-base meningiomas, that emboldened us to treat other midline lesions by using these concepts and the technological advances of image guidance and endoscopic instrumentation. This was amply demonstrated by the results of Oldfield’s group in dealing with suprasellar lesions as well. They demonstrated that suprasellar tumors could be removed by a transphenoidal trans–tuberculum sellae approach without injury to normal pituitary function. Our original series was reported in 2001 and since then we have enthusiastically pursued the approach and have investigated its utility and challenges.

The challenges of course include the selection of suitable patients. Not every patient with a midline suprasellar lesion is a candidate, and a good deal depends on the surgical anatomy, which is beautifully displayed by high-quality magnetic resonance imaging studies. These serve as a guide and roadmap to determine whether an extended transphenoidal approach will be safe and adequate for dealing with a given lesion. In the selection process the goals of surgery must be evaluated carefully as well, and for some cases in which palliation is the goal, the technique is quite safe and effective. In cases in which gross-total removal is the goal, the difficulties of dealing with the blood supply of the tumor...
and its possible adherence to important structures, such as the optic chiasm and the hypothalamus, must be considered. The technical aspects of the approach that we favor include the use of a lumbar drain inserted before surgery and left in place postoperatively for a period of approximately 48 hours.\textsuperscript{4,8,13} We almost always use image guidance to help us with the extent of resection of the skull base and, as mentioned above, decide on a direct endonasal or sublabial approach, depending on the amount of room and the scope of vision necessary. The amount of skull base removed varies depending on the lesion to be treated, and one must be cautious not to drill too widely at the level of the tuberculum, lest the optic nerves be injured. The carotid arteries (CAs) can be localized using both image guidance and the micro-Doppler probe, and this has been an important technical adjunct. Control of bleeding from the superior intracavernous sinus can often be challenging. In many cases it can be coagulated and in others we use a custom surgical clip applicator to control the sinus before it is divided. Once the dura mater over the sella turcica and planum is divided, one can accomplish an extraarachnoid dissection and expose the dorsal aspect of the pituitary gland, which often can be preserved intact. The pituitary gland is carefully protected. The arachnoid is opened, the capsule of the tumor is carefully delineated, and surface vessels are cauterized; the tumor is then debulked. In cases of meningioma, dural arterial feeding vessels can be coagulated to devascularize the lesion. Once the tumor is debulked, the capsule can be carefully mobilized and extracapsular feeding vessels can be controlled using long insulated bipolar forceps. As Al-Mefty\textsuperscript{1} has demonstrated, there is very often a good arachnoid plane between the dorsal aspect of a suprasellar meningioma and the optic chiasm itself. There is often an excellent similar plane against the CAs, but this is not always the case, and thus great caution is necessary while removing the lateral aspects of a suprasellar meningioma arising from the tuberculum sellae or the diaphragm itself.

Once the tumor capsule has been mobilized it can be carefully dissected under direct vision by using the microscope and endoscope, away from the optic chiasm, after which it must be dissected from adjacent vessels. The apex of the tumor represents the most difficult aspect of its removal and, in many cases of craniopharyngiomas, there is significant adherence to the brain at the most dorsal aspect of the tumor; this must be handled with great care and meticulous microsurgical technique. As the posterior aspect of the tumor capsule is mobilized, one can often identify and preserve the pituitary stalk by applying microsurgical methods and careful dissection. Hemostasis in the intracranial compartment is critical and must be handled in a very precise fashion.

All the aforementioned technical aspects are challenging, but closures of the dura mater and skull base bone defect represent the most serious and continual challenges; this is reflected in the high rate of postoperative cerebrospinal fluid (CSF) leak that was encountered in the series of Dussick, et al., and in our own experience. A perfect technique has not yet been devised, despite the valiant and ingenious methods that have been suggested.\textsuperscript{2,16,21,30}

Our current experience with the extended transsphenoidal skull base technique includes 56 patients who underwent surgery between 1999 and 2004. Forty-eight of these patients had lesions other than pituitary adenomas. They included 30 craniopharyngiomas, three entirely suprasellar Rathke cleft cysts, seven meningiomas, two germ cell tumors, one granular cell tumor, a salivary cyst, a chordoma of the superior clivus, a granulomatous lesion of the pituitary stalk, a case of solid lymphocytic hypophysitis involving the optic chiasm, and a hemangioblastoma.

Surgery was generally accomplished in a satisfactory fashion. There were two meningiomas that could not be removed, one because it was entirely suprasellar and without a dural attachment, and the other because it was simply too large and too firm to be mobilized and removed safely. One craniopharyngioma was not removed because of profuse bleeding from a very elaborate intercavernous sinus. One patient with a craniopharyngioma died postoperatively of a hemorrhage at the apex of the tumor. We were able to accomplish gross-total removal of 25 craniopharyngiomas, all three Rathke cysts, and five meningiomas.

Regarding outcomes of vision in our series, 12 patients had no visual problems before or after surgery. Twenty-three patients (64\%) with visual impairments improved, five (14\%) had unchanged vision, five (14\%) had transient decrease in vision, and three patients (8\%) had permanent worsening of their vision. There were no cases of postoperative blindness.

Cerebrospinal fluid leakage and meningitis occurred in 12.5\% of our patients. We had five patients with craniopharyngioma who experienced postoperative CSF leaks and one patient with a chordoma who had a hard-to-treat postoperative CSF leak. Five of these six patients also had meningitis, which developed in some in a delayed fashion; all responded to appropriate therapy (repeated transsphenoidal repair and antibiotic agents).

Although our approach has been fairly aggressive with regard to these very difficult lesions, we believe that the results are quite satisfactory when compared to traditional craniotomy approaches and this is reflected in the excellent postoperative quality of life of most of our patients.

We continue to work on the challenges, particularly those of effective closure of the skull base.

References