Endoscopic endonasal approach to Meckel's cave

Zoli et al. published all patients with Meckel's cave tumors treated at Bologna by endoscopic endonasal approach (EEA) between 2002 and 2016. Patients underwent brain MRI, CT angiography, and neurological evaluation before surgery. Complications were considered based on the surgical records. All examinations were repeated after 3 and 12 months, then annually. The median follow-up was of 44.1 months (range 16-210).

The series included 8 patients (4 F): 5 neuromas, 1 meningioma, 1 chondrosarcoma, and 1 epidermoid cyst. The median age at treatment was 54.5 years (range 21-70). Three tumors presented with a posterior fossa extension. Radical removal of the MC portion of the tumor was achieved in 7 out of 8 cases. Two patients developed a permanent and transitory deficit of the sixth cranial nerve, respectively. No tumor recurrence was observed at follow-up.

In this preliminary series, the EEA appeared an effective and safe approach to MC tumors. The technique could be advantageous to treat tumors located in the antero-medial aspects of MC displacing the trigeminal structures posteriorly and laterally. A favorable index of an adequate working space for this approach is represented by the ICA medialization, while tumor extension to the posterior fossa represents the main limitation to radical removal of this route [1].

The EE transmaxillary transinferior orbital fissure approach was simulated in 10 specimens. The approach included an ethmoidectomy followed by an extended medial maxillectomy with transposition of the nasolacrimal duct. The infraorbital fissure was opened, and the infraorbital neurovascular bundle was transposed inferiorly. A quadrilateral space, bound by the maxillary nerve inferomedially, ophthalmic nerve superomedially, infraorbital nerve inferolaterally, and floor of the orbit superolaterally, was exposed. The distances from the foramen rotundum (FR) to the ICA, orbital apex (OA), and infratemporal crest (ITC) and from the OA to the ICA and ITC were measured.

The distances obtained were FR-ICA = 19.42 ± 2.03 mm, FR-ITC = 18.76 ± 1.75 mm, FR-OA = 8.54 ± 1.34 mm, OA-ITC = 19.78 ± 2.63 mm, and OA-ICA = 20.64 ± 142 mm. Two imaginary lines defining safety boundaries were observed between the paraclival ICA and OA, and between the OA and ITC (safety lines 1 and 2).

The reported approach provides a less invasive route compared to contemporary approaches, allowing expanded views and manipulation anteromedial and anterolateral to MC. It may be safer than the existing approaches as it does not require transposition of the ICA, infratemporal fossa, and pterygopalatine fossa, and allows access to tumors located anteriorly on the floor of the middle cranial fossa [2].

Many benign and malignant tumors as well as other inflammatory or vascular diseases may be located in the areas of Meckel's cave or the cavernous sinus. Except for typical features such as for meningiomas, imaging may not by itself be sufficient to choose the best therapeutic option. Thus, even though modern therapy (chemotherapy, radiotherapy, or radiosurgery) dramatically reduces the field of surgery in this challenging location, there is still some place for surgical biopsy or tumor

removal in selected cases. Until recently, the microscopic subtemporal extradural approach with or without orbitozygomatic removal was classically used to approach Meckel's cave but with a non-negligible morbidity. Percutaneous biopsy using the Hartel technique has been developed for biopsy of such tumors but may fail in the case of firm tumors, and additionally it is not appropriate for anterior parasellar tumors. With the development of endoscopy, the endonasal route now represents an interesting alternative approach to Meckel's cave as well as the cavernous sinus.

Jouanneau et al. from the Pierre Wertheimer Hospital, described the modus operandi and discuss what should be the appropriate indication of the use of the endonasal endoscopic approach for Meckel's cave disease in the armamentarium of the skull base surgeon [3].

Van Rompaey et al performed an endoscopic endonasal approach as well as a lateral approach to the Meckel cave on six anatomic specimens. To access the Meckel cave endoscopically, a complete sphenoethmoidectomy and maxillary antrostomy followed by a transpterygoid approach was performed. For lateral access, a pterional craniotomy with extradural dissection was performed.

The endoscopic endonasal approach allowed adequate access to the Gasserian ganglion. All the relevant anatomy was identified without difficulty. Both approaches allowed for a similar exposure, but the endonasal approach avoided brain retraction and improved anteromedial exposure of the Gasserian ganglion. The lateral approach provided improved access posterolaterally and to the superior portion.

The endoscopic endonasal approach to the Meckel cave is anatomically feasible. The morbidity associated with brain retraction from the open approaches can be avoided. Further understanding of the endoscopic anatomy within this region can facilitate continued advancement in endoscopic endonasal surgery and improvement in the safety and efficacy of these procedures [4].

The opening of Meckel's Cave may be particularly useful for lesions located in the cerebellopontine angle having a minor component that extends anteriorly and laterally in the middle cranial fossa [5].

1)
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