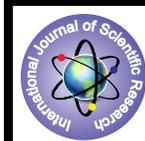


## Neurocysticercosis in a 48 Year Old Male – A Case Report



### Medical Science

**KEYWORDS:** Brain, Neurocysticercosis, Taenia solium, Pork

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### ABSTRACT

*Neurocysticercosis is a central nervous system (CNS) infection with Taenia solium. It is the commonest parasitic infestation of the CNS. Cysticercosis caused by larval stage of the tape worm of Taenia solium, is a major public health problem, exists worldwide but is most prevalent in Latin America, sub-Saharan Africa, China, India, and Southeast Asia. Cysticercosis occurs in industrialized nations largely as a result of the immigration of infected persons from endemic areas. Cysticerci can be found anywhere in the body but are most commonly detected in the brain (Neurocysticercosis), cerebrospinal fluid (CSF), skeletal muscle, subcutaneous tissue, or eye. The clinical presentation of cysticercosis depends on the number and location of cysticerci as well as the extent of associated inflammatory responses or scarring. Neurologic manifestations are the most common symptom. We report a case of Neurocysticercosis in a post mortem of 48 year old male. On Histopathological examination, brain shows evidence of Neurocysticercosis.*

### INTRODUCTION

Cysticercosis is caused by larval form of *Taenia solium* (Pork tapeworm) which is a member of phylum Platyhelminthes; class Cestoda, Order Cyclophyllida and family Taeniidae. The common larval stage of *Taenia solium* is known as *Cysticercus cellulosa*. The infection is common in people eating raw or insufficiently cooked "measly" pork<sup>1</sup>.

*Taenia solium* (pork tapeworm) and *Taenia saginata* (beef tapeworm) are the two species of *Taenia* that infect man<sup>1</sup>. These parasites are hermaphrodite and are very long enough to measure in metres (*Taenia solium* measure 3-5 meter while that of *Taenia saginata* measures 5-10 meter). The body is divided into head, neck and a long segmented body (strobilla)<sup>2</sup>. Ingestion of *Taenia solium* eggs by man result into a disease called cysticercosis (neuro, ocular, cutaneous or disseminated). Cysticercosis also results from autoinfection (sometimes the mature terminal segments are thrown into the stomach where the eggs are released). Diagnosis of cysticercosis is made by detecting cysticerci in histological examination of tissue, by personal history of the residence in the endemic areas, eating history of pork, or by serological means.<sup>1</sup>

### CASE STUDY

We report a case of Neurocysticercosis in a 48 year male who was died in hospital with provisional diagnosis of cerebrovascular attack. He had history with complaints of generalized weakness, hemiparesis right side the body, seizure, aphasia and urinary incontinency. He was diagnosed and treated as a case of cerebrovascular accident but he was died. Autopsy was done next day to ascertain the cause of death.

Multiple organs i.e. brain, liver, part of both lung, liver, spleen, piece of both kidney, and heart were send for histopathological-examination to know the cause of death.

### Gross Findings-

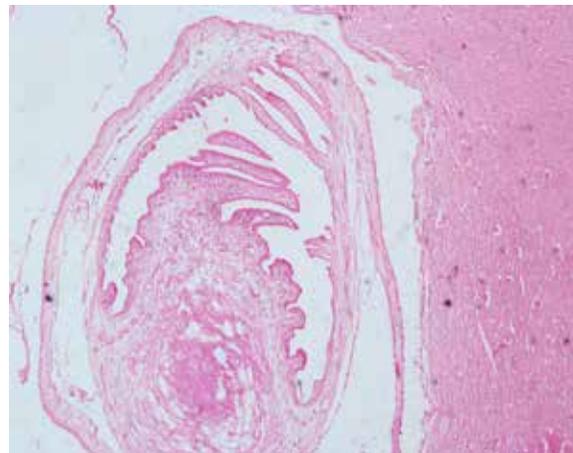
Brain measured 15 x 11 x 8 cm. Outer surface of brain shows gyri and sulci. Cut surface showed multiple gray white cystic areas. Other organs were liver, part of both lung, liver, spleen, piece of both kidney, and heart not revealed any significant gross finding.

### Microscopy-

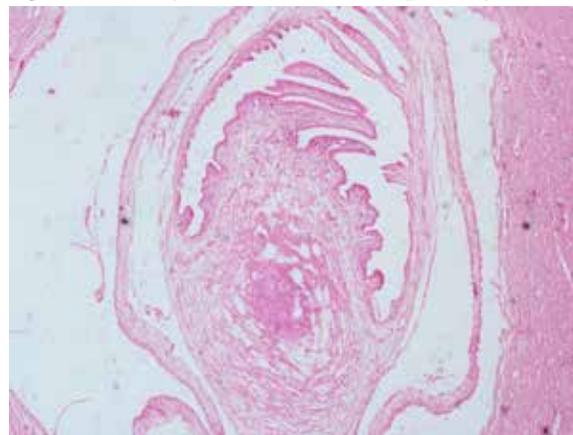
Section from brain showed congested blood vessels, areas of necrosis and cysticercuscellulosa. All cysts have similar structure consisting of 3 layers: outer or cuticular layer, middle cellular

layer and inner fibrillary layer.(Fig-1,2,3,4)

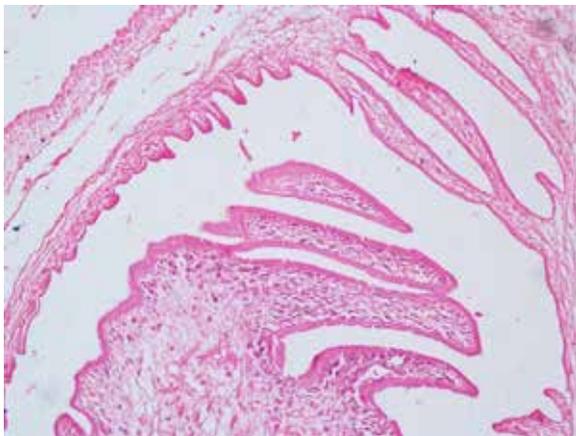
### FIGURE WITH LEGENDS



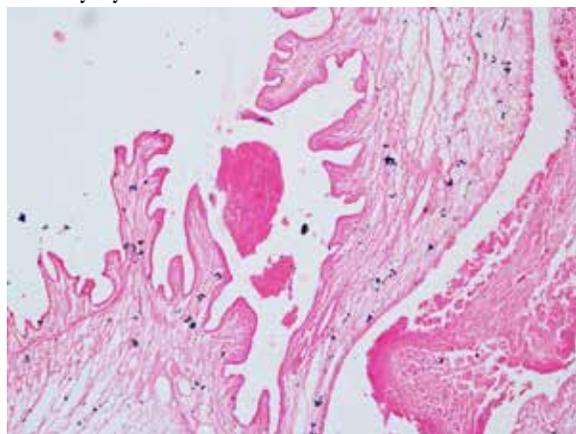
**Figure -1 shows cysticercosis with in brain parenchyma.**



**Figure 2-Cysticercus in brain. The worm is seen in the cyst while the cyst wall shows palisade layer of histiocyte.**



**Figure -3 shows Neurocysticercosis cyst. Cyst consist 3 layers: outer or cuticular layer, middle cellular layer and inner fibrillary layer**



**Figure 4- section shows invaginated scolex with its suckers and rostellum with double row of alternating large and small hooklets.**

## DISCUSSION

*Taenia solium* commonly known as pork tapeworm distributed worldwide. The infection is common amongst those who eating raw or insufficiently cooked "measly" pork.<sup>2</sup>

Humans are only definitive host of *Taenia solium* harbouring the adult tapeworm in the intestine (referred to as, Taeniasis). Both humans and pigs act as intermediate hosts and harbour *Taenia solium* larvae in different internal organs (referred to as, cysticercosis) including the brain (referred to as, neurocysticercosis -NCC).

Neurocysticercosis is central nervous system (CNS) infection with *Taenia solium*. It is perhaps the commonest parasitic infestation of the CNS, and has received attention in the last two decades because of the availability of MRI and CT scanning in the countries where cysticercosis is endemic.

In a study of 2862 autopsy cases conducted by Costa Cruz et al, 39 cases (1.4%) of cysticercosis were found out of which 35 (89.7%) showed central nervous system involvement, isolated or in association to other clinical forms of the disease, 9 cases showed isolated or associated cardiac form, 4 showed muscular form, isolated or associated. In only 7 (17.9%) cases, the cysticercosis was assumed to be the direct cause of the death.<sup>7</sup>

A retrospective study of 6500 autopsy cases conducted by S M de Almeida and L F B Torres found cysticercosis in 52 (0.8%) autopsies. NCC was present in 96% of cases and seizures were the most frequent clinical manifestation.<sup>8</sup>

Neurocysticercosis is a specific form of the infectious parasitic disease cysticercosis which is caused by infection with larvae of *Taenia solium*, a tapeworm found in pigs. Neuro-cysticercosis occurs when cysts formed by the infection grow within the brain causing neurologic syndromes such as epileptic seizures. It has been called a "hidden epidemic"<sup>9</sup>

The cysts may occur virtually anywhere in body and accordingly produce symptoms; most common sites are the brain, skeletal muscle and skin. *Cysticercus* consists of a round to oval white cyst, about 1 cm in diameter, contains milky fluid and invaginated scolex with birefringent hooklets. The cysticercus may remain viable for a long time and incite no inflammation.

But when the embryo dies, it produces granulomatous reaction with eosinophils. Later, the lesion may become scarred and calcified.

The adult worm lives in the human intestine, usually jejunum, where it lies in several folds in the lumen. Commonly a single worm is present but rarely up to 25 or more may be present *Taenia*<sup>3</sup>

The adult worm is usually 2 to 3 meter in length. The body is divided into head (scolex), neck and a long segmented body (proglottides the total number is approximately 800-900)<sup>2</sup>

The gravid segments are expelled passively, in chain of 5 to 6 at a time and not singly.<sup>2</sup>

Each proglottid contains thousands of eggs, which are fully embryonated, infective, and resistant to adverse environments.

The eggs are spherical measuring 30-40 $\mu$  in diameter, when freshly released from proglottid, the egg has a thin hyaline embryonic membrane around it, which soon disappear. The outer wall is thick, in the centre, hexacanth embryo is present *Taenia*<sup>3</sup>

When the egg are ingested by human or pig, the embryos are released in the intestinal wall, by the action of bile and digestive enzymes, the scolex of a cysticercus evaginates and attaches to the intestinal wall, and enter in the mesenteric venule or lymphatics and carried to the circulation in different part of body. They are infiltrated principally in the muscles where the develop in to larval stage cysticercus *cellulosae*.<sup>3</sup>

Man is occasionally serving as the larval host of *Taenia solium*, becomes infected by drinking contaminated water or by eating uncooked vegetables infected with eggs. Besides this, man harbouring the adult worm may auto-infect himself. The distribution of these cysticerci is usually in the subcutaneous tissue and muscles causing palpable or visible nodules but may be found in the brain leading to Neurocysticercosis and causes epileptic attack. They have tendency to become calcified and obsolete in the course of 5 to 6 years.

Anatomical classification of neurocysticercosis (NC)<sup>11</sup>

1. Parenchymal NC
2. Extraparenchymal NC
  - a. Ventricular
  - b. Subarachnoid
3. Mixed

Morphologically, four stages of development and regression of the cysticercus in the CNS are recognized<sup>11</sup>:

- i. Cystic or vesicular stage is viable and comprises of well-defined, fluid-filled membrane containing scolex.
- ii. Degenerating, colloid stage; It appears as eosinophilic struc-

ture in which components of the bladder and scolex are in various stages of disintegration and tissue around have multinuclear giant cells, foamy macrophages, and neutrophils.

- iii. Nodular stage.
- iv. The fibrous nodule undergoes mineralization and calcification.

CT scan & MRI are useful in anatomical localization of cyst of the cysticercus cellulosae<sup>5</sup>. Approximately 50 million people worldwide are estimated to have cysticercus infection, although estimates are probably low since many infections are sub-clinical and there are relatively few population based data on prevalence. Cysticercosis is endemic in many regions of Central and South America, sub-Saharan Africa, India, and Asia<sup>6</sup>.

**Diagnosis**

The diagnosis of intestinal Taenia solium infection is made by the detection of eggs or proglottids. In cysticercosis, diagnosis can be difficult A consensus conference has delineated absolute, major, minor, and epidemiologic criteria for diagnosis<sup>10</sup> (Table-1). Diagnostic certainty is possible only with definite demonstration of the parasite (absolute criteria). This task can be accomplished by histologic observation of the parasite in excised tissue, by fundoscopic visualization of the parasite in the eye (in the anterior chamber, vitreous, or sub retinal spaces), or by neuroimaging studies demonstrating cystic lesions containing a characteristic scolex. With improving resolution of neuroimaging studies, the scolex can now be identified in many cases. In other instances, a clinical diagnosis is made on the basis of a combination of clinical presentation, radiographic studies, serologic tests, and exposure history.

**Table-1-Diagnostic Criteria for Human Cysticercosis<sup>10</sup>**

1.Absolute criteria	a. Demonstration of cysticerci by histologic or microscopic examination of biopsy material b. Visualization of the parasite in the eye by funduscopy
	c. Neuro radiologic demonstration of cystic lesions containing a characteristic scolex
2.Major criteria	a. Neuro radiologic lesions suggestive of neurocysticercosis
	b. Demonstration of antibodies to cysticerci in serum by enzyme-linked immunoelectrotransfer blot
	c. Resolution of intracranial cystic lesions spontaneously or after therapy with albendazole or praziquantel alone
3.Minor criteria	a. Lesions compatible with neurocysticercosis detected by neuroimaging studies
	b. Clinical manifestations suggestive of neurocysticercosis
	c. Demonstration of antibodies to cysticerci or cysticercal antigen in cerebrospinal fluid by ELISA
	d. Evidence of cysticercosis outside the central nervous system (e.g., cigar-shaped soft-tissue calcifications)
4. Epidemiologic criteria	a. Residence in a cysticercosis-endemic area
	b. Frequent travel to a cysticercosis-endemic area
	c. Household contact with an individual infected with Taenia solium

Diagnosis is confirmed by either one absolute criterion or a combination of two major criteria, one minor criterion, and one epidemiologic criterion. A probable diagnosis is supported by the fulfilment of (1) one major criterion plus two minor criteria; (2) one major criterion plus one minor criterion and one epidemiologic criterion; or (3) three minor criteria plus one epidemiologic criterion.

**Treatment<sup>10</sup>**

Intestinal Taenia solium infection is treated with a single dose of praziquantel (10 mg/kg). However, praziquantel occasionally evokes an inflammatory response in the CNS if concomitant cryptic cysticercosis is present. Niclosamide (2 g) is also effective.

The initial management of neurocysticercosis should focus on symptom-based treatment of seizures or hydrocephalus. Seizures can usually be controlled with antiepileptic treatment. Taenia

If parenchymal lesions resolve without development of calcifications and patients remain free of seizures, antiepileptic therapy can usually be discontinued after 1–2 years.

For the treatment of patients with brain parenchymal cysticerci, most favor antiparasitic drugs, including albendazole (15 mg/kg per day for 8–28 days) or praziquantel (50–100 mg/kg daily in three divided doses for 15–30 days). Longer courses are often needed in patients with multiple subarachnoid cysticerci.

Thus, patients receiving these drugs should be carefully monitored, and high-dose glucocorticoids should be used during treatment.

For patients with hydrocephalus, the emergent reduction of intracranial pressure is the mainstay of therapy. In the case of obstructive hydrocephalus, the preferred approach is removal of the cysticercus via endoscopic surgery

For patients with subarachnoid cysts or giant cysticerci, glucocorticoids are needed to reduce arachnoiditis and accompanying vasculitis. Methotrexate can be used as a steroid-sparing agent in patients requiring prolonged therapy. In patients with diffuse cerebral edema and elevated intracranial pressure due to multiple inflamed lesions, glucocorticoids are the mainstay of therapy, and antiparasitic drugs should be avoided. For ocular and spinal medullary lesions, drug-induced inflammation may cause irreversible damage. Most patients should be managed surgically, although case reports have described cures with medical therapy.

**Prevention<sup>3</sup>**

Proper meat inspection in slaughter houses to eliminate mealy pork, adequate cooking of pork, clean personal habits and general sanitary measures can prevent the infection. For control of cysticercosis, prevention of faecal contamination of soil, proper disposal of sewage and avoiding raw vegetables grown in polluted soil are useful measures. It is important to detect and treat persons harbouring adult worms as they can develop cysticercosis due to autoinfection.

**Conclusion:**

Neurocysticercosis is a major health problem in “mealy pork” eater so most important aspect of our case report is to highlight the preventive measure like: Cooking pork well, proper boiling of vegetables, proper sanitation and improved access to clean water in urban, as well as rural part of India.

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