

## CASE REPORT

# Migration of intraventricular neurocysticercus after ventriculostomy

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## ABSTRACT

Intraventricular neurocysticerci are an uncommon occurrence and are often difficult to diagnose. They are often a cause of obstructive hydrocephalus and inflammatory reactions, which can be life threatening. Intraventricular neurocysticerci are most common in the fourth ventricle and surgical decompression of obstructive hydrocephalus is an important step in their management. However, these cysticerci are also known to migrate within the ventricular system and may cause confusion during surgery. It thus becomes very important for radiologists and neurosurgeons to be aware of this phenomenon.

**Key words:** Intraventricular neurocysticercosis, neurocysticercosis, migrating

## Introduction

Neurocysticercosis (NCC) is one of the most common parasitic infestations involving the central nervous system (CNS). Whereas neuroparenchymal cysticerci may be readily identified on CT and MRI, it may be difficult to identify lesions within the cerebrospinal fluid (CSF) spaces.

Intraventricular lesions are known to occur in approximately 20% to 40% of neurocysticercosis cases.<sup>[1]</sup> They are often a cause of obstructive hydrocephalus and inflammatory reactions, which can be life threatening.

Intraventricular neurocysticerci (IVNCC) are most common in the fourth ventricle and surgical decompression of obstructive hydrocephalus is an important step in their management. However, these cysticerci are also known to migrate within the ventricular system. Rarely, intraventricular neurocysticerci may migrate within the ventricular system due to the sudden pressure differential across the ventricular system created during ventriculostomy and lead to confusion during the surgery. It thus becomes very important for radiologists and neurosurgeons to be aware of this phenomenon.

Few cases have been reported in literature, most of them reporting spontaneous migration of cysticerci from one location in the ventricular system to another.<sup>[2,3]</sup>

We report a case of intraventricular neurocysticercosis presenting with hydrocephalus due to third ventricle obstruction which later migrated to the lateral ventricle subsequent to ventriculostomy.

## Case Report

A 42-year-old male patient presented with new onset seizures with two episodes of seizure over 20 days. He also complained of severe intermittent headaches for 2 weeks. There was no history of fever. The patient did not have any other significant systemic complaints. Neurologic examination did not reveal any significant abnormality. There were no focal neurologic deficits.

Routine blood investigations were within normal limits and there was no evidence of electrolyte imbalance. A CSF analysis revealed increased proteins (73 mg%). CSF was negative for HIV antibodies and CSF culture was sterile.

A contrast-enhanced CT scan was performed taking 3 mm axial sections from base of skull to the vertex after injecting 30 ml of iv contrast, on a 6 slice Siemens Somatom scanner. There was dilatation of both lateral ventricles and the third ventricle with associated subependymal transudation of CSF. A subtle well-defined rounded lesion was noted within the third ventricle. The lesion was of CSF density and showed a punctate enhancing focus within. The fourth ventricle was normal [Figure 1a]. There were no obvious neuroparenchymal lesions. The cranial vault appeared normal. A provisional diagnosis of third ventricular neurocysticercosis was made and the patient was referred for an MRI.

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MRI of the brain was performed using a 1.5T Seimens Avanto magnet with a standard head matrix coil. Standard T1 and T<sub>2</sub>-weighted images were acquired. In addition, a fluid inversion recovery (FLAIR) sequence was also obtained.

MRI revealed dilatation of the lateral and third ventricles with subependymal transudation of fluid. A cystic structure was seen within the third ventricle, distending it [Figure 1b]. Furthermore, an eccentric mural nodule of intermediate signal intensity was identified. This nodule was thought to represent the scolex.

A diagnosis of third ventricular cysticercosis causing obstructive hydrocephalus was made.

The patient was then taken for surgical evacuation of the cysticercus. A right parietal approach was taken with the plan of approaching the third ventricle through the right lateral ventricle. However, during ventriculostomy, no lesion was seen within the third ventricle. A VP shunt was placed *in situ* to decompress the hydrocephalus and the procedure was abandoned. An endoscopic third ventriculostomy was not attempted due to lack of adequate expertise and equipment.

MRI of the brain was repeated to locate the cysticercus. The third ventricle did not reveal the neurocysticercus [Figure 2a]. The cysticercus was now seen to have migrated into the occipital horn of the right lateral ventricle [Figure 2b]. However, the hydrocephalus was seen to have decreased in severity compared to the previous scan.

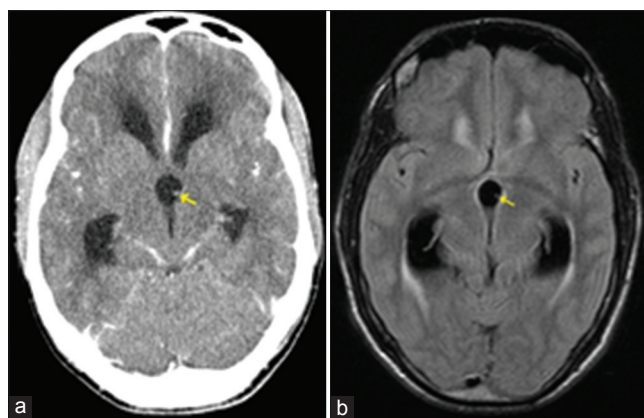
The patient then received antihelminthic therapy and a repeat MRI performed after 2 months did not reveal any evidence of neurocysticercosis.

## Discussion

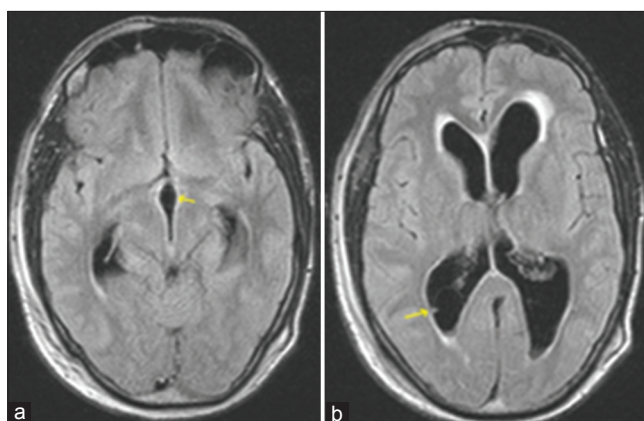
Cysticercosis occurs when humans ingest the eggs or proglottids of *Taenia solium* directly, through fecal contamination of hands or food, and the larval forms in the human intestine migrate to various sites in the body and develop into cysticerci. There are three different types of cysticerci: The cellulose, intermediate, and racemose varieties. The cellulose cysticerci are the most common form of IV NCC.

There is involvement of the central nervous system in about in 60% to 90% of cases with cysticercosis. Among these, the brain parenchyma is involved in about 60% to 92% of cases. Intraventricular NCC occurs in only 7% to 20% of patients.<sup>[4]</sup>

The intraventricular cysts may circulate freely throughout the CSF pathways and can cause obstruction of CSF outflow anywhere in the ventricular system, but their predilection is for the fourth ventricle. Common symptoms include focal neurological deficits, altered sensorium, seizures, or symptoms due to ependymal inflammation associated with cyst degeneration. Sometimes, the patient may present with features of meningitis or encephalitis causing communicating hydrocephalus.<sup>[5,6]</sup>



**Figure 1:** (a) Axial contrast-enhanced CT scan image showing the cysticercus with an eccentric scolex (arrow) within the third ventricle causing obstruction of both lateral ventricles. (b) T2 FLAIR axial image showing the cysticercus with an eccentric scolex (arrow) within the third ventricle causing obstruction of both lateral ventricles



**Figure 2:** (a) T2 FLAIR axial image (post operative) showing a normal third ventricle (arrow). The cysticercus is not seen within the third ventricle. (b) T2 FLAIR axial image (post operative) showing the cysticercus (arrow) within the occipital horn of the right lateral ventricle

Due to the effect of gravity and taking into consideration the path of CSF outflow, intraventricular cysts are most commonly seen in the fourth ventricle followed by the third ventricle, lateral ventricles and uncommonly in the aqueduct of Sylvius.<sup>[5]</sup>

Hydrocephalus can either be obstructive or communicating. The cysticerci may physically obstruct the ventricular outflow pathway or may incite an inflammatory response which later leads to scarring of the ependyma. The later may also cause non-obstructive hydrocephalus.<sup>[7]</sup> Acute meningoencephalitis may also be associated with the communicating form of hydrocephalus. A mobile IVNCC may sometimes cause sudden loss of consciousness resulting from acute intermittent hydrocephalus known as Brun's Syndrome.<sup>[8]</sup>

Although contrast-enhanced CT is a good modality to demonstrate parenchymal neurocysticerci, intraventricular cysticerci maybe very difficult to image on CT as they follow CSF density.

MRI is the modality of choice to diagnose IV NCC. T1 and PD-weighted images are known to be better than T<sub>2</sub>-weighted images in picking up these cysts although the intensity of the lesion may not be very different from CSF on T<sub>1</sub> and T<sub>2</sub>-weighted images.<sup>[8]</sup> However, FLAIR images have been seen to demonstrate the cyst wall well in our practice. FLAIR sequences may also show the scolex as a hyperintense focus within the cyst. There is not much role of contrast-enhanced MRI. MRI also depicts degenerative changes in these cysticerci well. Various stages of development of the cyst are also well depicted by MRI.<sup>[9]</sup> IVNCC may also be suspected due to their secondary effects like hydrocephalus especially in patients with no other cause for the same.

A surgical evacuation of an intraventricular cysticercus is indicated, especially if it is seen to cause obstructive hydrocephalus. Recently, an endoscopic approach for the removal of intraventricular cysticerci using a flexible fiberoptic scope has also been developed.<sup>[10]</sup>

The migration of the cyst to other parts of the ventricular system may occur spontaneously or even during surgery. The fourth ventricle is the common location of intraventricular cysticercus; gravity postulated as an important factor.

In our case, the cause of migration was postulated to be sudden change of pressure differential across the foramen of Monro at the time of ventriculostomy causing the cysticercus to be suctioned into the right lateral ventricle as a right ventriculostomy was performed.

In this report, we present a rare form of migrating intraventricular neurocysticercosis. Albeit uncommon, this condition is important to diagnose in so far as preventing

repeated admissions with hydrocephalus and providing a better approach to planning of surgery if indicated.

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