Ocular cysticercosis at a teaching hospital in Northern India

Rajendra P. Maurya, C. P. Mishra1, Meghna Roy, Virendra P. Singh, Mahendra K. Singh, Mahima Yadav2, Abdullah S. Al-Mujaini3

Abstract:

BACKGROUND: Ocular cysticercosis (OC) is common in tropical countries. This study aimed to analyze the clinical presentation patterns, management and treatment outcomes of OC cases seen at a teaching hospital in North India.

METHODS: This study took place between March 2014 and February 2019. A total of 36 patients with OC were analyzed to determine clinical presentation and outcomes.

RESULTS: Of the 36 patients, 13 (36.11%) were male and 23 (63.89%) were female. The most frequently affected age group was 10–29 years (n = 22; 61.11%). All of the patients had unilateral lesions, with involvement of the left eye in 22 (61.11%) and the right in 14 (38.89%). The majority of cases were isolated to the ocular region; however, five (13.89%) demonstrated neural involvement as well. In terms of cyst location, 15 (41.67%) were orbital, 13 (36.11%) were subconjunctival and four each (11.11%) were intraocular or on the eyelid. The most common clinical presentations were subconjunctival masses or propitosis in 13 each (36.11%) and periorbital swelling in 12 (33.33%). Most patients received medical treatment (n – 23; 63.89%), while the others required surgical excision. Recurrence was noted in seven patients (19.44%), of which three underwent surgery while the rest were treated medically. Two patients (5.56%) developed ptosis.

Conclusions: In this study, OC cysts were more often orbital or subconjunctival compared to findings reported from Western countries. In addition, a female preponderance was noted in contrast to previously reported findings. Advanced radioimaging is crucial to ensure early diagnosis and treatment.

Keywords:

Albendazole, ocular cysticercosis, orbital cysticercosis, scolex, T. solium

Introduction

Ocular cysticercosis is a disease caused by the parasitic infestation of the human eye by the Taenia solium species of pork tapeworm, resulting in the encystment of the ocular tissues.1,2 Soemmering reported the first case of ocular cysticercosis in 1830, with the larvae responsible for the condition subsequently isolated during the extraction of the cyst from the anterior chamber.3 Cysticercosis is endemic in tropical regions, including Southeast Asia, Sub-Saharan Africa, and Central and South America.4 In India, the prevalence of cysticercosis is high, particularly in Uttar Pradesh, Andhra Pradesh, Odisha, and Punjab.5-10 Predisposing factors include poor hygiene and sanitary conditions, contaminated pig-rearing conditions and drinking water, and eating undercooked pork and contaminated raw vegetables.11

In general, T. solium larvae most commonly infect the nervous system, followed by the eyes, with ocular involvement accounting for 13%–46% of all systemic cases.2,11 Clinical presentation depends on the location of the cyst.12 In the eye, cysts may be located either intraocularly (i.e., in the vitreous body or subretinal space) or extraocularly (i.e., in the orbit, subconjunctival space, or on the eyelids). Intraocular cysts are especially...
harmful as they can lead to blindness due to severe inflammation.\cite{4} In Western countries, cysts are most commonly observed in the posterior segment of the eye, while subconjunctival cysts are more frequent in India.\cite{12-14} Ocular cysticercosis is usually unilateral, with bilateral intraocular cysticercosis reported in only 5\% of cases.\cite{15} Disseminated cysticercosis with multiple organ involvement is also reported.\cite{16}

The early diagnosis of ocular cysticercosis is aided by clinical suspicion and B-scan ultrasonography or computed tomography (CT) of the orbit; such investigations also help to visualize the resolution of the cyst following treatment.\cite{4,8} In some cases, an enzyme-linked immunosorbent assay (ELISA) may also be used to detect anticysticercus antibodies.\cite{4} In general, treatment is conservative in the form of high doses of systemic oral steroids and anti-worm medication (i.e., albendazole).\cite{4,8} The aim of this study was to describe the clinical presentation and treatment outcomes of cases of ocular cysticercosis seen at a teaching hospital in Northern India.

**Materials and Methods**

This hospital-based descriptive case series took place between March 2014 and April 2019 at the Regional Institute of Ophthalmology, Banaras Hindu University, Varanasi, Uttar Pradesh, India. A total of 36 consecutive patients diagnosed with ocular cysticercosis were followed up prospectively. Cases treated elsewhere and those who were lost to follow-up were excluded from the study.

All patients were evaluated in an oculoplasty unit and underwent detailed history-taking, including for systemic illnesses, followed by a thorough physical and ocular examination. The latter included visual acuity tests and slit-lamp biomicroscopy, as well as a fundus examination of both eyes. Where appropriate, ancillary tests were also performed to determine the presence of diplopia and proptosis as well as ultrasonography A and B scans. Radiological investigations including CT scans and magnetic resonance imaging (MRI) of the brain and orbit were ordered to determine the extent and location of larvae infestation. Patients also underwent routine laboratory investigations, including a complete blood count, eosinophil count, and a stool examination to check for the presence of ova and larvae.

A diagnosis of cysticercosis was supported by CT findings and positive serum cysticercosis antibodies via ELISA. In terms of treatment, all patients were initially prescribed albendazole tablets at a dose of 15 mg/kg daily and oral steroids at a dose of 1.5 mg/kg daily for 1 month. Subsequently, the systemic steroids were tapered gradually over the following 4 weeks. Patients who did not respond to medical treatment underwent surgical excision.

Data concerning the patients’ demographic characteristics, presenting symptoms and signs, cyst locations, and treatment outcomes were analyzed. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 19.0 (IBM Corp., Armonk, New York, USA). Ethical approval for this study was obtained from the institutional ethical committee of Banaras Hindu University. All of the study procedures were performed in accordance with the revised Declaration of Helsinki. All patients provided written informed consent before being included in the study.

**Results**

Of the 36 patients with ocular cysticercosis, 13 (36.11\%) were male and 23 (63.89\%) were female, with a male-to-female ratio of 1:1.8. Patients ranged in age from 7 to 58 years, with the most frequent age group being 10–29 years (n = 22; 61.11\%). The mean duration of symptoms was 5.40 months. All patients were affected unilaterally, with the left eye involved in 22 cases (61.11\%) and the right eye in 14 (38.89\%) [Table 1].

The majority of ocular cysticercosis cases were isolated (n = 31; 86.11\%); however, five cases (13.89\%) demonstrated simultaneous involvement of the brain. The location of the ocular cysts were orbital in 15 cases (41.67\%) [Figures 1 and 2], subconjunctival in 13 (36.11\%) [Table 1].
[Figures 3 and 4], intraocular in four (11.1%), and on the eyelid in four (11.11%). The most common clinical presentation was a subconjunctival mass (n = 13; 36.11%) and proptosis (n = 13; 36.11%), followed by periorbitai swelling (n = 12; 33.33%), diminished visual acuity (n = 6; 16.67%), and diplopia (n = 4; 11.11%) [Table 1].

Ultrasonography B was performed for 22 patients (61.11%) and revealed the presence of a hyperechoic area (i.e., the scolex of the tapeworm) within a well-demarcated clear cyst-like lesion. All of the patients underwent CT imaging, which demonstrated typical cysts in twenty patients (55.56%). In addition, 20 patients (55.56%) were tested for the presence of serum antibodies, of which 12 (60%) were positive. Examination of the stool for ova and larvae was positive in 15 cases (41.67%).

Most patients (n = 23; 63.89%) were managed through medical treatment, while 13 (36.11%) required surgical excision. Patients were followed up for between three months and two years to check for recurrence. Overall, lesion recurrence was observed in seven patients (19.44%), of which three underwent surgery and the remaining four were treated medically. Two patients (5.55%) with intraocular cysticercosis developed phthisis [Table 1].

Discussion

Overall, approximately 50 million people worldwide are estimated to be affected by cysticercosis.[4] In India, the reported prevalence of cysticercosis is 1.41%–4.51%.[17] The clinicoeppidemiological profile of ocular cysticercosis varies in different countries depending on geographical location, socioeconomic status, environmental conditions, sanitary and personal hygiene practices, and dietary habits.[4,18]

In the present study, there was a predominance of female patients, with a male-to-female ratio of 1:1.8. In contrast, most previous studies report no gender predilection, although some have reported a male predominance.[12‑14,19‑21] Infection mostly occurs among younger individuals, although individuals of any age may be affected. In the current study, the majority of patients (n = 26; 72.22%) were <30 years of age,
with 14 (38.89%) being between 10 and 19 years old. These findings are similar to those observed in other case series. Reddy et al. reported that nine out of ten patients were younger than 15 years. However, Madigubba et al. observed that patients with intraocular cysticercosis usually present at a more advanced age.

While ocular cysticercosis usually involves one eye, both eyes may be involved in cases of disseminated disease. In the present study, no cases of bilateral involvement were noted; however, there was a greater frequency of left-sided compared to right-sided lesions. One possible explanation for this might be due to the fact that the left internal carotid artery arises directly from the aorta, thus allowing the larvae to travel directly to the left eye, with the course of the ophthalmic artery encouraging the development of the cyst on the nasal side of the orbit or in the subconjunctival region.

Any part of the eye can be affected by ocular cysticercosis. In Western countries, ocular cysticercosis cases are most commonly intraocular (i.e., in the vitreous body or retina), whereas cysts are more often orbital or subconjunctival among patients from the Indian subcontinent. In the current study, orbital cysts were most common (n = 15; 41.67%), followed by subconjunctival cysts (n = 13; 36.11%). Rath et al. reported the anterior orbit to be the most common location of ocular cysts (69%). In another study, Kruger-Leite et al. reported that 35.0% of cysts were found in the subretinal space, 22.0% in the vitreous cavity, 22.0% were subconjunctival, and only 1.0% were orbital. Table 2 highlights the differences in the location of ocular cysts in various case series. The most common clinical presentations of ocular cysts in the present study were proptosis and subconjunctival masses (36.11% each). Diplopia was also noticed in 11.11% of cases. Two patients with eyelid cysts presented with abscesses. Those with subconjunctival cysticercosis usually presented with painful or painless hyperemic epibulbar masses, whereas 16.67% of patients had reduced vision, likely due to either optic nerve compression or involvement of the vitreous body and retina.

Advanced radioimaging studies, such as ultrasonography, CT, and MRI scans, are crucial in diagnosing ocular cysticercosis. In particular, ultrasound B scans are of great help in diagnosing lesions with hazy media in the intraocular regions and show a well-defined cyst filled with fluid or calcified nodules. In addition, a CT scan of the orbit is a useful diagnostic tool to determine the presence of orbital cysts. Usually, CT scans reveal a hypodense mass with central hyperdensity suggestive of the scolex of the tapeworm.
Overall, 23 patients (63.89%) in the current study responded to medical treatment, with only 13 nonresponders (36.11%) requiring surgical excision. Cysticidal drugs were administered only after ruling out intraocular involvement, as dying cysticercus can release toxins which can cause a severe inflammatory reaction leading to blindness. Albendazole and praziquantel are the most commonly recommended cysticidal drugs. Adnexal cysts are best treated by a combination of oral albendazole (15 mg/kg/day) and oral steroids (1.5 mg/kg/day) in tapering doses for 4–6 weeks, with oral steroids recommended to control any inflammatory reactions caused by dying cysticercus. del Brutto and Sotelo found albendazole to be more effective and less expensive than praziquantel. Current guidelines for treating cystericercosis recommend albendazole, with a reported cure rate of 60%–85%. However, surgical removal with a pars plana vitrectomy should be considered in cases of intravitreal cystericercosis. Surgical excision of orbital cysts may cause postoperative fibrosis leading to restrictive ocular motility.

The limitations of this study include its relatively small sample size for the purposes of internal subgroup comparison and the attrition rate during follow-up. Nevertheless, this study provides important data regarding patterns of clinical presentation and disease management in North India.

**Conclusion**

Despite being a preventable cause of blindness, ocular cystericercosis is a common parasitical infestation in tropical countries such as India. The present study found that the majority of ocular cystericercosis cases were orbital, followed by subconjunctival, in contrast to previously reported findings from Western countries. Radioimaging and ELISA analysis for anticysticeral antibodies are important tools to ensure early diagnosis and timely treatment.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Chatterji KD, editor. Parasitology. 11th ed. Calcutta: Chatterjee Medical Publishers; 1976. p. 107-206.
2. Kean BH, Sun T, Ellsworth RM, editors. Colour Atlas/Text of Ophthalmic Parasitology. Tokyo: Igaku-Shoin; 1991. p. 173-81.
3. Soemerling ST. Cysticercus cellulosae in the human eye. Oken Iseis 1830;7:17-8.
4. Bodh SA, Kamal S, Kumar S, Ruchi G, Naggal S, Aditya K. Orbital cystericercosis. Delhi J Ophthalmol 2012;23:99-103.
5. Parija SC, Sahu PS. A serological study of human cystericercosis in Pondicherry, South India. J Commun Dis 2003;35:283-9.
6. Veliath AJ, Ratnakar C, Thakur LC. Cysticercosis in South India. J Trop Med Hyg 1985;88:25-9.
7. Prasad KN, Prasad A, Verma A, Singh AK. Human cystericercosis and Indian scenario: A review. J Biosci 2008;33:571-82.
8. Pushker N, Bajaj MS, Chandra M, Neena. Ocular and orbital cystericercosis. Acta Ophthalmol Scand 2001;79:408-13.
9. Reddy PS, Satyendra DM. Ocular cystericercosis. Am J Ophthalmol 1964;57:664-6.
10. Sen DK, Mathur RN, Thomas A. Ocular cystericercosis in India. Br J Ophthalmol 1967;51:630-2.
11. Mais FA. Cryosurgery in ocular cystericercosis. Rev Bras Oftalmol 1969;28:99-103.
12. David S, Mathai E. Ocular cystericercosis – A review of 25 cases. J Assoc Physicians India 2000;48:704-7.
13. Welsh NH, Peters AL, Crewe-Brown W, Blignaut P, Donnoli P, da Souza BS, et al. Ocular cystericercosis. A report of 13 cases. S Afr Med J 1987;71:719-22.
14. Cano MR. Ocular cystericercosis. In: Ryan SJ, editor. Retina. 2nd ed. St. Louis: Mosby; 1994. p. 1553-8.
15. Wender JD, Rathinam SR, Shaw RE, Cunningham ET Jr. Intraocular cystericercosis: Case series and comprehensive review of the literature. Ocul Immunol Inflamm 2011;19:240-5.
16. Pushker N, Mehta M, Meel R, Bajaj J. Disseminated cystericercosis with multiple bilateral orbit cysts. Ophthalmic Plast Reconstr Surg 2009;25:499-501.
17. Kamali NI, Huda MF, Srivastava VK. Ocular cystericercosis causing isolated ptosis: A rare presentation. Ann Trop Med Public Health 2013;6:303-5.
18. Atul K, Kumar TH, Mallika G, Sandip M. Socio-demographic trends in ocular cystericercosis. Acta Ophthalmol Scand 1995;73:438-41.
19. Malik SR, Gupta AK, Choudhry S. Ocular cystericercosis. Am J Ophthalmol 1968;66:1168-71.
20. Lesh JR. Ocular cystericercosis. Am J Ophthalmol 1949;32:523-48.
21. Duke-Elder S, Perkins ES, editors. Diseases of the uveal tract. In: System of Ophthalmology. Vol. 9. London: Henry Kimpton; 1966. p. 478-88.
22. Kaliaperumal S, Rao VA, Parija SC. Cysticercosis of the eye in South India – A case series. Indian J Med Microbiol 2005;23:227-30.
23. Madigubba S, Vishwanath K, Reddy G, Vemuganti GK. Changing trends in ocular cysticercosis over two decades: An analysis of 118 surgically excised cysts. Indian J Med Microbiol 2007;25:214-9.
24. Rath S, Honavar SG, Naik M, Anand R, Agarwal B, Krishnaiah S, et al. Orbital cysticercosis: Clinical manifestations, diagnosis, management, and outcome. Ophthalmology 2010;117:600-5, 605.e1.
25. Kruger-Leite E, Jalkh AE, Quiroz H, Schepens CL. Intraocular cysticercosis. Am J Ophthalmol 1985;99:252-7.
26. Rao N, Balakrishnan E. Cysticercosis of the eye. Orient Arch Ophthalmol 1967;5:249-52.
27. Honavar SG, Sekhar CG. Ultrasonological characteristics of extraocular cysticercosis. Orbit 1998;17:271-84.
28. del Brutto OH, Sotelo J. Albendazole therapy for subarachnoid and ventricular cysticercosis. Case report. J Neurosurg 1990;72:816-7.
29. Shields JA, editor. Diagnosis and Management of Orbital Tumors. 1st ed. Philadelphia: Saunders; 1989. p. 117-20.