

## Recurrent Meningitis in Children

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### Abstract

Recurrent meningitis in children, although rare, results in an increased risk of acute complications and long term morbidity. We did a retrospective case series to analyze the clinical presentation, predisposing factors, treatment and outcome of children with recurrent meningitis admitted at Shifa International hospital, Islamabad. All children presenting with recurrent meningitis from December 2006 to May 2011 were included in the study. There were a total of 8 children with a mean age of  $6 \pm 2.97$  years (2-10 years). Majority (87%) were males. There was an average of  $4 \pm 4.92$  (2-9) episodes of meningitis in each patient. Fever with vomiting was the most common (87%) presenting symptom, followed by seizures (62%) and headache (50%). The underlying etiology was confirmed on CSF analysis, computed tomography scan (CT) and magnetic resonance imaging (MRI). About half of them had history of head trauma. All responded to antibiotics and six needed surgery. On follow up, 2 (25%) children had some neurological impairment.

**Keywords:** Recurrent meningitis (RM), Head trauma, Congenital defects of skull.

### Introduction

Recurrent meningitis (RM) in children is rare but potentially serious and life threatening. In addition to medical complications, it also causes significant psychological stress and financial burden for the patient and family due to repeated hospitalizations and multiple investigations. Congenital or acquired defects of skull or spine, parameningeal foci of infection and immunodeficiency states are important causes of recurrent bacterial meningitis.<sup>1</sup> The modern imaging techniques have made possible the early identification of most of the occult dural defects. The precise localization of these defects is important for successful surgical repair. We present a case series of eight children with RM with emphasis on investigations and management.

### Case Series

This retrospective case series was carried out at the

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Department of Pediatrics, Shifa International Hospital, Islamabad. All children who presented with RM from December 2006 to May 2011 were included in the study. Their medical records were reviewed to collect the relevant data including the clinical features, physical signs, microbiological and radiological investigations. The medical and surgical treatment and outcome was also recorded.

A total of 8 children presented at our hospital with RM over 4.5 years. The mean age at presentation was  $6 \pm 9.7$  years (2-10 years). Majority (87%) were males. There was an average of  $4 \pm 2.9$  years (2-9) episodes of meningitis among these children and all of them had acute presentation. Fever with vomiting was the most common (87%) presenting symptom, followed by seizures (62%) and headache (50%).

The underlying etiology was confirmed on CSF analysis, CT scan and MRI. All responded well to antibiotics but six of them also needed surgery for the repair of underlying defects. One child who presented with meningo-encephalitis and fever of  $107^{\circ}\text{F}$  had Mollaret meningitis and was treated with acyclovir for 14 days even though his CSF HSV PCR was negative. Investigations for immunodeficiency syndromes were carried out in two children (one had chronic suppurative otitis media and the



**Figure:** T2W coronal image of MRI showing loss of left cribriform plate of ethmoid in a 9 year old with head trauma.

Table: Demographic, clinical features, management and outcome.

Sr No	Age (year) / Sex	Predisposing Conditions	No of episodes Of meningitis	Clinical Features	Diagnostic investigations	Final Diagnosis	Treatment	Outcome
1	9/ M	Head Trauma	2	Fever, Headache, Vomiting	*CT Scan	Fracture of left cribriform plate (Figure)	Antibiotics alone	No deficit
2	10/ F	++CSOM/ Mastoiditis	2	Fever, Headache, Vomiting, Dizziness	*CT Scan and +MRI	Bony defect in posterolateral wall of left mastoid air cell and communicating hydrocephalus	Antibiotics and surgery	No deficit
3	5/ M	Head Trauma	4	Fever, Vomiting, Seizures, Lethargy, #CSF rhinorrhea	*CT Scan and +MRI, Group C Streptococcus in #CSF culture	Defect in left cribriform plate and encephalocele	Antibiotics and surgery	Epilepsy
4	8/ M	Base of skull defect	4	Fever, Headache	*CT Scan and +MRI	Defect in anterior part of cribriform plate and encephalocele	Antibiotics and surgery	No deficit
5	2/ M	Spina bifida	10	Fever, Vomiting, Seizures	*CT Scan and +MRI, Pseudomonas & E coli in #CSF culture	Defect in lumbar spine, lumbar spine abscess (L2-L3), tethered cord, defect in right cribriform plate	Antibiotics and surgery	Speech deficit and motor developmental delay
6	9/ M	Head trauma	2	Headache, Vomiting, Seizures, #CSF rhinorrhea	*CT Scan and +MRI	Multiple defects in left frontal bone, defect in left cribriform plate, fluid in ethmoid sinus	Antibiotics and surgery	No deficit
7	4/ M	Meningocele	2	Fever, Vomiting, Seizures	*CT Scan	Defect in left cribriform plate and communicating hydrocephalus	Antibiotics and surgery	No deficit
8	4/ M	None	3	Fever, vomiting, seizures, drowsiness	*CT Scan, Mollaret cells in #CSF	Mollaret Meningitis	Acyclovir	No deficit

\*Computed tomography scan.

+Magnetic resonance imaging.

++Chronic suppurative otitis media.

#Cerebrospinal fluid.

other had spina bifida but had recurrent episodes of meningitis despite correction of underlying defect). Complete blood count and immunoglobulin levels were done and were normal. The immunodeficiency work up was not done in rest of the children as the diagnosis was confirmed on radiological investigations. On follow up, two children (25%) had some neurological impairment (one had epilepsy and hearing impairment while the other had speech deficit and motor developmental delay) (Table).

## Discussion

RM may result from congenital or acquired defects of skull and spine, parameningeal foci of infections or underlying immunodeficiency states. The prevalence of recurrent bacterial meningitis however remains low. A male predominance was found among patients with RM by researchers in Netherlands who prospectively collected nationwide data over 17 years (1988-2005) from 18,915 patients with meningitis, out of which 202 had RM. *Streptococcus pneumoniae* was the commonest causative organism in 40% of cases followed by *Neisseria meningitidis* in 22% and non-type b *Haemophilus influenzae* in 9% of cases.<sup>2</sup> In contrast, we found atypical pathogens (group C streptococcus, pseudomonas and E coli) in two of our patients whereas in rest of them, the

CSF culture yielded no growth. However, *Streptococcus pneumoniae* is difficult to grow and that may be the reason for negative culture in majority of the cases.

Presence of anatomical defects is a major cause of RM (Table). They are often occult and difficult to diagnose but the availability of thin section High Resolution CT (HRCT) with multi planner reformats (MPR) has made it possible to identify these bony defects. One of our patients with congenital defects of skull and spinal cord had nine episodes of meningitis before a defect in cribriform plate was discovered and successfully repaired. Tuygun et al reported 67 episodes of meningitis in 14 patients with a mean age of 87 months and a male predominance. The majority had developmental or congenital anatomical defects. Other causes included traumatic anatomical defects and primary immunodeficiency states.<sup>3</sup> Rare causes of RM with extensive workup have been reported as case reports.<sup>4,5</sup>

Spinal dysraphism is also a cause of RM. Dermal sinus tracts in spinal dysraphism also predispose to RM. This was exactly the problem in one of our patients with spina bifida and tethered cord. In this patient the cribriform defect was demonstrated with the help of CT cisternography. Gupta et al from India has also reported a

33 month old female with dermal sinus tract and CSF leak in association with tethered cord.<sup>6</sup>

The congenital, acquired and post surgical ear defects may also result in RM. Therefore, all patients with RM in association with auditory or visual symptoms should be evaluated to exclude occult perilymph leak. Surgical correction of the defect prevents further attacks of meningitis as well as the resultant progressive hearing deficit.<sup>7</sup> Patients with head trauma have the highest risk of developing RM. In our study, 37.5% of the patients had history of head trauma resulting in CSF leak.

Even with the advent of modern radiological studies, the diagnosis of occult skull and spinal defects is sometimes difficult. Thin section high resolution CT scan with MPR may aid the diagnosis of base of skull defects in patients with RM without CSF rhinorrhea when the plain CT scan/MRI are negative.<sup>8</sup> All the patients with recurrent meningitis should undergo diagnostic imaging to identify underlying defects of skull and spine.

Most of the children with congenital and acquired defects of skull and spine ultimately require surgical treatment. Yadav et al reported 12 cases of CSF rhinorrhea managed conservatively but 7 of them subsequently required surgical repair of the underlying dural defect as they had repeated hospitalizations due to RM. The risk of developing meningitis as a result of base of skull defect or CSF leak ranges from 9 to 50% if surgical repair is not performed.<sup>9</sup>

RM secondary to immunodeficiency has frequently been reported.<sup>3</sup> Among our patients, immunodeficiency was suspected in two children; one had chronic suppurative otitis media and the other had spina bifida but had recurrent episodes of meningitis despite the correction of underlying defect of the spine. The immunoglobulin levels were normal in both of them.

Mollaret meningitis is a form of recurrent benign lymphocytic meningitis characterized by greater than three episodes of fever and meningismus lasting two to five days, followed by spontaneous resolution.<sup>10</sup> Quite a number of cases have been reported worldwide, in

association with viral infections, predominantly HSV-2. Our patient with Mollaret meningitis was treated with acyclovir for 14 days, although his CSF HSV PCR was eventually reported as negative.

It has been reported that there is good prognosis following successful surgical repair of congenital or acquired anatomical defects of skull and spine.<sup>5,8,9</sup> Fortunately most of our patients had uneventful recovery and only two of them had neurological sequelae on follow up. Early presentation and initiation of antibiotic therapy and supportive care probably saved them from developing long term neurological disabilities.

## Conclusion

Healthy children presenting with RM should be evaluated for possible defects at base of skull, either congenital or post traumatic.

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