Endonasal resection of craniopharyngiomas

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Gardner and colleagues have described their series of 16 patients who underwent an endoscopic, expanded endonasal approach (EEA) for craniopharyngioma between 1999 and 2006. The primary outcomes of their study included the following: endocrine and ophthalmological results, extent of resection, and complications. The majority of their patients underwent planned complete resection. In these patients, 73% (8 of 11) had a gross-total resection without recurrence during a mean follow-up of 34 months. No patient in the series experienced visual worsening. The postoperative rate of permanent diabetes insipidus (DI) was 8%. Cerebrospinal fluid (CSF) leaks were documented in 58% of patients. In 1 patient, a stroke occurred from a perforating vessel from a posterior cerebral artery injury.

Of interest here is the classification of craniopharyngiomas into a system that is best appreciated by the endoscopic, endonasal neurosurgeon: Type I, preinfundibular; Type II, transinfundibular; and Type III, retroinfundibular. In theory, this is an attractive classification system. In practice, however, there will be instances in which the craniopharyngiomas are either too large and the stalk obscured, or the MR images will be inadequate to fully ascertain the location of the tumor with respect to the infundibulum. I would like to commend the authors on their willingness to tackle some of the more difficult types of craniopharyngiomas (for example, the Type IIIa and IIIb lesions) through an EEA. Years ago, I would have thought such an approach to the “retrochiasmatic” craniopharyngioma would have been impossible. Now, with the advent of the techniques that have been uniquely shared by the minimally invasive neurosurgeon and otolaryngologist and which are expounded on in this study, craniopharyngiomas of all types can be the target of EEA.

As with all new techniques that come forward for analysis when compared with established, conventional ones, a critical review of the complications must be undertaken. Here, it is clear that EEA for craniopharyngioma is well tolerated, and the vast majority of patients do well after tumor resection. Endocrine and ophthalmological functions were reasonably well preserved and/or maintained. The one area, of course, where greater strides will need to be taken and where improvements in technique will be mandatory is with the rate of CSF leakage. However, it sounds as though the authors are well on their way to improving their outcomes with CSF leaks by using vascularized mucosal flaps together with local reinforcement of the sellar floor.

This report by Gardner and associates is more than a technical note, but is not yet quite at the level of the larger published series on craniopharyngioma\(^1\)–\(^4\) in which more patients with craniopharyngioma have been studied and followed, in some instances, for longer periods of time. In all series, however, including the present one, recurrences of craniopharyngioma are a fact of life. The rate of recurrence may be as high as 40% in some series. The treatment of the recurrent craniopharyngioma is a vexing problem, and one wonders whether patients who were first treated using the EEA would again be candidates for a repeated procedure using this approach.

The EEA described here was performed in adults. As craniopharyngiomas commonly occur in children, it would be interesting to use this approach in the child with a craniopharyngioma. In this regard, the limitations would likely be similar to those observed with the transsphenoidal approach in this age group: small nares, nonpneumatized sella, and smaller midline corridor between the carotid arteries.

Finally, as the authors expand their series and gather more patients for analysis, I exhort them to analyze the effects of EEA on the neuropsychology of their patients. It is here that I suspect that EEA may be a beneficial approach over craniotomy and subfrontal or pterional approaches to craniopharyngioma.

References

Craniopharyngiomas

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“Craniopharyngiomas: transsphenoidal method of ap-
proach—for the virtuoso only?” is the title of the Ciric and Cozzens' presentation at the Congress of Neurological Surgeons meeting in Las Vegas, Nevada, in 1979. This question does not seem true but rather rhetorical, which is confirmed by the reasons reported by the authors. Coming almost 30 years later, the article by Gardner et al.—while observing the evolution of the technique, which is not limited as before to sellar lesions with suprasellar extension (preferably infradiphragmatic or cystic), but is targeted to the suprasellar ones—raises further questions and at the same time reinforces the provocation of Ciric and Cozzens. As a matter of fact there are few brain lesions with such a multiform aspect and an unpredictable biological behavior as craniopharyngiomas, whose optimal treatment is controversial. If it is true that the radical surgical approach is the only therapeutic option to ensure a long-term control of the disease, it is also true that the price to pay for the radicality at all costs is sometimes very high in terms of functional outcomes, which may help explain why many different surgical approaches have been used for the purpose and the alternatives to the classic surgical indications, especially in cases of children.

In most cases, craniopharyngiomas are tumors located in the midline skull base. There are no other surgical approaches other than the extended transsphenoidal approach that offer the advantage to visualize the tumor just after the dural opening without brain retraction. No other approach provides a good and close visualization of the relevant anatomy, a direct trajectory, and a wide window. The transsphenoidal approach is even more attractive when the surgeon is dealing with a recurrence, which is quite common in these lesions, and the tumor can be controlled from a different perspective, thus avoiding new brain manipulation. Over the last decade tremendous efforts have been made to overcome some of the major problems that have provoked criticisms to such a technique, namely better-quality endoscopic images and new surgical instruments and tools to render the overall procedure safer and more effective.

Our experience is in agreement with the report of Gardner et al. They point out the crucial role of the endoscope in the transsphenoidal management of suprasellar skull base lesions in that there are no limitations created by the transsphenoidal speculum. Even more central is the importance they attribute to the perfect knowledge of the once-unfamiliar anatomy of the approach and the relevance of the team strategy to add competences to open and go along well new surgical tasks.

Gardner and associates describe 16 adult patients harboring craniopharyngiomas located above the sella, superior and posterior to the chiasm and even in the third ventricle. Six of these patients had previously undergone surgery or radiosurgery, which is in line with similar reports. Some aspects need to be highlighted. Near-total resection was attained in 12 (75%) of the 16 patients, which is a good result. The quality of life after surgery was good in all but 1 patient, who suffered a posterior cerebellar artery infarct. There was no worsening in the patients’ ophthalmological conditions after surgery, and in fact almost all improved. All patients experienced excellent results in anterior pituitary function, which is not surprising given that the approach follows a supraglandular route. One patient suffered permanent DI and 4 suffered temporary DI, which seems like a good outcome, but it should be considered that the stalk was preserved also in infundibular craniopharyngiomas, which can expose to recurrence. Four patients with Type II tumors experienced recurrence or regrowth without stalk sacrifice. No patient died as a result of surgery, and there were no cases of bacterial meningitis. The vascular injury rate was 5%, which seems a good outcome. The major complication was cerebrospinal fluid (CSF) leakage. Over the course of their study, the CSF leakage rate decreased from 70% to 20% in the more recently treated cases.

Currently, a major problem that might limit the procedure is the high rate of postoperative CSF leakage, and no radically effective solution has been found yet. In the effort to lower such a rate, we have followed some of the indications proposed by the Pittsburgh group, like the use of the Foley balloon to hold the reconstruction material(s) in place and, more recently, the nasoseptal mucosal flap. At the moment we have adopted the use of the nasoseptal flap in 12 patients who underwent an extended transsphenoidal approach for suprasellar lesions. In this cohort we experienced 5 cases of CSF leakage, 3 of which were intraventricular craniopharyngiomas. If we analyze our present series of 17 patients with craniopharyngiomas who underwent surgery via an extended transsphenoidal approach, we have experienced 5 cases of CSF leakage, 4 of which were intraventricular craniopharyngiomas. Three of these were reconstructed with the nasoseptal flap. These patients with intraventricular craniopharyngiomas are a very challenging subgroup. They present with a direct communication of the third ventricle with the nasal cavities, and they must undergo a wide arachnoid dissection. However, the postoperative CSF leakage rate reaches unacceptable percentages, and the expectancies of the nasoseptal flap seem to have failed their promises in these circumstances. In our opinion it means that the reconstruction strategy is not yet fit to the purpose and that the solutions proposed (that is, multilayered planes, vascularized flap, and so on) are not completely adequate to the goal; none has been shown to reduce the rate of postoperative CSF leakage to an acceptable level (< 1%), as it currently is for the “standard” transsphenoidal pituitary surgery.

Nevertheless, as reported in some of our recent contributions the extended transsphenoidal approaches offer undeniable advantages in better visualization of the subchiasmatic and/or intraventricular area, where several suprasellar craniopharyngiomas arise and/or extend, when compared with the transcranial operations. Another advantage of the low-route approach is that the procedure can be performed regardless of the position of the chiasm and the sometimes low position of the anterior communicating artery complex, which may lead to a very difficult tumor resection in all types of basal transcranial approaches. When performing the dissection under direct visual control, the extended transsphenoidal route permits surgeons to reach from below the various types of craniopharyngiomas. Using the same surgical corridor, but depending on the site of the lesion, the surgeon can work either below or above the optic chiasm with minimal optic apparatus manipulation and through both sides of the stalk, thus managing both the suprasellar prechiasmatic and the intraventricular craniopharyngiomas. The trajectory afforded by the transsphenoidal approach permits the neurosurgeon to work along the same axis of the path of this type of craniopharyngioma.