Case Report

A case report: Cerebral venous sinus thrombosis

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Abstract

Cerebral venous sinus thrombosis (CVST) is an uncommon neurologic condition that can present with signs and symptoms of increased intracranial pressure (ICP). The clinical presentation of CVST mimics that of idiopathic intracranial hypertension (IIH). Contrast-enhanced magnetic resonance imaging (MRI) is useful in conjunction with magnetic venography (MRV) for the detection of CVST. Early diagnosis can decrease focal neurological deficit in these patients. A 21 year-old non-obese female presented with a history of chronic headaches that have persisted for two months. The patients did not report transient visual obscuration or diplopia. Eye examination revealed bilateral swollen optic discs. Neurological examination revealed no neurological deficit. Ocular findings may be related to the effect of increased ICP. Contrast-enhanced computed tomography (CT) brain has been demonstrated normal cisterns without a mass lesion. Lumbar puncture was performed and the cerebrospinal fluid (CSF) opening pressure was elevated; the CSF composition was normal. Contrast-enhanced MRI and MRV brain have been demonstrated partial thrombosis at the anterior part of the superior sagittal sinus and the left anterior frontal/frontopolar cortical veins. The patient received a carbonic anhydrase inhibitor and anticoagulation therapy. Her symptoms resolved, and papilledema improved. We reported a non-obese woman who developed chronic daily headache from CVST. CVST should be considered in the differential diagnosis of intracranial hypertension.

Key words: Cerebral venous sinus thrombosis, Idiopathic intracranial hypertension, Papilledema

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Introduction

Pseudotumor cerebri (PTC) is characterized by elevated intracranial pressure (ICP) with normal CSF analysis. Neurological examination often reveals no neurological deficit except sixth nerve palsy from elevated ICP. It is proposed that the mechanism in PTC is the resistance to CSF outflow.[1] Symptoms of PTC may include headache, transient visual obscuration (TVO), tinnitus, diplopia, and peripheral visual loss. Axoplasmic flow stasis in papilledema result in the death of retinal ganglion cells, which is the cause of permanent visual impairment.[2, 3] There are three known causes for PTC: (1) increased cerebral venous pressure from dural sinus thrombosis, arteriovenous (AV) fistula (2) damaged arachnoid granulations from meningitis, subarachnoid hemorrhage, meningiomatosis (3) chemically-induced conditions from corticosteroid withdrawal, hypervitaminosis A, tetracycline, isotetrinoin, cyclosporine, or oral contraceptives.[4 - 6] A majority of cases of PTC have no known cause, also called idiopathic intracranial hypertension (IIH).[7]

A majority of cases are obese women or women gained an average weight of 20 pounds.[2] IIH may also occur in children, but there is no gender predilection and no excessive weight gain.[8, 9] The modified Dandy criteria used to diagnose IIH include: (1) signs and symptoms of increased ICP (2) no localizing neurological signs, except sixth nerve palsy (3) increased CSF opening pressure with normal CSF composition (4) no evidence of hydrocephalus, structural, or vascular lesion on neuroimaging (5) no other known cause of increased ICP.[10] IIH is a diagnosis of exclusion, therefore, other structural causes of increased ICP must be excluded before IIH can be diagnosed.

Cerebral venous sinus thrombosis (CVST) can affect the cerebral venous drainage. Increased cerebral venous pressure results primarily from to total or partial occlusion of cerebral venous sinuses. Thrombosis most commonly affects the dural (sagittal, transverse) sinuses and less commonly affects the jugular veins, superior vena cava, and right heart.[11] The incidence of CVST among adults is reportedly 3 - 4 cases per million.[12] Symptoms and signs of CVST include headache (80 - 90%), intracranial hypertension and papilledema. Dural sinus thrombosis can be associated with intracranial inflammation (meningitis, connective tissue diseases), intracranial trauma or surgery, and hypercoagulable states.[13] Contrast-enhanced cerebral venogram study is preferred for diagnosis of CVST. The diagnosis is established by demonstrating a lack of flow in the cerebral venous drainage. Partial occlusion of a dural sinus is usually caused by a partial obstruction of CSF outflow and, consequently, increased ICP. We reported a case of non-obese female diagnosed with CVST after presenting with a history of increased ICP.

Case report

A 21 year-old non-obese female presented with a history of chronic headaches that have persisted for two months. The patients did not report transient visual obscuration or diplopia. She wore soft contact lens for myopic correction. She presented first to an ophthalmologist because she noticed her worsening headache. She had a 6-month history of migraine without aura and she took non-steroidal anti-inflammatory drugs to relieve her symptom. She had no prior history of precipitating factors of IIH including excessive weight gain, certain medications such as antibiotics, isotetrinoin, or oral contraceptives. Initial best corrected visual acuity (BCVA) was 20/30 OU. The intraocular pressure and ocular motility were normal in both eyes. The anterior segment and ocular motility were unremarkable. The pupils were 3 mm in size and react to light both eyes without afferent pupillary defect. The fundus examination revealed bilateral swollen optic discs (Figure 1). Ishihara test revealed normal color vision. Humphrey field analyzer revealed bilateral enlargement of the blind spot. Neurological examination revealed no neurological deficit.

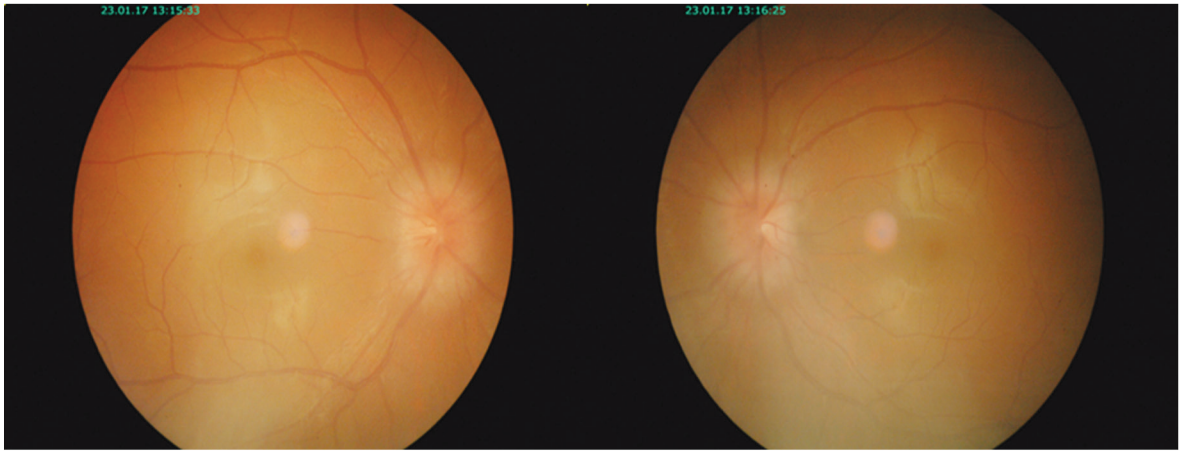

Figure 1 Fundus examination showed bilateral optic disc swelling.

Emergency contrast-enhanced brain CT was performed to exclude structural brain lesions. Contrast-enhanced brain CT revealed enlargement of bilateral optic-nerve-sheath complexes with decrease density, tortuous course and blurry contour, favored swelling indenting posterior aspect of bilateral globes without a mass lesion. Enlargement of the optic nerve sheath, flattening of the posterior sclera, and tortuosity of the optic nerve are commonly reported images of patients diagnosed with papilledema.[14] She was admitted and referred to a neurologist and she underwent lumbar puncture. The CSF analysis revealed open pressure of 38 cm H_2O and close pressure of 13 cm H_2O, normal CSF protein, sugar, no white blood cells or red blood cells, and negative Gram stain. This finding was consistent with increased ICP which is possibly caused by PTC. Contrast-enhanced brain MRI revealed partially empty sellar, dilated CSF spaces around bilateral optic nerves with tortuosity and mild flattening of the posterior sclera (Figure 2). Contrast-enhanced brain MRV revealed partial thrombosis at anterior part of superior sagittal sinus and left anterior frontal/frontopolar cortical veins (Figure 3). The deep cerebral veins and inferior sagittal sinus were intact. No foci of abnormal intensity or restricted diffusion in brain parenchyma.

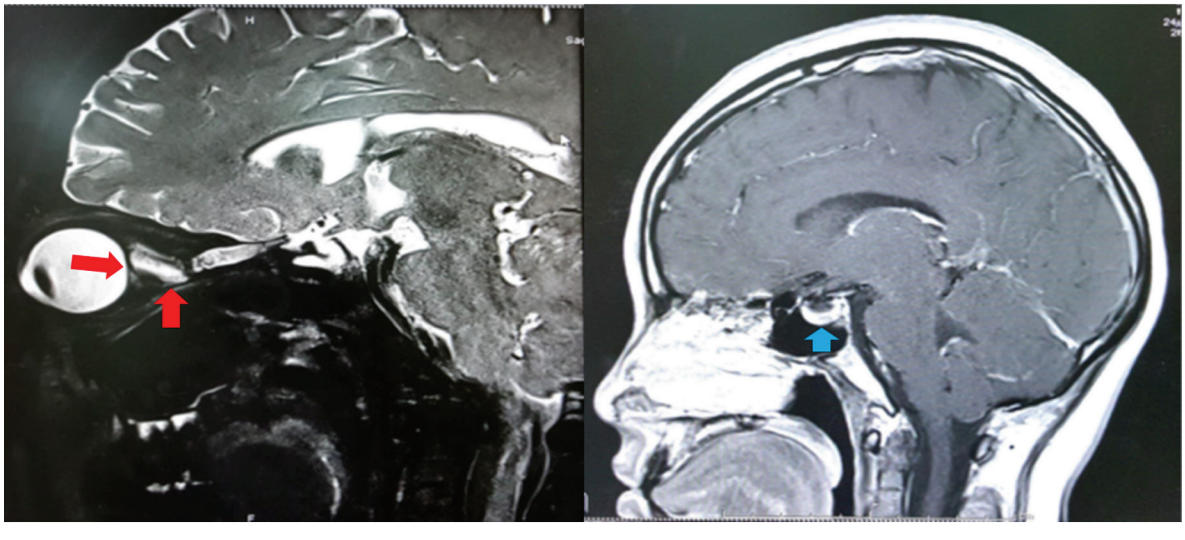

Figure 2 Sagittal view of contrast-enhanced brain MRI showed partial empty sellar (blue arrowhead), dilated CSF spaces around bilateral optic nerves with tortuosity and mild flattening of the posterior sclera (red arrowhead).

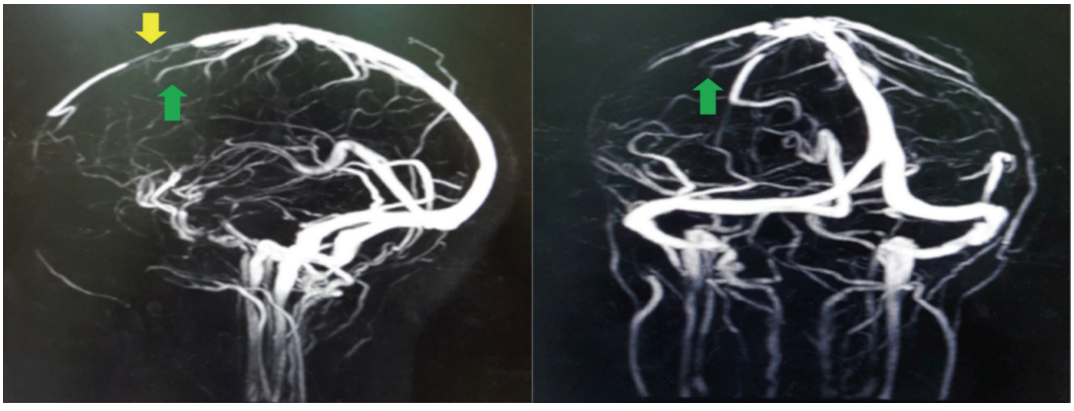

Figure 3 Contrast-enhanced brain MRV showed filling defect from partial thrombosis at anterior part of superior sagittal sinus (yellow arrowhead) and left anterior frontal/frontopolar cortical veins (green arrowhead).

The following laboratory investigations for hypercoagulable states included anticardiolipin IgG and IgM, anti-beta2glycoprotein IgG and IgM, lupus anticoagulant, anti-thrombin protein C, Protein S, and homocysteine factor V Leiden gene were normal. Neurologist prescribed warfarin 3 mg once daily. We prescribed acetazolamide 500 mg twice daily, but her headache symptom did not improved, so a neurologist prescribed topiramate 25 mg once daily. Combination therapy (of acetazolamide and topiramate) was effective treatment in this patient. She was discharged from the hospital with International Normalized Ratio (INR) control after she received anticoagulation therapy. On follow-up at one week after admission, her BCVA was improved to 20/20 OU, and bilateral optic disc swelling was decreased. On follow-up at seven weeks after admission, bilateral optic disc swelling and enlargement of the blind spot were resolved (Figure 4).

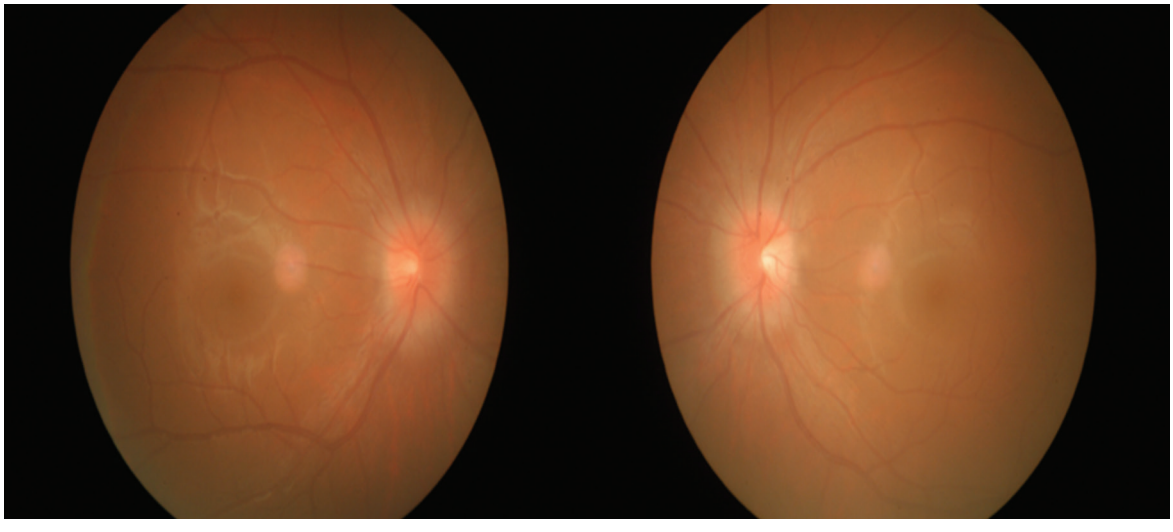

Figure 4 Fundus examination showed resolution of bilateral optic disc swelling.

Discussion

The differential diagnosis of bilateral true optic disc swelling with minimal visual dysfunction includes papilledema and true optic disc swelling caused by some etiologies other than increased ICP. True optic disc swelling that mimics papilledema may be caused by inflammatory, ischemic, compressive or infiltrative optic neuropathy. Inflammatory optic neuropathy such as optic perineuritis has optic disc swelling with minimal visual dysfunction, but there is associated with intraocular inflammation.[15] Ischemic optic neuropathy such as nonarteritic anterior ischemic optic neuropathy (NAION) has diffuse/sectoral optic disc swelling with arcuate/altitudinal visual field defect.[16] Rare patients with NAION have normal visual function. Compressive or infiltrative optic neuropathy may appear similar to papilledema, and the diagnosis in such cases can be made by neuroimaging. The present case had chronic headache, bilateral optic disc swelling with minimal visual dysfunction, and lack of intraocular inflammation can help us focus on papilledema.

The choroid plexuses produce CSF which flows from the lateral ventricles into the third ventricle and the CSF then flows through the cerebral aqueduct into the fourth ventricle, and out into the subarachnoid space. The route of CSF absorption is passively through the arachnoid granulations that protrude into the venous sinuses and then drain to the internal jugular vein and other extracranial veins.[17] A change in several mechanisms of CSF production or CSF absorption can result in increased ICP includes (1) an increase in the intracranial tissue by a space-occupying lesion or cerebral edema (2) a blockage of the CSF outflow within the ventricular system (obstructive hydrocephalus) or within the arachnoid granulations (non-obstructive hydrocephalus) (3) a decrease in CSF absorption from obstruction of venous outflow and/or (4) an increase in CSF production by an intracranial tumor.[18] The differential diagnosis of increased ICP without neurological deficit includes (1) space-occupying lesion (brain tumor, abscess, hematoma, vascular malformation) (2) cerebral edema (trauma, infection, stroke, metabolic encephalopathy) (3) hydrocephalus (4) obstruction of cerebral venous drainage (5) CSF secreting tumor and (6) idiopathic intracranial hypertension. The present case had increased ICP with otherwise normal CSF and without space-occupying lesion and enlargement of ventricles can help us focus on obstruction of cerebral venous drainage.

CVST causes intracranial hypertension and thereby severe headache. CVST is life-threatening and requires immediate treatment. The thrombus backs up into the cortical veins can result in seizure and hemiparesis. Venous stroke from CVST accounts for 0.5 - 1.0% of all strokes.[19] The causes of CVST were local process that alters venous outflow (sinus trauma, infection, tumor compression) or systemic process that promotes thrombosis (protein C and protein S deficiencies, hypercoagulable states secondary to malignancy).[20] The following laboratory investigations included complete blood count (CBC), partial thromboplastin time (PTT), protrombin time (PT), INR, lumbar puncture, anticardiolipin, anti-beta2glycoprotein antibodies, lupus anticoagulant, anti-thrombin protein C, protein S, and factor V Leiden should be performed.

Neuroimaging plays a role in the diagnosis of CVST. Non-contrast brain CT can reveal hyperdensity of cortical vein or dural sinus findings associated with CVST, however 10 - 40% of patients with CVST can have a normal brain CT.[21] Contrast-enhanced brain MRI and MRV or CT venogram (CTV) is more sensitive for the detection of CVST than CT. The absence of flow void and filling defect should raise suspicion for CVST.

Mainstay treatment for CVST involves anticoagulation or thrombolytic treatment. In cases of neurologic deterioration, open surgical thrombectomy combined with local endovascular thrombolytic

treatments have been described as beneficial.[22] If patients are overweight or obese, they should be encouraged to lose a modest amount of body weight (5% to 10% of total body weight) by a low-salt diet and lifestyle changes, including an exercise program.[23] Patients often have chronically elevated ICP and other medical and surgical symptomatic treatments can be given to relieve the symptom and to preserve the vision. Acetazolamide, a carbonic anhydrase inhibitor, is thought to decrease CSF production, leading to decreased ICP. Acetazolamide is the first-line symptomatic treatment. A starting dose is 500 mg twice daily and gradually titrating up to a maximum of 4 g daily in twice-daily doses.[24] If acetazolamide is insufficient when given as monotherapy, other medications can be considered as combination therapy. Topiramate, a weak carbonic anhydrase inhibitor, is commonly used for primary headache disorders, and can be considered for severe headache from intracranial hypertension. A starting dose is 25 mg once daily and gradually titrating up to 100 mg twice daily.[25] Acetazolamide and topiramate are contraindicated in patients with known sulfa allergy, liver failure and are relatively contraindicated in patients with a history of kidney stones. Diagnostic lumbar puncture can improve headache, however, the improvement is transient and some patients develop low-pressure rebound headache.[26] Thus, we did not consider repeated lumbar puncture as symptomatic treatment. Optic nerve sheath fenestration (ONSF) can improve visual function in patients who had severe papilledema, however, ICP not be affected.[27, 28] ONSF may not be effective treatment in intracranial hypertension. Early diagnosis and prompt treatment can reduce mortality rate to only 5% - 10%. Patient achieved adequate anticoagulation can be observed without surgical treatment. Reopen of dural sinus results in resolution of the dural sinus narrowing, and normalization of ICP.

The present case was non-obese female presented with chronic headache from increased ICP in which the patient had no history of excessive weight gain or certain medications. Because the patient had bilateral optic disc swelling, so papilledema must be rule out include other causes of increased ICP. Emergent brain CT imaging should be performed in a patient with a clinical suspicion of increased ICP. If brain CT comes back negative, then a diagnostic lumbar puncture should be performed for CSF analysis. In the present case, the contrast-enhanced brain CT revealed radiographic findings of papilledema without a mass lesion and lumbar puncture revealed increased ICP, thereby we suspect the presumed diagnosis of IIH. Although no evidence of ventriculomegaly or mass effect in the contrast-enhanced brain CT, further contrast-enhanced brain MRI and MRV or CTV should be performed to excluded the secondary causes which attributable to the increased ICP. In the present case, the contrast-enhanced brain MRV revealed partial dural venous sinuses thrombosis which may propose CVST has led to intracranial hypertension. The patient was received immediate appropriate management. Anticoagulation therapy with combination therapy of acetazolamide and topiramate is effective treatment in this case. The patient reported that her headache severity was decreased and the eye examination revealed improvement of visual function and papilledema. The patient was subsequently discharged from the hospital and the patient should be follow-up for the document visual function with stereo optic disc photography and visual field for full recovery within few months. Patient with CVST may require long-term anticoagulation therapy for a minimum of 6 months.

Conclusion

We reported a case of CVST presenting initially as papilledema with negative brain CT that made a suspicion of IIH. CVST should be considered in the differential diagnosis of intracranial hypertension. Proper investigations are essential to achieve the etiology of the disease.

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บทคัดย่อ

รายงานผู้ป่วย: ภาวะหลอดเลือดดำในสมองอุดตัน

สุนทรี ธิติวิเชียรเลิศ

ภาควิชาจักษุวิทยา คณะแพทยศาสตร์ มหาวิทยาลัยธรรมศาสตร์

ภาวะหลอดเลือดดำในสมองอุดตันเป็นภาวะทางระบบประสาทที่พบได้ไม่บ่อย มาด้วยอาการและอาการแสดงของความดันในกะโหลกศีรษะสูงขึ้นได้ ซึ่งลักษณะทางคลินิกจะคล้ายกับภาวะความดันในกะโหลกศีรษะสูงโดยไม่ทราบสาเหตุ การตรวจเอกซเรย์คลื่นแม่เหล็กไฟฟ้าสมองและหลอดเลือดดำมีประโยชน์ในการวินิจฉัยภาวะนี้ การตรวจวินิจฉัยได้อย่างทันท่วงทีมีความสำคัญเพราะภาวะนี้อาจทำให้มีภาวะแทรกซ้อนทางระบบประสาทตามมา รายงานผู้ป่วยหญิงไทยรูปร่างสมส่วน อายุ ๒๑ ปีมาด้วยอาการปวดศีรษะเรื้อรังและปวดศีรษะรุนแรงจนต้องตื่นกลางดึกมา ๒ เดือนโดยไม่มีอาการตามัวชั่วขณะหรือเห็นภาพซ้อน ตรวจตาพบขั้วประสาทตาบวมทั้งสองข้าง การตรวจทางระบบประสาทไม่พบอัมพาตของเส้นประสาทสมองเส้นอื่น ผลการตรวจเข้าได้กับภาวะขั้วประสาทตาบวมอันเนื่องมาจากความดันในกะโหลกศีรษะสูง ผลตรวจเอกซเรย์คอมพิวเตอร์สมองไม่พบพยาธิสภาพผิดปกติในสมอง ผลตรวจน้ำหล่อเลี้ยงไขสันหลังพบความดันของน้ำหล่อเลี้ยงไขสันหลังสูงโดยไม่มีเซลล์ผิดปกติ ผลตรวจเอกซเรย์คลื่นแม่เหล็กไฟฟ้าสมองและหลอดเลือดด้วยการฉีดสีพบภาวะอุดตันบางส่วนของหลอดเลือดดำซุพีเรียร์ ซาจิตตัล ไซนัสด้านหน้าและภาวะอุดตันของหลอดเลือดดำฟรอนทัลและหลอดเลือดดำฟรอนโทโพลาร์ คอร์ติคัลด้านซ้าย ผู้ป่วยได้รับการรักษาด้วยยากลุ่มคาร์บอนิก แอนไฮเดรส อินฮิบิเตอร์และยาต้านการแข็งตัวของเลือด ภายหลังการรักษาอาการปวดศีรษะและภาวะขั้วประสาทตาบวมดีขึ้น ภาวะหลอดเลือดดำในสมองอุดตันเป็นภาวะที่ควรตระหนักถึงในผู้ป่วยที่มีอาการปวดศีรษะโดยที่มีลักษณะทางคลินิกไม่จำเพาะกับภาวะความดันในกะโหลกศีรษะสูงโดยไม่ทราบสาเหตุ

คำสำคัญ: ภาวะหลอดเลือดดำในสมองอุดตัน, ภาวะความดันในกะโหลกศีรษะสูงโดยไม่ทราบสาเหตุ, ภาวะขั้วประสาทตาบวมอันเนื่องมาจากความดันในกะโหลกศีรษะสูง