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A Case Study on Neurocysticercosis At Selected Villages in Madurai

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Abstract:
A 20-year-old female had a sudden episode of seizure, first noted by her family followed by generalized seizure of 3-4 episodes and she was presented to the emergency department (ED). On administering Anti-seizure drugs patient was normal. During withdrawal of the anti-seizure therapy the patient again started to experience multiple episodes of seizure and she was finally diagnosed with Status Epilepticus and got admitted in the hospital.
Diagnostic evaluation for the patient was done using electroencephalogram (EEG) in both sleep and awaken state and Magnetic Resonance Imaging (MRI) was also done, which shows multiple extra-parenchymal lesions. The patient was adviced to continue medications such as TEGRITAL CR 200mg, TRIGABANTIN 100mg, REJENURON, EVION LC, SHELCAL OS 500mg, NORFLOX TZ, VIZYLAE and proper followup was adviced.
Conclusions: Neurocysticercosis is a common condition seen in third-world countries. There is a very low incidence of this condition in developed countries. Due to the rarity of this lesion in developed countries, practitioners sometimes have low exposure to this disease. Immigration among citizens of different countries has increased the possibility of seeing this condition, and awareness of this disease should be emphasized. The practitioners should be aware of this infection when they are presented with a patient from or traveling to high-risk countries. The location of the lesion is also important due to the range of presentations in these patients. The presentation can range from headache to seizure and finally severe neurologic impairments. Treatment starts with a proper diagnosis. The providers need to be aware of the location and the possible ramification of the treatment. An inactive lesion may be observed and when/if symptoms are present then symptomatic treatment has to be rendered. In those cases treatment options may include antiparasitic medication and if accessible surgical excision.

Keywords: Neurocysticercosis, causes, clinical manifestation, and management, Status epilepticus, extra-parenchymal lesion, anti-seizure therapy

INTRODUCTION

The proximity of Tenia solium is a larval cyst of the tapeworm that affects a significant number of patients worldwide. This condition is transmitted from an infected individual with cysticercosis to a new host using a fecal-oral route. In low-income countries, individuals in the same household are nearby, which results in a higher incidence of larval transmission. Fecal transmission and the proximity of

humans to the pigs also lead to secondary infections. Consumption of undercooked pork subsequently transmits the tapeworm to a new human host, and the cycle continues.

In the case of neurocysticercosis, the larvae circulate in the blood and enter the nervous system. The eggs create cysts in different organs, leading to a range of conditions from mild to severe and at times lethal..[(1)(2)]

Tissue. Neurocysticercosis could present as an intraparenchymal or an extraparenchymal lesion. The location of the lesion can cause a significant difference in symptoms, treatment, and prognosis. In the case of intra-parenchymal involvement, the embryos access the gray matter via arteries. Once in place, they grow as a cystic fluid-filled mass surrounded by brain parenchymal tissue. In most patients, there is an equilibrium present with no specific symptoms. However, over time, the cyst will damage the surroundings, leading to characteristic seizure activity.[(1)]

Eventually, the host's immune system overcomes the homeostasis and the larva dies. The released larva particles generate a significant immune response with various symptoms depending on the location of the cyst.

The lesion calcifies and leaves a residual calcification in the brain parenchyma. Most of these cysts have benign prognoses with minimal host symptoms. At times, there may be multiple simultaneous lesions, and this condition is known as cysticercotic encephalitis.[(1)]

The extra-parenchymal lesion can involve subarachnoid space, basal cisterns, or ventricles. The enlargement of the cyst in these spaces can obstruct the cerebrospinal fluid flow, leading to an increase in the intracranial pressure and possible death from herniations.

This report presents the case of a patient who presented to the clinic with an extra-parenchymal lesion which was later diagnosed as neurocysticercosis.

DEFINITION:

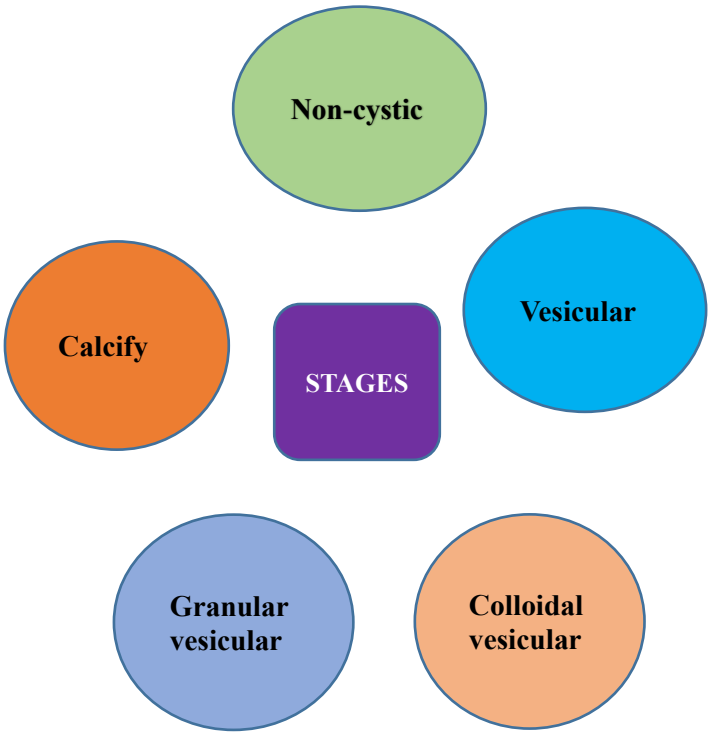
Neurocysticercosis is a parasitic infection of the central nervous system caused by the ingestion of eggs of the adult tapeworm called T. solium. It's the most common parasite infection of the brain, which is the leading cause of epilepsy in the world..[(1)(3)]

Causes:

- Most common cause- pork tape worm taenia solium.
- Consuming under-cooked food.
- Particular pork or water contaminated with tape worm eggs.
- Poor hygienic practices.

Stages of the disease:

There are five stages of neurocysticercosis, and these align with the lifecycle of the parasite that causes it



Life-cycle of the parasite:

Once a live T. solium tapeworm enters the body, it attaches to the intestinal wall and matures.

The head of the tapeworm contains many small segments called proglottids, each of which contains a complete reproductive system. There are 1.000-2.000 fertile eggs in each of these segments.[(11)]

The person passes these eggs out in stool. The larvae then live in environments such as soil, water, and vegetation, where they may be ingested by a pig or human.

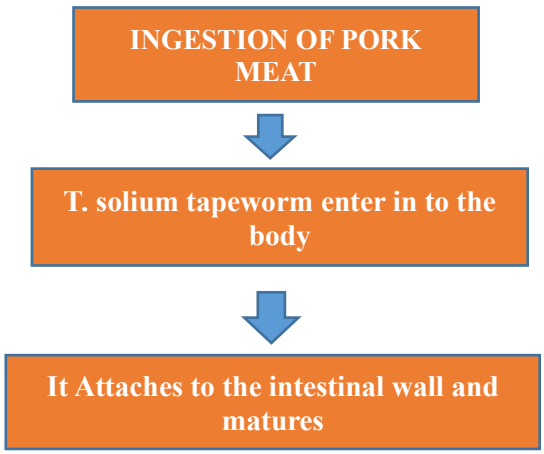
A pig's body cannot completely support the parasites, so the larvae do not fully develop. However, the human body contains the necessary enzymes.

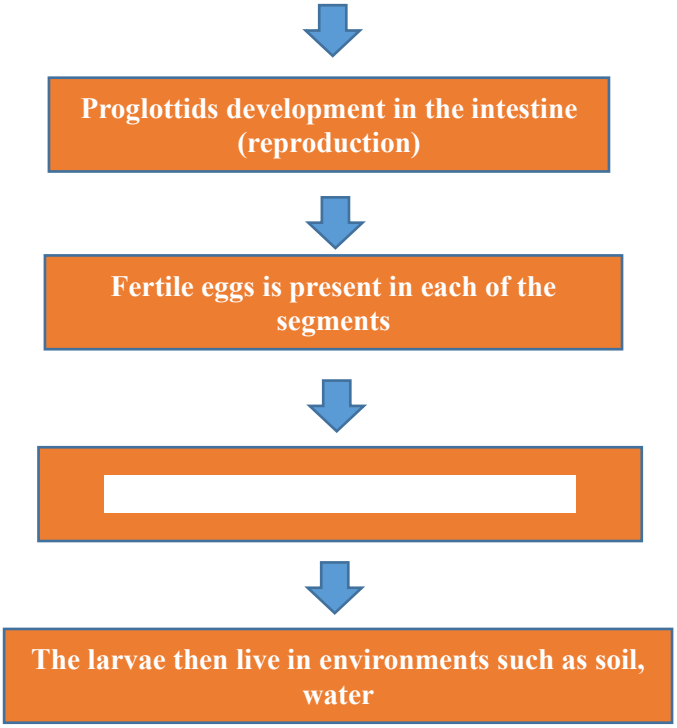
If, after ingesting the parasite, the tapeworm stays at the opening of the person's bowels, it can cause a disease called taeniasis.

However, a person consumes the parasite's larvae, they are at risk of cysticercosis. The larvae may enter the body through food contaminated with feces or via hand-fecal-oral transmission.

Also, the parasitic embryos can enter the body's tissues and develop into larvae, causing cysticercosis.

If the growing parasites attach anywhere in the CNS, neurocysticercosis can develop.





Clinical Manifestations of Neurocysticercosis:

The pathological features of NCC depend on the infection's stage and the cysticerci's location within the central nervous system. The cysticerci reach the CNS through the bloodstream or lymphatic system. They can penetrate the blood-brain barrier and disseminate throughout the brain or spinal cord. The most common sites of cysticercosis formation in NCC include the brain parenchyma, ventricular system, subarachnoid space, and, rarely, the spinal cord.[(11)(12)]

- Tissue damage
- Perilesional edema
- Neurological complications
- Granuloma formation and calcifications in neurocysticercosis
- Cytokine and chemokine expression
- Fibrous capsule formation
- Heterogeneity of granulomas
- Hydrocephalus
- Aggregation of multiple cysts:
- Obstruction of cerebrospinal fluid pathways

Other clinical manifestations 0f NCC:

- Headache-chronic migraine-type Dizziness.
- Epilepsy-the most common presentation.
- Intracranial hypertension.
- Stroke-hemorrhagic.
- Neuropsychiatric changes-dementia, cognitive decline.

- Diplopia.
- Hydrocephalus-communicating or noncommunicating Movement disorders.
- Hemisensory loss.
- Gait disturbances.
- Hyper/hyporeflexia.
- Hemiparesis.
- Dysarthria.

Diagnostic evaluation:

Excision biopsy

Biopsy is usually achieved by excision of the subcutaneous cysticerci, which are found in 4–25 % of patients with NCC. However, radiologic and serologic tests are required for confirmation of diagnosis, unless biopsy of a CNS lesion is possible (Carlton et al. 1997).(4)

Neuroimaging

Antigen detection tests

CSF analysis

Novel methods of diagnosis:

Fast imaging employing steady-state acquisition

Microscopic examination of feces for *Taenia* eggs

Coproantigen detection assays

Detection of specific antibody in serum

DNA based methods

- Computed Tomography.
- Magnetic Resonance Imaging.
- Serological testing.
- Enzyme Linked Immunoelectrotranfer Blot (EITB).

Medical Management:

AGENT	DURGS NAME
Antihelminthic	Albendazole (15mg/kg/day) in 2 divided doses for 15 days.
	Praziquantel (50mg/kg/day) for 15 days.
Steroids	Dexamethasone at doses between 4.5 and 12mg/day.
	Prednisone at 1mg/kg/day
Anticonvulsant	Tegrital CR 200mg (0-0-1)
	Trigabantin 100mg (1-0-1)
Vitamin and Mineral Supplements	Rejenuron, vitamin B12 (1-0-0).
	Evion LC, vitamin E (0-0-1).
	Shelcal OS, calcium supplement (1-0-0).

Surgical Management:

- Endoscopic surgery for intraventricular cyst.
- Emergency shunt placement and cyst removal by open craniotomy.
- CSF diversion procedure.

Statistical data of NCC

Neurocysticercosis has been increasingly recognized as a major cause of neurologic disease worldwide and an important problem among immigrant populations in the United States. Neurocysticercosis is the most common parasitic infection of the CNS. Tissue-invading larval forms of the pork tapeworm Taenia solium cause the disease.

Historically, neurocysticercosis was endemic to only Latin America, Asia, and Africa, although it has become increasingly frequent in the United States since the 1980s.

The infection by *T solium* produces two different diseases: taeniasis (TE) and/or cysticercosis (CC). When humans eat eggs of *T. solium* they acquire CC that can be found in any tissue including heart, liver, lungs, and peritoneal cavity. The location of the cysticercus (CT) in the CNS and in the retina (considering the retina as an extension of the CNS) is called NCC and is considered the most important neurological disease of parasitic origin in humans and the main cause of late-onset epilepsy. Cysts of NCC are located mainly at the distal vascular territory in the cortical gray substance or at the level of the connection between substance gray and white matter. In total 1494 patients with NCC were confirmed between 1980 and 2004 of which 66% suffered from epilepsy, 16% had an obstructive hydrocephalus and 15% headache due to NCC (91 %), intraventricular (6 %) or subarachnoid (2 %) either because travelled to endemic areas, were of Hispanic origin or had any contact with carriers of the parasite. (Wallin & Kurtzke, 2004; Uddin et al., 2010)

Epidemiology

United States: Not a public health threat; infection has a specific and limited distribution ~1,000 cases occur per year, usually in Latin American immigrants in major urban centers with large immigrant populations (Chicago, Los Angeles, New York City).

Worldwide: 50 million people are affected, 50,000 die annually, mainly from complications of cysticercosis. Highest incidence in Central South America (some regions of Mexico have 4% prevalence) and Africa Also prevalent in Southeast Asia, India, Philippines, China, Eastern Europe.

CONCLUSIONS:

Neurocysticercosis is a common condition seen in third-world countries.

There is a very low incidence of this condition in developed countries. Due to the rarity of this lesion in developed countries, practitioners sometimes have low exposure to this disease.

Immigration among citizens of different countries has increased the possibility of seeing this condition, and awareness of this disease should be emphasized. The practitioners should be aware of this infection when they are presented with a patient from or traveling to high-risk countries. The location of the lesion is also important due to the range of presentations in these patients. The presentation can range from headache to seizure and finally severe neurologic impairments. Treatment starts with a proper diagnosis. The providers need to be aware of the location and the possible ramification of the treatment. An inactive lesion may be observed and when/if symptoms are present then symptomatic treatment has to be

rendered. In those cases treatment options may include antiparasitic medication and if accessible surgical excision.

In 2017, the Infectious Diseases Society of America (IDSA) provided the diagnosis and management guidelines for the treatment of neurocysticercosis. The distinction of the guidelines is based on the symptoms of patients such as headache, seizures, and signs of neurologic involvement. The general recommendation for intraparenchymal neurocysticercosis includes evaluation for intracranial pressure and enzyme-linked immunotransfer blots for confirmation. The patients should be ruled out for tuberculosis prior to anti-inflammatory treatment. The patients should also undergo funduscopic evaluation prior to treatment Brain MRI and a non-contrast CT scan are also necessary. In the cases of calcified parenchymal neurocysticercosis, the recommendation changes for asymptomatic patients. No anti-inflammatory or antiparasitic medication should be used unless symptoms such as hydrocephalus or seizures are present. MRI with three-dimensional (3D) volumetric sequencing over time is the recommended approach. Antiparasitic therapy namely albendazole and praziquantel has been described in the literature. These medications do kill the larva, however, as a consequence, a severe inflammatory reaction will ensue and it is essential that patients receive anti-inflammatory treatment simultaneously. The anti-inflammatory medication such as corticosteroids will reduce the additional neurologic damage from inflammation.

Medical management has been the subject of controversy and it is recommended that patients receiving medical treatment be hospitalized and closely These medications such as albendazole can have side effects including increased liver enzyme levels, however, liver failure from these medications is rare. It has been suggested that in developing countries mass human chemotherapy may be considered a preventative method to minimize spread. Surgical treatment in case of assess able lesions or endoscopic approaches may also help with some of these lesions.

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