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BRIEF COMMUNICATION

Fetal Germinal Matrix Hemorrhage: Prenatal Diagnosis and Management

Mamatha Gowda[1] · **Nivedita Mondal**[2] · **G. Ramkumar**[3]

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Abstract We report a case of germinal matrix intraventricular hemorrhage (GMIVH) diagnosed antenatally at 30 weeks of gestation. The pregnancy was continued with close monitoring up to 37 weeks of gestation. A healthy baby was delivered and had normal neurological development after 8 months of postnatal follow-up. GMIVH, though common in premature neonates, is rarely seen in fetal life. Diagnosis is possible by prenatal ultrasound usually in the third trimester. Tomographic ultrasound imaging is a useful alternative to fetal MRI in assessing the extent of parenchymal involvement. The findings on imaging studies can elude the correct diagnosis if the lesion is not observed over a period of time and can often be misdiagnosed as choroid plexus tumors. Severe hemorrhage with gross hydrocephalus can impair the neurological development of the child. However, if the hemorrhage is confined to the ventricles and there is no serious underlying etiology, it is likely to resolve spontaneously leaving no significant neurological sequelae. Counseling the parents is of utmost importance to avoid any medico-legal issues.

Keywords Germinal matrix hemorrhage · Germinal matrix intraventricular hemorrhage · Choroid plexus lesions · Intracerebral hemorrhage · Asymmetrical hydrocephalus

✉ Mamatha Gowda
drmamathagowda@gmail.com

[1] Department of Obstetrics and Gynecology, JIPMER, Dhanvantri Nagar, Pondicherry 605006, India

[2] Department of Neonatology, JIPMER, Pondicherry, India

[3] Department of Radiology, JIPMER, Pondicherry, India

Introduction

Subependymal germinal matrix and intraventricular hemorrhage (GMIVH) is the most common type of intracranial hemorrhage in neonates. It is characteristically seen in premature infants, mostly within the first 72 h of birth. GMIVH is a rarely seen in fetal life and has never been reported before 22 weeks of gestation. The subependymal germinal matrix undergoes a progressive process of involution after 22 weeks and the capillary network becomes increasingly susceptible to insults. In most of the series, the diagnosis has been made at 30–33 weeks of gestation. In the present case, GMIVH was diagnosed at 30 weeks of gestation. The pregnancy was followed with serial ultrasound monitoring until a healthy baby was delivered at 37 weeks. This case is presented to emphasize the importance of differentiating the hemorrhage from other lesions which may not have as favorable a prognosis as GMIVH.

Report of Case

A 25-year-old G2A1 at 30 weeks of gestation was referred as fetal hydrocephalus. On ultrasound, there was asymmetric dilatation of both lateral ventricles, left more than the right. Left ventricle atrial diameter measured 19 mm and right ventricle atrial diameter measured 14 mm. The third ventricle was also dilated and measured 7 mm. There was a lesion of size 3.47 cm × 1.6 cm adjacent to and surrounding the left choroid plexus with highly echogenic borders and hypodense content within (Fig. 1a). Tomographic ultrasound imaging (TUI) did not reveal any involvement of cerebral parenchyma (Fig. 2a). A provisional diagnosis of GMIVH was made. Fetal MRI corroborated with ultrasound findings, however, choroid

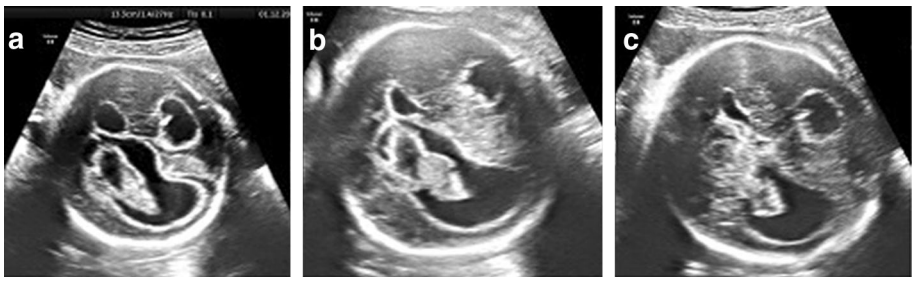

Fig. 1 **a** Asymmetric dilatation of lateral ventricles and the lesion with hyperechoic borders and echolucent content surrounding the choroid plexus, **b** Follow-up ultrasound after 2 weeks showing irregular borders of the lesion, **c** Ultrasound after 4 weeks showing organization of the lesion into echogenic mass resembling choroid plexus tumor

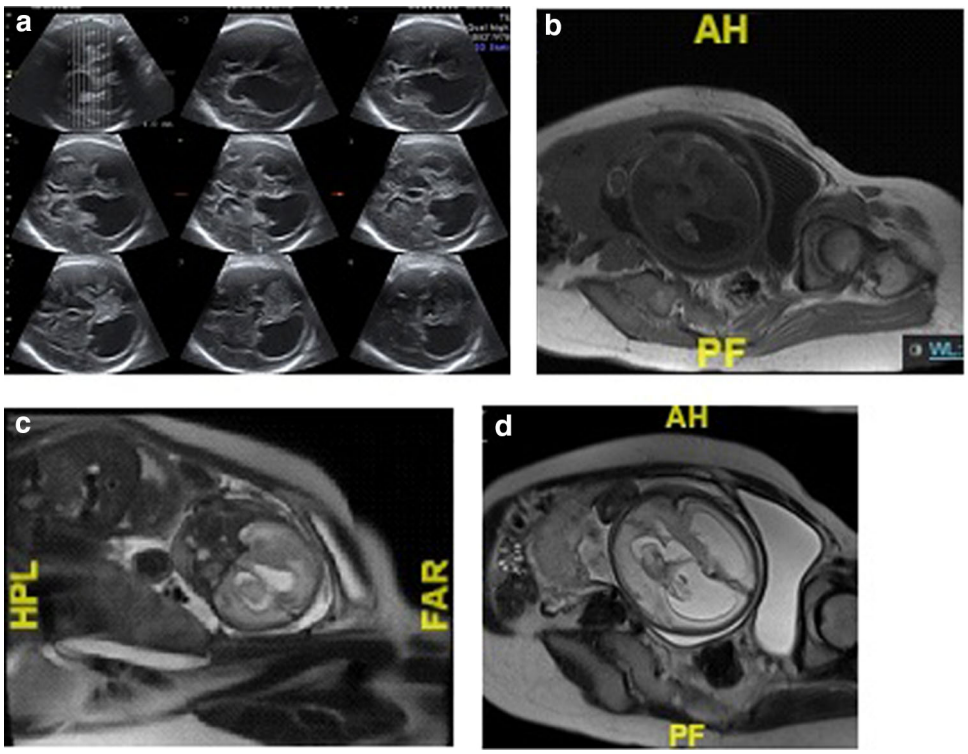

Fig. 2 **a** No extraventricular extensions found on TUI. **b**, **c**, **d** MRI scans corroborating the ultrasound findings

plexus carcinoma was an alternative differential to be considered (Fig. 2b). Maternal thrombocytopenia and pre-eclampsia were ruled out with relevant investigations.

Serial follow-up with ultrasound showed a reduction in the size of the lesion over three to four weeks; the ventriculomegaly, however, persisted (Fig. 1b, c). Cesarian section was performed at 37 weeks due to fetal tachycardia and labored breathing movements noted on biophysical profile. A healthy baby of 2.9 kg was delivered. Examination of the neonate revealed fused cranial sutures, small anterior fontanelle (1 cm), and closed posterior fontanelle suggesting secondary craniosynostosis. Further neonatal investigations for thrombocytopenia, CMV infection, coagulation disorders, and liver function were unremarkable. On postnatal ultrasound and MRI, the size of the lesion had significantly reduced and ventriculomegaly resolved spontaneously. No neurological deficits or developmental issues were noted after eight months of follow-up.

Discussion

Germinal intraventricular hemorrhage is a common diagnosis among premature neonates. The preterm germinal matrix is fragile, friable, and highly susceptible to insults of delivery such as hypoxemia, anoxia, acidosis, and sudden changes in blood pressure. GMIVH can be seen rarely in fetal life on prenatal ultrasound usually in the third trimester. Antenatal fetal ICH may occur spontaneously or in association with various maternal or fetal conditions. Predisposing factors may be identified in 44% of cases and

these include pre-eclampsia, abruptio placentae, twin-to-twin transfusion syndrome (TTTS), demise of a co-twin, severe fetal growth restriction, alloimmune thrombocytopenia, fetomaternal hemorrhage, severe abdominal trauma, seizures, pancreatitis coagulation disorders, congenital infections, sex-linked disorders, and placental or cord abnormalities [1]. There were no identifiable risk factors in our case after a thorough clinical evaluation and investigation.

Transabdominal ultrasound can demonstrate prenatal intracranial hemorrhage, albeit with some limitations. There are several case reports of GMIVH diagnosed by antenatal ultrasound in fetal life [2]. Most cases were detected between 26 and 33 weeks of gestation. Intraventricular hemorrhage is seen as a hyperechoic lesion in contrast to the hypoechogenicity of CSF on ultrasonography. Hemorrhage within the parenchyma of cerebrum is more difficult to diagnose because of the poor contrast from surrounding tissue [3]. In this fetus, GMIVH was suspected by prenatal ultrasound at 30 weeks of gestation. The diagnosis was reinforced by monitoring for change in size and appearance of the lesion by serial sonography. MRI is a useful additional investigation to demonstrate the type, size, and site of lesion and in differentiating the various possible diagnosis. MRI is useful to rule out a hematoma, determine the presence of tumor and peritumoral edema. Delineating the extent of parenchymal involvement can help predict neurodevelopmental outcome [4]. The fetal MRI done for this patient gave the impression of possible choroid plexus carcinoma. This reiterates the importance of serial monitoring to differentiate GMIVH from other lesions of choroid plexus as this has important implications on prognosis.

GMIVH has to be differentiated from other lesions of choroid plexus such as, benign papilloma, malignant carcinoma, angioma, epidermoid tumors, lipomas, nodular hyperplasia, ependymoma, and meningiomas. Choroid plexus tumors are most often diagnosed in third trimester and can present as a homogenous mass or as hydrocephalus. Considering that papilloma and carcinoma are both possible etiologies and as histology cannot be assessed prenatally, close follow-up and counseling is important. In contrast to good prognosis with GMIH, the choroid plexus papilloma and carcinoma, necessitate surgery and have a 5-year survival rate of 100% and 40%, respectively [5].

There are no established guidelines regarding the time and mode of delivery of fetus with GMIVH. Since progressive hydrocephalus during fetal life may result in irreversible brain damage, earlier termination of pregnancy may improve the neurological outcome as long as the fetus is mature enough to survive and receive treatment for hydrocephalus. Elective cesarean section is usually chosen to avoid a hard labor due to a large head and associated intracranial hemorrhage. However, it is not clear whether elective surgery is really essential and may be an overtreatment. We have done elective cesarean section at term as the biophysical profile showed tachycardia in the fetus.

Neurodevelopmental outcome depends on the presence and severity of parenchymal damage. Periventricular parenchymal changes, especially encephalomalacia and PVL associated with GMIVH, contribute significantly to neonatal mortality and long-term morbidity. An antenatal diagnosis of fetal stroke with IVH Grades III and IV or with brain parenchymal involvement is associated with poor neurologic outcome [6]. There was no parenchymal involvement in our case and the size of the lesion regressed gradually. This infant has been under follow-up for over eight months now and is doing well in all neurological/developmental parameters. Fetal intracranial hemorrhage can also have medico-legal implications as the fetal distress due to active hemorrhage may be wrongly attributed to obstetric malpractice during labor. The accurate identification of parenchymal injury in fetal GMIVH is important for counseling the parents [1].

Conclusions

Germinal matrix intraventricular hemorrhage, though common in premature neonates, is rarely seen in fetal life. Diagnosis is possible by prenatal ultrasound usually in the third trimester. TUI is a useful alternative to fetal MRI in assessing the extent of parenchymal involvement. The findings on imaging studies can elude the correct diagnosis if the lesion is not observed over a period of time and can often be misdiagnosed as choroid plexus tumors. Severe hemorrhage with gross hydrocephalus can impair the neurological development of the child. However, if the hemorrhage is confined to the ventricles and there are no serious underlying etiology, it is likely to resolve spontaneously leaving no significant neurological sequelae. Counseling the parents is of utmost importance to avoid any medico-legal issues.

Compliance with ethical standards

Conflict of interest None.

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