Extended endoscopic endonasal approach to the midline skull base: the evolving role of transsphenoidal surgery

P. Cappabianca, L. M. Cavallo, F. Esposito, O. de Dvitiis, A. Messina, and E. de Dvitiis

Division of Neurosurgery, Department of Neurological Sciences, Università degli Studi di Napoli Federico II, Naples, Italy

With 30 Figures

Contents

Abstract .......................................................................................................................... 152
Introduction .................................................................................................................. 153
Endoscopic anatomy of the midline skull base: the endonasal perspective .............. 154
  Anterior skull base .................................................................................................... 154
  Middle skull base ..................................................................................................... 156
  Posterior skull base .................................................................................................. 161
Instruments and tools for extended approaches ......................................................... 164
Endoscopic endonasal techniques .............................................................................. 166
  Basic steps for extended endonasal transsphenoidal approaches ......................... 166
  The transtuberculum-transplanum approach to the suprasellar area ..................... 169
    Surgical procedure .................................................................................................. 169
  Approach to the ethmoid planum ............................................................................ 177
  Approaches to the cavernous sinus and lateral recess of the sphenoid sinus (LRSS) ........................................................................................................... 178
  Approach to the clivus, cranio-vertebral junction and anterior portion of the foramen magnum ................................................................................................. 182
  Reconstruction techniques ...................................................................................... 184
Results and complications ............................................................................................ 187
Conclusions ..................................................................................................................... 190
Acknowledgements ....................................................................................................... 190
References ...................................................................................................................... 190
Abstract

The evolution of the endoscopic endonasal transsphenoidal technique, which was initially reserved only for sellar lesions through the sphenoid sinus cavity, has led in the last decades to a progressive possibility to access the skull base from the nose. This route allows midline access and visibility to the suprasellar, retrosellar and parasellar space while obviating brain retraction, and makes possible to treat transsphenoidally a variety of relatively small midline skull base and parasellar lesions traditionally approached transcranially.

We report our current knowledge of the endoscopic anatomy of the midline skull base as seen from the endonasal perspective, in order to describe the surgical path and structures whose knowledge is useful during the operation. Besides, we describe the step-by-step surgical technique to access the different compartments, the “dangerous landmarks” to avoid in order to minimize the risks of complications and how to manage them, and our paradigm and techniques for dural and bony reconstruction. Furthermore, we report a brief description of the useful instruments and tools for the extended endoscopic approaches.

Between January 2004 and April 2006 we performed 33 extended endonasal approaches for lesions arising from or involving the sellar region and the surrounding areas. The most representative pathologies of this series were the ten craniopharyngiomas, the six giant adenomas and the five meningiomas; we also used this procedure in three cases of chordomas, three of Rathke’s cleft cysts and three of meningo-encephaloceles, one case of optic nerve glioma, one olfactory groove neuroendocrine tumor and one case of fibro-osseous dysplasia.

Tumor removal, as assessed by post-operative MRI, revealed complete removal of the lesion in 2/6 pituitary adenomas, 7/10 craniopharyngiomas, 4/5 meningiomas, 3/3 Rathke’s cleft cyst, 3/3 meningo-encephalocele.

Surgical complications have been observed in 3 patients, two with a craniopharyngioma, one with a clival meningioma and one with a recurrent giant pituitary macroadenoma involving the entire left cavernous sinus, who developed a CSF leak and a second operation was necessary in order to review the cranial base reconstruction and seal the leak. One of them developed a bacterial meningitis, which resolved after a cycle of intravenous antibiotic therapy with no permanent neurological deficits. One patient with an intra-suprasellar non-functioning adenoma presented with a generalized epileptic seizure a few hours after the surgical procedure, due to the intraoperative massive CSF loss and consequent presence of intracranial air. We registered one surgical mortality.

In three cases of craniopharyngioma and in one case of meningioma a new permanent diabetes insipidus was observed. One patient developed a sphenoid sinus mycosis, cured with antifungal therapy. Epistaxis and airway difficulties were never observed.

It is difficult today to define the boundaries and the future limits of the extended approaches because the work is still in progress. Such extended