DOI: 10.7860/JCDR/2017/25284.10151

Case Report

Paediatrics Section

Neisseria Meningitidis Causing Multiple Cerebral Abscesses in Early Neonatal Period: Case Report and Review of Literature

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ABSTRACT

Neisseria meningitidis is a rare cause of meningitis and septicemia in neonates. There are few published case reports of neonatal meningococcal meningitis complicated by subdural empyema, cerebral abscess and hydrocephalus. Few cases of neonatal meningococcal meningitis have been reported in the literature with none of them having the complication of multiple cerebral abscesses in early neonatal period (<seven days of life). We report a case of meningococcal meningitis with multiple cerebral abscesses which presented on fifth day of life and developed hydrocephalus at five weeks of life requiring a Ventriculo Peritoneal (VP) shunt. To the best of our knowledge, this is the first documented case of neonatal meningococcal meningitis with multiple cerebral abscesses.

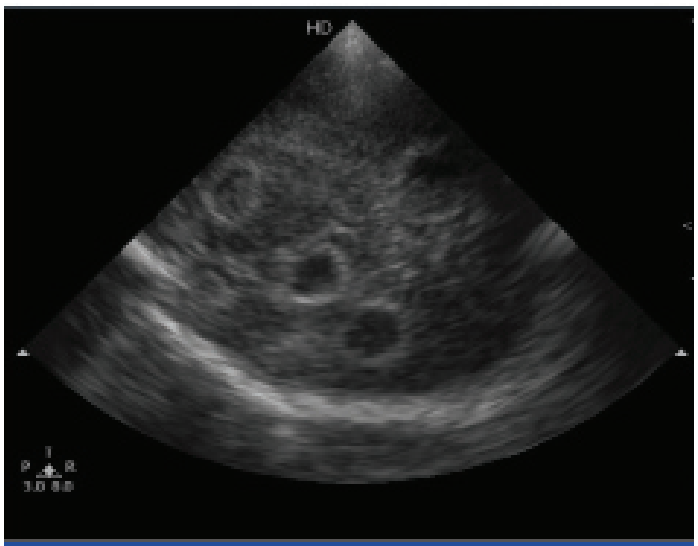
Keywords: Cerebral abscess, Meningitis, Newborn

CASE REPORT

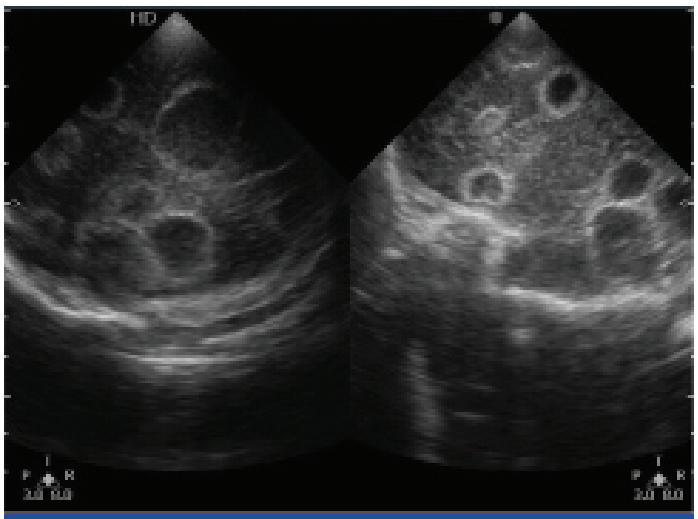
A term male baby born at 38 weeks gestation to a 26-year-old primi gravida mother by cesarean section was admitted on fifth day of life with seizures and jaundice. Antenatal period was normal with no history of fever or rupture of membranes. Baby was vigorous at birth, weighed 2800 grams and was breastfed. Bilirubin on third day of life was 16.4 mg/dL and baby received phototherapy. Baby had an episode of seizures on fourth day of life, controlled with phenobarbitone and was referred to our unit.

At admission, baby was febrile (101.9^{0}F), deeply icteric, sick looking and anterior fontanelle was full. Laboratory investigations showed haemoglobin of 12.5 gm/dL, leucopenia (WBC: 3200/mm^3), thrombocytopenia (platelets: 1.1 lakhs/mm^3) and positive septic screen (CRP: 65.4 mg/l). Bilirubin was 24.6 mg/dL with direct fraction of 1.2 mg/dL and there was evidence of haemolysis due to blood group incompatibility (baby's group: B$^+$; mother's group: O$^+$; reticulocyte count 12%; direct Coombs test positive). Baby was given intensive phototherapy, antibiotics (cefotaxime, amikacin) and ionotropic support. Head ultrasound at admission showed multiple cerebral abscesses in bilateral frontal and parietal lobes [Table/Fig-1]. Cerebrospinal Fluid (CSF) was turbid and showed 720 cells (neutrophils 90%; lymphocytes 10%), proteins 382 mg/dL and glucose 10 mg/dL (blood glucose: 64 mg/dL). Gram-stain showed Gram-negative intracellular diplococci.

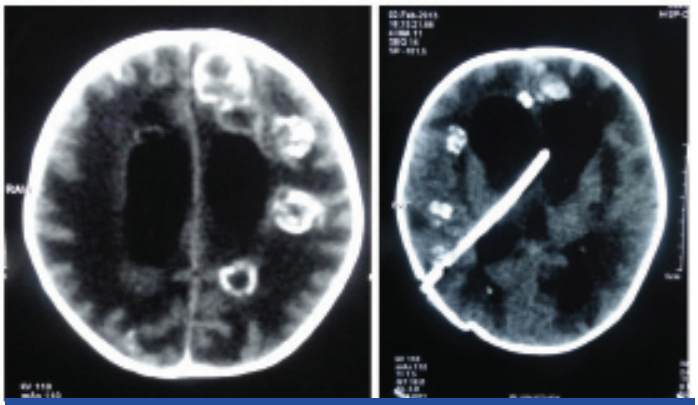
Double volume exchange transfusion was done at four hours after admission with fresh O$^+$ whole blood. Baby had six episodes of seizures, controlled with phenobarbitone and phenytoin. Blood culture was negative. CSF culture grew *N. meningitidis* B which was sensitive to ceftriaxone, cefotaxime, meropenem and penicillin and resistant to ciprofloxacin. CSF analysis repeated after 48 hours showed 280 cells (neutrophils 80%; lymphocytes 20%), proteins 146 mg/dL and glucose 34 mg/dL. Serial head ultrasound scans (done twice weekly) showed multiple cerebral abscesses and mild ventricular dilatation [Table/Fig-2]. CT scan of brain done at three weeks of age showed mild hydrocephalus and few abscesses [Table/Fig-3]. Neurosurgeon's consultation was taken and no surgical intervention was required till three weeks of age. Repeat cultures (blood and CSF) were sterile and baby received antibiotics (penicillin, cefotaxime) for three weeks. Head circumference remained static measuring 34 cm at discharge.



[Table/Fig-1]: Ultrasound brain at admission showing multiple cerebral abscesses.



[Table/Fig-2]: Ultrasound brain showing increase in number of abscesses.



[Table/Fig-3]: CT scan brain at three weeks showing mild hydrocephalus and cerebral abscesses. **[Table/Fig-4]** CT scan brain done after placement of VP shunt.

Unfortunately, mother and her family members were not screened for *N. meningitidis* before rifampicin prophylaxis was given. CT scan of brain repeated at five weeks of age showed hydrocephalus and a VP shunt was placed [Table/Fig-4]. Child is 18 months of age now, weighed 10.9 kg with height of 79 cm. Child has motor delay (truncal weakness and walking with support) without any recurrence of seizures. Child's vision and hearing were normal.

DISCUSSION

Neisseria meningitidis is a Gram-negative, aerobic, encapsulated intracellular diplococcus primarily transmitted by close contact with respiratory secretions but can colonize maternal genital tract leading to intrauterine infections. *N. meningitidis* causes significant morbidity and mortality in children but is uncommon in neonates, possibly due to transplacental transmission of maternal antibodies [1]. The incidence of neonatal meningococcal infection is estimated to be 2- 9/100,000 newborn infants in the developed world [1-4].

Both sporadic infections and wide spread epidemics of *N. meningitidis* were reported [5-8]. The route of transmission could be intrauterine or acquired during perinatal or postnatal period and is often difficult to ascertain [3,9-12].

Literature search of Pubmed, EMBASE, MEDLINE and Google scholar was done using the words: neonate, sepsis, *N. meningitidis* and meningitis. WHO bulletins and cross references of all articles were reviewed. Infants < 30 days of age and those reported as newborn or neonate were included in the review. Early and late onset infections were defined as development of symptoms during first 7 days of life and between 8 to 30 days of life respectively.

In our literature review, though we found 127 reported cases of infection (from 55 articles) with *N. meningitidis* in the neonatal period, we believe it may be an underestimate of the true burden of this infection [Table/Fig-5] [1-55]. Invasive meningococcal disease can have a fulminant course with fatality rates of 5%-20%. Infection was early in onset in 17.9% of cases (*n*=23 cases, from 16 citations) with mortality of 34.8% [1,2,5,6,10-14,17,24,30,35,43,46,51]. Two neonates in early onset group developed hydrocephalus [13,36]. Serogroups were reported in 13 cases: serogroup B being the most common with five cases, serogroup A-2 cases, serogroup C-3 cases, serogroup W135-2 cases and one case of serogroup Y.

In 2003, Lo WT et al published a review on early-onset meningococcal infection and reported a mortality rate of 50% [2]. In 2014, two cases of uncomplicated late onset meningococcal meningitis were reported from India [53,54]. In the same year, Kiray Bas E et al., reported a fatal case of meningococcal infection in a 10 day old neonate and reviewed the literature [55]. There are few published case reports of neonatal meningococcal meningitis complicated by subdural empyema, cerebral abscess and hydrocephalus [6,13,36,50].

Author	Year	No. of cases	Age in days	Group	Complications	Outcome
Koplik H [13]	1916	1	3	ND	Hydrocephalus	Survived
Barron M [14]	1916	1	Newborn*	ND	-	Unknown
Miller DJM [15]	1917	1	14	ND		Died
White TW [16]	1917	1	29	ND	-	Survived
Root JH [17]	1921	1	Newborn*	ND		Died
Cooke JV [18]	1922	1	17	ND		Died
Neal JB [19]	1927	2	21, 21	ND		Both died
McLean S [20]	1928	1	23	ND	-	Unknown
Brown A [21]	1933	1	22	ND	-	Survived
Ravid JM [22]	1935	1	27	ND	-	Unknown
Garrow DH [23]	1951	1	10	ND	-	Died
Carmona EM[24]	1953	2	2, 4	ND, ND	-	Survived
Smith ES [25]	1954	1	30	ND	-	Unknown
Yung-en K [26]	1956	5	8, 22, 25, 26, 28	ND		1 Died / 4 Survived
Watson DG [27]	1957	1	24	ND	Subarachnoid haemorrhage	Died
Ziai M [28]	1958	1	Newborn*	ND		Unknown
Stiehm ER [29]	1966	1	7	B	-	Survived
Wherle P [30]	1976	1	Newborn*	ND		Unknown
Sunderland WA [9]	1972	1	2	C		Died
Jones RN [10]	1976	1	15	ND		Died
Manginello FP [31]	1979	1	15	B	-	Survived
Clegg HW [32]	1980	1	25	B	-	Survived
Mulder CJJ [33]	1984	3	Newborn*	B, B, A#		Unknown
Donald PR [34]	1986	4	Newborn*	ND		Unknown
Embree J [35]	1987	1	1	W135	-	Survived
Chugh K [36]	1988	1	3	A	Cerebral abscess, hydrocephalus	Died
Bhutta ZA [11]	1991	1	1	ND		Died
J de Louvois [37]	1991	11	≤28 days	ND	-	Survived
Ellis M [12]	1992	2	2,3	C, W135	-	Survived
Sapan N [38]	1993	1	20	ND		Died
Kirkpatrick M [39]	1994	1	21	B	Spinal dysfunction	Survived
Chiu CH [40]	1994	2	28, 16	ND,ND	-	Survived
Arango CA [41]	1996	2	21, 13	B, B	-	Survived
Falero GMP [42]	1999	1	25	C	-	Survived
Campagne G [8]	1999	11	< 1 month	ND		Unknown
Casanova RM [43]	2000	1	3	B	-	Survived
Shepard LW [5]	2003	6	< 7 days	ND		Unknown
Shepard CW [5]	2003	16	8 – 30 days	ND		Unknown
Lo WT [2]	2003	1	1	C	-	Survived
Katier N [44]	2003	1	12	C	-	Survived
Huang HR [6]	2006	2	28, 28	-/ B	- , Subdural empyema	Survived
Falcao MC [1]	2007	1	15	C	-	Survived
Arya S [3]	2007	1	1	A		Died
Tinsa F [45]	2008	1	20	B	-	Survived
Ahmareen O [4]	2008	1	12	B	-I	Survived
Kurlenda J [46]	2010	1	1	B	-	Survived
Cho HK [47]	2010	2	< 1 month	ND		Unknown
Fuentes AD [48]	2011	3	9,15,15	B,B,B	-	Survived
Gaschignard J [7]	2011	14	5 - 28	ND		Unknown
Smith A [49]	2013	1	7	B		Died
Ramsamy Y [50]	2013	1	21	W135	Subdural empyema, hydrocephalus	Survived
Bosman M [51]	2013	1	3	Y	-	Survived
Shah S [52]	2013	1	12	B		Died
Kumar D [53]	2014	1	9	ND	-	Survived
Devi U [54]	2014	1	14	Y	-	Survived
Kiray Bas E [55]	2014	1	10	ND		Died
Present report		1	5	B	Cerebral abscesses, hydrocephalus	Survived

[Table/Fig-5]: Characteristics of neonates with meningitis caused by *Neisseria meningitides* [1-55].
Newborn*: age not specified; ND: not done, Unclusterable or not disclosed
early neonatal period
Serotypes A, B

Chugh K et al., reported a case of meningococcal meningitis in a three-day-old neonate which had complications of cerebral abscess and hydrocephalus at three weeks of age [36]. We did not find any other case reports of multiple cerebral abscesses presenting in the neonatal period.

The possible mode of transmission of infection in this patient is either intrauterine or perinatal, because of development of cerebral abscesses by the fifth day of life. Unfortunately, neither were we able to obtain a culture of the placenta or high vaginal swabs nor screen the health care personnel of the referral hospital. In this patient, there was evidence of motor delay without vision or hearing impairment or recurrence of seizures. Despite prompt diagnosis at admission and treatment, baby developed hydrocephalus requiring a VP shunt.

CONCLUSION

Meninogoccal meningitis should be suspected in neonates who present with sepsis and seizures even in the absence of rash. Establishing the aetiological diagnosis and identifying cerebral abscesses early was vital for treating meningitis and the associated complication of hydrocephalus. To the best of our knowledge, this is the youngest reported case of neonatal meningococcal meningitis with multiple cerebral abscesses.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Nov 08, 2016**
Date of Peer Review: **Jan 12, 2017**
Date of Acceptance: **May 01, 2017**
Date of Publishing: **Jul 01, 2017**