Frontobasal Midline Meningiomas: Is It Right To Shed Doubt on the Transcranial Approaches? Updates and Review of the Literature

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■ BACKGROUND: **Traditionally, the surgical removal of tuberculum sellae meningioma (TSM) and olfactory groove meningioma (OGM) requires transcranial approaches and microsurgical techniques, but in the last decade endoscopic expanded endonasal approaches have been introduced: transcribriform for OGMs and transtuberculum-transplanum for TSM. A comparative analysis of the literature concerning the two types of surgical treatment of OGMs and TSM is, however, difficult.**

■ METHODS: **We conducted a literature search using the PubMed database to compare data for endoscopic and microsurgical techniques in the literature. We also conducted a retrospective analysis of selected cases from our series presenting favorable characteristics for an endoscopic approach, based on the criteria of operability of these lesions as generally accepted in the literature, and we compared the results obtained in these patients with those in the endoscopic literature.**

■ RESULTS: **We believe that making the sample more homogeneous, the difference between microsurgical technique and endoscopic technique is no longer so striking. A greater radical removal rate, a reduced incidence of cerebrospinal fluid fistula and, especially, the possibility of removing lesions of any size are advantages of transcranial surgery; a higher percentage of improvement in visual outcome and a lower risk of a worsening of a pre-existing deficit or onset of a new deficit are advantages of the endoscopic technique.**

■ CONCLUSION: **At present, the microsurgical technique is still the gold standard for the removal of the anterior cranial fossa meningiomas of all sizes, and the endoscopic technique remains a second option in certain cases.**

INTRODUCTION

Skull base meningiomas account for approximately 40% of all intracranial meningiomas.[1,2] The object of this study is an analysis of the surgical treatment of meningiomas originating from the midline structures of the anterior cranial fossa—olfactory groove, planum ethmoidalis, planum sphenoidalis, and tuberculum sellae—grouped under the names of olfactory groove meningiomas (OGMs) and tuberculum sellae meningiomas (TSMs). The former constitute 5%–15% of all meningiomas, and the second constitute 3%–13%.[1]

Traditionally, the surgical removal of these lesions requires transcranial approaches and microsurgical techniques,[3] but in the last decade endoscopic expanded endonasal approaches have been introduced: transcribriform for OGMs and transtuberculum-transplanum for TSM.[4,5] The advantages of these techniques are the direct view they give of the base of implant, with early devascularization of the lesion and without brain retraction or manipulation of the neurovascular structures.[6,7] The use of endoscopic approaches could change ultimately the removal of a skull base meningioma making it similar to that of a convexity meningioma.[5,8]

Confrontations between the supporters and detractors of endoscopic techniques have resulted in several attempts to compare the results of the latter with those of traditional approaches.[6,9] A comparative analysis of the literature concerning the two types of surgical treatment of OGMs and TSM is unreliable, because of the greater number of microsurgical cases and because traditional surgery allows to treat very different kind of lesions in term of size and involvement of anatomical structures, without any limitation.

Key words
- Endoscopic removal
- Microsurgical removal
- Olfactory groove meningioma
- Tuberculum sellae meningioma

Abbreviations and Acronyms
CSF: Cerebrospinal fluid
OGM: Olfactory groove meningioma
TSM: Tuberculum sellae meningioma

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The studies are often focused on endoscopic surgical technique, including different lesions for localization and histologic features.[10,11]

The goal of this study is to compare data on endoscopic and microsurgical techniques in the literature by eliminating the above bias as much as possible, in a retrospective analysis of cases of OGMs and TSMs treated with microsurgical technique at the Neurosurgery Department of Sapienza University of Rome from 2000 to 2014. Based on the criteria of operability of these lesion via endoscopic approach, as generally accepted in the literature,[5,6,12] we selected cases from our series presenting favorable characteristics for a similar approach, by comparing the results obtained in these patients with those in the endoscopic cases.

MATERIALS AND METHODS

We conducted a literature search using the PubMed database for a 10-year period from January 2005 to December 2014, using the following key words: olfactory groove meningioma, tuberculum sellae meningioma resection, microsurgery, endoscopy, and outcomes. We used the following combinations: endoscopic resection and tuberculum sellae meningioma, endoscopic resection and olfactory groove meningioma, microsurgery and tuberculum sellae meningioma, microsurgery and olfactory groove meningioma, outcome and olfactory groove meningioma, outcome and tuberculum sellae meningioma, planum sphenoidale meningioma and surgery, tuberculum sellae meningioma and surgery. The number of articles was 2215, from which the reviews, editorials, commentaries, case reports, articles of technical notes about the approaches, and anatomic studies were excluded, resulting in a list of 60 studies (Tables 1 and 2).

We also retrospectively analyzed our series of TSMs and of OGMs operated from January 2000 to December 2014 (Table 3). The medical records, preoperative and postoperative radiologic images for each of these patients were reviewed. From the total number of patients, and after careful review of the images, we selected those who, according to the criteria commonly accepted in the literature, could have been operated by endoscopic approach. The criteria used were: size < 4 cm, no carotid encasement, no cavernous sinus invasion, no optical nerve involvement or absence of optical canal invasion, extension not reaching above the middle orbital line, anterior limits crista galli and frontal sinus, predominant midline location. For all patients data related to pre-operative MRI were retrospectively collected (in order to identify patients eligible for the study) and we also collected data about post-operative MRI, on the basis of which the degree of removal was assessed. Data were also obtained from Medical records regarding visual outcome, the presence of a cerebrospinal fluid (CSF) fistula, the presence of postoperative seizures and mortality.

STATISTICAL ANALYSIS

The χ quadro test was used to perform the analysis and to compare groups, matching the following data about microscopic and endoscopic surgery for TSMs and OGMs:

- Visual function: postoperative improvement, unchanging and worsening
- Gross total removal
- Postoperative CSF leak
- Epilepsy
- Mortality

The following data were matched to our series on endoscopic surgery for TSMs and OGMs.

- Visual function: postoperative improvement, unchanging and worsening
- Gross total removal
- Postoperative CSF leak
- Epilepsy
- Mortality

The P value was considered statistically significant at <0.005.

RESULTS

From the literature search, we selected 60 articles. Of the 40 studies addressing microsurgical removal, 15 concern OGMs (652 patients) and 25 concern TSMs (1004 patients). The 20 studies regarding endoscopical removal are distributed as follows: 2 include only OGMs, 11 include only TSM, 6 include both types of meningioma, and 1 presents various types of cancers, but from which it is possible to deduce the outcome for OGM and TSM. One thousand six hundred fifty-six patients were treated with the microsurgical technique, and 292 were treated with the endoscopic technique (Tables 1 and 2).

When available, data were collected regarding postoperative results in terms of: extension of removal; visual outcome reported as improved, stable, or worse; the presence of CSF fistula; epilepsy; and mortality. Data regarding olfaction and cognitive outcome are reported in all microsurgical studies, whereas they are never mentioned in endoscopic studies, meaning that we cannot make a comparison.

In some series, the visual outcome reported refers to the entire series and not the proportion of patients with preoperative visual disturbances. For greater clarity, the data for postoperative visual outcome will refer to all patients with or without preoperative visual disturbances, as reported in the studies considered, rather than only to the group of patients with preoperative visual disturbances. The difficulty with adopting this methodology lies in discerning any new postoperative visual loss in cases of deterioration when an already compromised visual acuity is evident.

OGMs Microsurgical Approach (652 cases)

As shown in Table 1, preoperative visual impairment was present in 240 patients (36.80%). Of these, 94 patients (39.16%) have improved after surgery, 304 patients (73.79%) were stable, 14 patients (3.4%) worsened, and 52 patients (7.97%) developed a postoperative CSF fistula. The extent of the removal was complete (grade I/II