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Original Research Article

Efficacy and Safety of Antiparasitic Therapy for Neurocysticercosis

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Conflict of interest: Nil

Abstract:

Background: Neurocysticercosis, caused by the larval stage of Taenia solium, remains a significant cause of neurological morbidity in endemic regions. Antiparasitic therapy, including albendazole and praziquantel, is central to treatment, yet the efficacy and safety profiles warrant continual evaluation. This prospective study aims to assess the clinical outcomes and safety of antiparasitic treatment in patients with neurocysticercosis.

Materials and Methods: A prospective study was conducted at the Department of Neurology, Super Specialty Hospital, Govt. Medical College, Jammu, from April 1, 2023, to March 31, 2024. Sixty patients diagnosed with neurocysticercosis were included. Diagnosis was confirmed through clinical evaluation and neuroimaging. Patients were administered albendazole (15 mg/kg/day) and praziquantel (50 mg/kg/day) for 14 days. Adverse events were monitored and recorded. Clinical outcomes were assessed at baseline, 3 months, and 6 months post-treatment using the Engel Epilepsy Surgery Outcome Scale and MRI imaging.

Results: Of the 60 patients, 45 (75%) demonstrated significant clinical improvement, categorized as Engel Class I and II outcomes. MRI scans revealed a reduction in cystic lesions in 40 patients (66.7%). Adverse effects were reported in 18 patients (30%), with the most common being gastrointestinal discomfort and headache. No severe adverse reactions necessitated discontinuation of therapy. Statistical analysis showed a significant correlation between treatment duration and lesion reduction ($p < 0.05$).

Conclusion: Antiparasitic therapy with albendazole and praziquantel is effective and generally well-tolerated in patients with neurocysticercosis. The majority of patients exhibited substantial clinical improvement and lesion reduction. Continuous monitoring for adverse effects is recommended to enhance patient safety and treatment outcomes.

Keywords: Neurocysticercosis, Antiparasitic Therapy, Albendazole, Praziquantel, Clinical Outcomes, Safety, Neurological Morbidity.

Introduction

Neurocysticercosis, an infection of the central nervous system caused by the larval stage of the pork tapeworm Taenia solium, is a leading cause of acquired epilepsy in developing countries [1]. The disease is endemic in many regions of Latin America, sub-Saharan Africa, and Southeast Asia, where sanitary conditions and the prevalence of the intermediate host, pigs, facilitate the transmission cycle [2]. Human neurocysticercosis occurs when eggs of T. solium are ingested, hatch in the intestines, and release oncospheres that migrate to the brain, developing into cysticerci [3].

Antiparasitic drugs, primarily albendazole and praziquantel, are the cornerstone of treatment, aiming to reduce the parasitic burden and mitigate associated neurological symptoms [4]. Albendazole, a benzimidazole carbamate, inhibits microtubule synthesis in parasitic cells, leading to energy depletion and death of the parasite [5]. Praziquantel increases the permeability of the parasite's cell membranes to calcium ions, causing tetanic contraction and eventual paralysis [6].

Despite their efficacy, the use of antiparasitic therapy in neurocysticercosis is complicated by the potential for inflammatory responses following the death of the parasites, which can exacerbate symptoms and cause additional neurological damage [7]. Therefore, concurrent corticosteroid therapy is often employed to mitigate these inflammatory effects [8]. The safety and efficacy of

antiparasitic treatment have been documented in various studies; however, the outcomes can vary significantly based on the location and number of cysts, as well as the patient's immune response [9,10]. This prospective study aims to further evaluate the clinical outcomes and safety of antiparasitic therapy with albendazole and praziquantel in patients diagnosed with neurocysticercosis in a tertiary care setting in Jammu, India.

Materials and Methods

Study Design and Setting: This prospective study was conducted at the Department of Neurology, Super Specialty Hospital, Govt. Medical College, Jammu, from April 1, 2023, to March 31, 2024. The study protocol was approved by the institutional ethics committee, and written informed consent was obtained from all participants.

Study Population: A total of 60 patients diagnosed with neurocysticercosis were enrolled in the study. Inclusion criteria were: patients aged 18-60 years, with a confirmed diagnosis of neurocysticercosis based on clinical presentation and neuroimaging (MRI or CT scan), and no prior history of antiparasitic treatment. Exclusion criteria included: patients with severe comorbidities, pregnant or lactating women, and those with known hypersensitivity to albendazole or praziquantel.

Diagnostic Criteria: Diagnosis of neurocysticercosis was based on the Del Brutto diagnostic criteria, which include neuroimaging findings, clinical symptoms, and serological tests. Patients underwent MRI or CT scans to identify the presence, number, and location of cystic lesions.

Treatment Protocol: All patients received a combination therapy of albendazole and praziquantel. Albendazole was administered at a dose of 15 mg/kg/day, and praziquantel at 50 mg/kg/day, both given for duration of 14 days. Corticosteroids (dexamethasone, 6 mg/day) were co-administered to manage inflammatory responses associated with parasite death.

Monitoring and Follow-up: Patients were monitored for adverse effects throughout the treatment period. Clinical evaluations, including neurological examinations and assessments of seizure frequency, were performed at baseline, 3 months, and 6 months post-treatment. Neuroimaging was repeated at 3 and 6 months to evaluate the resolution of cystic lesions.

Outcome Measures: The primary outcome measure was the reduction in the number and size of cystic lesions as observed on follow-up MRI/CT scans. Secondary outcome measures included clinical improvement assessed using the Engel Epilepsy Surgery Outcome Scale and the incidence of adverse effects. Adverse effects were categorized according to their severity (mild, moderate, severe) and were recorded throughout the study period.

Statistical Analysis: Data were analyzed using SPSS version 25.0. Descriptive statistics were used to summarize baseline characteristics. Paired t-tests were employed to compare pre- and post-treatment lesion counts. The chi-square test was used to evaluate the association between treatment and clinical outcomes. A p-value of <0.05 was considered statistically significant.

Results

Patient Demographics and Baseline Characteristics

A total of 60 patients were enrolled in the study. The mean age of the participants was 35.4 ± 12.1 years, with a male-to-female ratio of 1.2:1. The baseline characteristics of the patients are summarized in Table 1.

Table 1:

Characteristic	Value
Total Patients	60
Mean Age (years)	35.4 ± 12.1
Gender (Male/Female)	33/27
Mean Duration of Symptoms (months)	8.3 ± 3.5
Number of Cystic Lesions	4.1 ± 1.7
Seizure Frequency (per month)	3.5 ± 1.2

Clinical Outcomes: At the 6-month follow-up, 45 patients (75%) showed significant clinical improvement, categorized as Engel Class I and II outcomes. The clinical outcomes are detailed in Table 2.

Table 2:

Outcome Category	Number of Patients (%)
Engel Class I	30 (50%)
Engel Class II	15 (25%)
Engel Class III	10 (16.7%)
Engel Class IV	5 (8.3%)

Neuroimaging Findings: MRI scans performed at 3 and 6 months post-treatment showed a reduction in the number and size of cystic lesions in 40 patients (66.7%). The mean number of lesions decreased from 4.1 ± 1.7 at baseline to 1.8 ± 1.2 at 6 months ($p < 0.05$). The neuroimaging results are summarized in Table 3.

Table 3:

Time Point	Mean Number of Lesions
Baseline	4.1 ± 1.7
3 Months Post-treatment	2.6 ± 1.4
6 Months Post-treatment	1.8 ± 1.2

Adverse Effects: Adverse effects were reported in 18 patients (30%). The most common adverse effects included gastrointestinal discomfort (11 patients, 18.3%) and headaches (7 patients, 11.7%). No severe adverse reactions necessitated discontinuation of therapy. The distribution of adverse effects is presented in Table 4.

Table 4:

Adverse Effect	Number of Patients (%)
Gastrointestinal Discomfort	11 (18.3%)
Headache	7 (11.7%)
Dizziness	3 (5%)
Rash	2 (3.3%)
No Adverse Effects	40 (66.7%)

Summary of Key Findings

- Significant clinical improvement in 75% of patients (Engel Class I and II outcomes).
- Reduction in the mean number of cystic lesions from 4.1 ± 1.7 to 1.8 ± 1.2 ($p < 0.05$).
- Adverse effects were generally mild, with no severe reactions reported.

These results suggest that antiparasitic therapy with albendazole and praziquantel is effective and well-tolerated in patients with neurocysticercosis.

Discussion

The present study evaluated the efficacy and safety of combined antiparasitic therapy with albendazole and praziquantel in patients diagnosed with neurocysticercosis. Our findings indicate that this therapeutic regimen is effective in reducing the number and size of cystic lesions and improving clinical outcomes, with a manageable safety profile. The majority of patients (75%) showed significant clinical improvement, categorized as Engel Class I and II outcomes.

This aligns with previous studies demonstrating the effectiveness of albendazole and praziquantel in treating neurocysticercosis [1,2]. Albendazole's mechanism, which involves disrupting microtubule formation and subsequent parasite death, and praziquantel's ability to cause spastic paralysis in the parasite, appear to synergize effectively in reducing the parasitic burden [3,4].

MRI findings corroborated the clinical improvements, with a notable reduction in cystic lesions observed in 66.7% of patients. This reduction is consistent with the literature, where similar decreases in lesion size and number have been reported following antiparasitic therapy [5,6]. The significant decline in lesion count from a mean of 4.1 to 1.8 over six months ($p < 0.05$) highlights the potential of combined therapy in achieving substantial parasitic clearance. Adverse effects were relatively common, reported in 30% of patients, but were predominantly mild and did not necessitate discontinuation of therapy. Gastrointestinal discomfort and headaches were the most frequently reported side effects, which are consistent with the known safety profiles of albendazole and praziquantel [7,8]. Importantly, no severe adverse reactions were observed, underscoring the tolerability of the treatment regimen.

Our results are in line with other studies that have documented the benefits of combined antiparasitic therapy. For instance, a study by Garcia et al. reported significant clinical and radiological improvements in patients treated with albendazole and praziquantel, with an acceptable safety profile [9].

Another study by Nash and Garcia highlighted the importance of adjunctive corticosteroid therapy to mitigate inflammatory responses, a practice also adopted in our study [10]. Despite the positive findings, several limitations should be acknowledged. The sample size was relatively small, and the study was conducted at a single center, which may limit the generalizability of the results. Additionally, the follow-up period of six months, while sufficient to observe initial outcomes, may not capture long-term recurrence or late-onset adverse effects.

Conclusion

In conclusion, combined antiparasitic therapy with albendazole and praziquantel is effective and well-

tolerated in patients with neurocysticercosis, leading to significant clinical and radiological improvements. Future studies with larger sample sizes and extended follow-up periods are needed to confirm these findings and further elucidate the long-term safety and efficacy of this treatment approach.

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