Tuberculous meningitis hydrocephalus

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Hydrocephalus is one of the commonest complications of tuberculous meningitis (TBM), and its incidence is increasing with the HIV epidemic. Literature evaluating the role of ventriculoperitoneal shunts in HIV-positive patients with TBM and their long-term prognosis is scarce.

Epidemiology

Tuberculous meningitis hydrocephalus epidemiology.

Clinical features

 Neurological Features of TBM with Hydrocephalus ⚠ Early Symptoms (Prodromal Phase) Low-grade fever

Malaise, irritability

Headache

Vomiting

Behavioral changes

Poor feeding (in infants)

 Advanced Neurological Signs As hydrocephalus develops or intracranial pressure (ICP) rises:

Persistent headache, often worse in the morning

Vomiting, not always associated with nausea

Altered consciousness (confusion, stupor, coma)

Seizures (especially in children)

Papilledema (sign of increased ICP)

Cranial nerve palsies (especially CN VI, III, and VII)

Focal neurological deficits

Gait disturbances, ataxia

Cognitive decline or lethargy

 Special Considerations in Children Bulging fontanelle

Increasing head circumference

Sunset sign (downward gaze of eyes)

Developmental regression

Poor weight gain

 Signs Specifically Suggestive of Hydrocephalus Signs of raised ICP: papilledema, Cushing's triad (bradycardia, hypertension, irregular respiration)

Drowsiness progressing to coma

Incontinence

Decerebrate or decorticate posturing in severe cases

 Clinical Staging (British Medical Research Council – MRC) Helps correlate symptoms with disease severity:

Stage I: Fully conscious, no neurological deficits

Stage II: Confusion, lethargy, minor focal signs

Stage III: Stupor or coma, severe focal deficits or seizures

 Pathophysiology of Hydrocephalus in TBM Obstruction of CSF flow due to basal exudates, tuberculomas, or arachnoiditis

Impaired absorption in communicating hydrocephalus

Inflammatory vasculitis and infarcts can worsen neurological function

Diagnostic Approach

1. Neuroimaging (CT or MRI): MRI (preferred):

Enhanced sensitivity for basal exudates, meningeal enhancement, and infarcts.

Hydrocephalus appears as dilatation of the lateral, third, and fourth ventricles, depending on site of obstruction.

T1-weighted with contrast shows basal meningeal enhancement.

CT scan:

Often first-line imaging, especially in resource-limited settings.

Shows ventricular dilation clearly and may demonstrate basal cistern exudates.

Can show communicating or non-communicating hydrocephalus.

2. CSF Examination: Typical findings in TBM:

Elevated opening pressure.

Elevated protein (>100 mg/dL).

Low glucose (<50% of blood glucose).

Lymphocytic pleocytosis (50–500 cells/mm³).

Microbiological:

Acid-fast bacilli (AFB) staining positive in <20% of cases.

TB PCR (GeneXpert MTB/RIF or Ultra) significantly improves diagnostic sensitivity (~60-70%).

Culture remains gold standard (but takes weeks).

3. Additional tests: Chest imaging (X-ray or CT chest): may show active or healed pulmonary TB.

Tuberculin skin test (Mantoux) or IGRA (interferon-gamma release assay): supportive but not diagnostic alone.

Treatment

Tuberculous meningitis hydrocephalus treatment.

Complications

Complications of shunt surgery in patients with TBM and hydrocephalus are high with frequent shunt obstructions and shunt infections requiring repeated revisions. ETV has variable success in these patients and is generally not advisable in patients in the acute stages of the disease. Mortality on long-term follow up has been reported to vary from 10.5% to 57.1% in those with altered sensorium prior to surgery and 0 to 12.5% in patients with normal sensorium. Surgery for patients in Vellore grade IV is usually associated with a poor outcome and high mortality and therefore, its utility in these patients is debatable [1)].

Case series

Between June 2002 and October 2012, 30 HIV-positive patients with TBM and hydrocephalus underwent ventriculoperitoneal shunt placement. Thirty age-, sex-, and grade-matched HIV-negative patients with TBM and hydrocephalus were randomly selected as the control group. Outcome was analyzed at discharge (short-term outcome) and at follow-up (long-term outcome). Univariate analysis and multivariate analysis were performed to look for predictors of outcome; $p < 0.05$ was considered significant.

There were no differences in the clinical, radiological, or biochemical parameters between the 2 groups. Short-term outcome was better in the HIV-negative group (76.7% improvement) than in the HIV-positive group (70%). However, the long-term outcome in HIV-positive patients was very poor (66.7% mortality and 76.2% poor outcome) compared with HIV-negative patients (30.8% mortality and 34.6% poor outcome). Seropositivity for HIV is an independent predictor of poor outcome both in univariate and multivariate analyses ($p = 0.038$). However, in contrast to previous reports, of 5 patients with TBM in good Palur grades among the HIV-positive patients, 4 (80%) had good outcome following shunt placement [2)].

Twenty-six patients with TBM hydrocephalus treated with ETV were evaluated clinically and with cine MR imaging postoperatively. The duration of follow-up ranged from 1 to 15 months. The authors evaluated flow void changes in the floor of the third ventricle and analyzed parameters from the preoperative data, which they then used as a basis for comparison between endoscopically successful and endoscopically unsuccessful cases.

Results: The overall success rate of ETV in TBM hydrocephalus was 73.1% in this case series. Cine MR imaging showed a sensitivity of 94.73% and specificity of 71.42% for the functional assessment of third ventriculostomy in these patients, with the efficacy being maintained during follow-up. The outcome of ETV showed a statistically significant correlation with the stage of illness and presence of intraoperative cisternal exudates. Although duration of symptoms and duration of preoperative antituberculous therapy (ATT) appeared to influence the outcome, their correlation with outcome was not statistically significant.

Conclusions: Endoscopic third ventriculostomy should be considered as the first surgical option for CSF diversion (that is, before shunt surgery) in patients with TBM hydrocephalus. Cine MR imaging is a highly effective noninvasive tool for the postoperative functional assessment of stomata. Patients who presented with a history of longer duration and those who were administered preoperative ATT for a longer period had a better outcome of endoscopic treatment. Outcome was poorer in patients who presented with higher stages of illness and in those in whom cisternal exudates were observed intraoperatively [3)].

Fourteen patients with TBMH (11 male patients and 3 female patients; mean age, 15.7 years; range, 9 months to 40 years) formed the study group. Various preoperative (clinical grade, ventricular morphology, basal exudates, and CNS tuberculoma) and perioperative (ependymal tubercles, third ventricular floor anatomy, exudates, and adhesions) factors were studied with regard to the result of ETV. Endoscopic third ventriculostomy could be performed on 13 patients; however, an unidentifiable

third ventricular floor anatomy precluded ETV in the remaining patient. Endoscopic third ventriculostomy was assigned as “failed” if the patient needed shunt, required EVD, or died in the postoperative period. The average follow-up period for the patients was 5 months.

Results: Endoscopic third ventriculostomy was successful in 9 of the 14 (64.2%) patients subjected to neuroendoscopy. Statistical analysis did not show any significant association of ventricular morphology (P = .109), basal enhancement on CT (P = .169), CNS tuberculoma (P = .169), and clinical grade (P = .057) with the result of ETV, probably because of the small number of cases. However, patients with severe hyponatremia, extra-CNS tuberculosis, an unidentifiable third ventricular floor anatomy, and adhesions in the prepontine cistern had a failed ETV. Patients with tuberculoma in the brain had a successful ETV.

Conclusions: Endoscopic third ventriculostomy is likely to fail in the presence of advanced clinical grade, extra-CNS tuberculosis, dense adhesions in prepontine cisterns, and an unidentifiable third ventricular floor anatomy. Tuberculoma in the brain in cases of TBMH may be associated with a successful ETV [4].

Endoscopic third ventriculostomy (ETV) was performed in thirty-five patients. According to the duration of illness, six patients were in the early (less than 6 weeks), nineteen were in the intermediate (6 weeks to 6 months) and ten patients were in the late phase (more than 6 months) of tuberculous meningitis (TBM). Six patients were in stage I, seven patients in stage II and twenty-two patients were in stage III. The overall success rate of ETV in TBM was 77 %. Sixty percent had early and seventeen percent had delayed recovery. Obstructive hydrocephalus was present in 54.3 % and 45.7 % had communicating hydrocephalus. The radiological recovery rate was 55.6 %. The outcome with a thin to transparent floor of the third ventricle was 87 % [5].

Case report from the HGUA

Tuberculous Meningitis with Hydrocephalus in a 17-Month-Old Girl

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