



Is bridging vein rupture/thrombosis associated with subdural hematoma at birth?

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What is a bridging vein?

- Bridging veins
 Origin: cortical veins
 Termination: superior sagittal sinus
- Special anatomical properties
- Susceptible to rupture in their distal portion Bleeding in subdural space Particularly: antero-posterior movements



What is a bridging vein?

- Possible post-mortem analysis of bridging veins
- In vivo analysis: careful examination of the vertex on MRI









What is a bridging vein rupture/thrombosis?

- Bridging vein rupture/thrombosis (BVRT) Highlighted in Shaken Baby Syndrome
- Association of BVRT and subdural haematoma
 Very suggestive of abusive head trauma







Adamsbaum C, Rambaud C (2012) Yilmaz U, Körner H, Meyer S, Reith W (2015)

What is a bridging vein rupture/thrombosis?

- In vivo markers of BVRT
 Small round or tubular clot at the vertex
 CT or MRI scan
 Magnetic susceptibility sequences
- Lollipop or tadpole sign







Choudhary AK, Bradford R, Dias MS, Thamburaj K, Boal DKB (2015)

Background to the study

- Subdural haematomas common at birth up to 50% asymptomatic newborns
- Resolution ad integrum within 4 weeks
- Obstetrical risk factors: no consensus
- Debated pathophysiology
- Very few studies on BVRT in the neonatal context

Rooks VJ, Eaton JP, Ruess L, Petermann GW, Keck-Wherley J, Pedersen RC (2008) Pollina J, Dias MS, Li V, Kachurek D, Arbesman M (2001) Whitby E, Griffiths P, Rutter S, et al (2004) Craig WS (1938)

Objectives

Incidence of BVRT at birth

Incidence of subdural haematomas at birth

Association between BVRT and subdural haematomas at birth

Materials and methods

- Retrospective study (2012-2019)
- MRI in newborns < 10 days</p>
- Two French centres
- Standardised protocol axial T1 axial T2 axial diffusion axial T2 GRE/SWI



One MRI per patient

Materials and methods

- Reading grid specially designed for the study
- Independent double reading for specific items
 BVRT, subdural hematoma, subarachnoid hemorrhage
 Junior Reader (MB, 2 years experience) and Senior Reader (IM, 7 years experience)
- Possible BVRT: Third senior reader (CA, 30 years experience)
- Dedicated statistical analysis

Results: study population

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- Mean age: 5.4 days +/- 2.2
- Average term: 38.3 +/- 2.9
 76% full-term newborns
- Mode of delivery
 Caesarean section 44
 Vaginal route 42
 Unknown 14
- Main clinical indication
 Anoxic-ischemic encephalopathy

	(n=412)
Age (mean)	5.4 ± 2.2
Term in weeks LMP (mean)	38.3 ± 2.9
Preterm, n (%)	73 (18%)
Full term, n (%)	312 (76%)
Unknown, n (%)	27 (6%)
Sex, n (%)	
Male	249 (60%)
Female	163 (40%)
Delivery, n (%)	
Non-instrumental vaginal delivery	103 (25%)
Instrumental vaginal delivery	71 (17%)
C-section	179 (44%)
Unknown	59 (14%)
Clinical indication, n (%)	
Hypoxic-ischemic encephalopathy	306 (74%)
Seizure	70 (17%)
Miscellaneous	32 (8%)
Unknown	4 (1%)

Results: Bridging vein rupture/thrombosis

- 6/412 or 1.5% [0.5-3.1] rupture/thrombosis of bridging veins
- Almost perfect inter-observer reproducibility 0.85 [0.66-1.00]
- 1 case: more than five clots
 Context of maternal-fetal infection
- 5 cases: single, small clot





Results: Bridging vein rupture/thrombosis

- 6/412 or 1.5% [0.5-3.1] bridge vein ruptures/thrombosis
- Almost perfect inter-observer reproducibility 0.85 [0.66-1.00]
- 1 case: more than five clots
 Context of maternal-fetal infection
- 5 cases: single micro clot



Results: Bridging veing rupture/thrombosis

- No association between BVRT and subdural hematoma p=0.67
- No association with: term, indication for MRI, mode of delivery, other intracranial lesions
- Association of BVRT and gender More common in girls Probably related to the low number of rupture/thrombosis

Characteristics	BVRT	No BVRT	р
	N=6	N=406	
Female	5 (83%)	158 (39%)	0.04
Preterm	2 (33%)	71 (19%)	0.32
Indication			
Anoxic encephalopathy	5 (83%)	301 (76%)	
Seizure	0	70 (6%)	0.26
Other	1 (17%)	23 (6%)	
Delivery			
C section	2 (33%)	177 (51%)	0.21
Spontaneous vaginal delivery	1 (17%)	102 (29%)	
Instrumental vaginal delivery	3 (50%)	68 (20%)	
Subdural hemorrhage	5 (83%)	276 (68%)	0.67
Subarachnoid hemorrhage	0	46 (11%)	1.00
Anoxic ischemic lesion	3 (50%)	115 (28%)	0.36
Caput succedaneum	2 (33%)	151 (37%)	1.00

Results: subdural haematomas

- 281 subdural haematomas 68% [63.3-72.5]
- Moderate inter-observer reproducibility 0,41 [0,32-0,50]
- Association with mode of delivery p<0.05 More common with vaginal delivery

	SDH	No SDH	p
	N=281	N=131	
Preterm	47 (18%)	26 (21%)	0.49
Delivery			
C-section	90 (38%)	89 (79%)	
Non-instrumental VD	86 (36%)	17 (15%)	< 0.0001
Instrumental VD	64 (27%)	7 (6%)	
Caput succedaneum	111 (40%)	42 (32%)	0.15
Anoxic ischemic lesion	83 (30%)	35 (27%)	0.56

Limits

- No pathological confirmation
- Association between BVRT and subdural haematoma Not excluded Low number of BVRT
- Retrospective study
- Selection bias: symptomatic patients

Conclusion

- BVRT: rare at birth
- Subdural haematoma is common at birth, particularly with vaginal delivery
- Lack of association between BVRT and subdural haematoma: alternative aetiology
- Probable traumatic factor other than BVRT
- BVRT : probably a specific marker of abusive head trauma





Thank you for your attention

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