

МЕДИЦИНА И СТОМАТОЛОГИЯ

THE CASE OF BILATERAL DEFECTS OF THE LATERAL RECESSES OF THE SPHENOID SINUS

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Abstract. Spontaneous defects of the lateral recess of the sphenoid sinus are results from incomplete fusion of the greater sphenoid wing bone with the basisphenoid. This anomaly is known as the lateral craniopharyngeal canal or the Sternberg's canal. However, the exact mechanisms of the formation of defects in the lateral recess are still poorly understood and cause much controversy. The progressive erosion of the skull base in patients with increased intracranial pressure and well pneumatized sphenoid sinus may result in focal areas of dehiscence and herniation of intracranial contents. In this article, we present a rare case of the development of bilateral meningocele of the lateral recess of the sphenoid sinus with a recurrent bilateral cerebrospinal fluid leak. A 38 old female patient presented to our clinic with rhinorrhea when the head was tilted forward. A computer cisternography scan of the sinuses showed that the patient has bilateral meningoencephalocele of the lateral recesses of the sphenoid sinus. The operation “Endoscopic endonasal plasty of complex skull base defects in the lateral recesses of the sphenoid sinus on the left and right under the control of the Medtronic fusion navigation system” was performed. In the postoperative period, no complaints. The patient was discharged on day 6 after surgery.

Key words: Cerebrospinal fluid leak, meningoencephalocele, sphenoid sinus, sternberg's canal, endoscopic, transpterygoid approach, skull base

Введение.

Spontaneous defects of the lateral recess of the sphenoid sinus are results from incomplete fusion of the greater sphenoid wing bone with the basisphenoid. [1-3]. This anomaly is known as the lateral craniopharyngeal canal or the Sternberg's canal. [4]. However, the exact mechanisms of the formation of defects in the lateral recess are still poorly understood and cause much controversy. Many authors argue that meningocele and cerebrospinal fluid of this localization occurs as a result of increased intracranial pressure, hyperpneumatization of the sphenoid sinus and obesity [5-6].

The most common symptom in this pathology is nasal liquorrhea, which is manifested by cerebrospinal leak from the nasal cavity when the head is tilted. Other manifestations of the disease include headache, recurrent meningitis, coughing at night. [7-9]. Preoperative CT cystornography imaging for bony detail and MR imaging for soft tissue detail is critical for assessing pathology of the skull base. In some cases, when performing computed tomography of the brain, it is possible to detect meningocele as an accidental find [10-12]

Meningocele and cerebrospinal fluid leak from the lateral recess can lead to potentially fatal complications, such as meningitis, brain abscess or pneumocephalus. Therefore, some authors recommend surgical treatment, even in cases where there is no evidence of cerebrospinal fluid leak or there was no history of meningitis. [13-14].

Transcranial approach to the treatment of nasal CSF leak is gradually becoming less preferable due to its difficulty, possibility of trauma and a high risk of damaging the vital structures. Nowadays the choice

falls on the transsphenoidal, transthemoidal and transpterygoid approaches in endoscopic endonasal surgeries on the sphenoid sinus

The choice of the approach depends on the surgeon's experience, availability of the necessary tools, anatomical features of the patient and the location of the defect of sphenoid sinus [15, 16].

In this article, we present a rare case of the development of bilateral meningocele of the lateral recess of the sphenoid sinus with a recurrent bilateral cerebrospinal fluid leak.

Описание клинического случая.

A 38 old female patient presented to Institution “N.N. Burdenko National Scientific and Practical Center for Neurosurgery” with rhinorrhea when the head was tilted forward.

Life history: Childhood infections, obesity of the first degree. Craniocerebral injuries and allergic reactions are denied

Medical history: One year ago, the patient began to notice the flow of clear fluid from the left nasal passage, which periodically spontaneously ceased, then again recurred. She was treated at the place of residence with a diagnosis of allergic rhinitis without effect. After 6 months, the patient turned to the Novosibirsk Regional Hospital, where cerebrospinal leak was suspected and computerized cisternography was performed. After that, on the left, the discharge stopped, but appeared on the right. A computer cisternography scan of the sinuses showed that the patient has bilateral meningoencephalocele of the lateral recesses of the sphenoid sinus. The patient was sent to Institution “N.N. Burdenko National Scientific and Practical Center for Neurosurgery” for further treatment.

Objective data on admission: satisfactory condition. Somatically and neurologically preserved. ENT-examination: signs of nasal liquorrhea on the right are noted. Examination by an ophthalmologist: there were no signs of congestive optic discs, there were no oculomotor symptoms. The CT of the brain for the navigation system shows destructive changes in the

lateral recesses of the sphenoid sinus on the left and right, with the presence of meningocele in them. The ventricular system is not enlarged. Convex subarachnoid spaces are not expanded [5, 6]. The median structures are not biased. Basal tanks are traced (figure 1). Клинические анализы крови, мочи, ликвора в норме.



Figure 1 CT (frontal projection). Bilateral defects of the lateral recess of the sphenoid sinus (indicated by arrows). The lines connect the round foramen and the channel of the Vidian nerve.

Clinical diagnosis: Complex skull base defects. Spontaneous relapsing nasal liquorrhea. Bilateral defects of the lateral recesses of the sphenoid sinus.

Course of treatment: under general anesthesia, the operation “Endoscopic endonasal plasty of complex skull base defects in the lateral recesses of the sphenoid sinus on the left and right under the control of the Medtronic fusion navigation system” was performed. Lumbar puncture was performed during the operation. At the same time, cerebrospinal fluid pressure was increased and amounted to 200 mm. water pillar. A lumbar drain was inserted before surgery.

During the operation, the Medtronic fusion navigation system was used. Two-sided transpterygoid approach was performed. This method is commenced with the processus uncinatus, resection and the highest possible posterior expansion of the maxillary sinus ostium. After that basal plate of the middle turbinate is perforated, and the cells of ethmoid sinus are widely opened. This is followed by expanding the opening of the sphenoid sinus and removing posterior wall of the maxillary sinus with clipping or coagulating a. Sphenopalatina and its branches. During the final stage of the procedure, an anterior wall of the sphenoid sinus is gradually removed, since it actually serves as the

posterior wall of the sphenopalatine fossa, which allows a possibility for a better view of the lateral sections of the sinus with 00 endoscope and for manipulation with straight tools. As a result of a thorough anatomical dissection in the fossa itself, standard transthemoidal sphenotomy, and resection of the winged process of the sphenoid bone, an access route to the lateral sections of sphenoid sinus is formed, which is restricted downwards by a mobilized maxillary artery and which is divided into two parts by the nerve structures of the sphenopalatine fossa- pterygopalatine ganglion and the Vidian nerve. During the procedure, the vessels are coagulated and the nervous structures are moved laterally, this way anterior wall of the sphenopalatine fossa becomes exposed, making it possible to remove it with the drill and subsequently to localize CSF fistula.

After ensuring an access to the problematic location, in case meningocele was detected it was removed, further step was identifying the skull base defect and carrying out reconstruction using fascia lata, bone of the nasal septum and mucoperiosteum attached to the nasal septum fixed by fibrin-thrombin glue “Evicel”. (figure 2 a-d, рис 3 a,b)

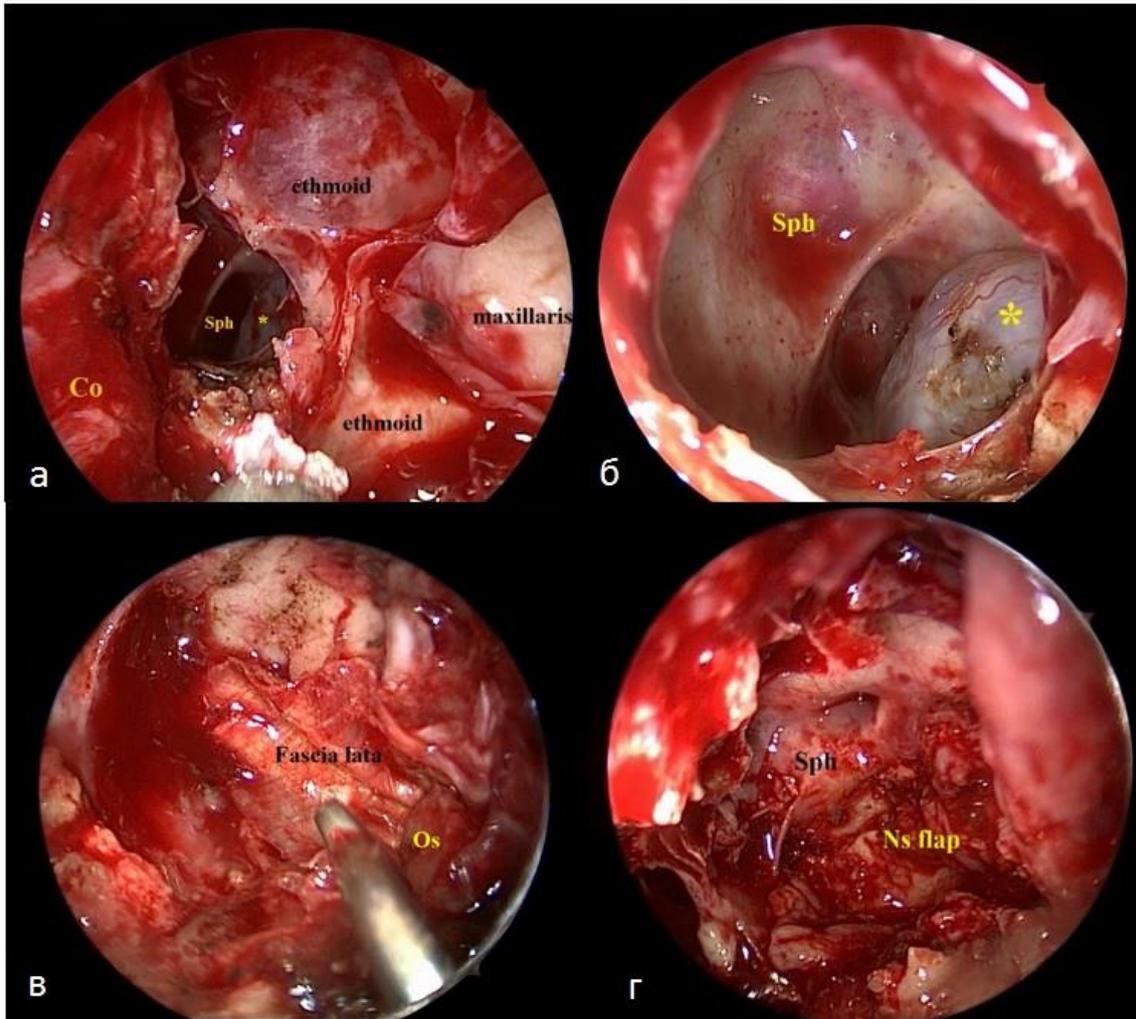


Figure 2 a-d Approach to the lateral recess of the sphenoid sinus on the left. (Intraoperative photo).
 A - uncovered cells of the ethmoid labyrinth, sphenoid sinus, maxillary sinus, b - lateral extension of the sphenoid sinus, c – plastic of the defect of autobone and fascia lata, d - a nanoseptal flap over the defect (ethmoid - cells of the the ethmoid labyrinth, maxillaris - maxillary sinus, sph - sphenoid sinus, * - meningoencephalocele, Co - middle turbinate, fascia lata – fascia lata, os - bone, ns flap - nasoseptal flap)

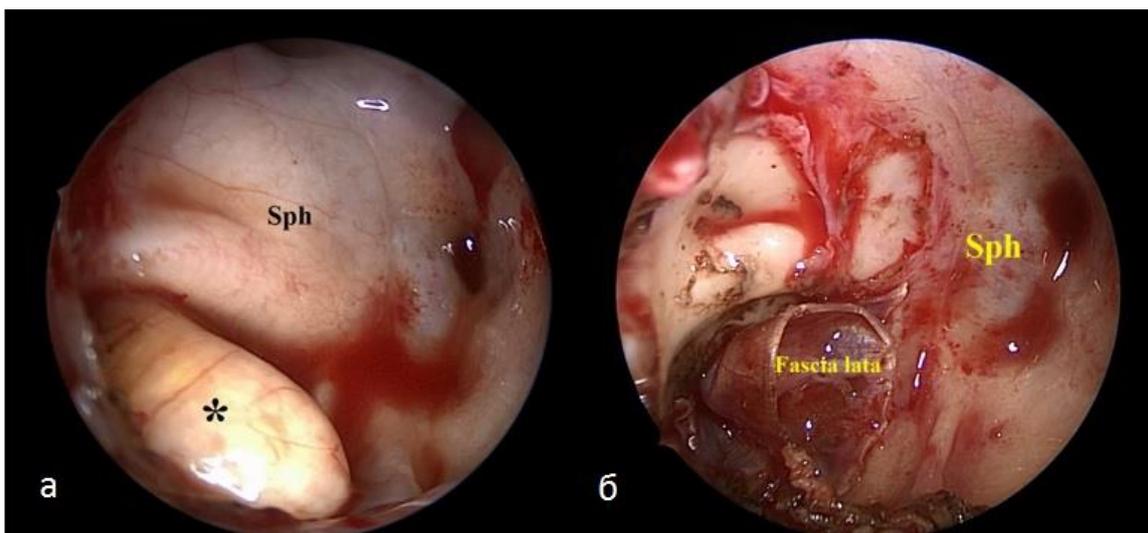


Figure 3 a-b Approach to the lateral recess of the sphenoid sinus on the right. (Intraoperative photo).
 A - lateral extension of the sphenoid sinus, b – plastic of the defect of fascia lata (sph - sphenoid sinus, * - meningoencephalocele, fascia lata – fascia lata)

In the postoperative period, the patient's condition is satisfactory. No sensory impairment on the face,

lacrimation, or other access complications were noted. Examination by ophthalmologist: there were no signs

of congestive optic discs, there were no oculomotor symptoms. Clinical analysis of blood, urine, cerebrospinal fluid is normal. The patient was prescribed antibiotic therapy, tampons from the nose were removed on the first day after the operation, lumbar drainage was removed by 3 day after the operation. The patient is discharged to the polyclinic at the place of residence under the care of a physician

Discussion.

The development of the sphenoid bone is a complex process and involves the fusion of several cartilage precursors into a single bone structure. The sphenoid sinus is fully formed only by adolescence. For different people, it can vary in size, shape and degree of pneumatization. [17, 18].

Presence of the lateral craniopharyngeal canal was discovered for the first time by Cruveilhier in 1877, and 11 years later by Sternberg in 1888 [7, 8]. Over the last decade, most authors have used the term Sternberg's canal. Sternberg described constant presence of the canal in the skulls of 3-4 year old children. The ossification process continues up to the age of 10, until the canal is closed. Under unknown circumstances, Sternberg's canal may persist patent until adulthood (Photo 1). When the sphenoid sinus develops and reaches the fusion plane, Sternberg's canal may create a connection between the middle fossa and the sphenoid sinus, and thus become a potential source of cerebrospinal leak, meningoencephalocele or meningitis [19].

Второй механизм возникает при изначально нормальном развитии клиновидной пазухи.

Elevated intracranial pressure (ICP) and obesity were associated with spontaneous meningocele. Far lateral pneumatization of the sphenoid bone, a normal variant in 22 to 40%, is commonly present in cases of spontaneous meningocele of the sphenoid wing. CSF rhinorrhea is the most common presentation of spontaneous meningocele of the sphenoid wing with lateral sphenoid sinus extension. [20-22].

Various epidemiological studies report that the Sternberg canal occurs from 0.42% to 6.1%. [23]. Sinus hyperpneumatization laterally according to world studies is found in 25% of patients [24].

There is debate in the literature about the existence of the Sternberg canal and its location with respect to the round opening and the maxillary nerve [25-26]. In our case, the patient has bilateral deep lateral recesses of the sphenoid sinus, with the defect located lateral to the round opening. Which is most likely associated with congenital malformations of the base of the skull. Provoking factors in the development of meningocele and nasal liquorrhea were increased intracranial pressure and metabolic disturbances (obesity).

No matter what is the etiology and pathogenesis of the cerebrospinal fluid leak in the lateral recess of the sphenoid sinus, the treatment strategy is reconstruction of the complex skull base. Due to the complex

anatomical location and the inability approach the defect directly, surgeries in this area have a high percentage of relapses (25%) [27].

Our case is unique in that the patient has bilateral lateral recesses with defects in them. In the PubMed database we have found over 5 articles dedicated to this problem [28-32]. The majority of them describe separate cases, and series of observation studies, the data from them is presented in Table 1. Elisa Illing et al. [32] describe the largest number of observations in an article. The authors analyze a series of 59 patients with defects in the base of the skull / encephalocele in the lateral recess of the sphenoid bone, of which 18 patients had bilateral injuries. They analyze in detail the causes of this pathology, but do not concern the tactics of treating patients.

Nathan et al. [31] report five cases of bilateral defects from 13 patients. They recommend performing transsphenoidal approach for reconstruction when the defect is located more medially than the second branch of the trigeminal nerve, that is, with minimal sinus pneumatization. In the presence of a defect, lateral to the second branch of the trigeminal nerve, according to the authors, it is necessary to perform transpterygoid approach.

In the case presented by us, endoscopic endonasal transpterygoid approach provided a convenient approach to encephalocele. When performing access, the maxillary sinus was opened, the back wall of which served as a guide when performing access.

In the literature, it has been shown that transpterygoid approach is effective for the treatment of cerebrospinal fluid in the lateral recess. Transpterygoid approach however is the most traumatic of all. Among the associated complications the most common are facial hypaesthesia, infections (meningitis, sphenoiditis), dry eye on the surgical site [33-34].

The number of authors, however, noted that the rate of success in the surgery is higher in the cases where multilayer plasty was carried out (fat, fascia lata, mucoperiosteum, cartilage/bone of the nasal septum) [28-32]. The method of using a mucoperiosteum attached to the nasal septum by a vascular stem to cover large skull base defects was invented in 2004. Authors claim that the percentage of relapses decreases when mucoperiosteum is used [29, 31-33]. Using the navigation system allows to improve the technique of endoscopic interventions, to avoid damage to nearby vital anatomical structures, to plan the volume of surgical intervention, which leads to a decrease in the number of postoperative complications [35]

In our case, we used lumbar drainage to control intracranial hypertension. Most recommend lumbar drainage in case of bilateral defects of the sphenoid sinus. And Nathan and Marston [30-31] even performed lumbar-peritoneal shunting in the postoperative period due to the onset of symptoms of congestive optic nerve discs.

Overview of treatment of bilateral defects in the base of the skull of the lateral recesses of the sphenoid sinus

Authors, year	Number of patients	Accompanying illnesses	Approach	Plasty materials	Lumbar drainage	Complications
Seth M. Lieberman et. all 2015 [28]	1	Obesity	No data	No data	No	No data
Varun Aggarwal et. all. 2017 [29]	1	dural arteriovenous fistula	Transpterygoid	Bone, fat, fascia lata, mucoperiosteum	Yes	No
Alexander P. Marston et. all. 2015 [30]	1	Obesity	Transpterygoid	Bone, fat, fascia lata	Yes, lumbar-peritoneal shun	No
Nathan S. Alexander et. all. 2012 [31]	5	Obesity	Transpterygoid	Fascia lata, fat, bone from the nasal septum, mucoperiosteum	Yes, lumbar-peritoneal shun	No data
Elisa Illing et. all 2014 [32]	18	Obesity, empty sella	No data	No data	No data	No data

Conclusions.

Bilateral meningoencephalocele in the lateral recesses of the sphenoid sinus probably results from an anomaly in the development of the base of the skull (Sternberg congenital canal, hyperpneumatization of the sphenoid sinus).

Endoscopic endonasal multilayer repair is the treatment of choice for treating defects in the base of the skull in the lateral recesses of the sphenoid sinus.

Disclaimer

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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ЭФФЕКТИВНОСТЬ ИСПОЛЬЗОВАНИЯ ОТЕЧЕСТВЕННОГО ОСТЕОПЛАСТИЧЕСКОГО МАТЕРИАЛА «BIO OSS» ДЛЯ ЗАПОЛНЕНИЯ ВНУТРИКОСТНЫХ ДЕФЕКТОВ ЧЕЛЮСТЕЙ

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EFFICIENCY OF USING DOMESTIC OSSEOPLASTIC MATERIAL “BIO OSST” FOR FILLING INTRACROSS JAW DEFECTS

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Резюме. Цель – повышение эффективности лечения послеоперационных внутрикостных дефектов челюстей с использованием отечественного остеозамещающего материала «BIO OST».

Материал и методы. Проведена сравнительная оценка эффективности хирургического лечения 63 больных околокорневыми кистами челюстей с заполнением костного дефекта остеопластическим материалом Osseo BioI» (группа сравнения) и «Bio Oss» (исследуемая группа).

Результаты. Динамика клинико-рентгенологических показателей свидетельствовала о том, что у больных группы сравнения тенденция к отторжению имплантата стала более выраженной, у больных основной группы сохранилась активность остеогенеза.

Заключение. Данные, полученные у больных исследуемой группы свидетельствуют о преобладании скорости процессов остеогенеза, над скоростью процессов резорбции, что, в свою очередь, характеризует остеозамещающий материал «Bio Osst» как отвечающий современным требованиям, предъявляемым к таким материалам.

Summary. The objective is increasing the effectiveness of the treatment of postoperative intraosseous defects of the jaw using the domestic «BIO OST» material.