

Study of radiological response to albendazole therapy in neurocysticercosis patients

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Abstract

Introduction: Neurocysticercosis infection caused by the larval form of *Taenia solium*, is widely prevalent in developing countries of Africa, Asia, and Latin America. According to WHO it is the most common preventable cause of epilepsy in the developing world, with an estimated 2 million people having epilepsy caused by *T solium* infection. **Aims and Objectives:** To study the radiological response to Albendazole therapy in solitary neurocysticercosis lesion observed in patients from Jammu region. **Materials and Methods:** In the present study total 80 cases of neurocysticercosis with no neurologic deficit on clinical examination were selected. A detailed sociodemographic and seizure history was elicited and a complete physical and neurologic examination was performed in all patients and recorded on a prestructured proforma. Out of total 80 cases, 44 were having solitary lesion whereas remaining 36 were having multiple lesions. The 44 cases having solitary lesions were randomly divided in two groups. 1) Group A: treated with Albendazole therapy in addition to anticonvulsants 2) Group B: treated with anticonvulsants only. All the patients were followed up regularly for any complication. A 24-hour accessible telephone number was given to patients. Patients were advised to report back immediately in case of seizure recurrence or neurological complaints. After three months repeat CT was done and the findings were recorded. **Results:** It was observed that the mean age of the patients suffering from NCC was 27.75±8.43 years. The proportion of male and female was nearly same (52.5% and 47.5% respectively). Among 80 cases of NCC, 44 were vegetarians (55%) and 36 non-vegetarians (45%) out of which 24 were pork eaters (30%). Generalized seizures was reported by 27 cases (33.75%) of NCC, while focal seizures in 45 cases (56.25%). It was also found that most of the NCC lesions are solitary in nature and was observed in 44(55%) patients whereas multiple NCC lesions were found in 36 patients (45%). It was observed that among group A (i.e. Group treated with Albendazole therapy in addition to anti-convulsants), 5 patients (22.72%) showed complete disappearance of lesion, 4 patients (18.18%) showed decrease in size of lesion on CT scan and 12 patients (54.54%) showed no change at all in lesion size. Besides, 1 patient (4.54%) showed increase in lesion size. On the other hand, in the group B (i.e. Group not treated with Albendazole therapy), 4 patients (18.18%) exhibited complete disappearance, another 4 patients (18.18%) showed decrease in size while 14 patients (63.3%) exhibited no change at all on CT scan. The difference observed in outcome in both the groups was statistically insignificant. $X^2 = 0.09$ (P=0.76). **Conclusion:** Thus in the end we conclude that albendazole was effective in managing 45.45% cases as compared to 40.91% patients treated with antiepileptic drugs only but the difference observed was statistically insignificant. **Key Words:** neurocysticercosis, Albendazole, radiological response.

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INTRODUCTION

Neurocysticercosis infection caused by the larval form of *Taenia solium*, is widely prevalent in developing countries of Africa, Asia, and Latin America. According to WHO it is the most common preventable cause of epilepsy in the developing world, with an estimated 2 million people having epilepsy caused by *Taenia solium* infection.¹ The infection is acquired in human from two different forms. First is by eating raw or undercooked pork containing *T solium* cysts and second by eating food

contaminated with *T. solium* eggs. Seeding of larvae in the CNS results in neurocysticercosis. Neurocysticercosis, in turn, may affect the CNS parenchyma or the CSF space.² When Neurocysticercosis involves the brain, a variety of symptoms may be manifested. The common symptoms are seizures (focal or generalized); headache, nausea, vomiting, lethargy, focal neurological deficits (hemiparesis, visual field defects and dementia).^{3,4,5} The definitive diagnosis of cerebral Neurocysticercosis is made by surgical biopsy with removal of cyst or cysts and the histological identifications of hooklets and suckers typical for cysticercosis cellulose.⁶ The use of antiparasitic therapy for neurocysticercosis is not without controversy. According to some authors antiparasitic drugs have no role in the management of neurocysticercosis. Whereas some study has shown significant improvement in the NCC lesion after treatment with antiparasitic agent. Thus the present study was undertaken to study the radiological response to Albendazole therapy in neurocysticercosis patients.

AIMS AND OBJECTIVES

To study the radiological response to Albendazole therapy in solitary neurocysticercosis lesion observed in patients from Jammu region.

MATERIALS AND METHODS

The present study was conducted in the Department of Neurosurgery and Department of Internal Medicine, Govt. Medical College, Jammu. For the purpose of study total 80 cases of neurocysticercosis with no neurologic deficit on clinical examination were selected. The study was conducted after receiving the approval from the institutional ethical committee and informed consent from all the patients. A detailed sociodemographic and seizure history was elicited and a complete physical and neurologic examination was performed in all patients and recorded on a prestructured proforma. The socioeconomic status of the family was calculated according to a modified Kuppaswamy scale.⁷ A complete clinical assessment was done on initial and subsequent visits. Haemogram, Erythrocyte sedimentation rate (ESR), Mantoux test, Chest radiography and Cysticercus serology (using ELISA) were done in all cases. The follow up contrast enhanced CT head scan was obtained after 3 months. All CT scans were assessed by a Radiologist who was blinded to treatment assigned and to clinical outcome. The site and size of the lesion and the presence of edema were recorded in the initial and follow up CT scans. Out of total 80 cases, 44 were having solitary lesion whereas remaining 36 were having multiple lesions. The 44 cases having solitary lesions were randomly divided in two groups.

1. Group A: treated with Albendazole therapy in

addition to anticonvulsants

2. Group B: treated with anticonvulsants only.

All the patients were followed up regularly for any complication. A 24-hour accessible telephone number was given to patients. Patients were advised to report back immediately in case of seizure recurrence or neurological complaints. After three months repeat CT was done and the findings were recorded. Complete resolution was defined as disappearance of the lesion on contrast enhanced CT scan. Partial resolution was defined as a reduction in size by 50% or more with the lesion still visible on CT scan. No resolution was defined as either no reduction or less than 50% reduction in size. Calcification was defined as the presence of a residual calcified speck without edema. The calcific change of the lesion was also grouped under radiological response/improvement.

RESULTS

Table 1: Distribution according to Sociodemographic details

	Variable	No. of Patients	Percentage
Age		27.75±8.43	52.5
Sex	Male	42	47.5
	Female	38	6.25
Socioeconomic Status	Rich	5	
	Middle	29	36.25
	Lower Middle	46	57.5
Dietary habits	Vegetarians	44	55
	Non-Vegetarians	36	45

It was observed that the mean age of the patients suffering from NCC was 27.75±8.43 years. The proportion of male and female was nearly same (52.5% and 47.5% respectively). Majority of the cases were belonging to lower middle socioeconomic class (57.5%). In the present study among 80 cases of NCC, 44 were vegetarians (55%) and 36 non vegetarians (45%) out of which 24 were pork eaters (30%).

Table 2: Distribution according to presenting symptom and CT scan characteristics

	Variable	No. of Patients	Percentage
Symptom	Generalized seizures	27	33.75
	Focal seizures	45	56.25
	Headache and Vomiting	5	6.25
	Other (weakness, visual and behaviour problems, incontinence, fever etc.)	3	3.75
	Solitary	44	55.00
	Multiple	36	45.00
Sign	Scolex Visualization	17	21.25
	Perilesions Edema	68	85.00
	Wall thickness Thick	00	0.00
	Wall thickness Thin	80	100.00
	Calcification	2	2.50

Generalized seizures was reported by 27 cases (33.75%) of NCC, while focal seizures in 45 cases (56.25%), headache and vomiting in 5 cases (6.25%), other symptoms (weakness, visual and behaviour problems, incontinence, fever etc.) were found in 3 cases (3.75%). It was also found that most of the NCC lesions were solitary in nature and was observed in 44(55%) patients whereas multiple NCC lesions were found in 36 patients (45%). In the present study scolex visualization was seen in 17 patients (21.25%) while perilesional edema was seen in 68 patients (85%). The presence of hydrocephalus was diagnosed in only 4 patients (5%) while calcification was found in only 2 patients (2.5%). On CT scan the wall of these NCC lesions were found to be thin and smooth in outline.

Table 3: Follow up CT scan findings in patients with single lesion with and without Albendazole therapy

Follow Up	Group A	Group B
No change	11 (50.00%)	13 (59.09%)
Size decreased	4 (18.18%)	4 (18.18%)
Disappeared	5 (22.73%)	4 (18.18%)
Calcification	1 (4.55%)	1 (4.55%)
Size increased	1 (4.55%)	0
Overall improvement (disappeared, decreased)	10 (45.45%)	9 (40.91%)

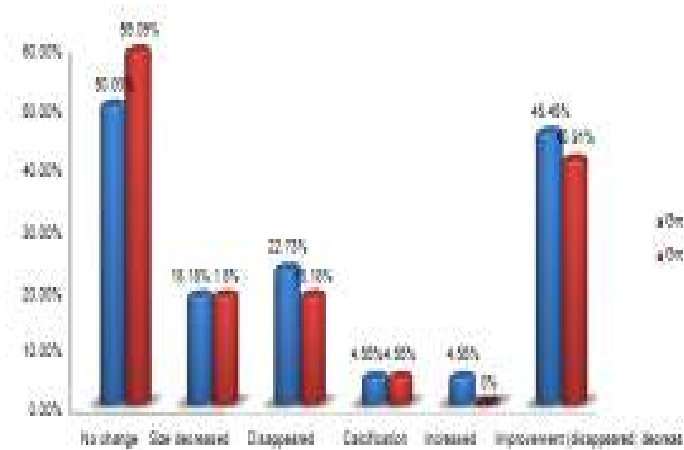


Figure 1: Follow up CT scan findings

In the present study it was observed that among group A (i.e. Group treated with Albendazole therapy in addition to anti-convulsants), 5 patients (22.72%) showed complete disappearance of lesion, 4 patients (18.18%) showed decrease in size of lesion on CT scan and 12 patients (54.54%) showed no change at all in lesion size. Besides, 1 patient (4.54%) showed increase in lesion size. On the other hand, in the group B (i.e. Group not treated

with Albendazole therapy), 4 patients (18.18%) exhibited complete disappearance, another 4 patients (18.18%) showed decrease in size while 14 patients (63.3%) exhibited no change at all on CT scan. The difference observed in outcome in both the groups was statistically insignificant. $X^2 = 0.09$ ($P=0.76$).

DISCUSSION

In the present study 80 cases of NCC attending the OPD and IPD of Neurosurgery, Neurology & Internal Medicine Departments of Govt. Medical College, Jammu were studied. It was observed that the mean age of the patients suffering from NCC was 27.75 ± 8.43 years. The proportion of male and female was nearly same (52.5% and 47.5% respectively). Majority of the cases were belonging to lower middle socioeconomic class (57.5%). In the present study among 80 cases of NCC, 44 were vegetarians (55%) and 36 non-vegetarians (45%) out of which 24 were pork eaters (30%). Similar findings were also reported by Varma A *ET AL*⁸, Prasad KN *ET AL*⁹ and Ashish Kumar *ET AL*¹⁰. Generalized seizures was reported by 27 cases (33.75%) of NCC, while focal seizures in 45 cases (56.25%), headache and vomiting in 5 cases (6.25%), other symptoms (weakness, visual and behaviour problems, incontinence, fever etc.) were found in 3 cases (3.75%). Sotelo J *ET AL*¹¹ also reported that the usual presentation of NCC was in the form of focal seizures. It was also found that most of the NCC lesions are solitary in nature and was observed in 44(55%) patients whereas multiple NCC lesions were found in 36 patients (45%). Ashish Kumar¹⁰ in their study observed that single lesion was present in 66.7% patients and multiple lesions in 33.3% patients. In the present study scolex visualization was seen in 17 patients (21.25%) while perilesional edema was seen in 68 patients (85%). The presence of hydrocephalus was diagnosed in only 4 patients (5%) while calcification was found in only 2 patients (2.5%). On CT scan the wall of these NCC lesions were found to be thin and smooth in outline. Gupta RK *ET AL*¹² stated that perilesional edema and rim enhancement were easily visualized on radiological analysis and correlated well with the diagnosis of the disease. In the present study we observed that response to Albendazole therapy in 22 solitary NCC patients. In 5 patients (22.72%) the lesion completely disappeared while in 1 patient (4.54%) the lesion increased in size. In 4 patients the lesions decreased in size (18.18%) while in 12 patients (54.54%) there was no change in the size of the lesion. We also evaluated 22 solitary NCC patients without Albendazole therapy. It was observed that in 4 patients there was complete disappearance of lesion (18.18%), while in 14 patients (63.63%) there was no change in size of the lesion at all. None of the lesion in

this group showed increase in the size of lesion. The present study showed results similar to the study conducted by P. Singhi *ET AL*¹³ that Albendazole therapy is hardly of any benefit in solitary NCC lesions whereas in multiple NCC, Albendazole therapy should be prescribed. Padma MV *ET AL*¹⁴ conducted a study on 29 patients with multiple cystic lesions on CT. At 3 months, they found that 48.27% patients in Albendazole group and 34-48% patients in placebo group showed more than 25% reduction in the number of lesions. They too concluded that Albendazole does not change the natural course of neurocysticercosis. Prabhakar S *ET AL*¹⁵ reported that SPECT lesions show a complete or near complete resolution on a subsequent CT scan while these patients are treated with antiepileptic drugs alone. Rajshekhar and Chandy¹⁶ have postulated 2 mechanisms for enlargement of cysticercus granuloma. One was simply an increasing amount of inflammatory reaction giving rise to an increase in the size of ring enhancing lesion as well as the surrounding edema. The second mechanism postulated involved two cysticercus cysts located in proximity to each other, the degeneration of one following the other very closely. Singh *ET AL*¹⁷ believed that Albendazole therapy was the cause of such CT lesion. Albendazole administration would accelerate involution of cysticercus granuloma, thereby leading to increasing inflammation around granuloma. This would appear on CT scan as an enlarging lesion. The anti-parasitic therapy for neurocysticercosis is not without controversy. After the initial success of anticysticercal therapy, a number of case reports surfaced which noted that some cysts can resolve without anti-cysticercal therapy¹⁸. Since then, an alternative opinion has been voiced. The acute, severe brain inflammation resulting from their unnecessary use is avoidable because parenchymal brain cysticercosis has a benign course and cysts will degenerate and heal by natural evolution of the disease. Hector H *ET AL*¹⁹ conducted a study in which 120 patients who had living cysticerci in the brain and seizures treated with anti-epileptic drugs were randomly assigned to receive either 800mg of Albendazole per day and 6mg of Dexamethasone per day for 10 days (60 patients) or two Placebo (60 patients). The patients were followed for 30 months or until they had been seizure free for 6 months after the doses of the anti-epileptic drugs had been tapered. The efficacy of treatment was measured as the decrease in the number of seizures after treatment. They concluded that in patients with seizures due to viable parenchymal cysts, anti-parasitic therapy decreases the burden of parasites and was safe and effective, atleast in reducing the number of seizures with generalization. In a meta-analysis by Ruth Ann Baird *ET AL*² searched literature from Medline,

EMBASE, LILACS, and the Cochrane Database from 1980 to 2008, updated in 2012, resulted in the identification of 10 Class I or Class II trials of cysticidal drugs administered with or without corticosteroids in the treatment of neurocysticercosis. They observed that albendazole therapy, administered with or without corticosteroids, was probably effective in decreasing both long-term seizure frequency and the number of cysts demonstrable radiologically in adults and children with neurocysticercosis, and was well-tolerated. Willem M. Otte²⁰ analyzed fifteen randomized control trials. Out of them ten RCTs assigned 765 people with solitary cysticercus granuloma (SCG) to antiepileptic drugs (AED) treatment with or without anthelmintic drug (albendazole) treatment. A further 5 RCTs assigned 457 people with SCG to AED treatment with or without corticosteroid drugs. Anthelmintic treatment was associated with significantly increased rates of seizure freedom (nonevent odds ratio: 2.45; 95% confidence interval: 1.49–4.03; p = 0.0004) and significantly higher rates of granuloma resolution (odds ratio: 2.09; 95% confidence interval: 1.41–3.00; p = 0.0003), but did not alter the risk of residual calcification. Corticosteroid treatment was not significantly associated with any outcome. In the present study we didn't observed any significant difference in outcome between both the groups. One of the reasons for this may be the short follow-up period in the present study.

CONCLUSION

Thus in the end we conclude that albendazole was effective in managing 45.45% cases as compared to 40.91% patients treated with antiepileptic drugs only but the difference observed was statistically insignificant.

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