Abstract

To divide the anterior cranial fossa floor, from an endoscopic perspective, into five surgical corridors, to avoid damage to the olfactory system for preservation of preoperative olfactory function after endoscopic endonasal resection of OGMs. And, also to evaluate them as a mean to readily gain access to the anterior skull base for tumor resection.

These surgical corridors offer an accessible, and minimally invasive route, for resecting OGMs of small size, via an endonasal endoscopic approach, without compromising vital anatomic structures to olfaction. Although, their optimal application and means of combination, to best preserve olfaction, are currently unknown.

Introduction

Traditionally, the subfrontal, and ptterional approaches have been considered the standard transcranial routes to extirpate olfactory groove meningiomas (OGMs). Recently, however, with the evolution of minimally invasive techniques, the endoscopic endonasal approach (EEA) has been incorporated into the armamentarium of skull base surgery teams. Although most patients with OGM are anosmic at the time of diagnosis, some still have olfactory function. Smell preservation via EEA, however, has been considered impossible, and anosmia is considered an expected sequelae of this technique.

Methods and Materials

The nasal cavities of 23 cadaveric specimens were dissected. The cribiform plate, crista galli, the olfactory fila and the anterior and posterior ethmoidal arteries were preserved. Upon completing the dissection, the skull base was divided into five segments or corridors and their dimensions were measured, and their areas calculated. A simulation of the anterior skull base tumors was created using polyurethane insulating foam via supraciliary or bifrontal craniotomies to represent tumors of varying sizes. Subsequently, accessibility for their removal through each EEA corridor was evaluated.

Figure 1. Five surgical corridors.

Figure 2. Tumor models.

Figure 3. Areas calculated in each corridor.

Results

In all 23 specimens, the mean, median and the standard deviation of the area calculated for the right anterior corridor were of 142.3 mm², 132 mm² and 61.2 mm², respectively. For the left anterior corridor the mean, median and the standard deviation of the areas were of 142.6 mm², 140 mm² and 49.1 mm², respectively. The mean, median and standard deviation determined for the area of the right posterior corridor were 130.2 mm², 130 mm², and 29.6 mm², respectively. For the left posterior corridor, the calculated mean area was of 131.5 mm², while 132 mm² for the median and 43.0 mm² for the standard deviation. The mean and median values for the area of the corridor of the planum sphenoidei were of 273.3 mm² and 242 mm², respectively; while the standard deviation for the area of the planum sphenoidei was 84.4 mm². The differences among the anterior corridors on both sides, as well as among the posterior corridors on both sides were not found to be statistically significant. (Figure 3.)

Tumor models of different sizes were introduced intracranially through supraciliary or bifrontal craniotomies with the purpose of evaluating the size adequacy of each corridor for tumor resection. In cases where the tumor model was smaller than the area of the corridor under question, the dissection of a single corridor was sufficient. However, when the size of the model extended beyond the area of the corridor, the dissection had to be extended to involve the adjacent corridors. (Figure 2.)

Discussion

Management of olfactory groove meningiomas (OGMs) represents a considerable challenge to skull base surgeons, and, even though a variety of procedures have been proposed along the years to approach these tumors, none has been established as the gold standard. This study proposes a slight modification of the traditional expanded transcribriform endoscopic approach for resection of OGMs. The authors suggest dividing the anterior skull base into five segments based on anatomical boundaries, namely, a right anterior, left anterior, right posterior, left posterior and planum, which will serve as surgical corridors. This with the intention to tackle the issue of postoperative olfactory dysfunction. Taking advantage of these corridors to access pathologies of the anterior skull base, such as OGMs, in which the small tumor size allows minimally invasive access obviates the removal of the cribiform plate and crista galli, and minimizes the disruption of olfactory structures and their vascular supply at the roof of the nose, essentially preserving olfactory function.

Conclusions

These five surgical corridors offer an accessible, and minimally invasive route, for resecting small OGMs, via an endonasal endoscopic approach, without compromising structures vital to olfaction. However, at this time their optimal clinical application, to best preserve olfaction, remains undefined.

References