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LETTER TO THE EDITOR
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Turkish Neonatal Society Guideline on the Diagnosis and Management of Germinal Matrix Hemorrhage-Intraventricular Hemorrhage and Related Complications

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I have read the paper "Turkish Neonatal Society Guideline on the Diagnosis and Management of Germinal Matrix Hemorrhage-Intraventricular Hemorrhage and Related Complications," which is written by Çizmeci et al.[1] As a radiologist who performs cranial ultrasound (CUS) routinely, I have eminently benefited from this comprehensive and illustrative guide. This informative guide is quite useful not only for neonatologists but also for radiologists to enhance the multidisciplinary approach to the patient, to form more standardized CUS reports, and to ease communication between clinicians and radiologists.

In this guideline, the classification of germinal matrix hemorrhage (GMH) and intraventricular hemorrhage (IVH) is described. As mentioned, Papile classification is the first grading system of GMH-IVH proposed in 1978, originally based on computed tomography and then adapted to the CUS.[2] However, it is subsequently understood that most of the grade IV IVH with parenchymal extension in Papile classification is actually a periventricular hemorrhagic venous infarction (PHI), rather than parenchymal extension by rupture of the initial GMH-IVH.[3] Since PHI can be seen with any grade (Papile Grades I, II, or III), 3 grading classifications with a separate notation for the presence of PHI are suggested by Volpe and supported both in clinical practice and in the research context.[4]

Although, germinal matrix injury results in a relevant loss of glial precursors, the impact of subependymal GMH on brain development in relation to its extent and location is still not clear.[5] Consequently, detailed descriptions of the extent and location of GMH may be helpful to predict the outcome. Also, the advances in ultrasound technology, modern CUS preset, and transducers enable us to examine germinal matrix zone and adjacent structures more conspicuous. According to Volpe classification,[4] GMH and very limited IVH (intraventricular blood <10% of the ventricular lumen) were lumped under grade I, making the distinction between these 2 entities insignificant. Recent studies have shown that low-grade GMH-IVH leads to microstructural impairment in periventricular and subcortical white matter.[6,7] Therefore, the size and location of these small lesions might have detrimental effects in infants born at the lowest gestational ages.

A recent classification system (Table 1)—not indicated in the above-mentioned guide—is suggested by eurUS.brain group composed of neonatologists with a passion for CUS.[8,9] In their classification, subependymal GMH and IVH were graded separately. Also, GMH and PHI were described more thoroughly regarding location and extent. In the new classification, IVH has been described as limited or extensive and percentile measurement has not been used in the new classification. As a regular weekly CUS examiner, I think Volpe grade II and grade III discrimination is quite challenging in some patients unless ventricular dilatation exists. Therefore, I concur with the new classification that might increase inter-observer reliability.

In conclusion, although this recent classification system has not been adapted to routine clinical practice yet and needs to be validated in a large cohort of patients, it seems beneficial and useful especially for the follow-up of low-grade GMH. I strongly recommend the

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Table 1. Abbreviated version of eurUS.brain group GMH/IVH classification system[8]

Germinal matrix hemorrhage (GMH)	**Intraventricular hemorrhage (IVH)**	**Periventricular hemorragic venous infarct (PHI)**
Size		
• Largest diameter < 1 cm	Limited	Medullary
• Largest diameter > 1 cm	Extensive	Midline
Location near caudothalamic groove		
• In front of the foramen of Monro		Striatal
• Behind the foramen of Monro		
Other location		
• Along temporal horn		
• Other		

GMH, germinal matrix hemorrhage; IVH, intraventricular hemorrhage; PHI, periventricular hemorrhagic venous infarction.

CUS examiners (both radiologists and neonatologists) to view both the Turkish Neonatal Society Guideline and the article of eurUS.brain group.

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