Amygdalohippocampectomy via the Lateral Extended Transsphenoidal Endoscopic Approach Through the Pterygopalatine Fossa: An Anatomic Study

Pavel Kalinin[1], Oleg Sharipov[1], Maxim Kutin[1], Dmitry Fomichev[1], Andreis Gavrjushin[1], Georgiy Polev[2], Yevgeny Shults[1], Klementina Avdeeva[3]

BACKGROUND: **The lateral extended transsphenoidal endoscopic approach (LETEA) is used to remove tumors located lateral to the cavernous segment of the internal carotid artery under direct visual control and provides access to Meckel cave, pterygopalatine fossa, medial part of the middle cranial fossa, and orbit. We describe an extended transsphenoidal approach to the amygdalohippocampectomy through the pterygopalatine fossa.**

METHODS: **The LETEA to the middle cranial fossa through the pterygopalatine fossa was studied on 3 injected human cadavers at the Burdenko Neurosurgery Institute in Moscow, Russia.**

RESULTS: **LETEA and trepanation of the greater wing of the sphenoid bone allow access to the medial part of the middle cranial fossa. Medial segments of the temporal lobe (hippocampus and amygdala) and the temporal pole were removed under guidance of the 45° angled endoscope.**

CONCLUSIONS: **LETEA through the pterygopalatine fossa is minimally invasive and provides direct access to the temporal pole and medial part of the temporal lobe. This approach may reduce risk of neurologic deficit and help to avoid cosmetic defects in the frontotemporal region associated with injury to temporal muscle and facial nerve injury as can occur during transcranial approaches. Disadvantages that limit application of LETEA include risk of cerebrospinal fluid leak and skills needed for manipulation in a narrow and deep surgical field with angled 30° and 45° endoscopes.**

INTRODUCTION

Transsphenoidal procedures represent an efficient surgical option for treatment of chiasm-sellar tumors.[1,2] Cumulative experience of endoscopic procedures and the implementation of extended transsphenoidal approaches show that transsphenoidal surgery is an alternative choice for removal of not only pituitary adenomas but also craniopharyngiomas, chordomas, tuberculum sellae meningiomas, trigeminal schwannomas, and epidermoid cysts (cholesteatomas) of the chiasmatic region and posterior cranial fossa.[3,4] New anatomic data obtained from cadaveric studies broaden the indications for endoscopic approaches in neurosurgery. For example, Chen et al.[5] proposed an endoscopic transorbital approach for amygdalohippocampectomy as an alternative to well-known microsurgical external approaches.

The lateral extended transsphenoidal endoscopic approach (LETEA) is used to remove tumors located lateral to the cavernous segment of the internal carotid artery (ICA) under direct visual control. Additional resection of the skull base osseous structures (posterior ethmoid cells, posterior wall of the maxillary sinus, base of the pterygoid process, greater wing of the sphenoid bone) provides access to Meckel cave, pterygopalatine fossa, medial part of the middle cranial fossa, and orbit.[2,3] In this article, we describe an extended transsphenoidal approach to the amygdalohippocampectomy through the pterygopalatine fossa.

MATERIALS AND METHODS

At the Burdenko Neurosurgery Institute in Moscow, Russia, LETEA to the middle cranial fossa through the pterygopalatine fossa was studied on 3 injected human cadavers. The study used rod-lens endoscopes (4-mm diameter, 18-cm length) with 0°, 30°, and 45° angled lenses (Karl Storz, Tuttlingen, Germany), high-definition camera, and video monitor.

Key words
- Amygdalohippocampectomy
- Extended transsphenoidal endoscopic approach
- Transsphenoidal surgery

Abbreviations and Acronyms
ICA: Internal carotid artery
LETEA: Lateral extended transsphenoidal endoscopic approach
V2: Second branch of trigeminal nerve
V3: Third branch of trigeminal nerve

From the [1]Burdenko Neurosurgery Institute, Moscow; [2]Federal Scientific Clinical Center of Pediatric Hematology, Oncology and Immunology named after Dmtriy Rogachev, Moscow; and [3]Clinical Diagnostic Center Medsi, Moscow, Russia

To whom correspondence should be addressed: Oleg Sharipov, Ph.D. [E-mail: sharipof86@gmail.com]

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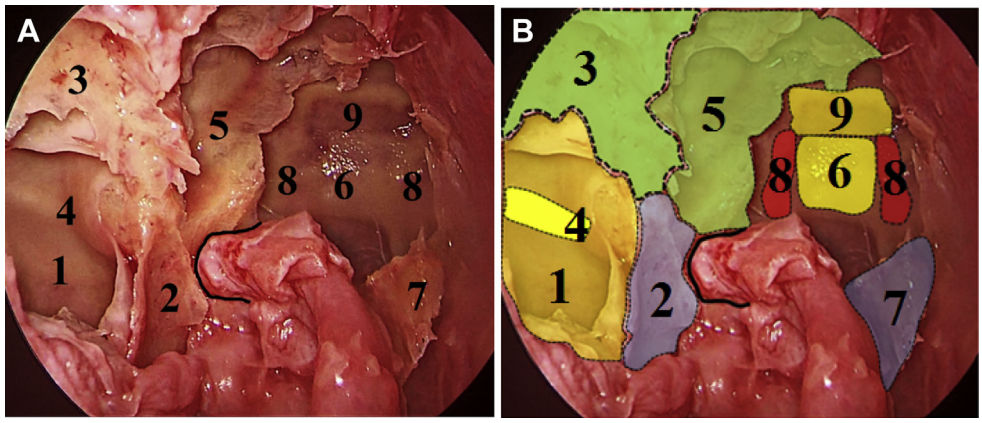

Figure 1. Endoscopic approach to the right sphenoid and maxillary sinuses. (**A**) Anatomic preparation. (**B**) Scheme (30° endoscopic view). Posterior cells of the ethmoid bone and medial wall of the maxillary cavity have been removed. Pterygopalatine fossa is limited by the maxillary cavity posterior wall on the front (1) and by the palatal bone on the side (2). Resection of the posterior cells of the ethmoid bone provides direct access to the lateral recess of the sphenoid sinus cavity. 3, medial orbit wall; 4, infraorbital nerve fissure; 5, partially excised ethmoid bone posterior cells; 6, sella; 7, rostrum; 8, carotid protuberance; 9, planum sphenoidale. The sphenopalatine foramen is marked with a black line (entry of the sphenopalatine artery into the nasal cavity).

With a o° endoscope, an endonasal approach to the right maxillary and sphenoid sinuses was performed. Removal of the uncinate process, the medial wall of the maxillary sinus, and the posterior ethmoids allows precise visualization of the anterior wall of the pterygopalatine fossa, the posterolateral wall of sphenoid sinus, and the medial orbital wall (Figure 1). The contents of the pterygopalatine fossa can be visualized after removal of the maxillary cavity posterior wall: a pterygopalatine ganglion, the vidian nerve and artery, and a maxillary artery (Figure 2). Next, resection of the base of the pterygoid process was performed using a 30° angled endoscope (Figure 3). The vidian nerve is the main anatomic landmark for locating the ICA. Meckel cave, containing the trigeminal ganglion, is limited by the ICA inferiorly and medially, by the second branch of trigeminal

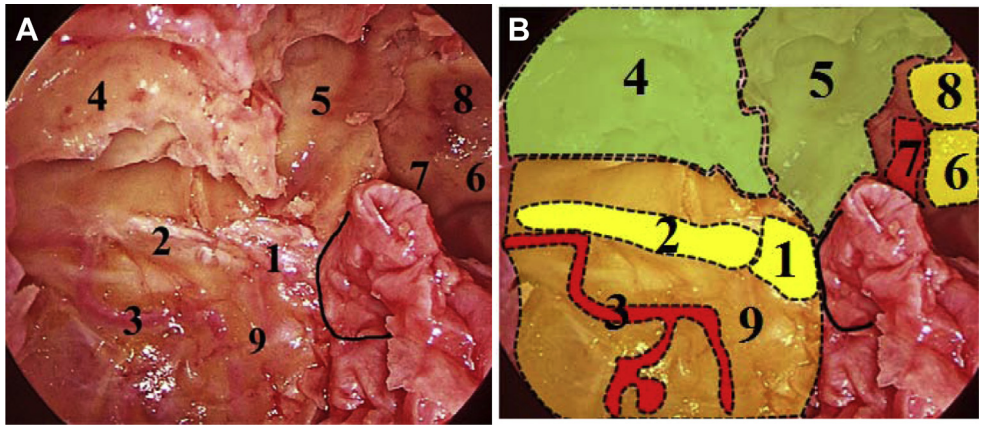

Figure 2. Endoscopic approach to the pterygopalatine fossa on the right side. (**A**) Anatomic preparation. (**B**) Scheme (30° endoscopic view). The maxillary cavity posterior wall and the palatal bone process have been removed, which allows access to the pterygopalatine fossa. 1, pterygopalatine ganglion; 2, infraorbital nerve; 3, maxillary artery; 4, medial orbit wall; 5, partially resected posterior cells of the ethmoid bone; 6, sella; 7, internal carotid artery; 8, planum sphenoidale; 9, pterygopalatine fossa (highlighted with orange). The sphenopalatine foramen is marked with a black line (entry of the sphenopalatine artery into the nasal cavity).