Case Report

Extensive Anterior Cranial Fossa Idiopathic Hypertrophic Pachymeningitis: A Case Report and Review of the Literature

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Idiopathic hypertrophic cranial pachymeningitis is a rare chronic inflammatory and fibrosing process of unknown etiology. This entity is characterized by fibrosis and thickening of the dura mater and resulting in neurological syndrome. The authors report a 72 year-old woman who presented with progressive bifrontal headache, bilateral visual loss and transient episode of confusion. Neurological examination revealed bilateral optic atrophy, apathy and no focal neurological deficit. Investigations showed anemia of chronic disease, elevated erythrocyte sedimentation rate and polyclonal hypergammaglobulinemia. No specific inflammatory diseases or malignancy such as systemic lupus erythematosus, syphilis, hematologic malignancy were found. MRI of the brain revealed thickened and enhanced dura mater and leptomeninges at the inferior aspect of bilateral frontal lobes as well as vasogenic edema of the frontal lobes. Cerebrospinal fluid showed mild pleocytosis, high protein level and normal glucose level. Meningeal biopsy revealed nonspecific inflammatory process of the dura and leptomeninges. There was no granuloma formation or evidence of vasculitis. Special stain for tuberculous bacilli, fungus and malignancy were all negative. The diagnosis of "idiopathic hypertrophic pachymeningitis" was made. The patient was treated with oral prednisolone 45 mg/day. Her headache was improved, but the profound vision loss in both eyes remained unchanged after 2 years of follow-up. Prednisolone was tapered within 18 months. Idiopathic hypertrophic cranial pachymeningitis usually involves dura at tentorium cerebelli, cavernous sinus and base of the skull. The extensive involvement at the anterior cranial fossa is extremely rare.

Keywords: *Pachymeningitis, Headache, Optic neuropathy, Anterior cranial fossa*

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Hypertrophic cranial pachymeningitis (HCP) is a rare chronic fibrosing inflammatory disease characterized by diffuse thickening of the cranial dura mater[1,2]. Common clinical manifestations include headache, multiple cranial nerve palsies and cerebellar dysfunction occurring alone or in combination[3]. The etiologies of HCP, including infections, autoimmune disorders and neoplasm have been documented. However, most cases of HCP have been classified as idiopathic[4]. Magnetic resonance imaging (MRI) of the brain is the most useful imaging technique in evaluating a patient with suspected pachymeningitis[5]. Intracranial thickening of the dura mater is mainly detected at the tentorium, posterior part of falx cerebri and skull base[2]. A dural biopsy is essential to establish the definite diagnosis of HCP[6]. Ninety nine patients of idiopathic hypertrophic cranial pachymeningitis (IHCP) were identified in a MEDLINE search from 1990 to 2004. The keywords were "idiopathic hypertrophic pachymeningitis", "idiopathic hypertrophic cranial pachymeningitis" and "idiopathic cranial hypertrophic pachymeningitis". Only four patients of IHCP with anterior cranial fossa and frontal lobe involvement have been documented. The authors report a rare patient of extensive

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pachymeningitis in the anterior cranial fossa with massive bilateral frontal white matter edema.

Case Report

A 72-year-old woman presented with progressive bilateral visual loss, two weeks after cataract surgery of the right eye. In March 2001, she notified a decreasing vision in both eyes, more on the left. Visual acuity was 20/50-1 and hand movement on the right and left eyes respectively. The extracapsular cataract extraction with an intraocular lens implantation was performed in the left eye. After operation, her vision had improved and visual acuity was 20/40 on the left eye. Nine months later, she had rapid deterioration of vision. Visual acuity was finger count foot on the right eye and 20/100 with pinhole 20/40-1 on the left eye. Another cataract operation was performed in the right eye. However, her vision had not been improved and was progressively worsened in both eyes. During this period, she began to suffer from bilateral frontal, non-pulsatile, daily headache of moderate intensity. The headache was not associated with photophobia, phonophobia, nausea or vomiting. She was disoriented to time, apathy, distraction and anorexia. Her underlying diseases included hypertension and ischemic heart disease for 10 years. She was treated with diuretics and beta blocker (hydrochlorothiazide 25 mg per day and atenolol 50 mg per day). She had also a history of chronic serous otitis media and right myringotomy had been performed in 2000. Physical examination revealed an afebrile, obese elderly woman. Her pulsation was 84 per minute, respiration rate was 20 per minute and a blood pressure of 150/80 mmHg. Her conjunctivae were moderately pale. Otologic examination revealed a small perforation of the right tympanic membrane. Audiogram showed mixed bilateral hearing loss. Neurological examination revealed a conscious, apathic and non-cooperative patient. Visual acuity was light perception on both eyes. Optic nerves were pale bilaterally and the pupils were 3 mm with sluggish reaction to light. Extraocular movements were normal. She had neither weakness nor meningeal irritation signs. The rest of the systemic and neurological examinations were normal.

A complete blood count revealed normal white blood cell and platelet count. The hematocrit was 21% and hemoglobin level was 7.7 mg/dL. Peripheral blood smear showed normochromic normocytic red blood cells and few roulaux formations. Serum globulin was 5.6 g/dL and protein electrophoresis revealed polyclonal hypergammaglobulinemia. Serum vitamin B 12, folate and thyroid function test were normal. Iron study showed characteristics of anemia of chronic disease. The erythrocyte sedimentation rate (ESR) was 91 mm/hr. Serum electrolyte, urea and creatinine were all normal. Fluorescent antinuclear antibody screen and circulating antineutrophilic cytoplasmic antibodies were negative. Human immunodeficiency virus serology was negative as was serological test for syphilis. Routine urinalysis and chest radiography were unremarkable. Computerized brain topographic scan with contrast media revealed an intense dural and leptomeningeal enhancement at the inferior aspect of bilateral frontal lobes and along both sides of the sphenoid wing with bone erosion (Fig. 1). Gadolinium-enhanced magnetic resonance imaging of the brain revealed low signal intensity lesions on T1-weighted images with intense enhancement along bilateral basal frontal lobes, sphenoid wings and dorsum sellae with optic nerve encasement (Fig. 2), as well as vasogenic edema of bilateral frontal lobes (Fig. 3). Cerebrospinal fluid analysis demonstrated a clear colorless CSF with an open pressure of 30 mmH2O, and white blood cell count of 10 cells/mm3 with 100% mononuclear cells. CSF protein was 237 mg/dL and sugar was 48 mg/dL (simultaneous plasma glucose was 116 mg/dL). CSF cultures for bacteria, tuberculous bacilli and fungus as well as CSF serology for syphilis and cytology were negative. During the admission, she had no light perception on both eyes. Right frontal craniotomy with meningeal biopsy was performed. Operative finding disclosed a pronounced thickening of the dura mater and pale frontal cortex. Histopathological examination revealed a chronic nonspecific inflammatory process, consisting of lymphocytes, plasma cells and histiocytes. Foci of necrosis were evident. However, there was neither formation of granuloma nor evidence of vasculitis. The inflammation also extended to involve the leptomeninges (Fig. 4). No microorganisms were demonstrated in Gram stain preparations, Gomori's methanamine silver preparations, Acid fast bacilli stain and Periodic acid Schiff stain. A diagnosis of IHCP and leptomeningitis was made. Oral prednisolone, 45 mg/day was prescribed. High dosage of prednisolone had been maintained for three months and was tapered to 20 mg/day after six months. Then prednisolone was discontinued within eighteen months later. The headache had subsided by three months after steroid therapy and ESR became normal. However, the profound visual loss in both eyes remained unchanged.

Discussion

Idiopathic hypertrophic cranial pachymenin-

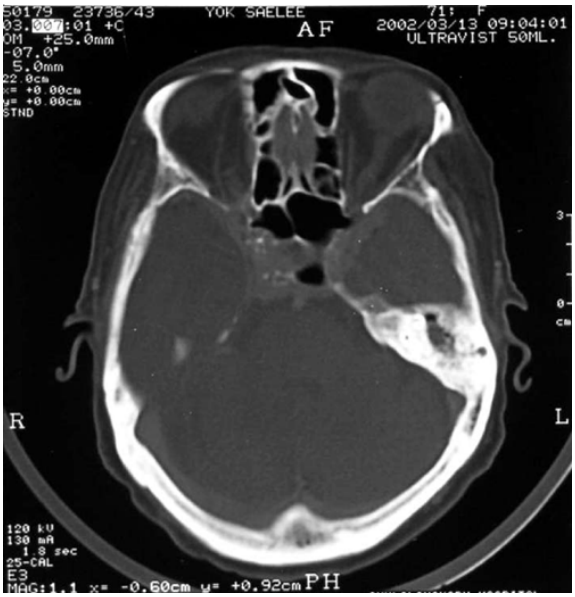

Fig. 1 CT of the brain (Bone window) showed bony erosion of the dorsum sellae and anterior clinoid processes

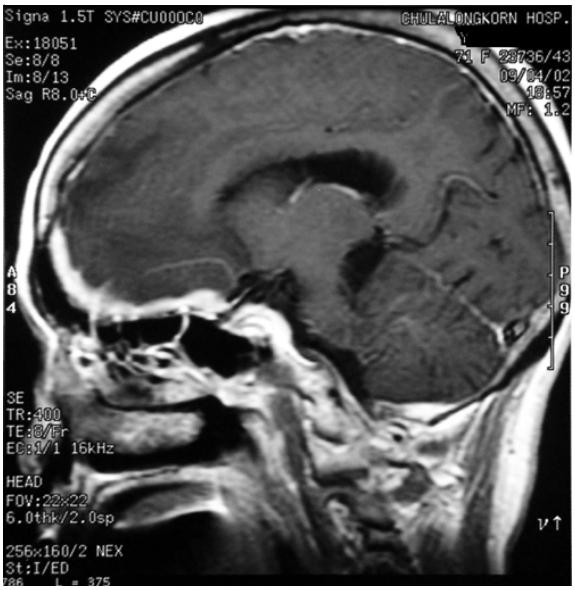

Fig. 2 Sagittal post gadolinium MRI of the brain showed intense dural and leptomeningeal enhancement along the inferior aspect of bilateral frontal lobes with optic nerve encasement on T1WI

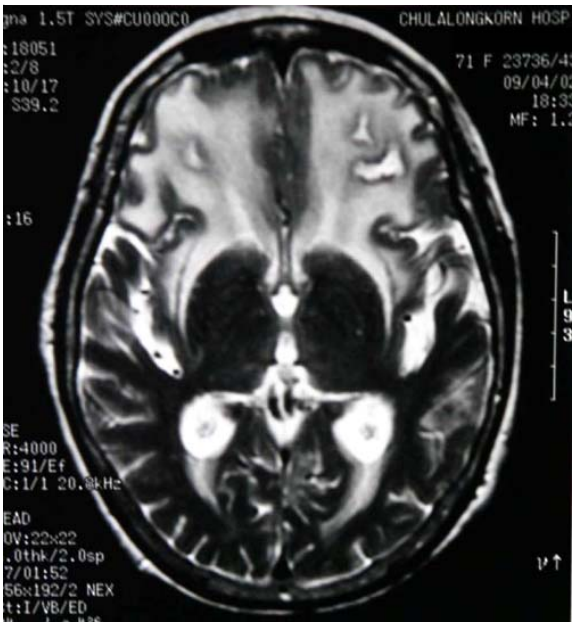

Fig. 3 MRI of the brain showed hyperintensity in the white matter of both frontal lobes on T2WI

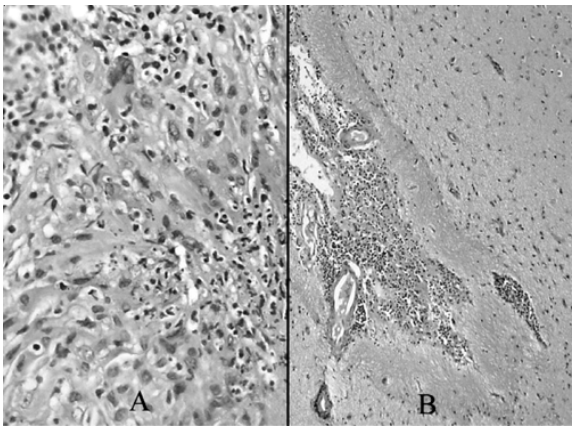

Fig. 4 Histopathological findings of the meningeal tissue from right frontal craniotomy showed inflammatory cells with lymphocytes, plasma cells, histiocytes and giant cells with vague granuloma-like lesion (A). The lep tomeninges were also infiltrated by inflammatory cells (B)

gitis (IHCP) is a rare fibrosing inflammatory disease of unknown origin that thickens the dura mater[1,3,7,8-10]. IHCP is a diagnosis of exclusion of other known causes of either pachymeningitis or dura mater thickening[9]. Exact etiopathogenesis of IHCP is still unknown[3]. IHCP is a rare entity and has been detected worldwidely. The age of onset ranges from 20 to 75 years (mean 51 years)[10]. Parney et al reported headache, cranial nerve palsy and ataxia in 88%, 62% and 32% of the 33 IHCP cases, respectively[10]. Headache is a universal symp-

tom, which may be focal or diffuse and at times may be the only symptom for many years[11,12]. Eighth cranial nerve is the most frequent cranial neuropathy, followed in equal frequency by the optic, oculomotor and lower cranial nerves[1,10]. Our patient presented with progressive irreversible visual loss and bilateral frontal headache. The visual impairment was caused by dense fibrous encasement of the optic nerves produced by the extensive dural thickening in the optic canals and possible ischemic damage by hypertrophic tissue[13,14]. The headache should be attributed to focal dural inflammation[15]. The intraparenchymal involvement in IHCP is rare and the documented lesions include cerebellum, frontal, parietal and temporal lobes. The presented case had apathy and behavioral changes, which reflected frontal lobe involvement. The frontal lobe dysfunction in this case caused by the pseudotumoral effect of the meningeal thickening, which predominantly affected the basal frontal meninges. The symptoms and white matter changes in the cerebrum and cerebellum have usually resulted from venous congestion due to dural venous sinus involvement or associated leptomeningeal inflammation[1,2].

In IHCP, ESR is usually increased, as is C-reactive protein. There is usually lymphocytic pleocytosis with variable increase in cell count in CSF[1,5,15-17]. Protein levels are moderately elevated. However, CSF study may be normal in many patients. In the presented patient, increased ESR, serum globulin, CSF protein, polyclonal hypergammaglobulinemia and mild lymphocytic CSF pleocytosis reflected inflammatory process in IHCP.

MRI of the brain is the most useful imaging technique in evaluating a patient suspected HCP[16-18]. The cranial pachymeningitis usually involves the dura mater more extensively with rarely intra-axial involvement[3,10]. In the presented patient, MRI demonstrated hypointensity on T1-weighted images with marked enhancement after contrast administration at the inferior aspect of bilateral frontal lobes and along bilateral sphenoid wings, as well as hyperintensity on T2-weighted images in the white matter of bilateral frontal

Table 1. Reported cases of idiopathic hypertrophic cranial pachymeningitis with anterior cranial fossa involvement

Series	Age	Sex	Clinical features	MRI	Treatment	Follow up
Leonardo et al, 2003[5]	45	F	Anosmia, visual loss, psychosis	Linear dural enhancement on the L fronto-basal lobe with frontal edema	Prednisolone, Azathioprine	Good improvement of visual and psychotic symptoms
Hansen et al, 2001[21]	40	F	Headache, seizure, psychosis	Bilateral frontal dural enhancement with bifrontal edema	Prednisolone, Methotrexate	Good recovery, complete disappearance of lesions
Nakazaki et al, 2000[22]	51	F	-	Dural enhancement on frontotemporal regions with perifocal edema	Prednisolone	Marked improvement of the mass effect
Takahashi et al, 1996[20]	55	M	Right hemiparesis, seizure	Patchy dural enhancement on L frontal region with frontal edema	Surgery	Gradual improvement
Boonyawairoj el al, 2004	72	F	Headache, visual loss, confusion	Bilateral frontal dural enhancement with bifrontal edema	Prednisolone	Headache free, unchanged visual loss

F: Female, M: Male
L: Left, R: Right

lobes. These findings reflected extensive anterior cranial fossa hypertrophic pachymeningitis and vasogenic edema in frontal lobes.

A meningeal biopsy is usually required to establish the diagnosis of IHCP[6]. Histopathological findings consist of thick fibrous dura often associated with chronic inflammatory cell infiltration which consisting of lymphocytes, plasma cells and histiocytes[6]. In the presented patient, the specimen demonstrated fibrosis as well as chronic inflammation, infiltrated by lymphocytes, plasma cells, histiocytes and few giant cells. No granuloma, microorganism or evidence of vasculitis were detected. Arachnoid involvement is rare but has been reported[10,16,19] and was observed in the presented case.

It was of interest that the lesions in the presented patient were presented in the restricted area of the dura mater and adjacent leptomeninges and brain parenchyma. Rare cases with white matter involvement, especially in anterior cranial fossa region had been reported. The clinical findings in four previous patients were reviewed (Table 1)[5,20-22]. These patients included one man and three women, with age ranging from 40 to 55 years (mean 47.75 years). The common clinical presentations included seizure and psychosis. Dura mater appeared thickened intense enhancement after gadolinium administration in MRI. All showed signal hyperintensities of brain parenchyma in anterior cranial fossa on T2-weighted images. In three patients, corticosteroid and immunomodulating agents (Azathioprine, Methotrexate) resulted in good clinical response. Repeated MRI revealed progressive decreasing of dural thickening and absence of cerebral edema in patient 2 and 3. Some reports suggested that the frontal white matter lesions were derived from vasogenic edema due to venous infarction[2,18,20,23-25] or inflammatory cells infiltrated the brain parenchyma after invading the subarachnoid and Virchow-Robin spaces[16].

The optimal management of IHCP is unknown. Spontaneous resolution of clinical symptoms, signs and dural thickening has been reported[26]. Corticosteroid therapy is often effective in ameliorating the symptoms and signs, and in arresting the progression of the disease[2,11,27]. Immunomodulating agents such as azathioprine, cyclophosphamide and cyclosporine have been tried[3]. In those who do not respond to steroids or those who developed steroid dependence with attended side effect, azathioprine and cyclophosphamide have been advocated[1,2,28,29]. Surgical excision is an option for patients with mass effect due to thickening of skull base dura mater who show no response to medical treatment[1]. Decompression has also been used for spinal and orbit lesions[15]. Decompression of the optic nerve has resulted in dramatic visual improvement in a patient with rapidly deteriorating vision[30]. Radiation therapy has been used in the past without any proven benefit[1]. Parney et al reported 26% of patients experienced full remission without steroid dependence, 15% of patients experienced steroid dependence with partial or complete remission, 15% of patients experienced progressive course inspite of steroid therapy, and 32% of patients died regardless of treatment[10]. The prognosis for visual loss in patients with optic nerve involvement is poor[13,24]. The presented patient was treated with high dose corticosteroid. Her headache was gradually improved, but she was permanently blind.

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โรคเยื่อหุ้มสมองชั้นดูราอักเสบหนาชนิดไม่ทราบสาเหตุบริเวณช่องกะโหลกส่วนหน้า

สุธิดา บุญยะไวโรจน์, กัมมันต์ พันธุมจินดา

โรคเยื่อหุ้มสมองชั้นดูราอักเสบหนาชนิดไม่ทราบสาเหตุ เป็นการอักเสบเรื้อรังที่พบไม่บ่อย โดยลักษณะของโรคคือเยื่อหุ้มสมองชั้นดูราเป็นพังผืดและหนาตัวขึ้นทำให้เกิดอาการต่าง ๆ ทางระบบประสาท รายงานผู้ป่วยหญิงอายุ 72 ปี มาด้วยอาการปวดศีรษะบริเวณหน้าผาก ตามัว 2 ข้าง และสับสนเป็น ๆ หาย ๆ ตรวจร่างกายพบเส้นประสาทตาฝ่อทั้ง 2 ข้าง หน้าตาเฉยเมย ไม่พบความผิดปรกติอื่น ๆ การตรวจทางห้องปฏิบัติการเพิ่มเติมพบภาวะซีดจากความเจ็บป่วยเรื้อรัง อีเอสอาร์สูงและอิมมูโนกลอบบูลินสูง ไม่พบลักษณะของโรคซิฟิลิส โรคแพ้ภูมิต้านทานตัวเอง เช่น เอส แอล อี หรือโรคมะเร็งของระบบเลือด ผลตรวจภาพแม่เหล็กไฟฟ้าสมองพบว่า มีการหนาตัวของเยื่อหุ้มสมองร่วมกับสมองบวมบริเวณสมองกลีบหน้าด้านล่างทั้งสองข้าง การตรวจน้ำไขสันหลังพบเซลล์เม็ดเลือดขาว โปรตีนสูง แต่น้ำตาลปรกติ พยาธิวิทยาของเยื่อหุ้มสมองมีการอักเสบไม่จำเพาะและไม่พบหลักฐานสาเหตุของการอักเสบอื่น ๆ ผู้ป่วยได้รับยาเพร็ดนิโซโลน 45 มิลลิกรัมต่อวัน อาการปวดศีรษะดีขึ้นแต่อาการตามัวคงเดิม จึงค่อย ๆ ลดยาลงในระยะเวลา 18 เดือน โรคเยื่อหุ้มสมองชั้นดูราอักเสบหนาชนิดไม่ทราบสาเหตุมักพบบริเวณเทนทอเรี่ยม คาเวอร์นัสไซนัส และฐานกะโหลกศีรษะ โดยพบน้อยมากที่เกิดในช่องกะโหลกส่วนหน้า