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Normal Pressure Hydrocephalus with Stroke History: A Case Report and Literature Review

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ABSTRACT

Normal pressure hydrocephalus (NPH) is characterized by enlarged ventricles despite normal intracranial pressure, caused by an abnormal build up of cerebrospinal fluid (CSF).It typically presents with the classic triad of symptoms: gait and balance disturbances, urinary incontinence, and cognitive decline. Unlike many other dementias, NPH is notable because it can often be reversed through surgical intervention, most commonly with ventriculoperitoneal shunt placement, which remains the standard treatment. Case Illustration: A 73-years-old male presented with loss of consciousness over the past six days, with worsening symptoms one day prior to admission. Associated symptoms included blank stare, no eye contact while communicating, and blisters all over the body due to a long period of bed rest. He denied any episodes of fever, cough, runny nose, diarrhea, headache, seizure, vomiting, abdominal pain, or fall. There was a history of stroke attacks that happened twice in 2023 and 2024 with sequelae aphasia since then. CT Scan revealed acute lacunar infarct in nucleus lentiformis dextra, no intracranial haemorrhage presented, cerebral atrophy with ventriculomegaly ex vacuo confirmed, there are ethmoidalis and frontalis sinusitis. The patient then treated with ventriculoperitoneal shunt but then passed away two days after the surgery.
Keywords: Hydrocephalus, Stroke, CSF

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1. INTRODUCTION

In 1965, Hakim and Adams described a syndrome of hydrocephalus with normal cerebrospinal fluid (CSF) pressure, characterized by gait disturbance, cognitive decline, and urinary incontinence, but without the typical signs of raised intracranial pressure. They termed this condition normal pressure hydrocephalus (NPH). It is essentially a form of communicating chronic hydrocephalus in which the ventricles enlarge while intracranial pressure remains within the normal range.

NPH is classified into three categories: congenital/developmental, idiopathic (iNPH), and secondary NPH (sNPH), which develops after events such as hemorrhagic stroke, trauma, infection, or tumors (Shigeki Yamada et al., 2021). It is considered a potentially reversible cause of dementia, with ventricular shunting being the main treatment. Outcomes are generally better when treated early, and about 50% of patients improve after shunt surgery (Sridhar et al., 2024). Roughly half of cases are idiopathic with no identifiable cause (iNPH), while the other half are secondary to previous neurological insults (sNPH).

Although treatable, NPH is challenging to diagnose (Tan et al., 2021). Its symptoms overlap with other neurodegenerative disorders, and no single clinical feature is specific. What distinguishes it from other forms of hydrocephalus is the ability to confirm intracranial pressure directly using an intraventricular catheter or external ventricular drain (EVD).

An EVD, also known as a ventriculostomy, is an invasive device inserted into the brain's ventricular system to both drain CSF in acute hydrocephalus and provide the most accurate measurement of intracranial pressure.

In clinical practice, NPH is usually suspected in older adults who show a combination of the classic triad of symptoms along with imaging findings of disproportionate ventricular enlargement compared to cortical atrophy, and without evidence of obstruction or other causes such as subarachnoid hemorrhage, tumors, meningitis, or trauma.

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Additional imaging features that support the diagnosis include dilated temporal horns not explained by hippocampal atrophy, a callosal angle less than 90°, upward bowing of the corpus callosum, narrowing of the posterior cingulate sulcus (the "cingulate sulcus sign"), tight sulci over the high convexity, and enlarged Sylvian fissures with focal sulcal dilation, collectively referred to as disproportionately enlarged subarachnoid space hydrocephalus (DESH).

Confirmation may also be obtained through a lumbar puncture, which typically shows normal opening pressure (5–18 mmHg), with improvement in symptoms after removal of a large CSF volume. The definitive management of NPH is CSF shunting to divert fluid and relieve symptoms.

2. CASE ILLUSTRATION

Mr. MT, a 73-years-old-male, presented with loss of consciousness six days before entering the hospital. The patient reported with significant worsening symptoms one day prior to admission. During this one month period, he sought prescribed treatment such as cefadroxil.

One day before entering the hospital, the patient reported difficulty swallowing the porridge. Associated symptoms included blank stare, no eye contact while communicating, and blisters all over the body due to a long period of bed rest. He denied any episodes of fever, cough, runny nose, diarrhea, headache, seizure, vomiting, abdominal pain, or fall.

There was a history of an uncontrolled hypertension then developed as stroke in 2023 for the first time and the next episode of stroke attack followed in 2024 which resulted in sequelae aphasia since then. History of heart disease, diabetes, chronic cough, pulmonary tuberculosis, and other diseases are denied. There was no known family history of similar complaints.

On examination, the patient was in a coma or in deep unconsciousness with Glasgow Coma Scale (GCS) score was 7 (coma). Vital signs when the patient was arrived at the hospital: blood pressure 134/70 mmHg, heart rate 88 bpm, respiratory rate 28 breaths per minute, and oxygen saturation 91% on room air. Random blood glucose test when arrived was 91 mg/dL.

General physical examination correlated with GCS score and vital signs resulted in severe brain injury. Neurological examination, motor strength, cranial nerve examination, and other examinations couldn't

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be performed since the patient was in deep unconsciousness.

Hematology examination showed anemia with 10.1 g/dL of hemoglobin, trombositopenia with 53,000/uL, hypoalbumin with 1.8 g/dL albumin, and normal CSF examination. MSCT radiological examination reveal lacunar infarct in nucleus lentiformis dextra, no intracranial haemorrhage presented, cerebral atrophy with ventriculomegaly ex vacuo confirmed, there are ethmoidalis and frontalis sinusitis.

Based on the results of the radiological examination, the patient then underwent VP Shunt. After undergoing surgery, the patient's GCS score remained the same and found worsen. The patient then passed away two days after the surgery.

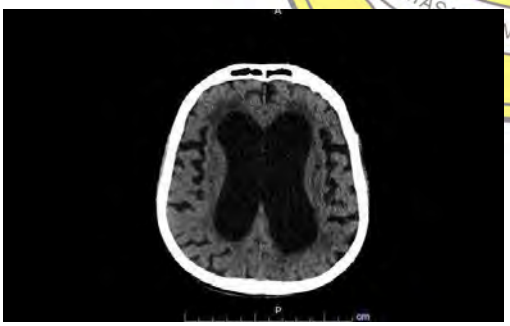

Figure1. Computed Tomography Scan with no contrast

3. DISCUSSION

This case describes a 73-years-old man with hydrocephalus. In this case, the patient's stroke history and loss of consciousness raise significant concern for potential brain injury. Due to uncontrolled hypertension with two stroke attacks and neurodegeneration based on age, the patient had been diagnosed with sequelae aphasia since then. It resulted in brain atrophy from the cranial imaging.

The cranial imaging also confirmed hydrocephalus with the evidence of ventriculomegaly or enlargement of brain's ventricles. Meanwhile, the CSF laboratory showed normal CSF. Any head injury history was denied. The examinations result in normal pressure hydrocephalus (NPH) for this patient where the brain's ventricle expands but no sign of intracranial pressure raising.

NPH is found commonly in adults, especially older people. NPH is a communicating type of hydrocephalus with the definition when there is an imbalance or increased accumulation of CSF or uncontrolled CSF flow that the body can't manage. NPH is also known as a chronic communicating hydrocephalus.

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The NPH itself is categorised by three types based on its aetiologies. Congenital NPH, idiopathic NPH, and secondary NPH. From the data this patient has, the diagnosis of this case based on its aetiology is secondary NPH because it happened by developing conditions such as after haemorrhagic stroke, trauma, infection, and tumour.

This patient's past medical condition is related to two attacks of hemorrhagic stroke. But it is also possible to diagnose the case as idiopathic NPH because the aetiology remained unclear. The patient's loss of consciousness was worsened because there is difficulty in swallowing the porridge or dysphagia.

Dysphagia is present when there is cranial nervous system dysfunction. Swallowing food is related to the cranial nervous system such as trigeminal nerve, fascial nerve, glossopharyngeus nerve, vagus nerve, and glossopharyngeus nerve. Swallowing the food is part of the motoric pathway which performs volunteer movements.

These nerves' pathways are correlated to the brain's cortex. If there is any dysfunction that happens from the cortex of the brain, it shows that there is brain injury. Other than that, through laboratory hematology examination, this patient is low in hemoglobin which possibly caused him to be weak clinically.

4. CONCLUSION

Hydrocephalus is a common neurological disorder in all ages that is characterised by pathological enlargement of the ventricles. In this case, the hydrocephalus type is a chronic communicating hydrocephalus or also known as normal pressure hydrocephalus. The diagnosis is confirmed due to normal findings in CSF production but ventriculomegaly on radiological examination. Based on the features, surgical intervention such as VP shunt was warranted.

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