

## Fetal idiopathic intracranial hemorrhage: A case report

Fetal intracranial hemorrhage

Abdullah Tok, Alev Ozer, Selim Karaküçük, Uğurkan Erkayıran  
Department of Obstetrics and Gynecology, Kahramanmaraş Sutculmam University, Kahramanmaraş, Turkey

### Abstract

Fetal intraventricular hemorrhage (IVH) is frequently associated with prematurity. It causes neurodevelopmental disorder by causing hydrocephalus and brain parenchymal damage. Fetal IVH is typically observed in the germinal matrix. This is due to the fact that the germinal matrix has a more fragile structure and is, therefore, more sensitive to hypoxia, anoxia, and acidosis and is rapidly affected by pressure changes during delivery. In this article, it is aimed to present a case of IVH which was detected as an intracranial mass on ultrasonographic examination at the 23rd week of pregnancy.

### Keywords

Fetus; Intracranial Hemorrhage; Idiopathic

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Corresponding Author: Alev Özer, Kahramanmaraş Sütçü İmam Üniversitesi Hastanesi, Kahramanmaraş, Turkey.  
E-Mail: dralevozer@gmail.com P: +90 3443003434 F: +90 3443113409  
Corresponding Author ORCID ID: <https://orcid.org/0000-0003-0998-5531>

**Introduction**

Fetal intraventricular hemorrhage (IVH) is a major neurologic complication of prematurity. It causes neurodevelopmental disorders, such as postnatal seizures, cerebral palsy, mental retardation, by causing hydrocephalus and brain parenchymal damage [1]. Fetal IVH is typically observed in the germinal matrix. This is due to the fact that the germinal matrix vasculature has a more fragile structure and is, therefore, more sensitive to hypoxia, anoxia, and acidosis and is rapidly affected by pressure changes during delivery [2].

It is aimed to present a case of IVH which was detected as an intracranial mass on ultrasonographic examination at the 23rd week of pregnancy.

**Case Report**

A 27-year-old nulliparous patient was referred to the obstetrics clinic of a tertiary level reference hospital with the diagnosis of fetal cranial mass.

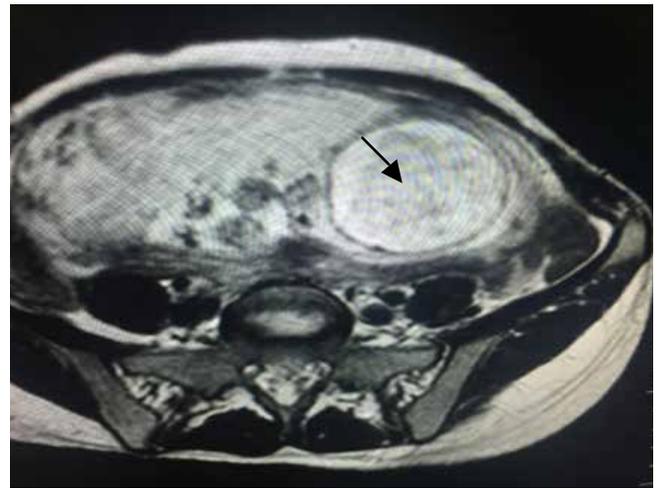
Fetal biometric measurements were found to be consistent with 23 weeks of gestation. The amniotic fluid amount, placental placement was normal. There was a 33 mm diameter hyperechogenic, irregularly limited mass in the middle part of the fetal cranium. There was no blood flow in the examination of this mass with Doppler ultrasonography (USG) (Figure 1). Fetal magnetic resonance imaging (MRI) was performed and the supratentorial lesion with a diameter of 3.5 cm was observed compressing the brain stem, brain parenchyma, and ventricular system. There was also fetal ventriculomegaly (Figure 2).

The patient was informed by the neurosurgery department about the potential complications due to fetal intracranial mass. The patient who decided continuing pregnancy delivered a male infant, weighing 3450 gr and with the first and fifth minute APGAR scores of 4/7, by cesarean section at 38th gestational week.

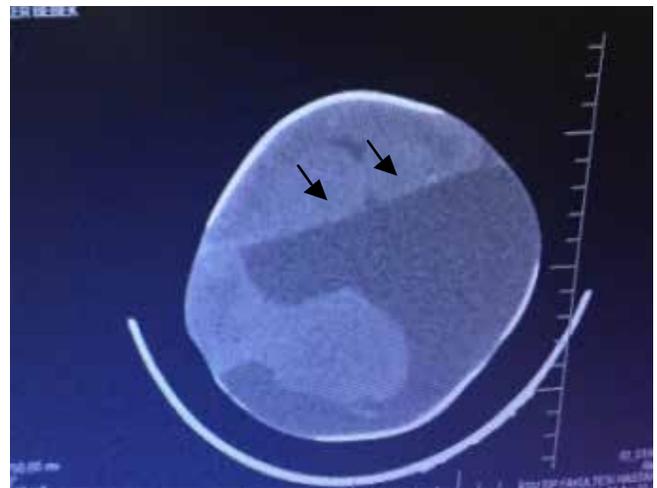
The infant was followed in the neonatal intensive care unit due to weak respiration. Cranial computed tomography (CT) of the neonate revealed reduced volume of the posterior fossa, thin left hemisphere parenchyma, multiple hemorrhagic hematoma foci in the ventricles, and hydrocephalus in the lateral ventricles ( Figure 3). Neurosurgery department could not identify any maternal or fetal problem that may cause IVH. Therefore, the present case was accepted as idiopathic IVH. Shunt operation was performed for neonatal hydrocephaly.



**Figure 1.** Fetal ultrasonography shows a heterogeneous echo mass covering the brain parenchyma (arrow).



**Figure 2.** Fetal magnetic resonance imaging revealed a space-occupying lesion in the supratentorial area of approximately 3.5 cm in diameter (arrow), showing a compression effect on the brainstem, ventricular system and brain parenchyma in the midline .



**Figure 3.** Cranialtomography of the newborn revealed that the left hemisphere parenchyma was thinner and multiple hemorrhage-hematoma foci (arrows) were present in the ventricle .

**Discussion**

In the intrauterine period, IVH is frequently seen as a hyperechogenic mass in the germinal matrix region or in the lateral ventricles. Gestational age is one of the most important risk factors for IVH. In a study by Volpe et al., the incidence of IVH was reported to be approximately 40% in preterm deliveries less than 32 weeks of gestation [1].

The germinal matrix formed by the subependymal layer of the lateral ventricles is rich in vascular supply. It is the source of cerebral neuroblasts at 10th and 20th weeks of gestation and glioblasts which will become oligodendria and astrocytes in the third trimester. The thin-layer structure of the vascular tissue in the germinal matrix and the insufficiency of connective tissue in the preterm fetuses cause this region to be more susceptible to hypoxia, anoxia, and acidosis and to be rapidly affected by pressure changes during delivery [1-3].

IVH is divided into four degrees depending on the localization, ventricular dilatation and spread to the parenchyma: Grade 1 is only limited bleeding in the germinal matrix, Grade 2 is a non-dilated bleeding that spreads to the ventricle, Grade 3 is classified as bleeding by dilating ventricle, and Grade 4 by bleeding is spread to the parenchyma [2]. The present case was classified as grade 4 due to parenchymal injury.

There are several case series diagnosed with USG or MRI

in the antenatal period [4]. The first diagnosis of IVH in the intrauterine period was put by Kim et al. in 1982 [5]. In a study of 29 patients, it was stated that the diagnosis of IVH could be detected at the earliest 25 weeks and that 40% of the intracranial hemorrhages were in the intraventricular area [6]. IVH is usually caused by intravascular, extravascular and vascular causes. Sometimes there is no reason. The increase in fibrinolytic activity and the absence of tissue that supports the vessels' wall are extravascular reasons. In a study by Sherer et al., maternal epileptic seizures, alloimmune thrombocytopenia, ITP, von Willebrand disease, warfarin use, cocaine exposure, trauma, amniocentesis, and febrile diseases were identified as maternal risk factors [7]. Fetal risk factors include coagulation disorders, congenital Factor 5 and factor 10 deficiency, twin to twin transfusion syndrome, fetomaternal hemorrhage, fetal distress, and intracranial tumors. Changes in fetal blood pressure may lead to bleeding due to the fragile microvasculature of the germinal matrix. The immature germinal microvascular area is easily affected by hypoxic-ischemic events [7].

Although preeclampsia was reported as a risk factor by Catanzarite et al., Pearlman et al. suggested that chronic stress environment in preeclampsia improves central system maturation and could be protective for IVH [6, 8].

Similarly to the present case, Catanzarite et al. could not detect any underlying risk factor in 18 of 29 IVH cases. In the same study, 9 of 29 fetuses were lost in the intrauterine period and 9 of them died just before labor. Quadripareisis, moderate neurological dysfunction, hydrocephalus and leukomalacia were detected in 11 (38%) living fetuses. Only 3 fetuses had normal neurological development [6]. In the present case, no underlying maternal and fetal reason was identified. Although there is not any treatment modality for antenatally detected IVH, delivery of the fetus may be planned following the administration of corticosteroids for fetal lung maturation when the intracranial bleeding area reaches a certain size on the serial fetal examinations by ultrasonography and MRI. In this way, the further damage of the IVC on intracranial structures may be prevented.

### Conclusion

IVH is an important problem that can cause neurological sequelae, intrauterine and neonatal mortality. It is frequently detected in premature neonates and occurs in the germinal matrix. It may occur due to fetal or maternal causes, or be idiopathic as in the present case. The differential diagnosis of IVH should be kept in mind in fetuses diagnosed with an intracranial mass on USG examination.

#### Scientific Responsibility Statement

*The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

#### Animal and human rights statement

*All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.*

#### Conflict of interest

*None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.*

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