Medullary Vein Thrombosis in Neonates: A retrospective study

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Background and Aim

- Deep medullary veins are venous network within the white matter, responsible for drainage into the corresponding subependymal vein and connection to the deep venous system.
- Neonatologists frequently encounter medullary vein problems including congestion, distension, and thrombosis on brain MRI.
- However, predisposing factors of medullary vein thrombosis (MVT) in the neonatal population are not well known.
- This study aims to evaluate the predisposing factors and clinical characteristics of medullary vein thrombosis on neonatal brain MRI.

Methods

- Retrospective study
- Brigham and Women's Hospital neonatal intensive care unit
- MRI examinations between 2015 and 2023
- The analysis included a review of medical records and brain MRI scans

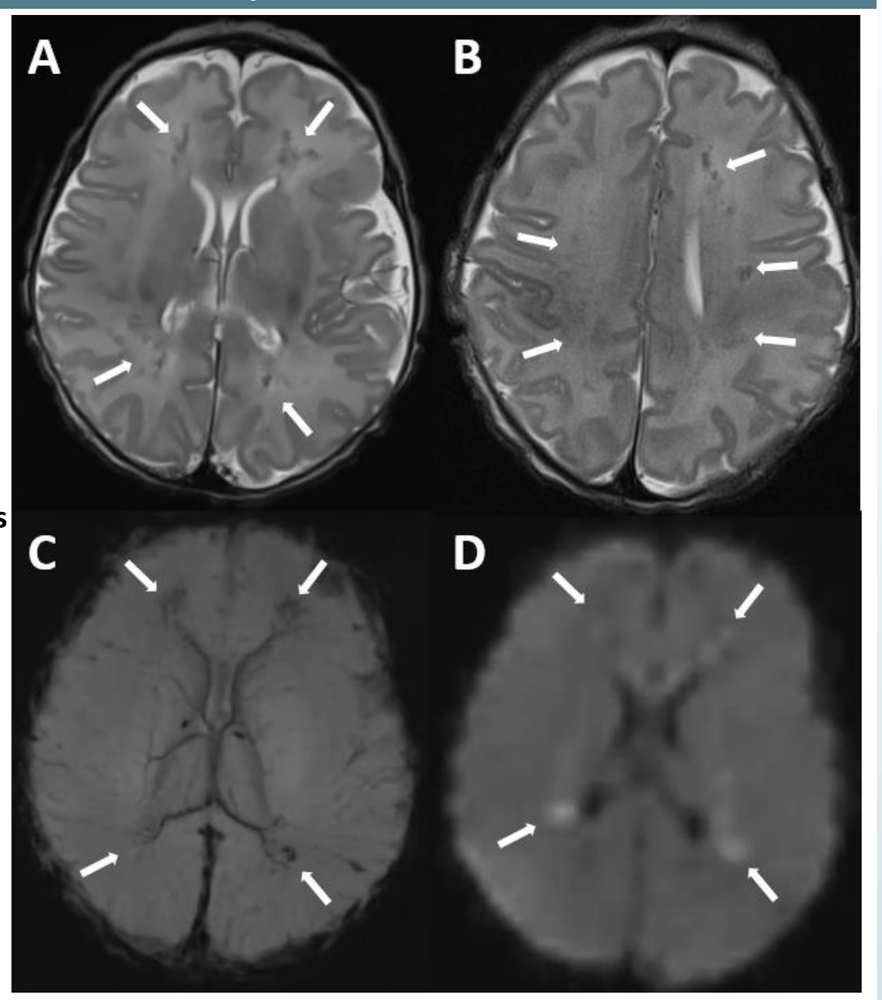
Table1. Clinical characteristics of study population

	Study population (N=10)	Preterm (N=5)	Term (N=5)	P value
GA (week) [a]	36.5 [31.3-39.7]	28.6 [28.0-34.0]	39.7 [39.4-39.7]	0.012
Birthweight (gram) [a]	2632.0 [1304.0-3190.0]	1304.0 [1165.0-1400.0]	3190.0 [3180.0-3705.0]	0.008
Male	5 (50.0%)	1 (20.0%)	4 (80.0%)	0.206
Cesarean section	4 (40.0%)	2 (40.0%)	2 (40.0%)	1.000
PMA at MRI (week) [a]	39.1 [37.3-40.3]	37.3 [37.0-39.0]	40.3 [40.1-40.9]	0.032
Timing of MRI (days of life) [a]	12.5 [4.0-52.0]	52.0 [37.0-68.0]	4.0 [3.0-4.0]	0.012
Maternal hypertension	2 (20.0%)	1 (20.0%)	1 (20.0%)	1.000
Maternal diabetes	0 (0%)	0 (0%)	0 (0%)	1.000
Maternal thrombotic disorder	1 (10.0%)	1 (20.0%)	0 (0%)	1.000
1 min Apgar score[a]	6.5 [1.0-8.0]	2.0 [1.0-6.0]	8.0 [7.0-8.0]	0.199
5 min Apgar score[a]	8.0 [5.8-8.8]	8.0 [4.5- 8.0]	9.0 [4.5- 9.0]	0.136
Seizures	3 (30.0%)	0 (0%)	3 (60.0%)	0.168
HIE	1 (10.0%)	0 (0%)	1 (20.0%)	1.000
Therapeutic hypothermia	1 (10.0%)	0 (0%)	1 (20.0%)	1.000
IVH	6 (60.0%)	4 (80.0%)	2 (40.0%)	0.519
Severe IVH	1 (10.0%)	1 (20.0%)	0 (0%)	1.000
IVH worst grade				0.333
0	4 (40.0%)	1 (20.0%)	3 (60.0%)	
1	5 (50.0%)	3 (60.0%)	2 (40.0%)	
2	0 (0%)	0 (0%)	0 (0%)	
3	1 (10.0%)	1 (20.0%)	0 (0%)	
4	0 (0%)	0 (0%)	0 (0%)	
PVL	1 (10.0%)	1 (20.0%)	0 (0%)	1.000
Focal MVT	3 (30.0%)	3 (60.0%)	0 (0%)	0.168
Extensive MVT	7 (70.0%)	2 (40.0%)	5 (100%)	0.168
Length of NICU stay (day)[a]	28.5 [15.0-80.0]	80.0 [46.0-81.0]	15.0 [11.0-18.0]	0.021
Mortality	1 (10.0%)	1 (20.0%)	0 (0.0%)	1.000

GA, gestational age; HIE, hypoxic ischemic encephalopathy; IVH, intraventricular hemorrhage; PVL, periventricular leukomalacia; MVT, medullary vein thrombosis; NICU, neonatal intensive care unit. Values are expressed as N (%) except [a]median [interquartile range].

Figure 1. Extensive Medullary vein thrombosis in Term infant

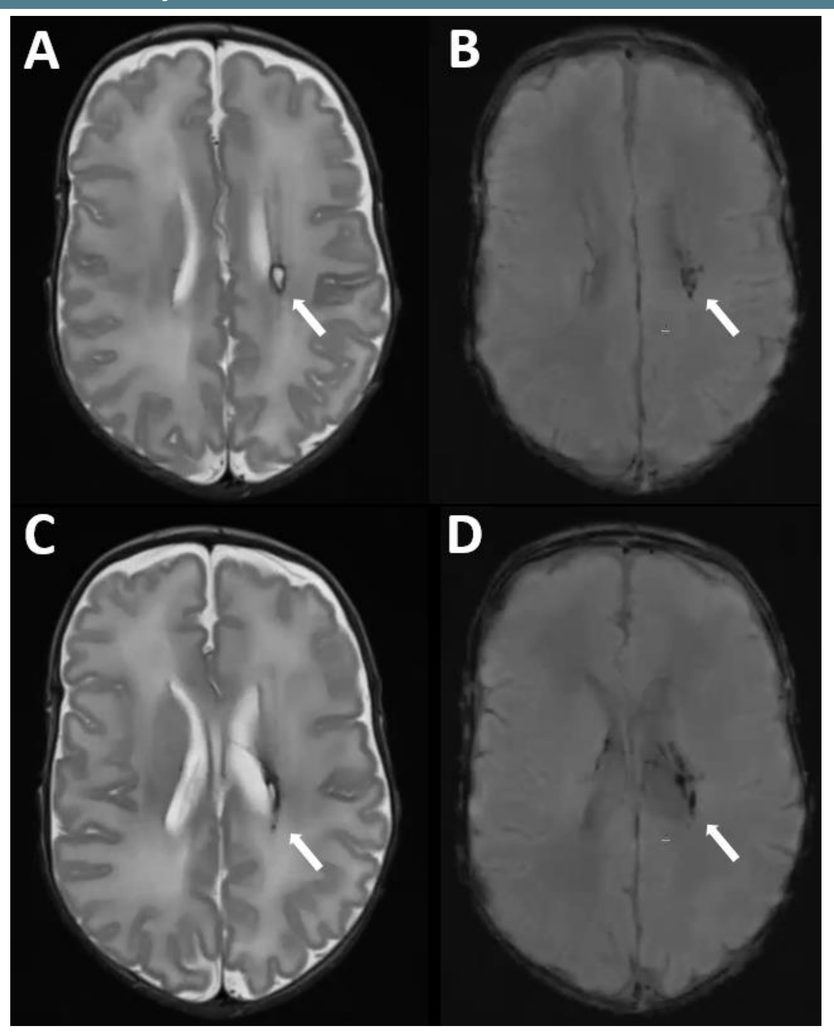
- **GA 38+1 weeks**
- **MRI PMA 38+3 weeks**



Brain MRI, axial T2 (A,B), SWI (C), and DWI (D). T2 shows hypointensity in periventricular area (white arrow). SWI (C) demonstrates engorged medullary veins in the corresponding area (white arrow). DWI (D) shows diffusion restriction in the corresponding area (white arrow).

Figure 2. Focal Medullary vein thrombosis in Preterm infant

- **GA 34+0 weeks**
- **MRI PMA 39+2 weeks**



Brain MRI, axial T2 (A,C), SWI (B,D). T2 shows a cystic change surrounded by hypointensity in left periventricular area (white arrow). SWI demonstrates hemorrhage and engorged medullary veins in the corresponding area (white arrow).

Results

- 30 infants with medullary vein problems in brain MRI were enrolled in this study. Among them, 10 (5 preterm and 5 term) infants had MVT in their MRI report.
- There was a male predominance in term infants with MVT 80.0%
- In the preterm group, 4 infants (80.0%) had intraventricular hemorrhage (IVH) and 1 infant (20.0%) had severe IVH.
- Overall mortality was 10.0%.

Conclusions

- MVT is not an uncommon finding in neonatal brain MRI.
- Further investigations are needed to further study MVT pathogenesis and long-term prognosis.