

## Diffusion weighted MR imaging and CSF analysis ; in a rarely reported case of pyogenic ventriculitis in Bankura .

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**Abstract :** Pyogenic ventriculitis refers to suppurative intraventricular collections, is a rare complication resulting from extension of meningitis or foci of cerebral abscess[7] . Though clinically indolent , it is extremely lethal and an early diagnosis remains the only hope to improve the prognosis[7] . There are hardly a few articles describing its radiological findings . In this case of pyogenic ventriculitis diagnosed radiologically and subsequently proved by CSF analysis, we shall emphasize the role of diffusion weighted MR imaging in its early diagnosis, and quantification of ventricular debris thereby promoting prompt initiation of treatment. The case may be considered 'primary' pyogenic ventriculitis as no intracerebral septic foci could be identified and hence is even a rarer diagnosis[7]

**Keywords:** pyogenic ventriculitis , diffusion weighted MR imaging , lethal , rare complication

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### I. Introduction

Ventriculitis is an inflammation of ependymal linings of the cerebral ventricles .It is a rare cerebral infection that results most often from intraventricular rupture of brain abscess[7]. Other etiological factors may be flaring of meningitis into the ventricles usually via choroid plexus, neurosurgical procedures such as shunt or external ventricular drain or external ventriculostomy and at times ,trauma[7]. Reduced immunity and a higher virulence of the causative organism are additional contributing factors. Microbiologically staphylococcus , streptococcus and enterobacter species are most common etiological agents[7]. Pyogenic ventriculitis in particular, has intraventricular dependent suppurative fluid/debris collections[1,2,3] .Though clinically indolent , the disease is potentially life threatening[7] .Most of patients do succumb without being diagnosed or diagnosed only at autopsy. Case fatality rate of ventriculitis varies from 27 to 85%[7,8]. Early radiological diagnosis remains the sole hope for its prompt treatment -stereotactic decompression[7] .Here we emphasize the role of diffusion weighted MR imaging which shows markedly increased dependent intraventricular signal intensity[1,2,3]. Restricted diffusion here signifies purulent , necrotic and proteinaceous intraventricular debris. Long standing cases may have intraventricular septation , compartmentalization and obstructive hydrocephalus (as in our case ) [1,2,3,4,5,6]

### II. Case Report

A 24 day old baby was brought for MRI by her parents. On taking history and detailed clinical evaluation we found that the baby was admitted in SNCU post birth in a case of normal hospital delivery at 37 weeks of gestation, birth weight being 2750 gm, APGAR score of 7 ,passed meconium within 6 hrs of birth .However ,24 to 48 hours post natal, there was history of sluggish breast feeding , irritability ,lethargy,hyperthermia, seizures, bulging fontanelle and variable episodes of apnea .The baby was put on empirical antibiotic coverage of gentamicin and a third generation cephalosporin .The baby showed no improvement even after 3 weeks of treatment . MRI findings revealed it to be a highly fatal and rare case of pyogenic ventriculitis. On MR imaging dependent occipital horn of bilateral lateral ventricle , third and fourth ventricle showed intraventricular deposits likely proteinaceous and necrotic debris having an irregular ependymal contour . This intraventricular deposits were hyperintense on T1-weighted images[figure 1], slightly hypointense on T2-weighted images[figure 2], and hyperintense on FLAIR images[figure 3], in comparison to normal cerebrospinal fluid in non dependent parts of ventricles . Diffusion weighted MR imaging showed a very high signal intensity in dependent parts of all the ventricles and hypointense signal in non dependent cerebrospinal fluid[figure 5] .On GRE sequences no features suggestive of intraventricular hemorrhages were noted[figure 4] . The apparent diffusion coefficient values in dependent intraventricular deposits , white matter and non dependent cerebrospinal fluid were 0.61,1.02 and 2.8 respectively[figure 6], i.e. Apparent diffusion coefficient was highest in non dependent cerebrospinal fluid in frontal horn , intermediate in white matter and least in most dependent intraventricular deposits/fluid .The cerebrospinal fluid analysis revealed pleomorphic leukocytosis , elevated CSF protein and reduced glucose .A noninvasive approach has been followed to avoid

further potentially life threatening complications and morbidity[1,2,3,4,5,6]. Intraventricular cellular debris also caused obstructive hydrocephalus.



Figure 1

Axial T1 sequence taken at TR 420ms and TE 13ms shows dependent intraventricular deposits slightly hyperintense in comparison to non dependent cerebrospinal fluid within ventricles



Figure 2

Axial T2 weighted MR imaging sequences taken at TR 5200ms and TR 123ms shows intraventricular deposits slightly hypointense in comparison to non dependent cerebrospinal fluid.

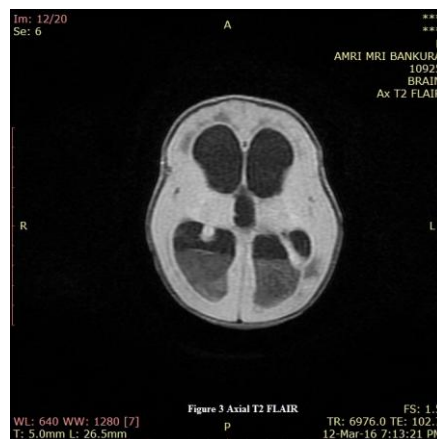


Figure 3

Axial T2 FLAIR MR imaging sequences taken at TR 6976ms, TE 103ms and inversion time of 2250 shows hyperintense ventricular deposits in comparison to non dependent cerebrospinal fluid.



Fig 4

Axial GRE taken at TR 560ms ,TE 20ms and 15.7 khz frequency shows isointense signal in all the ventricles and no features of intraventricular hemorrhage and calcifications .



Fig 5

Diffusion weighted MR imaging sequences taken at TR 4434ms ,TE 87.9ms and 250 kHz, showed a very high signal intensity in dependent parts of all the ventricles and hypointense signal in non dependent cerebrospinal fluid

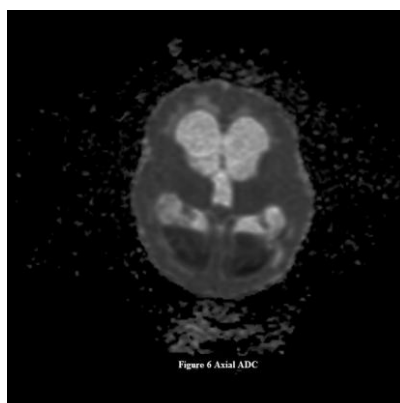


Figure 6

Apparent diffusion coefficient values in dependent intraventricular deposits , white matter and non dependent cerebrospinal fluid were 0.61,1.02 and 2.8 respectively[1,2,3,4,5,6]

### III. Figures and Tables

#### CSF Analysis

Gross appearance	
Amount	1.8ml
Colour	Cloudy
Deposits	Present
Xanthochromia	Absent
Coagulum	Absent
Specific gravity	1.025
Reaction	Alkaline (PH 7.2)

Parameters	Value obtained	Reference range
Total count WBCs	34,000 /cumm	0-5 /cumm
RBCs	Absent	
Neutrophils	90%	
mature lymphocyte	10%	
Protein	592mg/dl	10-40mg/dl
Glucose	22 mg/dl	45-70mg/dl
Chloride	115meq/l	125-135,eq/l

### IV. Discussion

Pyogenic meningitis as emphasized is a rare and fatal clinical complication of ruptured brain abscess[7] and meningitis , which in most of the undiagnosed cases happens to be the most vital cause of persistent therapeutic failure , increased morbidity and mortality.MR imaging helps to differentiate it from intraventricular hemorrhage[7] . Gradient echo and T2 Weighted MR images show hypointense signal[1,2,3,4,5,6] . Residual blood breakdown products have a large paramagnetic effect, which results in a signal loss in deoxygenated hemoglobin , intracellular methemoglobin (MetHb), and hemosiderin within macrophages[1,2,3,4,5,6] . There is dependent restricted diffusion in diffusion weighted MR imaging sequences in pyogenic ventriculitis . Pus is composed of protein rich exudate ,dead leukocytes principally neutrophil,micropathogens and cellular debris .The intraventricular debris has , in addition, denuded glial ependymal tissue. The relatively high restricted diffusion is attributed to high protein content , high viscosity and high cellularity of the purulent material[1,2,3,4,5,6]. The CSF analysis further shows a relatively high protein content due to decreased CSF production. The dilution of suppurative purulent necrotic material from dependent intraventricular debris to nondependent cerebrospinal fluid in the frontal horn of lateral ventricle explains the absence of restricted diffusion and a higher apparent diffusion coefficient value[1,2,3,4,5,6]. As a complication intraventricular debris may cause hydrocephalus by obstructing the foramen of Monro, aqueduct of Sylvius or the foramina of Luschka and Magendie by bridging glial projections[1,2,3,4,5,6].

### V. Conclusion

Pyogenic ventriculitis is a rare and uncommon complication of ruptured brain abscess or meningitis ,which though clinically indolent, is a potentially life threatening complication, with continued clinical deterioration[7] . Radiological imaging specially diffusion weighted MR imaging sequence and CSF analysis plays a significant role in its early diagnosis and treatment thereby improving morbidity and decreasing mortality

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