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Pediatric intracranial developmental venous anomalies (DVAs): how often do they bleed? A 10-year review

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Objectives: Developmental venous anomalies (DVAs) occur singly or in association with vascular malformations. Venous hypertension is implicated as a causal mechanism in haemorrhage, cavernoma development and white-matter ischaemia. There are no published studies describing paediatric natural history or risk factors for intracranial haemorrhage (ICH). A Scottish adult-DVA study reported haemorrhage in 1%. We evaluate clinico-radiological features, risk-factors and outcome of paediatric DVAs.

Design: Retrospective review.

Subjects: 52 children (20 girls, 32 boys), median age 6 years, with neonates < 2%, infants 11.5%, 1-5-years 31%, 5-12-years 31% and 25% 12-16-years.

Methods: Medical records, PACS and prospective neurosurgery databases reviewed. 303 radiological studies were evaluated between 2003-2013.

Results: Asymptomatic DVAs accounted for 92.3%. Age, gender, ethnicity were non-significant to DVA-bleeds. Half of DVAs occurred over the age of 5. Left-sided DVA bleeds predominated (75%; p=0.29). Anatomical distribution of DVAs revealed predilection for frontal region (42.3%), temporal (11.5%), parietal (9.6%), occipital (5.8%), posterior fossa (17.3%), 13.5% deep in basal ganglia. 5.8% (3/52) DVAs presented with cavernomas ($p<0.01$), none with aneurysms or AVMs. Relative risk of a cerebellar DVA-bleed was 5.35-fold greater, Odds Ratio of 6.83, 95%CI (0.8-58). 5.8% (3) had more than one DVA. 7.7% (4) suffered DVA-related ICH presenting with neurological deficits. 50% had conditions associated with venous hypertension/ICP. There were 3 deaths unrelated to DVAs over median follow-up of 3.8 years.

Conclusion: Most DVAs occur frontally. DVA haemorrhage was 7-fold greater than in the adults and significantly associated with cavernomas and cerebellar bleeds. A larger cohort evaluation is recommended.