

Research Article
Surgery

Gautam N. Gole^A, Sheetal G. Gole^B, Shekar Y. Tati^C, Ravinder Pal Singh^D

^A - Professor, Department of Surgery, Shaheed Hasan Khan Mewati Government Medical College, Nalhar, Nuh, Mewat

^B - Associate Professor, Department of Pathology, World college of medical sciences & RC, Gurawar, Jhajjar, Haryana

^C - Professor, Department of General Surgery, Mediciti institute of medical sciences, Ghanpur, Rangareddy, Telangana

^D - Professor, Department of Microbiology, Mayo Institute of Medical sciences, Barabanki, UP

TAENIA SOLIUM CYSTICERCOSIS: A STUDY OF THIRTY TWO CASES AT UNUSUAL AND RARE SITES

Corresponding Author:

Dr. Sheetal G. Gole
Associate Professor
Department of Pathology
World college of medical sciences & RC, Gurawar
Jhajjar, Haryana
email: drsheetalgole@rediffmail.com

Article submitted on: 03 February 2017

Article Accepted on: 30 March 2017

Abstract:

Introduction: Cysticercosis is one of the most common parasitic infestations in humans. Neurocysticercosis is the commonest parasitosis of the central nervous system. This article highlights the infestation of this common parasite at rare sites with unusual presentation.

Materials and methods: Thirty-two cases of Cysticercosis with unusual presentation at rare sites received within a period of 4 years at the Department of Pathology in a tertiary care hospital are discussed. Formalin fixed tissue sections were stained with hematoxylin and eosin. Histopathological diagnosis for all the cases was *Cysticercus cellulosae*.

Results: Twenty five cases were of subcutaneous tissue of chest wall, breast, lumbar region, umbilicus, abdominal wall, back, extremities, and neck region, 4 cases were of medial canthus of eye, and 3 cases were of oral cavity. The most common site was chest wall 8 (25%) cases and the second most common sites were eye medial canthus and lumbar region 4 (12.5%) cases each. Majority of the cases were in the age group of 11-20 years 10 (31.25%) and second most common age group was 21-30 years 7 (21.87%). Out of total 32 cases 22 (68.75%) cases were females and 10 (31.25%) cases were males.

Conclusion: Diagnosis of Cysticercosis though common in central nervous system, it should also be kept as a differential diagnosis even for the swellings at unusual sites in the endemic areas of Taeniasis infection.

Key words: *Cysticercosis; Oral cavity; Medial canthus of eye; Subcutaneous tissue.*

Introduction

Cysticercosis is a serious public health problem in several developing countries.^{1,2,3} It is estimated that 50 million people worldwide are infected with the taeniasis/ cysticercosis complex and 50,000 die from cysticercosis annually.^{2,3,4} Most infected individuals are aged between 20–50 years and debilitation from cysticercosis represents a financial blow, with human suffering.

Taenia solium has a complex two host life cycle. Humans are the only definitive hosts and harbour the adult tapeworm (taeniasis) and pigs are the intermediate host. Both humans and pigs can act as intermediate hosts and harbour the larvae or cysticerci.^{1,3,5}

In cysticercosis, humans become the intermediate host by ingesting the infective eggs of *Taenia solium* from contaminated food and water and replace the pig as intermediate host. Humans are the only host for the adult tapeworm and thus the only source of cysticercosis for pigs or other humans.⁶ After entering the intestinal wall, the embryo invade the blood stream and can lodge in various organs such as the central nervous system, eye, skeletal muscles, and subcutaneous tissue.⁵

Materials and methods

Thirty-two cases of Cysticercosis with unusual presentation at rare sites received within a period of 4 years at the Department of Pathology in a tertiary care hospital are discussed. In all the 32 cases, formalin fixed tissue sections were stained with hematoxylin and eosin.

Results

Thirty-two cases of Cysticercosis are presented in this study. Twenty five cases were of subcutaneous tissue of chest wall, breast, lumbar region,

umbilicus, abdominal wall, back, extremities, and neck region, 4 cases were of medial canthus of eye, and 3 cases were of oral cavity. (Table 1) The most common site was chest wall 8 (25%) cases and the second most common sites were eye medial canthus and lumbar region 4 (12.5%) cases each. Majority of the cases were in the age group of 11-20 years 10 (31.25%) and second most common age group was 21-30 years 7 (21.87%). (Table 2) Out of total 32 cases 22 (68.75%) cases were females and 10 (31.25%) cases were males. Grossly the swellings were ovoid/irregular tissue mass, having soft to firm consistency with solid grey white to cystic cut surface and containing watery fluid. The size of the swelling varied from 1 to 5 cm in diameter. The duration of disease varied from a week to many years. On microscopic examination, in some cases sections showed trilaminated corrugated chitinous cell wall of the *Cysticercus cellulosae* with chronic lymphoplasmacytic inflammatory infiltrate admixed with occasional eosinophils and histiocytes. (Figure 1) Few cases revealed cyst wall lined by flattened epithelium with fibrocollagenous tissue and the cysticercus bladder and the adjoining suckers. (Figure 2, 3, 4) In some cases the larval form of cysticercus cellulosae was seen. The larva showed bladder with multiple papillary invaginations lined by chitinous wall and scolex with four hooklets. All the 32 cases were histopathologically diagnosed as Cysticercosis of the respective sites.

Discussion

Human cysticercosis is ubiquitous worldwide where consumption of semi- or improperly cooked pork, contaminated salad, and inadequate

hygiene are all possible causes of taeniasis and thereby can cause autoinfection.^{2,3} Food habits, poor hygiene, autoinfection, or travelling patterns may be responsible for their distribution.^{1,3,5}

The clinical features of cysticercosis vary with the number, size, location and stage of cysticercosis as well as the intensity of the host's immune response.⁷ Ocular involvements include cysts in eyelids, extraocular muscles, orbit, conjunctiva, anterior chamber, uvea, retina-vitreous, and optic nerve.⁵ Brain and eye cysts cause the most morbidity, with the brain being most common location for cysts (60- 90% of all cases) and eye being the least common (1-3%). Our study includes 4 cases of Cysticercosis found near the medial canthus of right eye. Total number of cysts can range from a solitary lesion to several hundred. On review of all documented cases of ocular cysticercosis, it was found that 35% of the cysts were reported in subretinal space, and 22% in vitreous.⁸ Cysticerci can lodge themselves in any part of the ocular and extraocular tissues and associated brain parenchyma involvement is also quite rare. Pushker *et al.* studied 20 patients with ocular and extraocular cysticercosis, of whom only 2 (10%) had associated cysts in the brain parenchyma.⁹ In our study, the 4 cases of medial canthus eye swelling, central nervous system involvement was ruled out. Skeletal muscle or subcutaneous cysticercosis can cause localized pain and nodules. Cysticercosis may cause cystic swellings or nodules in mouth, and these may be the only evidence of disease,¹ as was seen in our 3 cases of oral cavity. Subcutaneous lesions can help in diagnosis of neurocysticercosis.

Human beings acquire cysticercosis through faecal-oral

contamination with *Taenia solium* eggs from tapeworm carriers. Thus, vegetarians and other people who do not eat pork can also acquire cysticercosis. Although cysticercosis has been known for ages, its relation to the adult tapeworm was not clear until it was shown by Kuchenmaister in 1855; he fed condemned prisoners with cysticercosis-infected pork and recovered young tapeworms at autopsy. The larvae evaginate in the small intestine; the head (scolex) attaches to the mucosa and begins forming segments (proglottids). *Taenia solium* has a scolex with four suckers and a double crown of hooks, a narrow neck, and a large strobila measuring 2–4 mm and consisting of several hundred proglottids. About 2 months after infection, gravid proglottids begin to detach from the distal end and are excreted in the faeces; each segment contains $50\text{--}60 \times 10^3$ fertile eggs.¹⁰ The worm attaches strongly to the mucosa of the upper small intestine by its suckers and hooks. The adult tapeworm causes only mild inflammation at the implantation site. Abdominal pain, distension, diarrhoea, and nausea are documented, but most patients seem to be free of symptoms. Viable *Taenia solium* cysts often do not produce symptoms and can evade host immune defences by producing taeniaestatin and paramyosin, which seem to inhibit complement activation.¹¹

Carriers of *Taenia solium* will neither look for medical care nor notice the tapeworm segments in their stools. Conversely, patients infected with *Taenia saginata* notice passage of numerous, motile proglottids, larger than those of *Taenia solium*. Identification of *Taenia solium* is important because of the risk of cysticercosis in the carrier or the immediate environment.¹⁰

The tapeworm carrier can be found in the patient's household.¹² Stool examination has poor sensitivity but screening of the patient and household members is recommended so that sources of infection can be detected and eliminated.¹⁰

The lifespan of the adult *Taenia solium* is unknown. Parasitology textbooks and reviews cite the lifespan as 20–25 years.¹³ Some studies suggest it to be probably less than 5 years.¹⁴

The invasive oncospheres (embryos) in the eggs are liberated by the action of gastric acid and intestinal fluids and cross the bowel wall, enter the bloodstream, and are carried to the muscles and other tissues. At small terminal vessels, they establish and encyst as cysticerci, reaching their definitive size of about 1 cm in 2–3 months.

Extraneural cysticercosis causes no major symptoms. Subcutaneous cysticercosis presents as small, movable, painless nodules commonly noticed over the arms or chest. After a few months or even years, the nodules become swollen, tender, and inflamed, and gradually disappear. The present study includes 25 cases of subcutaneous nodule over the chest wall, breast, lumbar region, umbilicus, paraumbilical region, abdominal wall, back, extremities, and neck region, 4 cases were of medial canthus of eye, and 3 cases were of oral cavity. Subcutaneous cysticercosis is common in Asia and Africa. Biopsy or fine-needle cytology of subcutaneous nodule helps to confirm the diagnosis of cysticercosis.¹⁵

Ophthalmic cysticercosis is less common than neurocysticercosis (1–3% of all infections), *Taenia solium* is the most common intraorbital parasite.¹⁶ The ocular manifestations can be destructive because the

cysticercus gradually increases in size, leading to blindness in 3 to 5 years. The death of the parasite causes release of toxins, leading to intense inflammatory reactions and eye damage.⁵ In our ocular cases there was no history of affection of vision.

Diagnosis

Two problems hamper the diagnosis of infection with *Taenia solium*: the poor sensitivity of stool microscopy, and morphological similarity between the eggs of *Taenia solium* and *Taenia saginata*. Haematoxylin-eosin staining of histological sections of proglottids can help.¹⁷ Visualisation of taenia eggs by microscopy was the only diagnostic method available until early 1990s. Perianal scraping with adhesive tape (Graham's test) is highly sensitive for *Taenia saginata* but not for *Taenia solium*. Coproantigen detection ELISA is a good tool for taenia-specific molecules in faecal samples with sensitivity of 95% and specificity of 99%. It confirmed that microscopy was poorly sensitive, missing 60–70% of cases. DNA-based assays to discriminate *Taenia solium* from *Taenia saginata* infections,^{17,18} and a serological assay for specific identification of tapeworm carriers have been described.

The most commonly used ELISA cross-reacts with *Hymenolepis nana* and *Echinococcus granulosus*, which are common cestode infections. The enzyme-linked immunoblot assay has sensitivity of 98% and specificity of 100%, and is better than ELISA¹⁰ Biopsy of brain, skin, or muscle provides a definitive diagnosis.

Serologic diagnosis

Advances in serologic diagnosis include the identification and synthesis of specific antigens to obtain consistent

and highly sensitive assays.

Antibody assays for cysticercosis

The Western blot for cysticercosis or the enzyme-linked immunoelectrodiffusion transfer blot (EITB), which uses lentil lectin purified glycoprotein (LLGP) antigens extracted from the metacestode of *Taenia solium*, has been the “gold standard” serodiagnostic assay since it was first described in 1989. GP50, a *Taenia solium* protein diagnostic for cysticercosis has been cloned, sequenced, and characterized. It is another diagnostic component of the LLGP antigens that has been used for antibody-based diagnosis of cysticercosis with the EITB assay. GP50 is a glycosylated and glycosylphosphatidylinositol–anchored membrane protein. GP50 purified from cysticerci has two homologs expressed in the adult worm: *Taenia solium* excretory/secretory (TSES) and TSES. Both are diagnostic for taeniasis.

A preliminary evaluation of recombinant GP50 (rGP50) in the EITB assay showed a specificity of 100% for cysticercosis and a sensitivity of 90% for cysticercosispositive serum samples reactive with the GP50 component of LLGP.⁶

Antigen-detection assays for cysticercosis

Detection of circulating parasite antigen reflects the presence of live parasites, establishes the presence of ongoing viable infection in the absence of definitive radiologic features.⁶

Antibody assays for taeniasis

Humans can be infected with either the tapeworm and/or the larval form of *Taenia solium*, resulting in taeniasis or cysticercosis, respectively. The

diagnosis and treatment of taeniasis is particularly important because this stage of the parasite produces large numbers of infective ova that after ingestion result in cysticercosis in humans and pigs. Treatment and elimination of tapeworms in carriers would eventually result in eradication of cysticercosis.⁶

Figure 1: Photomicrograph [10X] showing trilaminated corrugated chitinous cell wall of the *Cysticercus* cellulosa with chronic inflammatory

infiltrate.

Figure 2: Photomicrograph [10X] showing cyst wall with fibrocollagenous tissue and the cysticercus bladder

Figure 3: Photomicrograph [10X] showing cyst wall with cysticercus bladder, surrounding fibrocollagenous tissue and the adjoining suckers.

Figure 4: Photomicrograph [40X] showing cyst wall with cysticercus bladder and the surrounding fibrocollagenous tissue

Table 1: Anatomical distribution of lesions in patients (n=32)

Site	Number Of Cases	Percentage (%)
Eye – Medial canthus (Right: 3; Left: 1)	4	12.5
Oral cavity	3	9.37
Neck [Cervical (Right):2; Submental: 1]	3	9.37
Shoulder (Right:2 & Left:1)	3	9.37
Chest wall (Right: 5 & Left:3)	8	25
Breast (Right)	1	3.12
Anterior abdominal wall	2	6.25
Umbilicus	1	3.12
Paraumbilical (Right)	1	3.12
Lumbar region (Right: 3 & Left:1)	4	12.5
Thigh (Right medial: 1; Left lateral: 1)	2	6.25
TOTAL	32	100

Table 2: Age distribution of lesions in patients (n=32)

Age In Years	Number Of Cases	Percentage (%)
1-10	5	15.62
11-20	10	31.25
21-30	7	21.87
31-40	5	15.62
41-50	3	9.37
51-60	2	6.25

Conclusion

Cysticercosis though common in central nervous system, it can also be found in the rare sites like the eye, skeletal muscles, and subcutaneous tissue, as seen in our study. We had cases of cysticercosis in the oral

cavity, eye and subcutaneous tissue. Cysticercosis is much more common in our part of the world than usually thought. Hence the possibility of cysticercosis should be kept in consideration in all inflammatory/cystic/inflammatorycystic lesions.

Cysticercosis should also be kept as differential diagnosis even for the swellings at unusual sites such as the oral cavity, ocular and subcutaneous tissue in the endemic areas of Taeniasis infection.

References

- Bern C, Garcia HH, Evans C: Magnitude of the disease burden from neurocysticercosis in a developing country. *Clin Infect Dis*; 1999; 9: 1203–1209.
- Centers for Disease Control and Prevention. Recommendations of International Task Force for Disease Eradication (ITFDE). *MMWR Recomm Rep*; 1993; 42(RR-16): 1–38.
- Hoberg EP: Taenia tapeworms: their biology, evolution and socio-economic significance. *Microbes Infect*; 2002; 4: 859–866.
- Santos R, Chavarria M, Aguirre AE: Failure of medical treatment in two cases of intraocular cysticercosis. *Am J Ophthalmol*; 1984; 97: 249–250.
- Dipankar Das, Satyen Deka, Saidul Islam, Nilutparna Deuri, Panna Deka, Akshay Chandra Deka et al: Neuro and intraocular cysticercosis: A clinicopathological case report. *Eye and Brain*; 2010; 2: 39–42.
- Garcia H.H., Del brutto Oscar, Nash Theodore, White Clinton, Tsang Victor, Gilm Robert: New concepts in the diagnosis and management of neurocysticercosis (taenia solium). *Am. J. Trop. Med. Hyg*; 2005; 72: 3–9.
- Shanti Devi Th, Bhimo Singh Th, Suraj Singh Th, Biplab Singh N, Jatishwor Singh W, Chingsuigamba Y: A rare case of disseminated cysticercosis. *Neurology Asia*; 2007; 12:127 – 130.
- Agarwal B, Vemuganti G K, Honavar SG: Intraocular cysticercosis simulating retinoblastoma in a 5-year-old child. *Eye*; 2003; 17: 447–449.
- Pushker N, Bajaj MS, Chandra M: Ocular and orbital cysticercosis. *Acta Ophthalmol Scand*; 2001; 79(4): 408-413.
- García HH, Gonzalez AE, Carlton A W, Evan, Gilman RH, and Cysticercosis Working Group in Peru: Taenia solium cysticercosis. *Lancet*; 2003; 362(9383): 547–556.
- White AJ: Neurocysticercosis: updates on epidemiology, pathogenesis, diagnosis, and management. *Annu Rev Med*; 2000; 51: 187-206.
- Gemmell M, Matyas Z, Pawlowsky Z, Soulsby E.J.L: Guidelines for surveillance and control of Taeniasis/Cysticercosis. World Health Organization; Geneva: 1983.
- Richards F, Jr, Schantz PM: Cysticercosis and taeniasis. *N Engl J Med*; 1985; 312: 787-788.
- Allan JC, Velasquez-Tohom M, Torres-Alvarez R, Yurrita P, Garcia-Noval J: Field trial of the coproantigen-based diagnosis of Taenia solium taeniasis by enzyme-linked immunosorbent assay. *Am J Trop Med Hyg*; 1996; 54: 352-356.
- Sahai K, Kapila K, Verma K: Parasites in fine needle breast aspirates- assessment of host tissue response. *Postgrad Med J*; 2002; 78: 165-167.
- Rahalkar MD, Shetty DD, Kelkar AB, Kinare AS, Ambardekar ST: The many faces of cysticercosis. *Clin Radiol*; 2000; 55: 668-674.
- Mayta H, Talley A, Gilman RH, et al: Differentiating Taenia solium and Taenia saginata infections by simple hematoxylin-eosin staining and PCR-restriction enzyme analysis. *J Clin Microbiol*; 2000; 38: 133-137.
- Gonzalez LM, Montero E, Harrison LJ, Parkhouse RM, Garate T: Differential diagnosis of Taenia saginata and Taenia solium infection by PCR. *J Clin Microbiol*; 2000; 38: 737-744.