TRANSSPHENOIDAL ENCEPHALOCELE – CASE REPORT

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SUMMARY – A case of a 32-year-old woman with transsphenoidal encephalocele is presented. Encephaloceles are congenital defects in the skull through which meninges and brain tissues herniate. Basal encephaloceles account for 1.5% of all encephaloceles and are found in 1:35,000 live births. Transsphenoidal basal encephaloceles are very rare, accounting for only 5% of all basal encephaloceles. The pituitary and surrounding structures are drawn into the encephalocele with visual and hormonal disturbances. Transsphenoidal encephalocele rarely occurs in adult patients. Our patient presented with right-sided headaches, episodes of impaired vision on the right eye, a feeling of oozing down the pharynx, and secondary amenorrhea. In childhood, she had been diagnosed with pituitary somatic retardation and treated by pediatrician with thyroid replacement therapy from age 5 to 8. Due to strong headache and suspicion of a pathologic disorder in the sellar region, MRI was performed to demonstrate a transsphenoidal encephalocele, sella structures placed in the right nasopharynx and chiasm of the optic nerve that was shifted caudally. Endocrinologic analysis revealed low levels of gonadotropins, antidiuretic hormone and insulin-like growth factor 1, with a decreased level of growth hormone.

Key words: *Encephalocele – diagnosis; Encephalocele – complications; Growth hormone – secretion; Headache – etiology; Case report*

Introduction

Encephalocele is a cystic congenital malformation in which the central nervous system (CNS) structures, in communication with cerebrospinal fluid (CSF) pathways, herniate through the defect in the cranium[1,2]. The primary abnormality in the development of an encephalocele is a mesodermal defect resulting in a defect of the bone and dura associated with herniation of CSF pathways, brain tissue and meninges through the defect. The root cause is the failure of surface ectoderm to separate from neuroectoderm early in the embryonic development. In the calvaria, induction of bone formation may be defective, or pressure erosion from intracranial mass may occur. Defects at the skull base may be related to faulty closure of the neural tube or failure of basilar ossification[5]. Encephaloceles are classified as anterior (frontal, sincipital and basal) and posterior (infra- and supratorcular)[3]. Posterior encephaloceles are most common (75%) and basal ones most infrequent (1.5%). Encephaloceles occur more commonly in females than in males. Currently, most encephaloceles are diagnosed antenatally and present at birth. Postnatally, infants may present with CSF rhinorrhea and recurrent meningitis[6]. They are often associated with midline craniofacial dysraphism. Some, particularly sphenoidal encephaloceles are often clinically occult and usually become apparent at the end of the first decade of life[5]. Basal encephaloceles are rare anomalies and are classified as transethmoidal, sphenoorbital, sphenomaxillary and transsphenoidal[3]. The transsphenoidal variant represents approximately 5% of basal lesions[7,8]. It may be divided into intrasphenoidal, extending into the sphenoid sinus, and true transsphenoidal, traversing the floor of the sinus and protruding into the nasal cavity or na-

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Received May 12, 2005, accepted in revised form November 21, 2005

sopharynx[8]. Transsphenoidal encephaloceles are rare congenital anomalies that may be immediately apparent in infants with multiple cranial midline defects[9]. In adults they can be of a spontaneous, traumatic or congenital origin[10]. Associated findings in transsphenoidal encephaloceles include agenesis of the corpus callosum[2], CSF rhinorrhea, an epypharyngeal soft tissue mass, a visual defect, an endocrinologic disturbance, and various optic and midface abnormalities[8], such as an abnormal development of the optic nerve, the so-called morning glory syndrome[11].

Classification of Encephaloceles[4,12]

Posterior

a) supratorcular
b) infratorcular

Anterior

a) frontal
b) sincipital
   – nasofrontal (the most common type; the defect lies in the bregmatic region between the frontal and nasal bones)
   – nasoethmoidal (the osseous defect lies in the cribriform plate of the ethmoid bone where brain tissue herniates into the nasal cavity)
   – nasoorbital (the osseous defect lies between the frontal process of the maxilla and the ethmoid bone. The encephalocele passes into the medial wall of the orbit and presents as an orbital mass)
c) basal
   – transethmoidal (or intranasal)
   – transsphenoidal (or sphenopharyngeal)
   – sphenomaxillary
   – sphenoorbital

Parietal

– the least common form of encephaloceles

Non-midline cephaloceles

– generally of cosmetic importance only

Case Report

A 32-year-old woman first presented to Department of Endocrinology, Diabetes and Metabolic Diseases, University Department of Medicine, Sestre milosrdnice University Hospital in Zagreb, for additional endocrinologic evaluation. She reported right-sided occipital headaches radiating to the right eye and right ear. The headaches occurred daily, intermittently, from time to time followed by the loss of vision on the right eye. She mentioned an oozing feeling in the pharynx that tasted salty. There was no history of severe head trauma or meningitis, she had no facial abnormalities. History data revealed that she had been treated by a pediatrician from age 5 for the diagnosis of pituitary somatic retardation. Endocrinologic evaluation showed normal levels of thyroid stimulating hormone (TSH) and thyroid hormones, whereas the level of growth hormone (GH) was extremely low. Insulin tolerance test (ITT) showed inadequate growth hormone increase in response to hypoglycemia induced stimulation. On x-ray craniogram, attention was focused on sellar region, however, no pathologic changes were found.These diagnostic procedures were made in another medical institution.Wrist x-ray showed three small carpal nuclei. After diagnostic evaluation, thyroid replacement therapy was initiated. In this period of time, she grew by 17 cm (from 98 cm to 115 cm). At the end of age 8, based on control wrist x-ray that showed osseous maturation corresponding to osseous maturation by two years in advance, her pediatrician concluded it was a case of constitutional lower growth with later onset of puberty, so replacement therapy was discontinued. At age 15, her caryogram was normal (46, XX). Menstrual cycles were normal from age 12 until age 22. Gynecologic examination at age 22 showed normal genital finding. Transvaginal ultrasonography showed small uterus and normal ovaria. Endocrinologic evaluation was not performed and dydrogesterone (a gestagen) was prescribed for the lack of normal cycle, which she had been taking until two years ago, i.e. until age 30. Upon gestagen discontinuation she lost menstrual period, so secondary amenorrhea was diagnosed. Control testing performed during her taking the prescribed gynecologic therapy regularly indicated normal levels of TSH, luteinizing hormone (LH), follicle-stimulating hormone (FSH), thyroid hormones, estradiol and cortisol at 8.00 a.m. and 5.00 p.m., however, with increased prolactin (38.1 μg/L, normal range 3.6-18.9 μg/L). Computed tomography (CT) of the brain, performed 1.5 before, showed normal findings. The patient reported excessive thirst with gross water intake, at least four liters *per* day, for the last two years.

Clinical examination showed normal physical appearance with low body height (148 cm) and body weight of 45 kg. Secondary sexual marks were regularly developed.

Diagnostic evaluation

Because of the oozing feeling down the pharynx, the patient was examined by an ENT specialist, who performed nasal endoscopy that revealed a growth in the area of the right choana. The growth was covered by mucous membrane and was partially closing the right choana. There was no nasal secretion.

Visual perimetry according to Goldman revealed minimal concentric narrowing of the isopters on both eyes, but no pathologic events at the chiasmatic level or through the visual tract were detected. There were no pathologic findings on visus testing and fundus examination.

Radiologic study

Magnetic resonance imaging (MRI) is the first diagnostic study in patients with suspected pituitary disorder. MRI is the supreme method because it can better resolve the complicated anatomic relations in the pituitary region than CT. MRI is the test of choice to determine if neural tissue is involved in a bony defect and the nature of adjacent vascular structures[3,4]. We performed MRI of the sellar and parasellar region. MRI revealed a mass extending through the bony defect of the sellar floor and parcial defect of sphenoidal sinus resulting in traction of the sella turcica structures to the right nasopharyngeal cavity, up to the soft palate level. The mass extended to 1 cm below the floor of the sphenoid sinus. MRI suggested it to be a sphenoidal encephalocele of the sphenopharyngeal type. The chiasm structures of the optic nerve dropped caudally to the level of the sphenoid sinus bed. All suprasellar structures were slightly drawn caudally. Also, a narrowed right carotid artery was observed, which seemed to be hypoplastic (Figs. 1 and 2).

Densitometry (DXA) of the femoral column showed osteopenia and regular bone density of the lumbar spine.

Endocrinologic study

Endocrinologic examination showed a low borderline levels of gonadotropin hormones (LH 2.0 IU/L, normal range 1.9-8.0 IU/L; FSH 5.3 IU/L, normal range 2.4-9.3 IU/L), with consequential low levels of sex hormones (estradiol 51 pmol/L, normal range 92-367 pmol/L; progesterone <0.3 nmol/L, normal range 0.3-3.8 nmol/L). The levels of adrenocorticotropic hormone (ACTH) were 4.4 pmol/L and 2.3 pmol/L (normal range 2.0-13.3 pmol/L), and of cortisol 591 nmol/L (normal range 138-800 nmol/L) and 237 nmol/L (normal range 80-488 nmol/L) at 8.00 a.m. and 5.00 p.m., respectively. The level of prolactin was 13.0 mcg/L (normal range 2.0-30.0 mcg/

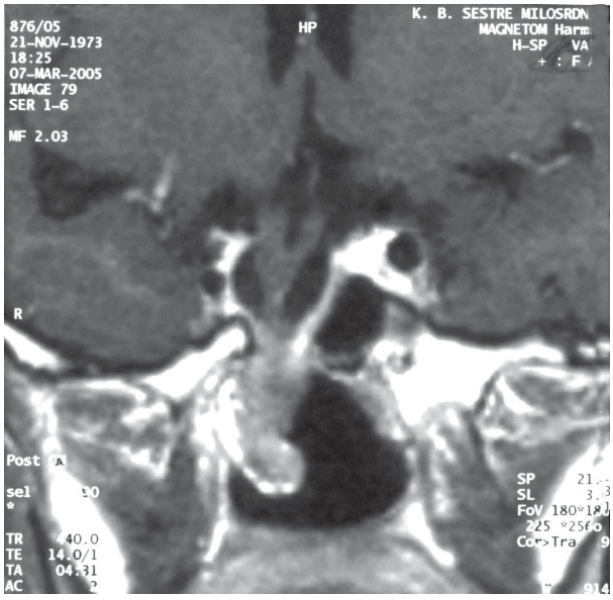

Fig. 1. MR image of the sellar and parasellar region in the patient with transsphenoidal encephalocele (coronary section, T1).

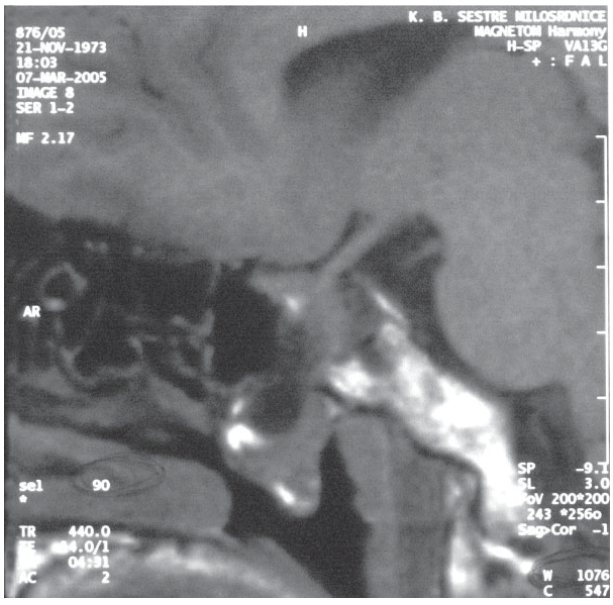

Fig. 2. MR image of the sellar and parasellar region: note defect of the sellar bottom and sphenoid sinus (sagittal T1 native section).

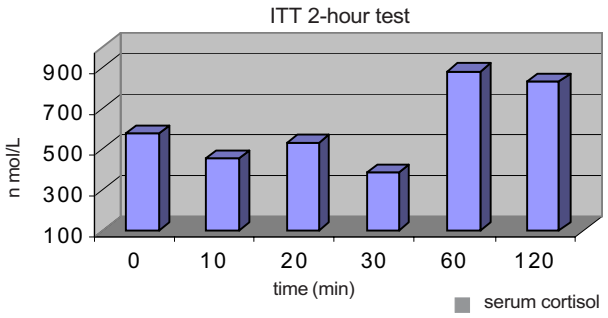

Fig. 3. Serum cortisol response in insulin tolerance test (ITT) in the 32-year-old woman with transsphenoidal encephalocele.

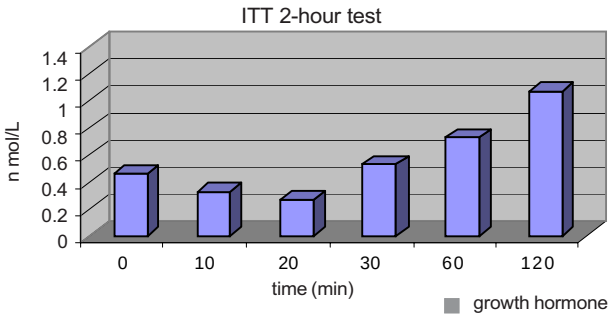

Fig. 4. Growth hormone response in insulin tolerance test (ITT) in our patient.

L); accordingly, these hormones showed normal values. The level of GH was 0.81 ng/mL (normal range 0-5.0 ng/mL) and of insulin growth factor-I (IGF-I) 62 ng/mL (normal range 115-420 ng/mL), i.e. low. The levels of triiodothyronine (T_3), thyroxine (T_4) and TSH were normal (T_3 1.9 nmol/L, normal range 1.1-2.8 nmol/L; T_4 109 nmol/L, normal range 60-165 nmol/L; TSH 2.53 mIU/L, normal range 0.3-4.5 mIU/L). Endocrinologic analysis also showed a very low level of antidiuretic hormone in 24-hour urine (1.3 ng dU/L, normal range 30-90 ng dU/L). To evaluate stress reserve and stress response we performed insulin tolerance test (ITT). During two-hour ITT a decreased and prolonged (60 min) stress response was recorded, measuring serum cortisol and GH levels (Figs. 3 and 4). To evaluate pituitary reserve of gonadotropins we performed the gonadotropin releasing hormone test (LHRH). During two-hour LHRH test, the levels of gonadotropins showed normal increase, however, with a prolonged response (60 min) (Fig. 5), indicating a decreased function of gonadotropin cells of the pituitary gland despite the normal and low borderline levels of FSH and LH.

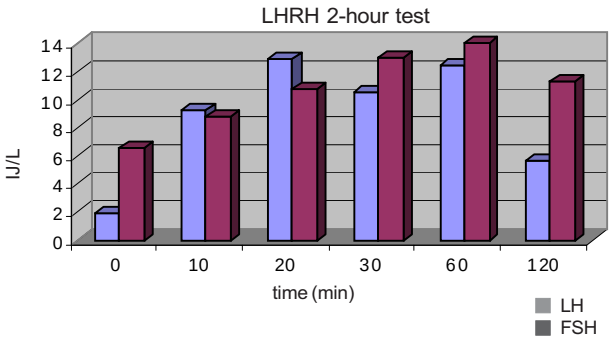

Fig. 5. Response of LH and FSH in LHRH test in our patient.

Discussion

Clinical presentation of a patient with a transsphenoidal encephalocele is in part dependent on age. The diagnosis is easily made in early childhood or infancy when, along with cranial midline defects, there are also breathing difficulties due to the obstruction of the epipharynx[9]. However, if during childhood there are no considerable difficulties and no distinctive facial anomalies, the diagnosis of the disease may be postponed up to adulthood, when distinctive symptoms occur, including headache, rhinorrhea, visual defect, endocrine dysfunction, or respiratory problems. Our patient presented with a temporary loss of vision on the right eye, strong right-sided headaches and secondary amenorrhea as the result of partial anatomical loss of pituitary function. The patient also mentioned a feeling of oozing down the throat. Transsphenoidal encephaloceles can be spontaneous, traumatic or congenital. In the literature we found two actual theories of encephalocele development. One theory claims it is the result of the naturally occurring dehiscence in the floor of the middle cranial fossa that has developed due to pneumatization of the underlying sphenoid sinus[13,14]. The other theory ascribes these lesions to ossification problems during early gestational development[13,14]. Our patient had no history of head trauma, so we presume that it is a case of congenital defect in the cranial base, and slow progression of symptoms. In other words, initial difficulties occur in early childhood when the lack of growth hormone is detected and before any replacement therapy has been prescribed. Problems with menstruation appear in early adulthood due to the decreased levels of gonadotropins and increased prolactin. Later, vision problems and headaches also occur due to the pressure of the prolapsed sella turcica structures upon the optic nerve chiasm and trac-

tion of the right optic nerve. In this case, an important anomaly is the narrow right carotid artery, which seems to be hypoplastic. If so, a hypoplastic artery could be related to poor perfusion of the sellar structures, so it could also be the cause of the sellar floor destruction, especially if congenital weakness of the sellar floor has already existed.

Hypothalamic-pituitary dysfunction is often found in transsphenoidal encephaloceles[15]. Marioka *et al.* report on 15 patients with transsphenoidal encephalocele who also had hormone deficiency. They describe deficiency of ADH and GH as the most common finding[16]. Our patient developed GH deficiency in her childhood and hyperprolactinemia in adolescence. After 12 years of regular menstrual cycles, the lack of gonadotropin suddenly appeared. Recent test results indicated a considerably decreased level of ADH. The above mentioned endocrinologic study showed a partial lack of GH and gonadotropins. The progressive hormonal dysfunction is probably caused by the increasing stretching of the pituitary stalk and hypothalamus. The importance of precise assessment of nasopharyngeal masses by an ENT specialist should be emphasized, however, additional neurosurgical evaluation may occasionally be necessary. The most common finding is a nasopharyngeal polyp or cyst, but it is highly advisable to always consider transsphenoidal encephalocele, although it is a rare clinical entity in adults.

Surgical treatment for transsphenoidal encephaloceles remains controversial due to very wide presentation of clinical features and very delicate procedure for impaired anatomic structures[8,9]. It is very important to make the right decision between two opposite views of this clinical entity. Some authors recommend surgical repair by an enforced team of medical professionals (neurosurgeon and ENT specialist)[13], when the symptoms are clearly present and the benefit of operation outweighs the risk of postoperative failure. Adult patients with intrasphenoidal encephalocele often present with rhinorrhea and should be considered for transsphenoidal repair, mostly with metal implantation or bone graft[17], whereas patients with true transsphenoidal encephalocele should not undergo surgery because of the complex anatomy and slow progression of symptoms. Intervention is suggested in case of respiratory obstruction, rhinorrhea, meningitis[8], and progressive visual defects ascribed to the lesion.

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Sažetak

TRANSSFENOIDNA ENCEFALOKELA – PRIKAZ SLUČAJA

A. Vidačić, M. Matovinović, A. Marić, D. Herman, J. Murgić, H. I. Pećina, V. Čerina i M. Vrkljan

Prikazuje se slučaj tridesetdvogodišnje žene s transsfenoidnom encefalokelom. Encefalokele su rijetke kongenitalne anomalije lubanje u kojima dolazi do hernijacije moždanih ovojnica i mozga kroz koštane otvore. Bazalnih je encefalokela 1,5% od svih encefalokela, a učestalost im je 1:35.000 živorođene djece. Transsfenoidne encefalokele su vrlo rijetke i čine samo 5% bazalnih encefalokela. Hipofiza i okolne strukture spuštaju se u encefalokelu, a posljedica su poremećaji vida i razina hormona. Transsfenoidna encefalokela se rijetko javlja u odraslih osoba. Bolesnica je došla s desnostranim glavoboljama, ispadima slabijeg vida na desnom oku, osjećajem cijeđenja niz ždrijelo, te sekundarnom amenorejom. Anamnestični podaci otkrili su da joj je u djetinjstvu postavljena dijagnoza pituitarne somatske retardacije te joj je uvedena nadomjesna terapija hormonima štitnjače koju je primala od 5. do kraja 8. godine života. Zbog izrazitih glavobolja i sumnje na patološko zbivanje u selarnoj regiji učinjena je MR selarne regije koja je prikazala transsfenoidnu encefalokelu, strukture sele turcike spuštene prema desnom nazofarinksu i hijazmu optičkog živca pomaknutu kaudalno. Endokrinološkom obradom utvrđene su niske razine gonadotropina i antidiuretskog hormona te granično snižen hormon rasta uz nizak faktor rasta sličan inzulinu (IGF1).

Ključne riječi: *Encefalokela – dijagnostika; Encefalokela – komplikacije; Hormon rasta – lučenje; Glavobolja – etiologija; Prikaz slučaja*