TREATMENT OF CYSTICERCOSIS WITH PRAZIQUANTEL AT THE BANGKOK HOSPITAL FOR TROPICAL DISEASES

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INTRODUCTION

Cysticercosis is not uncommon in Southeast Asia, cases has been reported from the Philippines, Thailand (Leelachaikul *et al.*, 1977, Quimosing *et al.*, 1983). Cysticercosis is an infection with *Cysticercus cellulosae*, the larval stage of *Taenia solium*. Man acquires *T. solium* infection by the ingestion of insufficiently cooked pork containing the larvae. *Cysticercus cellulosae* preferentially encyst in the subcutaneous tissue, in the brain, in the striated muscles and occasionally in the eyes. The clinical course of cysticercosis is determined by the number of cysts, tissue involved and reaction of normal tissue to the organism. Involvement of the subcutaneous tissue is generally asymptomatic however, the presence of skin and muscle cysts aids in the diagnosis. The most serious involvement arises when the cysticerci invade the central nervous system (Stanley, 1980, McCormick, 1982). The usual symptoms are headache, vomiting, seizures, convulsious, and mental deterioration. The definite diagnosis is by surgical biopsy of the tissue involved. Cerebral cysticercosis is often made by history, clinical features, the presence of pleocytosis with eosinophils in CSF, radiological proof of calcification in the brain, in soft tissues and by brain CT scan. Therapy for cysticercosis has been excision for subcutaneous lesions and control of seizures for cerebral cysticercosis. Recently clinical trials with praziquantel has shown its efficacy in human cysticercosis (Rim *et al.*, 1980, 1982; Botero and Castano 1982).

Cases of cysticercosis admitted to the Bangkok Hospital for Tropical Diseases were treated with praziquantel and the results of the follow up studies are reported herein.

MATERIALS AND METHODS

Twelve patients diagnosed as cysticercosis at the Bangkok Hospital for Tropical Diseases during August 1982 to January 1985 were studied. These included 2 subcutaneous cysticercosis and ten with cerebral and subcutaneous cysticercosis. The age ranged from 20 to 59 years. The ratio of male to female was 5:7. The diagnosis of cysticercosis was based on history, clinical manifestions, soft tissue radiography and computerized axial tomography of the brain, and in ten patients, confirmed by biopsy of subcutaneous nodules.

Laboratory studies included routine blood examination, biochemical tests, stool examination for *Taenia* proglottids and eggs, urinalysis and cerebrospinal fluid examination. Follow-up laboratory tests were done at weekly intervals after treatment during hospitalization and monthly when patients were discharged.

Radiography of the soft tissue, the head, chest, abdomen and extremities were taken prior to treatment, two weeks and six months post treatment.

Computerize axial tomography of the cranium was performed both before and after administration of contrast medium. The CAT scan was done on every patient prior to

treatment and six months after treatment for evaluation of treatment.

Biopsy was performed prior to treatment for confirmation of the diagnosis, and 2 weeks after the course of treatment to study the pathological changes and effects of the drug on cysticerci inside the cysts.

Praziquantel was administered orally at a dosage of 30 mg/kg/day in three divided doses at 4-5 hours interval for 10 days. Prednisolone was also given at a dosage of 10 mg thrice daily one day prior to praziquantel and continued for a day after the course. Patients who were taking antiepileptic drugs before were permitted to continue their medication.

RESULTS

The clinical features of the 12 patients are summarized in Table 1. One week post treatment follow-up, there was a marked decrease in size of large subcutaneous cysts in 2 patients and by the third month all cysts had disappeared. Minimally calcified cysts showed regression in size 3 months later.

Table 1

Clinical features of 12 patients with cysticercosis.

Symptoms and signs		No. of patients	Percent
Subcutaneous nodules		10	83
Headache	generalized	5	42
	migraine liked	2	17
Facial tics		2	17
Tonoclonic spasm		4	33
Impaired memory		3	25
Convulsions		2	17

Clinical response was seen in one month post treatment; five patients who were free of headaches, while in two there was mild improvement.

There was marked decrease in frequency of focal seizures six months post treatment in 3 out of 6 patients who previously had neurological signs. Slight improvement was seen in one of the 3 patients who presented with symptoms of mental deterioration. There was no improvement in two patients with a long history of convulsions.

Blood and cerebrospinal fluid results are summarized in Table 2. The CSF was normal in 8 patients and pleocytosis was found in 4 patients. By the end of six months post treatment, the CSF findings were normal in two patients, but lymphocytes were still present though significantly reduced in number in the other two. This finding suggestive of meningeal cysticercosis. There was no correlation between CSF findings and peripheral eosinophilia. Three patients had high CSF opening pressure and this abnormality persisted up to six months post treatment. This finding shows some degree of hydrocephalus though it was not confirmed by CAT scan.

No hematological, biochemical, urine, CSF protein, sugar and chloride abnormalities were detected during or after treatment. None of the patients passed *Taenia solium* eggs or mature proglottids in the stool.

The pre-treatment histopathological findings consisted of characteristic fibrous capsules with slight inflammatory cell reactions. Inside the capsules were intact section of parasite with rostellar hooks, a characteristic of *Taenia solium* larva. These findings indicated cysticercus in the cysts. Most of the post treatment biopsy specimens revealed dense cells infiltrations consisting of polymorphonuclear leukocytes, chronic inflammatory cells and plasma cell infiltrations with degenerated structure of the larva. There were various degrees of destruction of the cuticle and internal structures of the parasites. Few specimens showed fibrous capsule with

Table 2

Leukocyte count and cells in the cerebrospinal fluid of patients with cysticercosis.

No.	Age & Sex	Leukocyte count			Cerebrospinal fluid findings		
		Total cell dl	EO (%)	Absolute Eo.count	Cell dl	Lymphocyte %	Eosinophil %
1.	23 M	6200	4	248	2	100	0
2.	20 M	7800	5	395	5	100	0
3.	25 F	3900	8	312	2	0*	0
4.	49 F	5400	0	0	0	0	0
5.	41 F	8600	20	1720	5	30**	10
6.	44 M	6900	6	414	2	100	0
7.	26 F	9400	0	0	8	100	0
8.	59 M	8200	3	246	2	100	0
9.	35 F	7800	5	390	89	98	2
10.	22 F	5200	4	208	57	95	5
11.	33 M	7300	7	511	29	98	2
12.	56 F	5300	2	106	5	80	20

* Polymorphs 100%.
** Polymorphs 60%

heavy chronic inflammatory cells without parasite inside the capsules. These were consistent with dead parasite cysts due to the effects of treatment.

Most of the partially calcified large subcutaneous cysts showed a distorted appearance with a decrease in size when compared to the pre-treatment radiographs. These findings suggested dead cysticerci. The completely calcified lesions remained unchanged.

The pre-treatment CT scan findings in 10 patients with cerebral cysticercosis showed mixed patterns as follows:

(1) Thin wall cysts which took up the contrast medium in an annular pattern corresponding to cysts containing live cysticerci (Fig. 1).

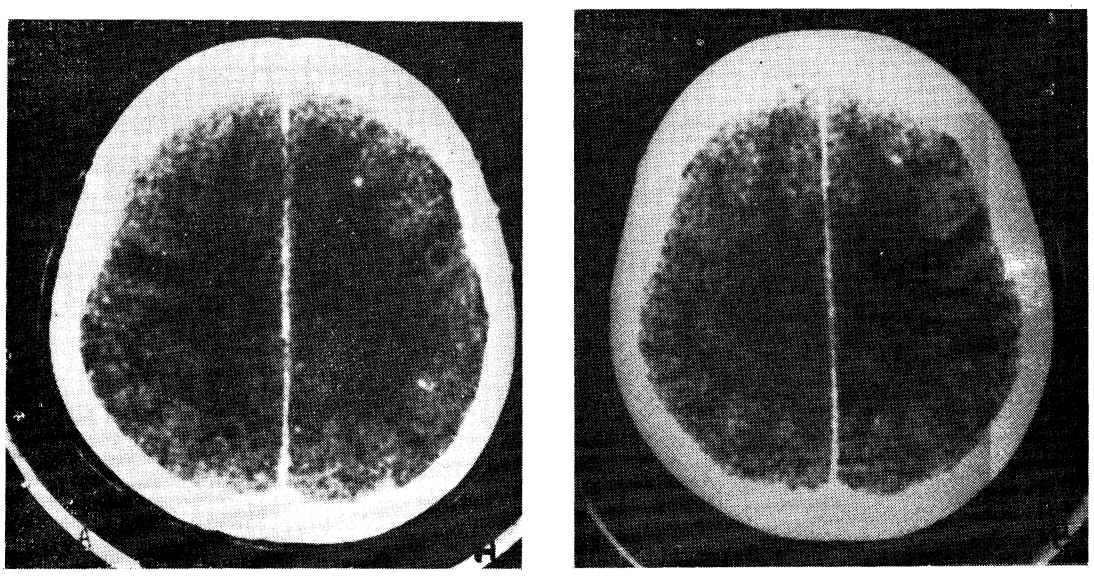
(2) Low density lesions with enhancement after contrast medium believed to be old cysts.

(3) Intraparenchymal calcifications with enhancement by contrast medium corresponding to dead parasites with host tissue reaction and

(4) Calcification without surrounding tissue reactions indicating completely inactive cysts.

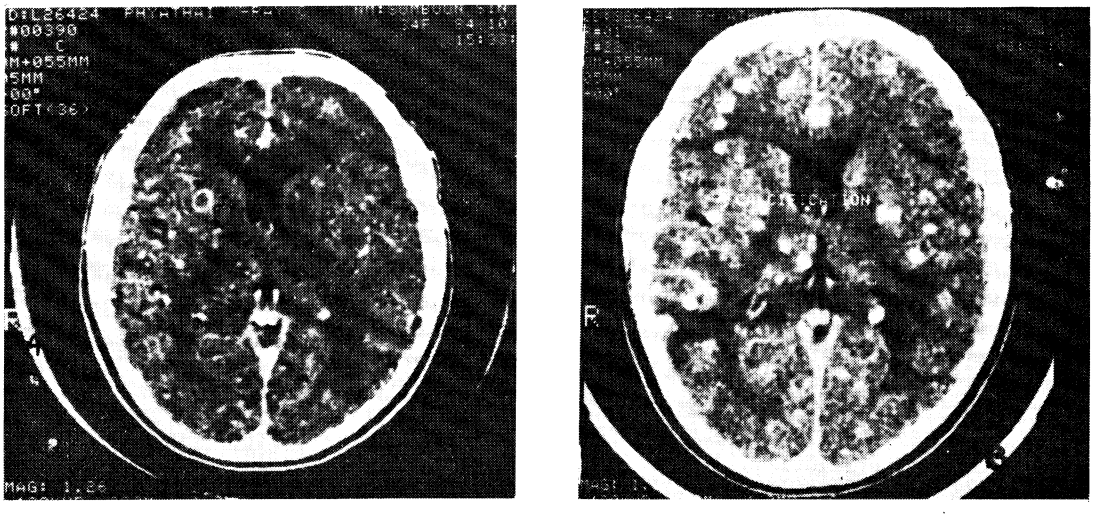
Post-treatment CT scans were performed in 8 patients, 6 months post treatment. Cysts presumed to be containing live cysticerci had completely disappeared (Fig. 1-Fig. 2). The cysts of older parasites showed evidence of destruction with healing process and reduction in number. There were no changes in old calcified lesions.

Three patients (25%) had mild and transient side effects, headache, nausea, vomiting, myalgia and back pain. Two patients (17%) had severe symptoms together with evidence of intracranial hypertension. One patient (8%) had multiple episodes of convulsions during treatment. No death occurred in this study.



A B

Fig. 1—CT scan of cerebral cysticercosis in patient No. 7. A. Multiple thin wall cysts in left parietal lobe pre-treatment. B. Complete healing post-treatment.



A B

Fig. 2—Contrast CT scans before and after praziquantel therapy with extensive diffuse parenchymal and meningeal cysticercosis. A. Extensive lesions with little uptake of contrast medium indicating live cysticerci pre-treatment. B. Six months post- treatment show nodular contrast enhancement of all cysts indicating acute inflammatory process and dead cysticerci.

DISCUSSION

The present study showed that praziquantel at doses of 30 mg per kilogram body weight daily for 10 days is adequate for the treatment of newly formed cysts in subcutaneous cysticercosis or intracranial parencymal cysts containing cysticerci. The patients with partially calcified subcutaneous cysts also responded to treatment as shown by distorted cysts in post treatment soft tissue radiographs. Older intracranial parenchymal cysts were reduced in number and size. Calcified cysts in subcutaneous tissues and intracranial parenchyma did not change. Similar results have been obtained by Rim *et al.*, (1982) using a higher dose of praziquantel 3 × 25 mg per kilogram of body weight for 3 to 7 days in the treatment of human dermal and cerebral cysticercosis in Korea.

The role of steroids in preventing complications arising from the death of parasites is controversial. In Rim's series patients received praziquantel with dexamethasone 4 mg orally 4 times a day had mild and transient side effects. However, when praziquantel 50 mg per kilogram of body weight for 15 consecutive days without dexamethasone were used in the treatment of macroscopic parenchymal cysts in Mexico (Sotelo, 1984), 92% of the patients had exacerbations of neurological symptoms with severe headache and 12 out of 26 patients had seizures during the treatment. In our series only 25% of the patients had mild and transient side effects while 17% had severe headaches, nausea and vomiting, and convulsions in one patient. This may be due to reaction of massive death of parasites, and increased inflammatory process. Steroids are thus useful in reducing intracranial hypertension during praziquantel treatment.

SUMMARY

Twelve patients with cysticercosis including two cases of subcutaneous cysticercosis and ten cases of combined subcutaneous and cerebral cysticercosis were treated with praziquantel 30 mg per kilogram of body weight daily in 3 divided doses for 10 days. To minimize possible reactions due to the death of parasites prednisolone 10 mg three times a day was also given in most cases. During treatment, an intense inflammatory reaction occurred as evidenced by increased intracranial pressure and convulsions.

Histopathological findings studied at 2 weeks post treatment revealed lymphocytic and plasma cell infiltrations with destruction of the larvae.

Clinical response was evident at one week post treatment, manifested by a significant decrease in size of the subcutaneous cysts which gradually disappeared at the end of three months. Radiology of soft tissues showed distortion of semicalcified cysts.

Brain computerized tomography at 6 months post treatment showed disappearance of the cysts presumed to be due to death of cystercerci and marked reduction in numbers and size of other stages of cysts. Mild and transient side effects were observed in 25% of cases. Two patients (17%) had severe side effects and one (8%) had convulsions during treatment.

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REFERENCES

BOTERO, D. and CASTANO, S., (1982). Treatment of cysticercosis with praziquantel in Colombia. *Amer. J. Trop. Med. Hyg.*, *31* : 811.

GRISOLIA, J.S. and WIEDERHOLT, W.C. (1982). CNS cysticercosis. *Arch. Neurol., 39*:540.

LEELACHAIKUL, P. and CHUAHIRUN, S., (1977). Cysticercosis of the thyroid gland in severe cerebral cysticercosis : Report of a case. *J. Med. Assoc. Thai., 60* : 405.

MCCORMICK, G.F., ZEC, C.S. and HEIDEN, J., (1982). Cysticercosis cerebri : review of 127 cases. *Arch. Neurol., 39* : 534.

QUIMOSING, E.M., CONDE, J. and CROSS, J.H., (1984). Subcutaneous and cerebral cysticercosis treated with praziquantel. *Southeast Asian J. Trop. Med. Pub. Hlth., 15* : 201.

RIM, H.J., WON, CH-R. and CHU, J.W., (1980). Studies on human cysticercosis and its therapeutical trial with praziquantel (Embay 8440). *Korea Univ. Med. J., 17* : 459.

RIM, H.J., LEE, J.S., JOO, K.H. KIM, S.J. (1982). Therapeutic trial of praziquantel (Embay 8440 Biltricide) in the dermal and cerebral human cysticercosis. *Korean J. Parasit., 20* : 169.

SOTELO, J., ESEOBEDO, F. and RODRIQUEZ-CARBAJAL, J., (1984). Therapy of parenchymal brain cysticercosis with praziquantel. *Brit. Med. J., 310* : 1001.