Tuberculous Meningitis: Role of Hydrocephalus in Prognosis

Z. Ahmadinejad, M.D.*
V. Ziaeie, M.D.**
S.R. Reisikarami, M.D.***
M. Aghaeeifar, M.D.***

*Department of Infectious Disease, Imam Khomeini Hospital, T.U.M.S., Tehran, Iran.
**Department of Paediatrics, Children Medical Center, T.U.M.S., Tehran, Iran.
***Department of Paediatrics, Imam Khomeini Hospital, T.U.M.S., Tehran, Iran.

Abstract

Objectives: Tuberculous Meningitis (TBM) remains a serious health threat in developing countries. Hydrocephalus in TBM significantly influenced the prognosis and unlike other prognostic factors its presence would change the management of the patients. This study was aimed to evaluate the incidence of hydrocephalus in TBM and relation between management of hydrocephalus and therapeutic outcomes of TBM.

Patients and methods: Over a period of 10 years (1991-2001) patients with diagnosis of TBM retrospectively identified. Computerized Tomography (CT) scan features in these patients and therapeutic outcome were analyzed.

Results: Ninety six patients fulfilled the diagnostic criteria and 21 patients (22%) died during admission. Seventy seven patients (80.2%) had hydrocephalus in their cranial CT scan, and of these, 23.4% underwent special treatment. 5.5% patients with special treatment of hydrocephalus and 33.9% patients without treatment deceased (P=0.018).

Conclusion: Early diagnosis and proper management of hydrocephalus should be considered in management of patients with TBM.

Key words: Tuberculosis, meningitis, prognosis, hydrocephalus, Iran.

Introduction

Tuberculosis is a mycobacterial infection and is still relatively common in some countries especially where disease is endemic, areas such as Southern Asia, Middle East and some parts of Africa.1,3,4 Tuberculous Meningitis (TBM) results from the hematogenous dissemination of bacilli from a primary lesion in the thorax, abdomen or genitourinary tract and remain a serious health threat in developing countries.5,8,11-14 Recently, TBM has become a larger concern because of the emergence of AIDS, the rising population of immunocompromised persons and the use of immunosuppressive therapy.10,11

Mild to marked third-ventricular enlargement was present in 100% of cases in one study but clinical findings is not observed in all patients.12 Severe hydrocephalus is occurring in more than 50% of children who present with the advanced stages (stage II, III) of TBM but in only 12% of adults.11,14 It is the most treatable complication of TBM.14 Hydrocephalus in TBM may result from obstruction at the level of the basal cisterns.15,16 A new view for the understanding of pathogenesis and hemodynamics of hydrocephalus has recently been proposed by Greitz and Greitz.15 It may
result from disturbed hemodynamics caused by any process that restricts the pulsations of the intracranial arteries. The obstruction at the level of the basal cisterns results in a decreased blood flow in main cerebral vessels, thereby causing damage to the brain parenchyma. Hydrocephalus can be obstructive or communicating. Intracranial Pressure (ICP) is rising due to obstructive hydrocephalus and thus prognosis is worse in the patients with obstructive hydrocephalus. Intracranial pressure above 400mm of CSF significantly impairs perfusion of cerebral tissue and so some authors recommend corticosteroids in patients with computerized tomography evidence of hydrocephalus. Another option of management of hydrocephalus is the usage of ventriculostomy or ventriculoperitoneal shunts to relieve acute hydrocephalus. However, timely surgical intervention in patients with hydrocephalus may have a critical role in the outcome.

In this study we evaluated the incidence of hydrocephalus in TBM and analyzed CT scan study and the therapeutic outcome of 96 patients with TBM.

Patients and Methods

Over a period of 10 years (1992 to 2001) 96 patients with TBM were admitted in three major teaching hospitals in Tehran. Diagnosis of TBM was based on the clinical, cerebrospinal fluid and radiological images and pulmonary involvement. The clinical criteria were: fever, headache, meningsitis signs and other clinical presentations of meningitis lasted for more than two weeks. Furthermore, typical CSF features in this study was defined as following: pleocytosis (more than 20 cells) with lymphocytes greater than 60%, protein greater than 100mg/l and glucose less than 60% of corresponding blood glucose.

We evaluated both the presumptive and definitive TBM patients simultaneously as it is performed in other studies. A definite bacteriological diagnosis was made by means of the isolation of mycobacterium tuberculosis from CSF, sputum or gastric aspirate. Presumptive diagnosis was based on the clinical criteria with typical CSF features and at least one of the following supporting criteria: 1- Chest X-ray findings suggestive of pulmonary TB (reticulonodular pattern in upper lobes with or without cavitary lesions), 2- Appearance of hydrocephalus in the brain CT scan, 3- A positive tuberculin skin test. All presumptive TBM patients had negative cultures for bacterial and fungal agents and negative Indian ink.

Brain CT scan studies were carried out on all patients at the time of admission (a follow up CT and/or magnetic resonance imaging was done in case of clinical deterioration). The findings of the initial CT scan were analyzed.

All patients received antituberculosis treatment consisting of four drugs including isoniazid, rifampin, pyrazinamide and ethambutol. Other promising antituberculosis agents such as streptomycin, ciprofloxacin and amikacin were used temporarily in patients with drug toxicity.

Based on the therapeutic outcome, patients were divided into two groups i.e. poor outcome and good outcome. Therapeutic outcome is considered as poor outcome in deceased patients.

The association between the management of hydrocephalus and the therapeutic outcome of the patients was analyzed by means of the X²-test.

Results

The patients included 46 (47.9%) males and 50 (52.1%) females. Forty-nine patients (51%) were less than 15 years old (26 patient less than 5 year) and 47 (49%) were more than 16 years old. A definite bacteriological diagnosis of TBM was made in 22 (22.9%) patients and remainder of them (74=77.1%) had presumptive TBM. On admission, 14 patients (14.6%) had stage I TBM, 33 (33.4%) stage II and 49 patients (51%) stage III.

Among 96, 77 (80.2%) had hydrocephalus in their cranial CT scan, and of these, 18 (23.4%) underwent shunt surgery or medical treatment with furosemide.

The treatment protocol which is discussed in the patients and methods would resume in all patients. Corticosteroids were used in 77 patients (80.2%).

In this study, 21 patients (22%) died during admission, of these, 11 (52.4%) were less than 10 years old and 4 (19%) were between 10-20 years old (r=0.82).

From 18 patients with special treatment of hydrocephalous one patients (5.5%) deceased while from 59 patients without treatment 20 patients (33.9%) deceased. We found a statistically significant association between management of hydrocephalous and therapeutic outcome (P=0.018).
Discussion

Tuberculous meningitis is one of the major infectious causes of chronic meningitis worldwide (including Iran), with high mortality and morbidity.13,29 and hydrocephalus is a serious but treatable complication of TBM.30 The overall mortality rate in this study was 22% (21/96), a figure which is close to the lower limit of the reported mortality rate.31,32

Some degrees of hydrocephalus is present in all patients with TBM.31,33 Although the rate of severe obstructive hydrocephalus is someone less especially in adult patients with TBM.14 Similarly (83%) to Bhargava et al and (80%) Ozates et al.12,14 we found a high incidence of hydrocephalus (80%) in our patients at the brain CT scan, where as in other studies, it has a wide range differing from 23% to 80%.32,33,35,36,37,38

Other CT findings in TBM exist that have been proven to aid in the management of TBM by facilitating the recognition of intracranial complications.15 These CT findings include: normal feature, characteristic features of contrast enhancement in the subarachnoid cisterns, sulci, brain parenchyma, hydrocephalus and tuberculosis.14 However a normal CT examination performed with contrast enhancement in a drowsy patient may exclude a diagnosis of TBM.14

Frequency of hydrocephalus was found in children higher than adults.13,15,17,34 Hydrocephalus in TBM significantly influenced the prognosis and unlike other prognostic factors its presence would change the management of the patients.23,24,25,30,31,33,38 Cases with noncommunicating hydrocephalus usually require ventricular drainage or a ventriculoperitoneal shunt in addition to the antituberculosis treatment.40 Ventricleptoriontal shunting of 28 cases of tuberculous meningitis resulted in a better outcome when compared with an equal number of matched nonshunted children.41 The critical role of the management of hydrocephalus in outcome is proved in our patients. Treatment for hydrocephalus with furosemide or ventriculoperitoneal shunt decreased mortality rate from 33.9% to 5.5%.

In summary, TBM, a central nervous system infectious disease with high mortality rate especially in children is still a serious public health problem. The presence of hydrocephalus is strongly associated with higher mortality rate. Therefore, early diagnosis and management of hydrocephalus are mandatory.

References

Tuberculous Meningitis: Role of Hydrocephalus in Prognosis


