Endoscopic Endonasal Surgery of Epidermoid Cysts of the Chiasmatic Region

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BACKGROUND: **Despite the rarity of epidermoid cysts in the chiasmatic region, their surgical treatment is particularly complicated because of the tendency toward massive dissemination of the epidermoid masses along cerebrospinal fluid pathways and significant deviation of the tumor from the midline.**

OBJECTIVE: **The purpose of the present work is evaluation of the role of extended transsphenoidal endoscopic endonasal approaches in the surgery of epidermoid cysts.**

METHODS: **The study included 6 patients with epidermoid cysts in the chiasmatic region who were operated on at the Burdenko Neurosurgery Institute in the last 5 years using an anterior extended transsphenoidal endoscopic endonasal approach.**

RESULTS: **The epidermoid masses were totally removed in 5 patients, but in no patient was it possible to completely remove the epidermoid cyst capsule. Visual deterioration was not noted in any patient, nor did new focal neurologic symptoms appear. One of the patients developed hypopituitary disorders in the postoperative period. No recurrence of the epidermoid cysts was observed during the follow-up period.**

CONCLUSIONS: **Removal of epidermoid cysts in the chiasmatic region using an anterior extended transsphenoidal endoscopic approach may be an alternative to transcranial microsurgery operations. This technique is widely accepted as an approach to this area.**

INTRODUCTION

Epidermoid cysts (cholesteatomas) are intracranial neoplasms and amount to not more than 1% of all intracranial neoplasms.[1] Intracranial epidermoid cysts are most frequently located in the air cells of the petrous part of the temporal bone, extending into the pontocerebellar angle, as well as in the chiasmatic region.

The pathogenesis of epidermoid cysts is typically related to pathologic processes in the inner ear region, such as chronic inflammation, injuries, and hemorrhages, leading to impaired drainage of the air cells of the petrous part of the temporal bone.[2,3] Also, congenital epidermoid cysts supposedly appear out of ectodermal epithelial fragments in the course of secondary cerebral vesicle formation or those remaining in the closed neural tube cavity.[4]

Microscopically, epidermoid cysts have an undulating pale gray surface and a lobulated inner structure with a laminar creamy consistency that consists primarily of keratohyalin. Epidermoid cysts have a tendency for accretion around vessels and cranial nerves, disseminating along the cerebrospinal fluid cisterns of the skull base. The microscopic structure of the cyst walls consists of desquamating stratified squamous cornified epithelium, which lies on a thin basal membrane. The cyst cavity consists of a keratinlike substance containing crystalline cholesterol. Unlike dermoid cysts, epidermoid cysts do not contain dermal rudiments, such as hair follicles and sebaceous glands.

Diagnosis of epidermoid cysts is based on data obtained from computed tomography (CT) and magnetic resonance imaging (MRI) examination. On CT scans, the density of epidermoid cysts is less than or similar to that of the cerebrospinal fluid (up to −30 HU); they do not accumulate the contrast substance. In 15%–20%, calcifications are encountered within the cyst. On MRI examination in T1 mode, epidermoid cysts are usually hyper

Key words
- Cholesteatoma
- Epidermoid cyst
- Extended transsphenoidal
- Endoscopic endonasal approach
- Transsphenoidal surgery

Abbreviations and Acronyms
EETA: Extended endoscopic transsphenoidal approaches
CT: Computed tomography
MRI: Magnetic resonance imaging

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intensive, and in T2 mode, they are isointensive compared with cerebrospinal fluid.

Clinical symptoms of epidermoid cysts are nonspecific and related to the compressing influence of the cyst on the basal brain and cerebral nerves manifested in the form of headaches, deterioration of visual acuity, and epileptic seizures.

Until recently, transcranial approaches have been exclusively used for surgical treatment of epidermoid cysts in the chiasmatic area.[5,6] However, for the last decade, as a result of rapid development of endoscopic technologies and improvement of extended endoscopic transsphenoidal approaches (EETAs), the surgical treatment of suprasellar neoplasms, including epidermoid cysts of the chiasmatic area, has undergone fundamental changes.[7-11]

The existing publications in the PubMed system using the key words "cholesteatoma" and "epidermoid cyst" are largely devoted to various aspects of diagnostics and treatment of epidermoid cysts in the pontocerebellar angle and in the temporal bone.

The goal of the present work is evaluation of the role of EETA in the surgical treatment of epidermoid cysts.

METHODS

The present study included 6 patients with epidermoid cysts in the chiasmatic region who were operated on at the Burdenko Neurosurgery Institute by the authors of this article (P.K., D.F., M.K.) in the last 5 years using anterior EETA.

All patients were examined before and after the operation according to a common protocol, including hormone status analysis; assessment of the neurologic, neuro-ophthalmologic, and endocrinologic status; and radiologic examinations (CT, MRI).

Clinical symptoms included visual symptoms (bitemporal hemianopia and visual loss) with various degrees of manifestation (4 patients), headache (2 patients), and hypopituitary disorders such as panhypopituitarism and diabetes insipidus (1 patient). The patients' clinical characteristics are presented in Table 1.

In 4 cases, endoscopic endonasal operations were the primary mode of treatment for newly diagnosed epidermoid cysts. Two patients had been previously operated on for epidermoid cysts (patient 3, paramedian approach for an epidermoid cyst in the pontocerebellar angle; patient 5, subfrontal approach for an epidermoid cyst in the chiasmatic region). The mean follow-up was 42 months (range, 6–120 months).

Surgical Technique

In 1 case, we used neuronavigation for surgical planning, the endoscopic approach, and intraoperative orientation (BrainLab AG, Germany). Extended transsphenoidal endonasal operations consist of several stages: the nasal, sphenoidal, and tumor resection stages and plastic closure of the skull base defects. At the nasal and sphenoidal stages, a standard approach to the fundus of the sellar fossa and the planum sphenoidale is performed, to be completed later by trepanation of these bone structures. The main features of the anterior extended approach at these stages is posterior ethmoidectomies, wide sphenoidotomy, and removal of the entire sphenoid septum. For removal of the tuberculum sellae and planum sphenoidale, we use Kerrison rongeurs and a transsphenoidal diamond drill. Removal of the planum sphenoidale is limited laterally by the optic canals. The frontal edge of the bone resection is determined based on the size and neoplasm growth. After adequate bone removal, the dura is opened with microscissors in the middle in the front-rear direction. Bleeding from the superior intercavernous sinus was controlled using Surgicel (Ethicon Inc., U.S.) and bipolar or monopolar cautery.

Later, microscissors or a scalpel are used to open the dura of the planum sphenoidale and the sellar fossa. At this stage, careful coagulation of the upper intercavernous sinus by means of monopolar or bipolar coagulation is required.

Removal of the epidermoid cyst tissue is performed under the control of 30°, 45°, and 70° 18-cm, 4-mm endoscopes (Karl Storz, Tuttlingen, Germany) using various suction tubes, curettes, and dissecting devices.[12] Extended endonasal surgery is not possible without well-concerted efforts *à quatre mains* together with an assistant trained to perform these surgical interventions.

The vascular and nervous structures of the chiasmatic region are located within the epidermoid masses (anterior cerebral and posterior communicating arteries, the optic and oculomotor nerves), which may be significantly displaced versus their normal anatomic position and sharply atrophied (occasionally amounting to a thin semitransparent tissue).

Table 1. The Patients' Clinical Characteristics

Number	Sex, Age (years)	Preoperative Symptoms	Postoperative Symptoms	Previous Surgical Procedures
1	F, 32	Bitemporal hemianopia, visual loss	Vision unchanged, hypocorticism	
2	M, 20	Bitemporal hemianopia, visual loss	Vision recovery	
3	F, 50	Bitemporal hemianopia, visual loss, panhypopituitarism, diabetes insipidus	Vision and endocrinologic symptoms unchanged	Transcranial removal via paramedian approach
4	F, 41	Headache	Regress headache	
5	F, 53	Bitemporal hemianopia, visual loss	Vision unchanged	Transcranial removal via subfrontal approach
6	F, 32	Headache	Regress headache	

F, female; M, male.