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Intracranial Cysticercosis: An Effective Treatment with Alternative Medicines

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Abstract. *The purpose of this study was to demonstrate the cysticidal activities of Ruta graveolens and calcium phosphate in fractional dilutions as a completely new approach for the treatment of neurocysticercosis in humans. These two homeopathic medicines when given to patients with neurocysticercosis have cured the infection in 25 subjects (69.4%) from a total of 36 patients. Our preliminary results indicate that Ruta graveolens in combination with calcium phosphate must be considered to be a potent cysticidal agent with very little or no side effects.*

Cestode infestations of the human nervous system represent a major health problem in many countries, as the disease is endemic in parts of Asia, Eastern Europe, Latin America, and Africa. Neurocysticercosis is one of the major causes of epilepsy worldwide. A recent increase in incidence has also been noted in developed countries, which is attributed to increased travelling and immigration (1). In India the incidence of neurocysticercosis is significantly high: e.g. 0.89% of children enrolled in a children's neurology clinic showed neurocysticercosis (2).

The varied and unpredictable natural history of cysticercus granulomas and the complex nature of host-parasite interactions in individual patients make the management of these patients more difficult (3). Thus the parasite resolutions often require a combined approach of treatment involving medical and, in some cases, selected surgical intervention (4). In orthodox medical treatment, commercial cysticidal drugs have shown excellent results by an 82% reduction in the mean number of brain cysts and a 95% reduction in the mean frequency of seizures (5). However, there are many side effects that include malaise, headache, dizziness, anorexia, fatigue, drowsiness, nausea, vomiting, generalized abdominal pain, loose stools, pruritus, urticaria, arthralgia, myalgia, pyrexia, and neurological complications. The treatment also requires hospitalization of the patient. Because of such side effects, some commercial drugs are not available in many countries, including the United States (6). In this study cysticidal activities of *Ruta graveolens* Linn. And calcium phosphate in fractional dilutions, a completely new approach to treatment of neurocysticercosis, have been observed. *Ruta graveolens* is a medicinal plant that has been recorded to have been used by Hippocrates himself. It was highly esteemed by the ancients as a remedy for resisting contagions and poisons. Many animal experiments were done with Ruta extracts (7), however, there is no conclusive evidence regarding its exact MLDs (Minimum Lethal Dose) in different ammals.

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Key Words: Cysticercosis, Ruta graveolens, calcium phosphate, cestode, cysticidal effects, intracranial, brain parenchyma.

Materials and Methods

Ruta graveolens 6c (10^{-12} Concentration). The ready-made medicine of *Ruta graveolens* 6c used in this study was obtained from the Homeopathic Poor Dispensary, Fr. Muller's Charitable Institutions, Kankanady, Mangalore, India. In the preparation of *Ruta graveolens* (7), the juice (alcoholic extract) of the whole plant before the flowers are developed is used. The initial lots of commercially available *Ruta graveolens* were checked by spectroscopic method (8) and were found consistent with the values given by them. The usual dose prescribed for our patients were two drops (about 100 microlitres) in a teaspoonful (about 5 ml) of water taken orally twice a day.

Calcarea phosphorica 3x (10^{-3} Concentration). Calcium phosphate preparation that was used in this study was supplied by Homeopathic Poor Dispensary, Fr. Muller's Charitable Institutions, Kankanady, Mangalore, India. The usual dose prescribed was 5 grains (0.324 grams) taken orally twice a day.

Some homeopathic medicines other than these two medicines were also given in a few cases to provide symptomatic relief of troublesome presenting complains (present prior to start of our treatment) such as headache, visual disturbances, etc.

Patient population. The total number of patients that were treated in this study was thirty-six. Their serial case numbers, age and sex are listed in Table I. Nineteen (52.8%) of them were males and sixteen (47.2%) females. Their ages ranged between 6 to 70 years with a median age of 30.6 years. Their duration of illness was between 2 days to 4 years.

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Results and Discussion

The times required for significant improvement and cure of the patients varied between 3 to 65 months. Twelve subjects were treated with palliative orthodox medicines (pain-killers like aspirin, paracetamol; anticonvulsive agents like phenobarbitone etc.) at different centers for 6 months or more without any improvement before beginning of our treatment and these patients were taken as controls in our study. This was done because patients suffering from neurocysticercosis could not be left untreated with only placebos for humanitarian reasons.

The major presenting complaints (present prior to start of our treatment) of our patients were headaches and convulsive seizures present in 50% of them. In addition, other features were problems with vision (41.7%), paralysis paresis (33.3%), altered sensorium C (16.7%), squint (16.7%) and others (41.7%).

Scan/MRI observations of the patients with neurocysticercosis. Of 36 patients, single lesions were found in 30 cases (83.3%) and multiple lesions in 6 cases (16.7%). The sites of the lesions were intra-cerebral in 75% and ventricular in 25% of the cases. In 44.4% cases, the lesions were found in the parietal area and the percentage of lesions in the temporal, occipital, frontal and other areas was each found to be 22.2%. The lesions were in vesicular stage in 8.3%, in colloidal vesicular stage in 66.7% and in granular nodular stage in 25.0% of the cases. Edema was noted in 25.0% of the cases. A typical CT image of neurocysticercosis of the patient number 3 before and after treatment is shown in Figure 1.

As mentioned earlier, a total of 36 patients with neurocysticercosis were treated during the last five years and the results are very encouraging. Of these, 25 patients (69.4%) were completely cured from their infection. Three patients (8.3%) showed marked improvement and an additional three did not show any improvement (static). Two patients (5.5%) are still continuing their treatment, whereas two have discontinued because of various reasons. One patient (2.8%) did not show improvement after treatment but rather took a downhill course. All those patients who have improved or been cured have not shown any side effects of the treatment to date and are leading normal lives.

In brain parenchyma the Cestode usually undergoes four developmental stages, namely (a) vesicular stage, (b) colloidal vesicular stage, (c) granular nodular stage and (d) nodular calcified stage (9). In the vesicular stage, the larva appears as a whitish nodule, isodense to brain parenchyma and hyperintense on MRI, invaginated into a small cyst containing fluid which is isodense to CSF on CT and isointense to CSF on MRI scans. In the colloidal vesicular stage the larva shows hyaline degeneration, the fluid becomes turbid or jelly-like showing increased density on CT and increased intensity on MRI scans; the capsule becomes noticeably thicker as

Table I. *Serial case numbers, ages (yr.) and sexes of all our patients involved in this study.*

Patient number	Age	Sex
1	7.5	F
2	15	M
3	37	F
4	11	F
5	10	M
6	22.5	F
7	45	M
8	18	M
9	55	F
10	13	M
11	15	F
12	16	F
13	31	M
14	42	F
15	15	M
16	29	F
17	36	-
18	28	M
19	14	M
20	06	M
21	15	M
22	58	M
23	70	M
24	32	F
25	12	M
26	45	M
27	48	F
28	27	M
29	17	M
30	50	F
31	25	F
32	58	F
33	36	M
34	25	F
35	70	F
36	50	F

* All patients were of Asian Indian origin; F = Female; M = Male

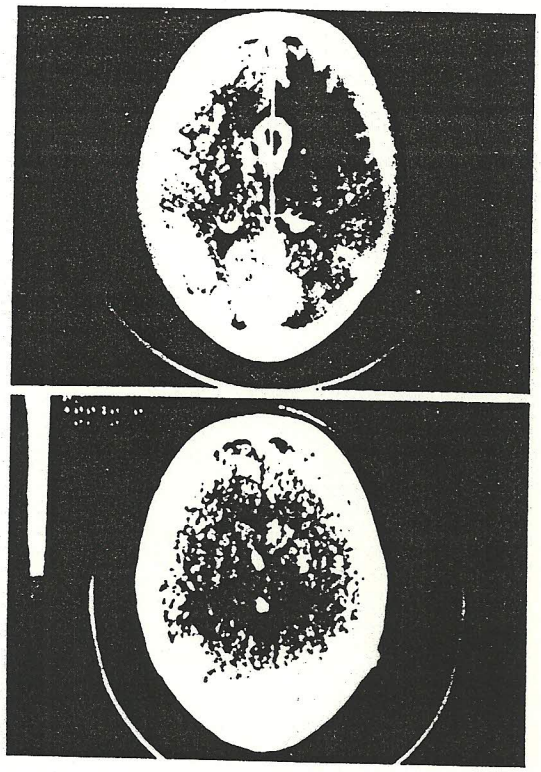

Figure 1. *CT images of the brain of patient number 3 with neurocysticercosis. Note the presence of lesions prior to treatment with Ruta graveolens Linn. and Calcium phosphate (above), but disappearance of lesions after treatment (below).*

indicated by contrast enhancement on CT or MRI scans. The cyst reduces its size and is mineralized with calcium salts in the nodular calcified stage. A nodular type of enhancement may be seen on contrast enhanced CT or MRI scans. In our study, CT/MRI observations revealed mostly single lesions (83.3%) at the colloidal vesicular stage (66.7%) mainly in the parietal region of patients (44.4%).

At present, the orthodox treatment of neurocysticercosis is either with cysticidal drugs or with the help of surgical intervention, particularly for the patients with ventricular cysts. As mentioned previously in this evaluation, of 36 patients with neurocysticercosis, 25 patients were cured, 3 were much improved and 2 are at present still under treatment. One important point to note here is that the ventricular cysts, which are usually treated by surgical procedures, were cured in this study. Our results clearly show that costly surgical procedures are not needed to cure such infections because they can be successfully eradicated by *Ruta graveolens* 6c and calcium phosphate treatments.

At present it is very difficult to explain properly how these homeopathic medicines act on neurocysticercosis. The flavones of *Ruta graveolens*-rutin and its glycone are well known to protect against nuclear hazards and capillary bleedings. Rutin is quercetin-3 rutinoside or 3, 3', 4',5,7-pentahydroxy flavone-3-rutinoside. A review of rutin is given by Thapa et al.(8). Rutin can combine with all types of amines including purines and pyrimidines. Reports on other flavones have shown antibacterial activities against various bacteria (10-13). The idea of addition of phosphate is that it activates phospholipase which cleaves a compound in the cell membrane called phosphatidylinositol biphosphate (PIB) which in turn activates protein kinase C which eventually leads to the synthesis of a protein complex AP-1. The cleavage product by phospholipase also triggers an influx of already administered calcium ions into the cell which will transfer cytoplasmic nuclear factor of activated T cells to the nucleus via Calmodulin and Calcineurin associated with activation of all calcium-dependent enzymes. All these mechanisms ultimately may lead to regression of the neurocysticercotic lesion. Other possible mechanisms of cell-killing including the erosion of telomeric DNA by these flavons are presently under investigation at The University of Texas M.D. Anderson Cancer Center Houston, Texas, USA.

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